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Ahmed N. Al-Masri
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Sustainable Development and Social Responsibility—Volume 2

Proceedings of the 2nd American University in the Emirates International Research Conference, AUEIRC'18—Dubai, UAE 2018

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Editors
Ahmed N. Al-Masri
Dubai International Academic City
American University in Dubai
Dubai, United Arab Emirates

Yousef Al-Assaf
Rochester Institute of Technology
Dubai, United Arab Emirates

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Preface

The 2nd American University in the Emirates International Research Conference (AUEIRC'18) was held on November 13–15, 2018 in Dubai. It has become one of the major events of the year in the field of sustainable development and social responsibility. AUEIRC'18 was organized under the patronage of His Excellency Sheikh Nahayan bin Mabarak Al Nahayan—Cabinet Member and Minister of Tolerance, United Arab Emirates. The conference had served as a platform for academicians, practitioners, scientists, and decision-makers from around the globe to engage in a dialogue on some of the most pressing issues in the drive toward sustainable development and social responsibility. The proceedings will be published in the Advances in Science, Technology & Innovation book series of Springer.

AUEIRC'18 highlighted the various aspects of sustainable innovations, smart technology, education and sustainability, human security and legislation, and creative business that can scale for the benefit of communities. The scope of the conference included a broad range of topics in different areas of sustainability that impact contemporary society. The AUEIRC'18 International Scientific Committee comprises over 60 international expertise in various fields as per the themes of the conference. The conference keynote speakers were highly profiled experts and researchers, more specifically: H.E. Dr. Rashid Alleem—Chairman of Sharjah Electricity and Water Authority (United Arab Emirates), Prof. Yousef Al-Assaf—President of Rochester Institute of Technology, Dubai (United Arab Emirates), and Prof. Toufic Mezher—Professor of Engineering Systems and Management, Khalifa University (United Arab Emirates).

It has received 164 abstracts and 103 full papers from 33 countries in six different tracks, namely, Sustainability and Smart Business, Sustainability and Smart Technology, Sustainability and Creative Industries, Sustainability and Social responsibility, Sustainability and Education, and Sustainability, Human Security and Legislation.

The panels were divided based on tracks and all papers were presented in 24 thematic sessions. Each session had a chairperson, while each paper had a discussant. A double-blind peer-reviewed process enabled 87 full papers to be accepted for publication (in two edited volumes) by Springer.

On behalf of the AUEIRC'18 Steering Committee, we would like to thank all the referees, track chairs, discussants, and paper authors. Special thanks to Prof. Muthanna G. Abdul Razzaq (Conference Chairperson), who contributed all resources at his disposal to ensure the high standard of the conference. We also thank the American University in the Emirates (AUE) Provost, Prof. Abhilasha Singh, for her contributions and for attending all the meetings to guarantee that the conference is on track. We likewise extend our gratitude to the Chairman of the AUE Board of Trustees, who was present on campus during the conference, for his valuable support. We also thank the members of the conference steering committee for their hard work, dedication, and continuous support throughout the preparation and implementation of the conference's activities. Moreover, we are grateful to the event management, information technology, auxiliary services, media, security, public relationship, and protocol teams. We

likewise extend our thanks to all faculty and staff members from different committees for their support in organizing the conference and ensuring its success.

AUEIRC'18 enabled undergraduate, graduate, and Ph.D. students from different academic institutions to participate in the conference and share their research achievements with an international community of academics and industry experts. Ten papers in total have been presented during the first day as part of the Master/Ph.D. session. Two papers presented by postgraduate students received the Best Paper Award: Ms. Noha Abd El-Rahman from British University in Egypt (BUE), Ph.D. student, for her research paper: "The Assurance of Sustainability Reporting: An Extra Fee or A Guarantee", and Ms. Wafa Aldamegh from Imam Muhammad Ibn Saud Islamic University (Saudi Arabia), Master student, for her research paper: "T-Mix a Threshold Based Cryptography Mixing Service Based on Mixcoin".

Overall, AUEIRC'18 was a high-quality event with remarkable success, although you must judge this matter for yourselves. We are optimistic that you will enjoy reading the collection of papers included in this book.

Dubai, United Arab Emirates

Dr. Ahmed N. Al-Masri
Prof. Dr. Yousef Al-Assaf

About This Book

The book presents high-quality research papers presented at the 2nd American University in the Emirates International Research Conference, AUEIRC'18, organized by the American University in the Emirates in Dubai, November 13–15, 2018. The book covers all dimensions of sustainable development and social responsibility which is broadly divided into four sections: Sustainability and Smart Technology, Sustainability and Social Responsibility, Sustainability, Human Security and Legislation, and Sustainability and Education. The topics covered under these sections are sustainable smart technology such as developing green curriculum for information technology, use ultrasonic velocity to predict quality of wheat, improve security features for visa system, factors affecting the cost of production of electricity and desalination plants, impact of smart traffic sensing in smart cities, smart healthcare system, simulation of Grey wolf optimization algorithm in painting digital forensics. The second track on Sustainability and Social Responsibility covers dimensions such as corporate social responsibility in the UAE, sustainable modes of mobility in new urban neighborhoods in the UAE, environmental communication, public discourse, and global media transforming fast travel forms, sustainable tourism development in historical cities. Sustainability, human security, and legislation covered topics of urban performance and sustainable environment, Eco-Certification as response on climate change, the criminal offence of tax evasion in law: case study, skills engineering in sustainable counter defense against Cyber extremism, the international law and challenges of transboundary water resources governance, the legal status of nuclear energy: case study, sustainable energy development and nuclear energy legislation in UAE, corruption-specific safety challenge, environmental management and sustainability, sustainable farming models for desert agroecosystems, future directions of climate change, earth and built environment toward new concept of sustainability. And finally, the track for sustainability and education deals with the role of humor in a sustainable education, multiple tools for innovative interdependent learning techniques in Higher Education, HEIs practices and strategic decisions toward planning for sustainable education programs, innovative pedagogy for higher educational institution, revised KHDA model of school improvement: identification of factors, and achieving sustainable development goals through higher educational institutions.

The papers in this book present original research work, findings and practical development experiences, and discussed many real-world challenges that cannot be easily handled with traditional methods. The exact solution of the challenges can be achieved with innovative approaches and sustainable business practices.

Contents

A Novel Nondestructive Ultrasonic Velocity and Attenuation Approach for Sustainable Quality Prediction of Wheat-Based Products

Hussein M. Elmehdi

Abstract

This paper presents a nondestructive novel approach for predicting the quality of wheat-based products using ultrasound longitudinal ultrasonic waves operated at 50 kHz, which are transmitted through various wheat samples. The velocity and attenuation coefficients were calculated using a signal processing technique based on measuring the transit time and amplitude changes of the signal. The acoustic parameters were then related to the mechanical properties of the wheat samples and correlated to the mechanical parameters determined from the mechanical testing micrograph, farinograph, and micro-extension tests. The results obtained in this study indicated that ultrasonic measurements at low frequencies allowed us to discriminate among wheat samples with a reasonable degree of confidence. Correlations between ultrasonic results and mechanical tests such as mixograph, farinograph, and micro-extension were found to be significant ($P \leq 0.05$) and in good agreement with the definitions of the parameters studied. To further explore the potential for ultrasound to be employed as a screening tool, the effect of the water content in different processes was investigated. Noticeable variations in both velocity and attenuation coefficient were observed. The results indicated that ultrasonic parameters (longitudinal phase velocity and attention coefficient) and the calculated longitudinal storage modulus were sensitive to differences in compositions of wheat samples, and hence, it can be used as a tool for sustainable quality prediction of wheat-based products.

Keywords

Quality • Gluten proteins • Ultrasound • Screening tests

1 Introduction

Wheat-based products are integral to our daily diet. From cereals to bread to almost every baked foods, wheat-based products are present in all our daily meals. For example, in Europe, the average person consumes between 40 and 100 kg of bread. In Middle East countries, the number is even higher in Middle Eastern countries, with Iran's annual consumption reaching 135 kg per person annually. These figures indicate the importance of studies focused on identifying quality attributes of wheat-based products and tools by which the effect of any of these factors can be accurately assessed. The standard approach focuses on assessing the contribution of each of the ingredients of wheat-based products. For any wheat-based product, the main ingredients include flour and its contents such as gluten protein, starch, and the subsequent processing attributes such as mixing time, water content, and air void size and distribution. In addition and upon the formation of the dough, which is the initial step for any process, other physicochemical factors such as the protein–starch interactions must also be considered (Zhou et al. 2014). Therefore, the quality of the end product of most wheat-based products (e.g., bread, pasta, noodles, and cakes) depends directly on how wheat-based products behave during processing, which is, in turn, a function of dough rheology (Delcour and Hoseney 2010). In conventional rheological tests, the performance of quality characteristics of the wheat-based doughs is evaluated empirically by evaluating the dough behaviors under different processing conditions such as mixing and baking times (Pagani et al. 2014). The most widely used empirical methods are mixograph and farinograph, which were invented in the 1920s, to empirically evaluate the protein quality characteristics of wheat and evaluate protein quality of wheat flour dough (Hermannseder et al. 2017). Due to the

H. M. Elmehdi (✉)
University of Sharjah, PO Box 27272 Sharjah, UAE
e-mail: hmelmehdi@sharjah.ac.ae

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complex structure of wheat flour dough, whose function is affected by several compositional and processing factors (Delcour and Hoseney 2010), the use of only one empirical method for the prediction of the final product quality may not provide all the information needed to determine the suitability of a wheat flour sample for a specific bakery product (Song and Zheng 2007). The drawback in such an approach lies in fact that it does not provide the effect of each of the ingredients on the quality of the end product based on rheological performance. Other approaches, which rely on measuring stress relaxation and dynamic oscillation, provide information on the effect of rheological parameters such as viscosity and elasticity on the quality of the end product (Chin and Martin 2014). Nuclear magnetic spectroscopy and near-infrared approaches have also been used to quantify or predict the quality of the end product. These approaches tend to be very expensive and take a long time, which raises the need for more rapid approaches that can give an accurate quantitative prediction of the quality of wheat-based products and cost-effective. One approach that has received considerable attention is acoustic waves at the ultrasonic range, i.e., frequencies above the human hearing range of 20 kHz. The sensitivity of ultrasonic waves to quality attributes stems from the fact that when incident ultrasonic wave propagates through heterogeneous medium, acoustic parameters including sound velocity, attenuation, and scattering are expected to be different as a result of variations of elastic properties in that medium. Ultrasonic attenuation is a measure of acoustic energy loss after the ultrasonic wave travels a distance z into the medium. Typically, there are two loss mechanisms, namely, absorption and scattering (Elmehdi et al. 2004). Both ultrasonic sound velocity and attenuation have been widely used to characterize soft tissues (Garcia-Alvarez et al. 2011) and are applied extensively to characterize several soft biological systems (Letang et al. 2001). The propagation of ultrasonic waves is characterized by longitudinal velocity (v_L) measurements that are obtained from compression waves. The velocity at which ultrasound waves travel through a material depends on the materials density (ρ) and the elastic moduli of the material including the bulk modulus (K) and modulus of rigidity (G) (Povey 1997).

For solids, the longitudinal velocity v_L is given by the following two expressions:

$$v_L = \left(\frac{K + \frac{4G}{3}}{\rho}\right)^{\frac{1}{2}} \tag{1}$$

While for a liquid medium, where the rigidity modulus is zero, the longitudinal velocity is given by the following expression:

$$v_L = \left(\frac{K}{\rho}\right)^{\frac{1}{2}} \tag{2}$$

For viscoelastic materials such as dough both elastic (storage) component and the viscous (loss) component need to be considered. The second important ultrasonic parameter to consider is the attenuation coefficient (α), which is determined from the energy losses encountered as the ultrasonic wave propagates through the sample. As the ultrasonic wave propagates through the sample, its amplitude and intensity falloffs exponentially as a function of depth, d. Mathematically, attenuation is defined in terms of attenuation coefficient (α), and the relative amplitudes according to the following expression:

$$A = A_0 e^{-ad} \tag{3}$$

where A_0 is the amplitude of the incident ultrasonic wave at the common interface, and d is the depth into the medium (or thickness), which is often referred to as the path length in attenuating medium. In general, the attenuation increases with increasing frequency.

The ultrasonic parameters (longitudinal velocity and attenuation coefficient) can be used to probe the mechanical properties of the material by calculating the viscoelastic moduli; namely, the elastic or storage component of the modulus and the viscous or loss component of the modulus, both of which can obtained from fundamental compression wave ultrasound measurements, and ω is the angular frequency.

Therefore, careful measurements of the longitudinal velocity and the attenuation coefficient will provide quantitative information about the viscoelastic properties and hence, the quality of the samples based on ingredients influencing the properties of the samples. Among the advantages offered by our ultrasonic approach include:

- Ultrasonic parameters are sensitive to different phases of the wheat-based doughs, especially the air cells, which is essential for the quality of the end product. Even though the effect of air voids will not be investigated in this paper, it has been shown in previous work that voids have a prominent impact of the measured parameters, i.e., longitudinal ultrasonic velocity and attenuation coefficient (Scanlon et al. 2002).
- The propagation of the ultrasonic wave, and hence its interactions with various phases of the dough, is not affected by the opacity of dough (Elmehdi et al. 2005).
- Ultrasonic equipment tends to be cheap and maybe employed online in during early phases of the production line to ensure quality is assessed at early stages of the processing (Awad et al. 2012).

2 Materials and Methods

Flour samples were milled from wheat, covering a range of dough strengths and protein content. A list of these samples, along with their properties, is presented in Table 1.

In the first experiment, ultrasound velocity and attenuation measurements were used to investigate gluten samples that were extracted from six flour samples covering a range of dough strengths and protein content. Three kinds of wheat used in these samples were field-grown in different locations across the provinces of Manitoba and Saskatchewan, Canada. The first category (varieties 1 and 2) is hard red spring wheat, which has the highest protein wheat content and is used for bread, hard baked goods, all-purpose flour, and flour blends. The subcategorization of extra healthy and robust is determined from the protein content where the protein concentration in the other active type is higher (varieties 3 and 4). The soft white spring wheat flour, which has lowest protein content among the screened wheats, however, it offers high yields to growers (varieties 5 and 6). It provides a whiter product for high-quality cakes, crackers, cookies, pastries, and Asian-style noodles (bakery products other than bread), and Middle Eastern flatbreads (Shewry et al. 2002).

In preparation for the ultrasonic experiment, first, a cohesive flour-water dough was formed by mixing 15 g samples with either distilled water only (0% saline) or 2% saline solution. After that, the starch was first washed out under distilled water or 2% saline solution depending on the treatment. The extracted gluten was then immediately transferred into the ultrasonic equipment to measure the transit time. For gluten samples that were subjected to a cooking treatment, the gluten was heated for 90 s at the boiling temperature of the water and then allowed to cool down to room temperature. After that, the gluten samples were sandwiched between the ultrasonic transducers (generator and receiver) forming a circular disk of specific thickness.

Table 1 List of varieties of samples investigated

Sample	Humidity (%)	Protein (%)	Ash (%)
Variety 1	9.09	13.98	1.75
Variety 2	9.14	13.63	1.73
Variety 3	9.12	14.32	1.86
Variety 4	9.09	13.43	1.77
Variety 4	9.11	13.83	1.67
Variety 5	9.15	15.86	1.68
Variety 6	9.15	15.92	1.79

The main two parameters measured in these experiments were the longitudinal velocity and attenuation coefficient, all of which were performed using the pulse transmission mode. A pulse generator-receiver was used; where the electromagnetic pulse was generated using a pulse generator-receiver produces EM signal that is converted into the ultrasonic signal by the piezoelectric transducer. One transducer was used as a generator, while the second transducer placed at the far end of the sample acts as a receiver. Figure 1 shows a schematic of the ultrasound setup.

The electromagnetic signal is converted into a mechanical signal of ultrasonic waves through the piezoelectric element in the generating transducer, which was coupled to the sample owing to the wet nature of the sample. After the ultrasonic signal travels through the sample, it is received by the second transducer where it is converted into an electromagnetic signal by the piezoelectric element in the receiving transducer. The signal is then amplified and captured on the oscilloscope and transferred to the computer for subsequent analysis. The main two measurements include the transit time, which is the time between two selected points on the reference signal and the first arrival time (i.e., the start of the first peak relative to the corresponding peak in the reference signal). The reference signal was taken with the two transducers in direct contact, i.e., $t = 0$. The longitudinal ultrasonic velocity is calculated from the fundamental velocity

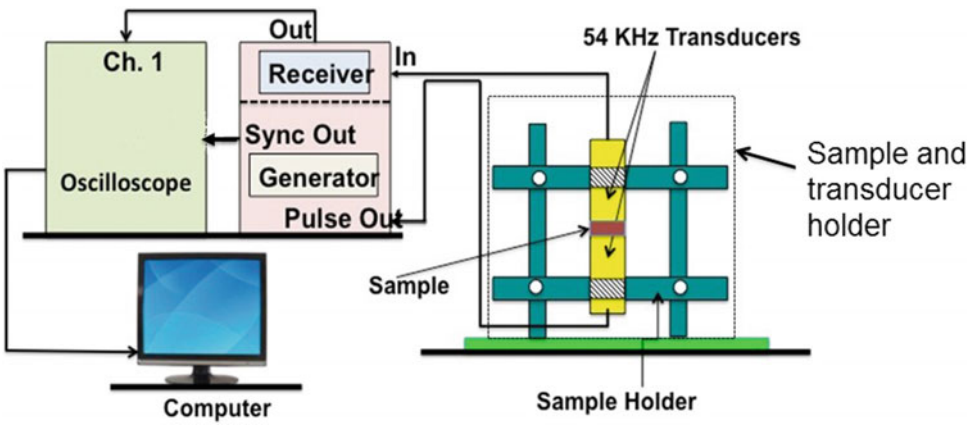

Fig. 1 Ultrasonic experiments setup

equation, i.e., the thickness of the sample (d) divided by the time taken to travel this distance:

$$v_L = \frac{d}{t_{\text{sample}}} \tag{4}$$

This equation represents the fundamental definition of the velocity, which can be related to Eqs. (1) and (2) to relate the longitudinal velocity to the elastic and physical properties of the material.

The attenuation coefficient (α) on the other hand, was calculated by measuring the relative amplitudes of the pulse that traveled through the dough of a specific mix time being analyzed at various thicknesses. This method of calculating attenuation relative to the least attenuating sample is following the attenuation calculations prescribed by (Shewry et al.2002). The equation for the attenuation coefficient (α) is determined from Eq. (2) by taking the natural logarithm of both sides of the equation and rearranging, as shown below:

$$\ln\left(\frac{A}{A_0}\right) = \alpha d \tag{5}$$

Therefore, the expression for the attenuation coefficient can be written as follows:

$$\alpha = \frac{1}{d} \times \ln\left(\frac{A_0}{A}\right) \tag{6}$$

where A_0 is the amplitude of the signal of the least attenuating sample, and A is the amplitude of the signal of the sample whose attenuation coefficient is being calculated.

Besides that, the limitation of the energy resources is pushing all the researchers and engineers to find new natural recourses and reduce the CO_2 increment. On the other side, cities are the base of economic growth and technological progress which the way for the legacy cities to expose the new world is becoming greener, more intelligent, more efficient, more attractive, more social and more digital which can even enhance the country economics.

3 Results and Discussion

To investigate the potential for using ultrasound as a quality screening technique, we examined gluten samples that were extracted from different flour varieties using different ingredients and processing approaches:

Treatment 1: Samples were mixed with distilled water only, zero NaCl, and zero cooking time.
Treatment #2: Samples were mixed using 2% NaCl and zero cooking time.
Treatment #3: Samples were mixed using 2% NaCl and 90 s cooking time.

The purpose of the three treatments was to investigate the flour strength, ingredients, and processing on the ultrasonic parameters due to the gluten rearrangement brought about by the addition of NaCl and elimination of some of the associated gluten bonding effects due to charge screening of the gluten polyelectrolyte by the counterions. The effects of the three gluten preparation treatments on ultrasonic velocity are summarized in Table 2. It is clear from these results that the magnitude of the ultrasonic velocity for the stronger variety (Glenlea) is higher than the weaker one (Fielder) by about 1000 m/s. Differences in ultrasonic velocity at this frequency for dough samples (rather than wet gluten) have previously been reported (Kovacs 1985), with velocities in doughs prepared from harder kinds of wheat being higher than those from softer wheat (although differences in velocity were not as pronounced as those reported for gluten samples here). It should also be noted that as the treatment of the gluten was changed so did the magnitude of the ultrasonic velocity, indicating that both NaCl concentration, as well as the cooking process, influence the gluten structure that is monitored by the ultrasonic signal propagation. The coefficient of variation was found to be the smallest for the third treatment, i.e., washing with 2% NaCl solution and 90 s of cooking time. This result is not unexpected since the effect of the addition of NaCl is to "order" the structure of the gluten.

These results indicate that ultrasound velocity in gluten prepared under all three conditions may indeed be used to differentiate among gluten extracted from different flour varieties. The p-values for each set of the reported velocities were computed using a two-tale test with a 95% confidence interval level. For all three cases, the p-value was less than 0.05%. To further explore the ultrasonic results, we correlated the velocity results to conventional dough quality tests including sedimentation of proteins in the surfactant SDS (SED), which is an indicator of end-use quality (Kovacs 1985). We also compared the velocity results to those of the mixograph development time (MDT) and total energy (TEG), and farinograph dough development time (DDT). The correlation results are summarized in Table 3. The linear correlation coefficient between our ultrasonic velocity measurements and the results obtained with conventional dough quality tests were low for treatment one (0% salt and zero cooking time), varying from 0.45 to 0.65, while the linear correlation coefficient is higher for treatments two and three, reaching as high as 0.99 for treatment three.

Table 2 Ultrasonic velocity for gluten samples for the three treatments

Variety	v (m/s) Treatment 1	v (m/s) Treatment 2	v (m/s) Treatment 3
Variety 1	1940 ± 90	1770± 97	1600 ± 95
Variety 1	1760 ± 93	1580 ± 90	1470 ± 95
Variety 1	870 ± 92	1140 ± 100	1080 ± 98

Table 3 Linear correlations with other screening tests

Screening test	Linear correlation coefficient Treatment 1	Linear correlation coefficient Treatment 2	Linear correlation coefficient Treatment 3
SED	0.51	0.68	0.99
MDT	0.49	0.64	0.83
TEG	0.45	0.71	0.86
DDT	0.56	0.60	0.87

In the next set of experiments, we examined the capability of ultrasonic parameters to discriminate among varieties of wheat flour doughs prepared with different water content. The aim of these experiments is utilizing the ultrasonic parameters to predict the quality of doughs based on water content. The ultrasonic velocity and attenuation coefficient were calculated using the same approach described earlier. The results are plotted in Figs. 2 and 3. As can be seen from both Figures, the velocity is slower for more hydrated samples, while the attenuation coefficient increases almost linearly as a function of increasing water content. The ratio of attenuation/velocity could be used as an indicator of the dough consistency, and thus also of the type of flour used, i.e., as a quality indicator.

The noticeable variations in both the velocity and attenuation coefficient to water content indicate the potential for using ultrasound as a low-cost tool for flour type and variety and to discriminate among flour types. It can provide complementary to conventional techniques, for wheat and gluten-free flour types.

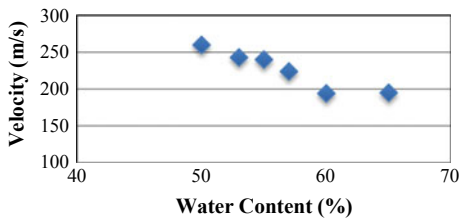

Fig. 2 The ultrasonic velocity as a function of water content

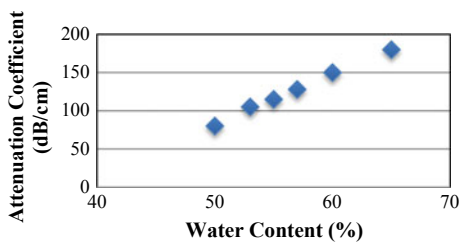

Fig. 3 The attenuation coefficient as a function of water content

4 Conclusions

The results presented in this paper show that ultrasonic velocity is sensitive to the structure and mechanical properties of doughs prepared from flours of various strengths. It was found that the ultrasonic velocity is indeed sensitive to protein content and processing conditions. These results demonstrate that ultrasonic techniques can be used to discriminate among flour types, which can be related to the quality of the end product. Also, ultrasonic parameters can be utilized to probe changes in physical, chemical, and biological properties of wheat proteins, which relate to noodle and pasta quality as well as baking quality. The sensitivity of ultrasound to measured differences between gluten from different cultivars shows its potential to be used as an early-generation selection tool for plant breeders. As an extension of the current research work, the author plans to examine the effect of other critical ingredients used in food processing and their effect on the quality of the end product. Besides, the effect of air bubbles, which were introduced during the mixing stages of food processing, needs to be examined. Ultrasonic parameters are expected to be sensitive to air bubbles since the variation in the density of the dough matrix and air bubbles is quite high.

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A Variable Neighborhood Search-Based Method with Learning for Image Steganography

Dalila Boughaci and Hanane Douah

Abstract

Image steganography is a security technique that used to hide secret information such as text or image in another cover image. The cover image, including the secret information, seems to be unchanged, and the hidden information can only be recovered by using a particular decoding technique. This paper proposes a variable neighborhood search (VNS)-based method for image steganography. The proposed VNS is combined with the least significant bits method (LSB) and enhanced with a learning process. LSB is the process of adjusting the lower bits of the pixels of the cover image. The least significant bit which is the eighth bit of some or all bytes inside the cover image is replaced by bits of the secret information. We improve LSB by combining it with VNS. The VNS method is a local search meta-heuristic working on a set of different neighborhoods. The basic idea is a systematic change of a certain number of neighborhoods combined with a local search. The objective is to explore the search space efficiently in order to locate the appropriate positions in the cover image where inserting the secret information. Further, a learning process is added to VNS in order to enhance the performance. The proposed methods are evaluated on some series of images. The numerical results are exciting and demonstrate the benefits of the new techniques for image steganography.

Keywords

Image steganography • Security • Optimization • Local search • Variable neighborhood search • Meta-heuristics

D. Boughaci (✉) · H. Douah
Computer Science Department, LRIA-FEI- USTHB, BP 32
El-Alia Bab-Ezzouar, 16111 Algiers, Algeria
e-mail: dboughaci@usthb.dz

1 Introduction

Steganography is the science of hiding secret information where the goal is to ensure a secret communication and avoid attracting suspicion about the existence of hidden data. The secret information is tucked inside the cover medium such that only the sender and receiver can detect the existence of the secret data. The secret data can be hidden in a text document, an image, a video, etc. (Provos and Honeyman 2003; Inoue et al. 2002; Li et al. 2011; Cachin 2002).

This work is focused on image steganography. We use the image as a cover file for hiding secret information that can be a text or an image. As shown in Fig. 1, in a generic steganography system, we have secret information to be embedded. The secret information can be a text document, an image, or so on. The cover medium is the data file in which the information will be embedded. When applying a steganographic technique, we obtain a *Stego* medium, which is the cover medium that contains the embedded information. We use a key which is a secret data needed for the embedding and extracting processes. This data is known only by sender and receiver.

In order to hide information in the cover medium, some particular bits in the cover medium are replaced by the bits of the secret data. By using steganography, an encrypted file can still hide information, even if the encrypted file is decrypted; the hidden message may not be visible.

The steganography is an exciting technique to hide secret information without arousing both human attention and analytical software. This technique has been used in various applications in particular when encryption is prohibited or as a supplement to encryption. Various methods have been studied for steganography (Fridrich et al. 2002; Das et al. 2008). Among them, we give the following ones: the Matrix Embedding technique (Arjun et al. 2007), the heuristic optimization (Sachnev et al. 2009), the genetic algorithms (El Shafie et al. 2008), the least significant bits

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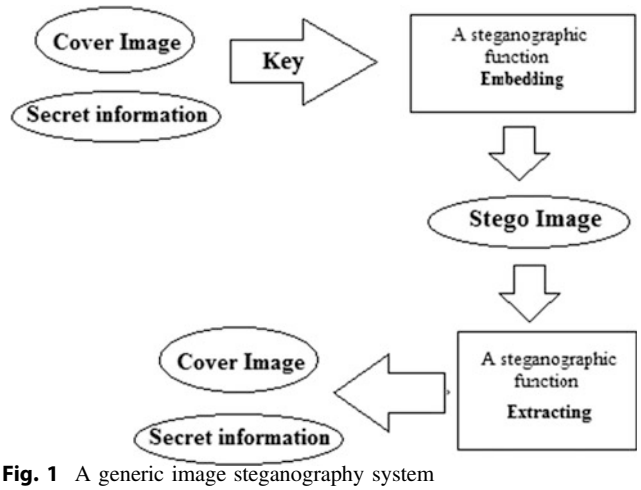


Fig. 1 A generic image steganography system

(LSB) method (Nosrati et al. 2011; Fridrich et al. 2001; Kavitha et al. 2012) and the stochastic local search combined with LSB (Boughaci et al. 2010). LSB (least significant bit) is a well-known technique for hiding information in the cover image where the principle is based on the modification of the least significant bit of each pixel in the image.

The least significant bit (LSB) is a well-known technique for hiding information. LSB is used to hide secret information in the cover image. This is done by replacing the eighth bit of some or all bytes inside the cover image by the bits of the secret information. However, when using the pure LSB technique, the obtained Stego image after the embedding process was not identical to the original one. In the hope to enhance the performance and develop an efficient steganography tool, we propose to combine LSB with the variable neighborhood search (VNS). VNS is a local search meta-heuristic with multiple neighborhood structures. Various variants of VNS have been proposed, but the basic idea is a systematic change of neighborhood combined with a local search. In this work, first, we propose to enhance the LSB performance by using the VNS meta-heuristic. The VNS method is used to locate the appropriate positions in the cover image, where the secret information will be embedded. Then, we propose a new variant of VNS with a learning process. The proposed methods are evaluated on some series of images and compared with the LSB method to show its performance.

The rest of the paper is organized as follows: Sect. 2 gives a background on the least significant bits (LSB) method. Section 3 presents the proposed VNS-based approaches for image steganography. Section 4 details the experiments and gives some numerical results. Finally, Sect. 5 concludes and gives some future works.

2 The Least Significant Bits (LSB) Method

The least significant bit (LSB) is a well-known steganographic method where the main principle is the adjusting of the lower bits of the pixels of the cover image. We note that an image is made of a set of pixels where a pixel is the smallest addressable element of a picture. The black-and-white image is made of pixels in different shades of gray. The color image is made of colored pixels. Each pixel represents the light intensity at a single point in the image. According to the RGB model, a pixel is composed of three components: the red, the green, and the blue color (Inoue et al. 2002; Ford 1998).

The RGB model is a color model in which the color red (R), the color green (G) and the color blue (B) are used together to reproduce a broad array of colors. The color image usually uses 24 bits for color representation.

The LSB method was used for image steganography where the eighth bit (the bit number 8 is called the least significant bit) of each byte of the image is replaced with the bit of the secret information (Ford 1998).

The main steps of the LSB process can be given as follows (Ford 1998):

- Browse all pixels of the cover image.
- Find the value of the color of each pixel between (0 and 255) and convert it to binary.
- Convert the secret information to be hidden in binary.
- For each bit of the secret information, replace the last bit of the color of each pixel color by this bit.
- Hide three bits of the information in each pixel and save the new color.
- Save all changes in the image to obtain the new image.

For instance, Fig. 2 shows the first step of the LSB method. The cover image is accessible as a series of bytes. Depending on the image format, a pixel may be represented by one or more bytes. For the 24-bit format of images, we use one byte for the red (R) color, one byte for the green (G) color and one byte for the blue (B) color.

As shown in Fig. 3, in the second step of LSB, we read from the text file and access to its bits. Then, we use the binary representation of the secret message.

When applying the LSB technique, we integrate the secret information in the least significant bits of this part of the image, as shown in Fig. 4.

2.1 The Data Encoding

The data encoding is the process of inserting secret information into the cover image. When we use the LSB technique to encode hidden data in an image, we follow these main steps:

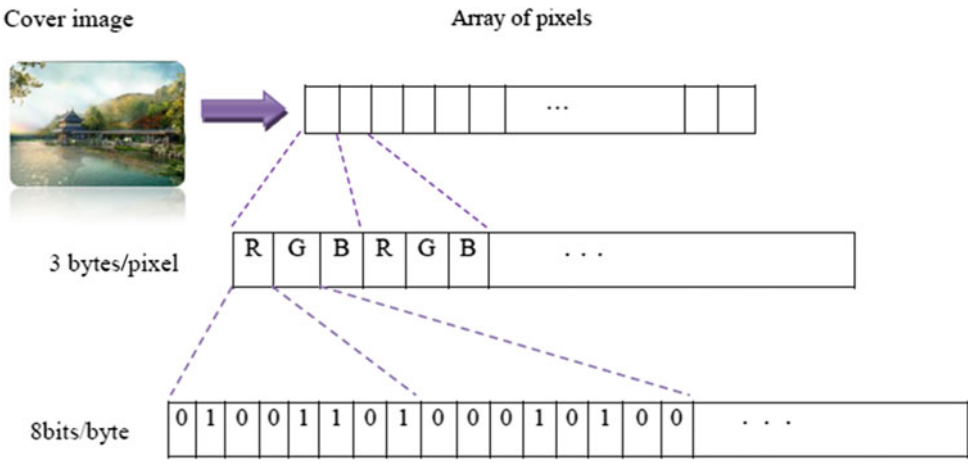


Fig. 2 Access to the bits of an image

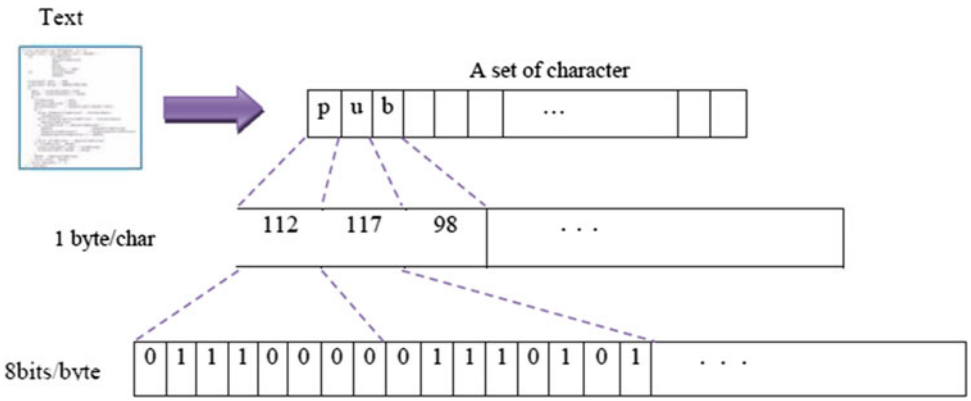


Fig. 3 Access to the bits of the text file

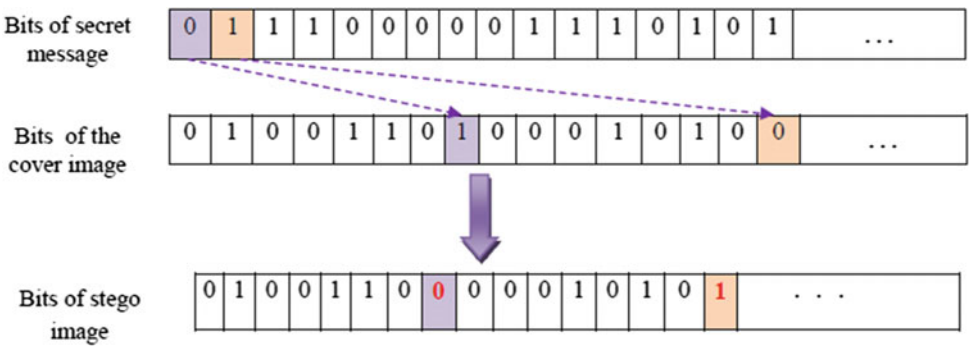


Fig. 4 Inserting bits of the secret information in the image

- Step 1: Extraction of the pixels of the cover image.
- Step 2: Extraction of the secret data to be hidden.
- Step 3: Extraction of the key to be used in the encoding process.
- Step 4: Start with the first pixel and pick characters of the key and place it in the first component of the pixel.
- Step 5: Place some terminating symbol to indicate the end of the key.
- Step 6: Insert characters of the data file in each first component of next pixels by replacing it.
- Step 7: Repeat Step 6 until all the characters have been embedded.
- Step 8: Place again some terminating symbol to indicate the end of data.
- Step 9: Get the *Stego* image.

2.2 The Extraction Process

The extraction process is the inverse operation that permits to obtain the hidden secret data from the least significant bit of the pixels within a cover image. The receiver can extract the hidden message by using the Stego-key.

To extract the hidden data from the *Stego* image, we follow these steps:

- Step 1: Extract the pixels of the *Stego* image.
- Step 2: From each pixel, we extract the three colors RGB (red, green, blue).
- Step 3: Convert each color in binary.
- Step 4: Recover the eighth bit of each color and always keep the bit order.
- Step 5: If the number of recovered bits is equal to eight, then convert to decimal and get the corresponding character in ASCII code.
- Step 6: Follow step 5 and six until the key indicates the end of the secret data.
- Step 7: reconstruct the secret data.

3 The Proposed VNS Based Approaches

As already said, the LSB is the process of replacing the least significant bits with embedded data bits. However, when the amount of embedded data is increased, the image will be distorted, and it would be challenging to integrate the secret information without changes being noticeable.

In order to enhance the performance of the LSB technique, we propose a variable neighborhood search (VNS) meta-heuristic to find the appropriate bits to be used to store the secret information. We use the same principles of LSB to embed the secret information into the cover image. However, we apply VNS that integrates the information optimally in the cover image, which makes it difficult to detect the existence of data in the cover medium.

3.1 VNS Method for Image Steganography

The variable neighborhood search (VNS) is a local search meta-heuristic working on a set of a different neighborhood. The basic idea is a systematic change of k neighborhoods combined with a local search (Mladenovi and Hansen 1997).

Local search (LS) is an iterative algorithm that starts with a random solution to the problem. Then it explores the search space to locate reasonable quality neighbor solutions (Boughaci et al. 2010; Hoos and Stutzle 2005; Ouaddah and Boughaci 2014). Neighbor solutions are obtained by applying a moving operator on the current solution. An essential move is a change in the current solution. The exploration process is repeated for a certain number of iterations fixed empirically or when the optimal solution is reached.

3.2 Main Components of the Proposed Method

The proposed method starts with converting the cover image into binary then decomposed it into a set of 4-bit blocks. The same process is applied to the data to be embedded. We convert the secret information in binary and divide into 4-bit blocks.

Then, we call the VNS process to search blocks in the image that are similar to the blocks of the secret information. The similar position blocks which we found in the image are used to create a key. The different components of the proposed method are detailed in the following.

The solution representation. A solution is a set of positions in the image where the bits of the secret information will be embedded. For each bit of the secret information, a position in the image is associated. A solution is then the correspondence between the blocks of the information to hide and the image blocks.

The initial solution of VNS is generated randomly. We insert randomly the blocks of the secret information in the image. Figure 5 gives an example of an initial solution

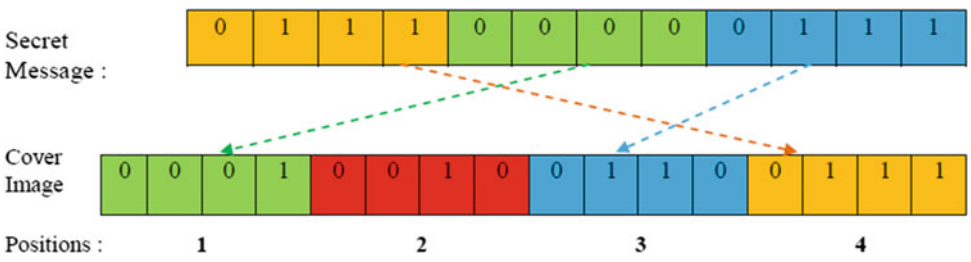


Fig. 5 Inserting bits of the secret information in the image

where the blocks of the secret information are inserted into the cover image.

The objective function. The VNS method uses an objective function to evaluate and measure the quality of the solutions generated during the search process. This function value is computed in two steps. For each block, we use the Hamming distance to measure the difference between the bits of the secret information to be hidden and the blocks of the cover image. We called this valuation as fitness. The possible fitness value varies between 0 and 4 because we used a block of 4 bits. If this function is equal to zero, it means that the best position is found for the block. Otherwise, we launch a search step on the left and right neighbor of each block, and we will compute again the new fitness value of the block until finding the value of 0. The fitness value of a block is given as follows:

Fitness (block) = Hamming Distance (block of secret information, the block of the cover image).

This fitness is equated to the difference between the bits of the block of the secret information to be hidden and the blocks of the cover image. The overall fitness for all the blocks of a given solution(s) is as

$$\textbf{Global Fitness} = \sum_{i=1}^{\text{numberofblock}} \text{Fitness (block)}$$

Neighbor solutions. The proposed VNS starts with a random initial solution, and then a neighbor solution is selected to be the next current solution for the next iteration. Neighbors' solutions are generated by modifying the position of a given block from the current solution. This is done by using a move or a structure of neighborhood. We use 11 structures of neighborhood ($k = 11$) which are given in the following:

- N1 ($k = 1$): where the position of a given block is modified randomly. This means that the new position of a given block is chosen randomly between 0 and the length of the cover image as given by the following pseudo-algorithm:

  Input: Current solution S ;
  Begin
  1: **For** each block of S **do**
  2 :position (block)= Random (0, image length);
  3: **end**
  end.
- N2 ($k = 2$): this move is made by replacing the position of a given block by the position of its left neighbor as follows:

  Input: Current solution S ;
  Begin
  1: **For** each block of S **do**
  2 :position (block) = position (block) – 1 ;
  3: **end**
  end.
- N3 ($k = 3$): this move is made by replacing the position of a given block by the position of its right neighbor as follows:

  Input: Current solution S ;
  Begin
  1: **For** each block of S **do**
  2 : position (block) = position (block) + 1 ;
  3: **end**
  end.
- N4 ($k = 4$): where the position of two given blocks of the current solution is randomly modified simultaneously.

  Input : Current solution S ;
  Begin
  1 : **For** each 2 blocks of S **do**
  2 :position (block 1) = Random (0, image length) ;
  3 :position (block 2) = Random (0, image length) ;
  4: **end**
  end.
- N5 ($k = 5$): this move is the permutation between the positions of two given blocks, as shown by this pseudocode. If the number of blocks in our solution is odd, the last block keeps its initial position.

  Input : Current solution S ;
  Begin
  1 : **For** each 2 blocks of S **do**
  2 : position (block 1) = position (block 2) ;
  3 : position (block 2) = position (block 1) ;
  4: **end**
  end.
- N6 ($k = 6$): where the position of the two given current blocks is shifted to the left. This move is not applied to the two first blocks of the solution because there will be an overflow. An example of this move is depicted in Fig. 6.

  Input : Current solution S ;
  Begin
  1 : **For** each 2 blocks of S **do**
  2 : position (block 1) = position (block 1) – 1) ;
  3 : position (block 2) = position (block 1) – 2) ;
  4: **end**
  end.
- N7 ($k = 7$): where the position of the two given blocks is shifted to the right. This move is not applied to the two

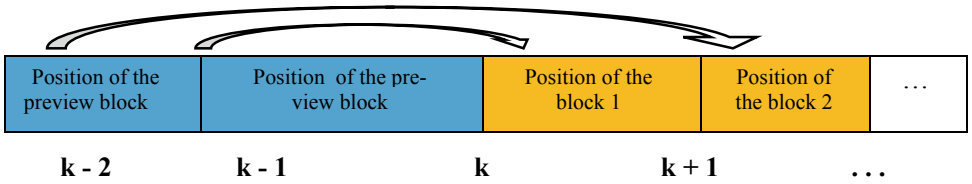


Fig. 6 Modification of the current solution by applying the move N6

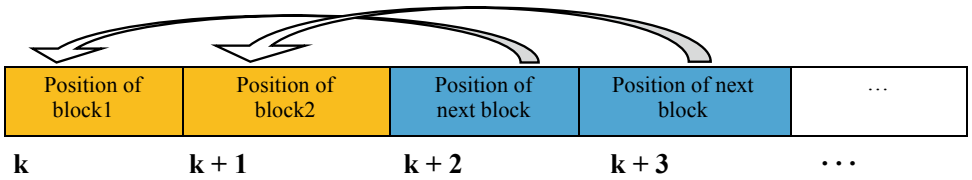


Fig. 7 Modification of the current solution by applying N7

last blocks of the solution because there will be an overflow. An example of this move is depicted in Fig. 7.

Input : Current solution *S* ;
Begin
1 : **For** each 2 blocks of *S* **do**
2 : position (block 1) = position (block 1) + 2) ;
3 : position (block 2) = position (block 1) + 3) ;
4: **end**
end.

- N8 (*k = 8*): where the position of three given blocks of the current solution is randomly modified.

Input : Current solution *S*;
Begin
1 : **For** each 3 blocks of *S* **do**
2 :position (block 1) = Random (0, image length) ;
3 :position (block 2) = Random (0, image length) ;
4 :position (block 3) = Random (0, image length) ;
5: **end**
end.

- N9 (*k = 9*): this move is the permutation between the positions of three given blocks, as shown in the following pseudocode.

Input : Current solution *S* ;
Begin
1 : **For** each 3 blocks of *S* **do**
2 : position (block 1) = position (block 1) +1 ;
3 : position (block 2) = position (block 1) +2;
4: position (block 3) = position (block 1) ;
5: **end**
end.

- N10 (*k = 10*): where the position of three given blocks is shifted to the left. This move is not applied to the three first blocks of the solution because there will be an overflow. An example of this move is depicted in Fig. 8.

Input : Current solution *S* ;
Begin
1 : **For** each 3 blocks of *S* **do**
2 : position (block 1) = position (block 1) – 1) ;
3 : position (block 2) = position (block 1) – 2) ;
4 : position (block 3) = position (block 1) – 3) ;
4: **end**
end.

- N11 (*k = 11*): where the position of three given blocks is shifted to the right. This move is not applied to the three last blocks of the solution because there will be an overflow. An example of this move is depicted in Fig. 9.

Input : Current solution s ;
Begin
1 : **For** each 3 blocks of S **do**
2 : position (block 1) = position (block 1) + 3) ;
3 : position (block 2) = position (block 1) + 4) ;
4 : position (block 3) = position (block 1) + 5) ;
5: **end**
end.

Stopping criterion. The proposed VNS method starts with a random solution and tries to explore the search space looking for reasonable solutions. When the image block is identical to the block information, the position search

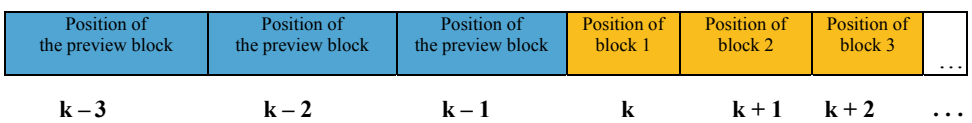


Fig. 8 Modification of the current solution by applying N10

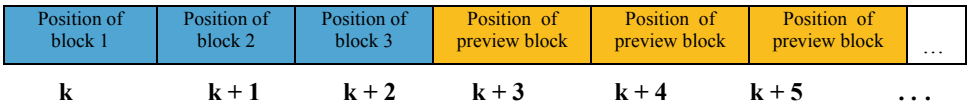


Fig. 9 Modification of the current solution by applying N11

process stops for this block and continues for the remaining blocks. At each iteration, we chose the best neighbor solution according to the fitness function. If the fitness function is equal to zero, the search is terminated. Otherwise, the process is repeated for a maximum number of iterations fixed empirically.

3.3 First Variant: VNS with Local Search for Image Steganography

The first variant of the proposed VNS method for image steganography uses the local search to search for the optimal solution. The method starts with an initial random solution. We assign a random position (in the interval of the length of the cover image) for each block of the secret information to be hidden. Then we start the search in the different 11 neighborhoods already detailed above. The aim is to search for the optimal positions in the cover image that we will be used to insert the secret data. We use the fitness function as a measure to evaluate the quality of the generated neighbor solutions. The best ones are selected. When there are no reasonable solutions in the current neighborhood, we leave this neighborhood and search in the next ones in the same way. We search from one neighborhood to another until the last block of our secret information is inserted correctly. The best solution is saved in a file to be later used for the extraction of our hidden information. The VNS with local search method is sketched Algorithm 1.

Algorithm 1. LSB with VNS for Steganography
Begin
1: Convert the secret data in binary.
2: Convert the cover image to binary.
3: Cut the secret data and the image in 4-bit block.
4: For each block C of the secret data **do**
5: Insert the secret information blocks: Random (0, image length);
6: Fitness_block = 4;
7: **end**
8: **Repeat**
9: k = 1; //the neighborhood structure N1
10: **For** each block C of the secret information **do**
11: Recover the block of the image corresponding to its initial position;
12: Compute the fitness of this block
13: **if** (fitness_block > 4) **then**
14: Generate the neighbor position according to the neighborhood structure k.
15: Compute the new fitness for this block
16 : **if** (new fitness_block < current fitness_block) **then**
17 : position (C) = new position; fitness_block = new fitness_block;
19: **else** stop searching in this neighborhood;
20: **end**
21 : k = k + 1 ; // go to the next neighborhood structure
22: **Until the** last block of the secret information.;
23: **end.**
From line 10 à 20, we call the local search process with a neighborhood structure k (1 ≤ k ≤ 11).

3.4 Second Variant: VNS with Learning for Image Steganography

The second variant improves the previous one in terms of execution time. We use a table of the index (*tb_op_map*) to memorize the blocks of information to hide that already have an improved solution (or a better position in our cover image). In other words, when the optimal position is found for a given block during the search process, then this position is inserted in the table of the index. The second variant is sketched in Algorithm 2.

4 Experiments

This section aims to present the numerical results found by the proposed methods. The code source is written in C# under Microsoft Visual C# 2010 Express and run on a machine with the following characteristics:

- One processor: Pentium (R) Dual-Core CPU 2.30 GHz,
- A RAM of 2.00 GB,
- A hard drive: 300 GB,
- An operating system: Professional Windows 7, and
- A screen resolution: 1366 * 768.

Algorithm 2. LSB with improved VNS for Steganography
Begin
1: Convert the secret data in binary.
2: Convert the cover image to binary.
3: Cut the secret data and the image in 4-bit block.
4: For each block C of the secret data **do**
5: Generate a random value to insert the secret information blocks: Random (0, image size);
6: Fitness_block = 4;
7: **end**
8:**For** (**i** from **1** to **16**) **do**
9: tb_op_map[i] = -1;
10: **end;**
11: Repeat
12: k = 1; //the first neighborhood structure N1
13: **For** each block C of the secret information **do**
14: **If** (tb_op_map[C_in_decimal] < 0) **then**
14: Recover the block of the image corresponding to its initial position;
15 : Compute the fitness of this block : fitness_block = distance hamming (block_image, block_information);
13: **if** (fitness_block > 4) **then**
14: Generate the neighbor position according to the neighborhood structure k.
15 : Compute the new fitness for this block
16 : **If** (new fitness_block < **current** fitness_block) **then**
21: **If** (new fitness_block <= 4) **then**
22: tb_op_map[C_in_decimal] = new position;
24: **else** position (C) = newposition;
25: fitness_block = new fitness_block;
26: **else** stop searching in this neighborhood;
27: **else** fitness_block = 4 ; tb_op_map[C_in_decimal] = position block ;
30 : **else** position (C) = tb_op_map[C_in_decimal] ; fitness_block = 4 ;
33 : **end**
34: k = k + 1;
35 :**Until** last block of the secret information ;
36: **end.**

4.1 Numerical Results

In this section, we evaluate the proposed methods on some series of images. For the comparison purpose, we use as measures:

- the quality of the image measured by the peak signal-to-noise ratio (PSNR),
- the execution time concerning the encoding of the information, and
- the size of the secret information.

The PSNR formula is calculated as follows:

PSNR = $10 * \log_{10} (d^2/\text{MSE})$.

MSE = $(\text{MSE}_1 + \text{MSE}_2 + \text{MSE}_3)/3$, where MSE_k denotes the mean square of the k-step forecast errors, $k = 1, 2, 3$;

$$\text{MSE}_k = \sum_{i=0}^{m} \sum_{j=0}^{n} \left(|co - cs| \right)^2 / (m * n).$$

$d = 255$, CO = is the color of the original image (RGB), CS = is the color of the *Stego* Imager (RGB), n = is the height of the image, m = is the width of the image.

When the two compared images are identical, the MSE is equaled to zero (0), and the PSNR is equaled to ∞.

Test 1.

Table 1 shows the results obtained by the LSB method, the VNS with local search, and the VNS with learning methods when the secret information is a text document. Figure 10 shows the cover image and the *Stego* image obtained when applying the VNS method to hid information into the cover image. The first column of Table 1 gives the size of the image. The second column gives the size of the secret information to be hidden.

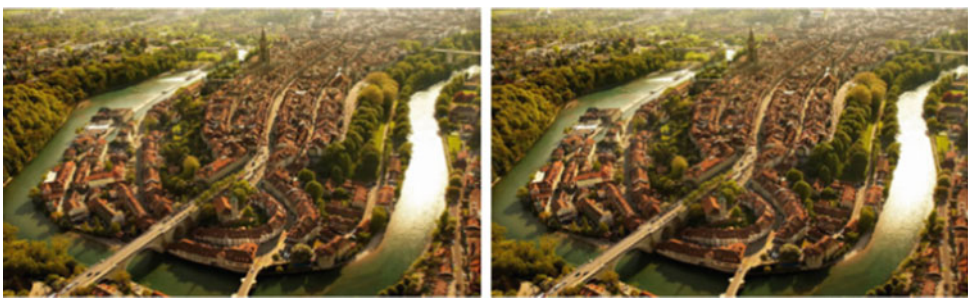
The third column gives the applied method. The fourth column shows the time consumed by each method. Finally, the fifth column gives the PSNR for each method. When the original and the *Stego* images are identical, the value of PSNR is equaled to ∞; it means that the cover image remains unchanged. This means that the secret information is embedded successfully. From Table 1, we can see that the two proposed VNS variants are better than the LSB method.

Test 2.

Tables 2, 3 and 4 show the results obtained by the LSB method and the VNS with learning methods when the secret information is an image. We give only the results obtained with the VNS with learning because the VNS variant without learning takes too much execution time. Figures 11, 12 and 13 show the cover image, the secret image, and the *Stego* image obtained when applying the VNS method.

Table 1 Numerical results of Test 1

Size of the cover image	Size of the secret information	The method	Encoding time (h: m: s: ms)	PSNR
640 * 480 pixels	4 Ko	LSB	(00 :00 :00 :07)	68.0491
		VNS (LS)	(02 :57 :20 :10)	∞
		VNS (LS with learning)	(00 :00 :12 :23)	∞
640 * 480 pixels	8.67 Ko	LSB	(00 :00 :00 :17)	65.5676
		VNS (LS)	(09 :38 :47 :12)	∞
		VNS (LS with learning)	(00 :00 :12 :78)	∞



(a) Original Image (b) Stego image generated with VNS

Fig. 10 The original and the *Stego* images of Test 1

As done with Table 1, we give in Tables 2, 3 and 4 the size of the image, the size of the secret image to be hidden, the applied method, the time consumed by the method, and finally the PSNR of the method. We remark that when the original and the *Stego* images are identical, the value of PSNR is equaled to ∞, it means that the cover image remains unchanged. This means that the secret information is embedded successfully. From Tables 2, 3 and 4, we can confirm that the proposed VNS method is better than the LSB method.

Discussion of the results. From the numerical results, we can see that he PSNR for the LSB method has a finite value, which means that the original image and the image *Stego* are not the same. There is modification after the encoding process. Whereas for the two VNS variants, the PSNR value always tends toward infinity, which implies that the cover image remains the same.

For the execution time, we can see that LSB takes the shortest time compared to other methods because LSB does only the insertion. However, VNS does a careful search to

Table 2 Numerical results of Test 2(a)

Size of the cover image	Size of the secret information	The method	Encoding time (h: m: s: ms)	PSNR
1920 * 1200 pixels	403 * 335 pixels	LSB	(00 :00 :00 :43)	71.7509
		VNS (LS with learning)	(00 :00 :24 :86)	∞

Table 3 Numerical results of Test 2(b)

Size of the cover image	Size of the secret information	The method	Encoding time (h: m: s: ms)	PSNR
1920 * 1200 pixels	640 * 416 pixels	LSB	(00 :00 :01 :15)	67.7486
		VNS (LS with learning)	(00 :00 :08 :99)	∞

Table 4 Numerical results of Test 2(c)

Size of the cover image	Size of the secret information	The method	Encoding time (h: m: s: ms)	PSNR
623 * 720 pixels	600 * 600 pixels	LSB	(00 :00 :00 :80)	68.2323
		VNS (LS with learning)	(00 :00 :06 :93)	∞

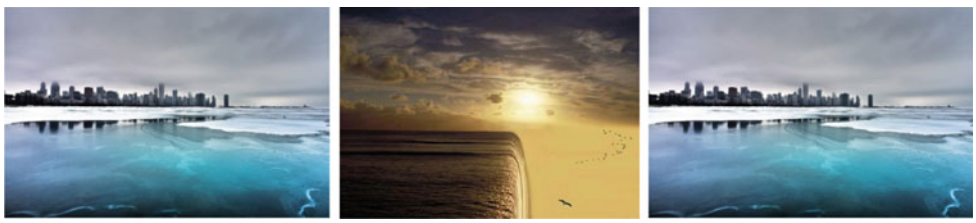


Fig. 11 The original, secret, and the *Stego* images of Test 2(a)

(a) Cover Image (b) Secret Image (c) stego -Image with VNS

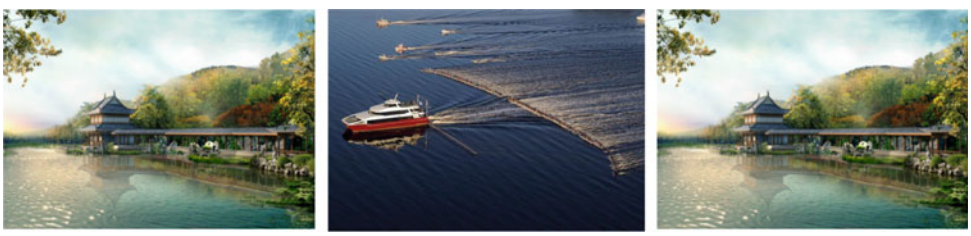


Fig. 12 The original, secret, and the *Stego* images of Test 2(b)

(a) Cover Image (b) Secret Image (c) stego -Image with VNS

Fig. 13 The original, secret, and the *Stego* images of Test 2(c)

(a) Cover Image (b) Secret Image (c) stego -Image with VNS

find the appropriate positions where the information will be inserted.

The execution time increases depending on the size of the information to be hidden and the coverage mage. We also remark that the VNS with learning is more rapid than VNS in terms of response time. Both VNS and VNS with learning methods are similar in terms of quality solutions. Both VNS and VNS with learning succeed in finding good results compared to LSB.

5 Conclusion

The image steganography is a way to hiding secret data in a cover image. The hidden data is embedded into the cover image and remains undetectable by sight. In the hope to develop an efficient technique for image steganography, we proposed a combination of the LSB with a variable neighborhood search meta-heuristic. The LSB technique is a simple steganography method that permits to hiding information in an image by using the least significant bits of pixels. However, we found that the standard LSB was not valid to hide information in the image because the size of the image increases significantly after inserting information which facilitates the discovery of the hidden information. This work studied three methods for image steganography: the LSB technique for hiding information in images by using the least significant bits of pixels, the VNS with LSB, and VNS with learning combined with LSB. The three methods are evaluated on a series of images. For the three proposed methods: LSB, LSB + VNS, and LSB + VNS with learning, we decomposed both the image and the secret message in 4-bit blocks. The numerical results are encouraging and demonstrate the benefits of the new VNS approaches for image steganography. The two variants of VNS are better than LSB. When the VNS method is used in combination with LSB, the original image remains unchanged which means that the secret information is embedded successfully. This means that VNS succeeds in finding appropriate positions in the cover image to embed the secret data. Further, the VNS with learning is rapid than the VNS with local search. As future work, we plan to validate our approach on the video files.

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Achieving SDGs Through Higher Educational Institutions: A Case Study of the University of Bahrain

Ahmed Buong

Abstract

This paper explores the role of higher educational institutions (HEI) in achieving sustainable development goals approved and promoted by the United Nations to ensure global sustainability. The paper empirically examines the conformity of Bahrain's Higher Education Council's (BHEC) Strategy and its Research Strategy with the norms of Sustainable Development Goals promoted by the United Nations. It also maps the performance of the University of Bahrain (UoB) in the context of these national strategies and SDGs. The guidelines published by SDSN Australia/Pacific 2017 have been used as a template to measure the performance of the University of Bahrain on multiple parameters. The University of Bahrain's transformational plan has a high degree of alignment with the goals of its Higher Educational Council and Research strategy. It also found that the newly developed Ph.D. and MSc programs of the University of Bahrain contributed immensely to the SDGs as recommended by the SDSN Australia/Pacific. Empirical evidence shows that higher education institutions can play a significant role in achieving the SDGs promoted by the United Nations. The study can also explore the possibility of acceleration and funding of programs relating to SDGs through higher education institutions for more sustainable global development.

Keywords

Sustainable developments goals • Higher educational institution • University of bahrain • SDGs • SDSN • United nations

1 Introduction

HEIs are vast societal contributors and high impact influencers on their communities, moreover, the conformity of HEIs strategies and plans with the SDGs will ensure more extensive reach of its influence and impact. The guidelines published by SDNS stated several methods in which HEIs may contribute to the achievement of SDGs, these include (i) learning and teaching, (ii) research, (iii) governance culture, and operations (iv) External leadership. This chapter will review the methods above against academic literature.

1.1 Learning and Teaching

The first method, through which HEIs can contribute to the achievement of the SDGs, involves learning and teaching (SDSN 2017). This method is aimed at equipping students with the necessary competencies required to address the multitude of sustainability challenges. Several goals within the SDG list that relate directly to this method have been highlighted in the SDSN report (2017) and these include: providing both genders with unimpeded access to education, ensuring that individuals have the appropriate vocational and entrepreneurial skills required for the modern economy, endowing students with the ability to manage sustainability challenges and creating a suitable environment for learning and ensuring the presence of qualified teaching staff.

Moreover, active learning and teaching are also stated to be essential prerequisites for the achievement of the SDGs as a whole (ibid). The SDSN has also provided recommendations on practical implementation, and this involves the development of curricula that effectively integrates learning outcomes that promote SDGs, advocacy for change of government policies to further emphasizes SDGs, the training and development of external stakeholders as well as the empowerment of students.

A. Buong (✉)
University of Bahrain, Sakhir, Kingdom of Bahrain
e-mail: Aybuong@uob.edu.bh

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The literature on the subject of learning and teaching to promote SDGs in HEIs offers varied perspectives. To begin with, research by Khalili et al. (2015), discusses the importance of curriculum design for the purposes of promoting less environmentally harmful industrial production practices. Khalili et al. (2015), indicate that curriculum design is a necessary first step for the development of human capital, which is in turn necessary to create the basis through which sustainability challenges can be overcome. Similarly, Adomßent et al. (2014) have examined the growing importance of designing management education programs to promote responsible and sustainable behavior and have suggested that allowing instructors and department heads autonomy to devise curricula is highly crucial in this regard.

Besides, several articles have attempted to assess methods through which curricula can be redesigned to incorporate sustainability in the field of engineering (Rose et al. 2015; Maalki and Paatero 2015). Both sets of authors recommend an approach based on trial and error that focuses on the further development and continued usage of best practices, while ineffective practices are abandoned.

Leal Filho et al. (2015), have discussed another critical element related to learning and teaching that has been highlighted in the SDSN report (2017) and this involves advocacy and influencing policymakers to tailor educational policy according to SDGs. According to the authors, this remains one of the key challenges facing academia, and other societal stakeholders as educating policymakers remain key to the development of effective action plans and policies. Barth et al. (2007) have established. The importance of diverse learning environments (including formal and informal) to develop competencies associated with sustainable development. Lastly, Verhulst and Lambrechts (2015) have emphasized the importance of the empowerment of all stakeholders in a bid to enact institutional change.

1.2 Research

The highly complex sustainability problems facing humanity, require equally complex solutions that must be developed through a process involving research and creativity. According to the SDSN (2017), universities are well-positioned to perform this role by their role as institutes that develop and disseminate knowledge.

The SDSN report (2017), has again highlighted several SDGs that are directly linked to research. These include: improving the scientific, technological, and industrial infrastructure of developing countries, increasing developing countries' ability to develop sophisticated technology, improve scientific research on key sustainability challenges including health and the environment and increase international cooperation on science and technology.

In order to achieve these goals, HEIs must promote sustainability as a topic of research among researchers of various levels of skill and experience, reward research that helps in attaining SDGs, identify key research areas that the institute can contribute to, participate in global research initiatives as well as the recruitment of researchers with an SDG focus. In addition to this, it is also necessary that a holistic multidisciplinary approach is taken to SDG research, and this requires collaboration within the institute and beyond.

The importance of research by HEIs aimed at generating knowledge, solutions, and innovations related to sustainable development has been discussed in detail by Waas et al. (2010). According to Waas et al. (2010), research on sustainable development must take new forms and cannot be restricted to the narrow parameters of current research. This must instead be holistic and adopt a systemic perspective, which considers the interrelationship of multiple disciplines. Based on an analysis of literature Waas et al. (2010) identified six key factors that were necessary to conduct research on SD-related issues, these included: a consideration of multiple disciplines, engagement and collaboration, the transfer of knowledge among crucial stakeholders, research that offers a solution to a problem and research findings that are implementable.

Yarime et al. (2012) have discussed the issue of sustainability research from the perspective of sustainability science and have defined the objective of sustainability science as being to understand the relationship between human and 'natural systems' (p. 101) in an attempt to identify the optimal balance that will lead to a sustainable future. Yarime et al. (2012) once again highlight the importance of integrating. Knowledge associated with multiple disciplines and collaborating with different stakeholders. The authors have also identified several institutional barriers that may prevent interdisciplinary collaboration, and these relate to increased specialization among researchers. Jones et al. (2010) argue that the interdisciplinary approach should be a fundamental guiding principle for sustainability research. They argue that this form of research requires not only a consideration of natural sciences but also of social sciences, due to the influence of human behavior.

Lastly, Lukman et al. (2009) have presented a case study on the University of Maribor and how it effectively serves as a research conduit for various local government agencies, NGOs, and research institutions for the purposes of developing solutions for local sustainability challenges. Lukman

et al. (2009) state that these collaborations have been mostly successful but that barriers remain in the form of contradictory objectives among stakeholders.

1.3 Governance, Culture, and Operations

The SDSN report has identified governance, culture, and operations as the third approach through which HEIs can achieve SDGs, and this approach refers primarily to the internal environment of the university. According to the SDSN Report, the university can attempt to achieve each of the SDG objectives at a micro-level or within its immediate environment and many if not all of these objectives may be applicable. The SDSN report states that this can be achieved through changes in its governance and operational policy as well as its organizational culture.

The SDSN report has also outlined specific goals as well as information related to how they can be achieved at a micro-level. For instance, poverty can be eradicated through the financial support of students living in poverty like conditions, eliminating hunger by providing affordable nutrition options on-campus and reducing environmental impact through a variety of environmentally friendly on-campus initiatives.

The importance of reshaping governance and operations has been discussed by Beringer and Adomßent (2008), who state that as an organization comprising of multiple smaller organizations, a university must enact widespread change if it is to become more sustainable. They also state that sustainability objectives must be enshrined within the governance agenda of the institute if attempts at micro-level sustainability are to be successful. Lukman et al. (2009), have also discussed how attempts to shape the institute's culture can have a significant impact on the sustainability behavior of students. Velazquez et al. (2005) have also identified several barriers within the institution that prevent the incorporation of sustainability goals into governance and operational policies. These include a lack of awareness, insufficient funding, organizational structures hampered by excessive bureaucracy, and a deeply embedded cultural resistance to organizational change.

1.4 External Leadership

The fourth and final approach through which SDGs can be achieved by HEIs has been described as external leadership by the SDSN Report. External leadership refers to universities embracing a leadership role in the pursuit of SDGs, and the SDSN Report has stated that universities can fulfill this role due to their identity as generators, organizers, and disseminators of knowledge. The university can serve as a focal point for stakeholder collaboration and examples provided by the SDSN Report include workshops, seminars, and conferences. Moreover, universities can also perform the role of policy advocates using their legitimacy.

Tilbury (2012), agrees with the notion that higher education can assume a leadership role in the battle for sustainability. However, the author also contends that this requires a change in perspective and the removal of traditional boundaries to allow the institution to collaborate with a wide variety of local and international stakeholders beyond the corporate world and academia. This is in line with the SDSN's Report recommendations regarding the hosting of public events that allow diverse stakeholders to participate. Similarly, Ferrer-Balas et al. (2009), have described how the University of Catalonia became a sustainability leader within its community by developing a sustainability strategy based on participation from a variety of local stakeholders (both internal and external).

2 Methods

The research involved the usage of the document analysis method (Bowen 2009). The selected documents include The University of Bahrain's (UoB) Transformation Plan 2016–2021 (2016) and the Bahrain Higher Education Councils (BHEC) Strategy 2014–2024 (2014). The analysis process was based on the grounded theory approach. This method of analysis involves using preexisting theory as a basis for analysis, and in this case, both the SDSN Report and relevant literature were used to evaluate the policies outlined in UoB's Transformation Plan and the BHEC's strategy.

3 Result and Discussion

3.1 Learning and Teaching

UoB's Transformation Plan has outlined several objectives that are advantageous to achieving SDGs through learning and teaching. First, learning and teaching are considered to be a key strategic pillar within the transformational plan and key elements of this strategy that are relevant to learning and teaching for the achievement of SDGs. These include: (i) the recruitment of world-renowned faculty members across disciplines. Moreover, to provide these individuals with substantial administrative support, training and development, (ii) the development of multiple learning environments and teaching methods as well as the use of digital technology to empower students. It has been established that capable staff is essential for the development of appropriate curricula and education for sustainable development (Adomßent et al. 2014), while the importance of varied learning environments

has also been highlighted in the SDSN report. Similarly, student empowerment through digital learning also contributes to the ability of students to meet future sustainability challenges. However, the Transformation Plan needs more emphasis on curriculum development and the integration of sustainability-related learning outcomes.

The UoB's current performance, with regards to learning and teaching relevant SDGs, also indicates that the university has made significant efforts to adopt the sustainability agenda. For instance, the university has a very long record in terms of gender disparity as over 70% of enrolled students are women. Moreover, the university is also attempting to increase the involvement of females in STEM subjects and also currently provides disabled students with a variety of facilities. There is, however, a room for improvement in demonstrating the university's commitment to curricula design based on sustainability requirements. However, the university is currently offering ESD themed programs at the MSc and Ph.D. level.

The Kingdom of Bahrain's Higher Educational Strategy (BHEC 2014) is also indicative of a realization of the key challenges posed by sustainability-related issues, and the sustainable use of resources has been highlighted as a core component of this strategy. Additionally, one of the key objectives of the strategy is to equip students with skills that are relevant for the second-century economy, and while sustainability is not explicitly mentioned in the discussion of this objective, it is assumed that it will play a fundamental role in policy. This objective is, however, deeply interlinked with the SDG of furnishing the youth and adults with relevant vocational and entrepreneurial skills for the future.

3.2 Research

Research is once again, a fundamental element of UoB's transformation strategy, and in this instance, sustainability research has been highlighted as one of the key area's that will be focused on by the university. Three key forms of sustainability research have been identified: "Renewable energy, food security, and water security." (p. 28).

These areas of focus have been selected based on the university's strengths and core competencies, and this is again in line with the recommendations of the SDSN Report and the empirical research. Moreover, the university has also recognized the importance of research collaborations and is aiming to cultivate several partnerships of this kind in the research above areas. An additional objective involves collaborating with regional stakeholders such as government agencies and NGO's. This strategy appears to be in conformance with best practices. Moreover, multidisciplinary research is being encouraged. This was repeatedly highlighted as a key factor for conducting useful sustainability research (Waas et al. 2010; Yarime et al. 2012; Jones et al. 2010) and the university considered incorporating this perspective, which is evident in the curricula design and admission policies for the MSc and Ph.D. programs which both are accepting students from all backgrounds and specializations.

The university's current performance is also in conformance with many of the research specific SDGs. Examples include the fostering of innovation and solution development through business incubation cells, the funding of scientific research, the maintenance of world-class scientific facilities and overseeing research that has led to the publication of over 150 peer-reviewed research articles. Moreover, the university has also attempted to contribute to local technology development through research partnerships with the petroleum company BAPCO and Microsoft. In addition to this, existing attempts have also been made to advance research on the three core sustainability research areas such as renewable energy (through partnerships with British universities such as Aston University), sustainable consumption (partnership with Oxford University) and agricultural (through local initiatives and partnerships).

Increasing the quantity and quality of research is also a key element in the strategy of Bahrain's Higher Education Commission. Research for innovation remains a key objective of the strategy, and it is expected that much of this will focus on sustainability as evidenced by the UoB's Transformation Plan.

3.3 Governance, Culture, and Operations

Governance, culture, and operations are discussed in Strategic Pillar 4 of the UoB's Transformational Plan, and this focuses on creating an environment that fosters an entrepreneurial mindset to make the university financially independent. As a result, the university aims to reevaluate all policies and procedures so that they are more efficient, non-bureaucratic, and facilitate innovation.

On a micro-level, the university is implementing a student's financial support system by which students with financial difficulties can be offered a 100% exemption of fees. Moreover, the university implemented several initiatives to transform its campus to be environmentally friendly, and these initiatives include the use of solar power to

generate enough electric energy to supply the university campus and surrounding living blocks with clean energy and the increase of green areas on-campus.

BHEC's Strategy Document primary focus is on improving the overall governance of the country's higher education system, mentions of culture are restricted to cultures of efficiency and continuous improvement.

3.4 External Leadership

UoB's Transformation Plan (2016), discusses the issue of community leadership owing to its central role in the community. The UoB's existing performance was found to have several instances where the leadership based on collaboration was evident. This includes several seminars on issues related to SDGs, smart cities, agriculture, water, and waste management.

The BHEC's Strategy Document stated the desire to promote leadership among HEIs, and though no discussion of sustainability leadership was present, it is expected that the statement indicates sufficient consideration and conformity of this aspect.

4 Conclusion

This paper discussed UoB's role as a contributor to the achievement of SDGs. The relevant guidelines stated in the SDNS report were reviewed along with the supportive academic literature and were utilized as a template to measure the performance of the university in achieving SDGs. Bahrain's Higher Education Council's (BHEC) Strategy and its Research Strategy were examined for conformity with the guidelines as well.

The UoB's Transformation Plan and current performance have been revealed to contribute significantly to SDG objectives in the areas of learning and teaching as well as research. These contributions are due to extensive efforts made by the university to ensure equal access, offer sustainability education at the M.Sc. and Ph.D. levels and also by hosting a variety of events and forming several partnerships.

UoB has also outlined a clear research agenda that focuses on three key sustainability issues. BHEC's future strategy was also found to be advantageous for creating an environment where HEIs can pursue sustainability goals.

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An Impact of Smart Traffic Sensing on Strategic Planning for Sustainable Smart Cities

Tareq T. Krishan, Rami S. Alkhawaldeh, Issam Al-Hadid, Rula Al Azawi, and Saleh H. Al-Sharaeh

Abstract

In recent years, smart governance in the context of smart city networks has emerged as a new trend for governments to monitor public activities. One of such activities is controlling the traffic lights that have a vital influence on strategic planning in shaping the smart cities. Thus, in this study, our contributions presented in a twofold as (i) solving the problems of using conventional traffic lights as well as reviewing the opportunities and challenges of the traffic sensing techniques, and (ii) innovating a novel model for traffic sensing and smart traffic monitoring called Smart Traffic Sensing Approach (STSA). In particular, regarding the STSA model, we proposed new traffic sensing model using ultrasonic-acoustic and biosensors, in intelligent ecosystem environments involving LED solar cells, for controlling the intensity of cars on the intersections of roads in non-stable situations due to their high accuracy in guided sensors and their modern characteristic in independency on a dynamic time period. Consequently, this technology reduces energy consumption, solves the problem of congestions, and increases productivity and flow on intersections in a more adaptive mode. In addition, it exploits the ecosystems to facilitate monitoring the mobile phone violations on the city's roads and highways. As a result, the STSA approach is being served as a next-generation framework for computing in smart traffic, having an effect on smart cities infrastructure planning, and achieves sustainable development chances.

Keywords

Acoustic-ultrasonic sensors • Cloud traffic • Future generation sensors systems • PH sensor • Smart traffic • Smart sustainable cities • Traffic ecosystem • Traffic sensing

1 Introduction

The continuous population increase and, subsequently, the growth in social and economic activities in cities lead to a rise in demand for transportation (El-Tantawy et al. 2013). The rising demand for transportation in the metropolises has made existing traffic infrastructures incapable of handling many vehicles and brings undesired everyday traffic congestions. Traffic congestions produced either by the routine traffic volumes (recurring congestion) or unexpected disruptions (nonrecurring congestion events), accidents, constructions, emergencies, breakdowns, debris, or inclement weather conditions (Bifulco et al. 2016; Islam and Hajbabaie 2017) have negative observable consequences such as long travel times, excess fuel consumption and increasing emission of local air pollutants. In order to reduce traffic congestion and its adverse negative effects, one of the most effective solutions is toward outfitting the existing infrastructure with Intelligent Transportation Systems (ITS). This raises the capacity of existing transportation infrastructures without imposing a high cost of road construction (Bazzan and Klgl 2013; Chowdhury and Sadek 2003). ITS systems utilizing synergistic technologies provide flexible approaches to active traffic sensing. So, one of the significant

T. T. Krishan (✉) · R. S. Alkhawaldeh · I. Al-Hadid
Faculty of Information Technology and Systems,
The University of Jordan, Aqaba, 77110, Jordan
e-mail: t.krishan@ju.edu.jo

R. S. Alkhawaldeh
e-mail: r.alkhawaldeh@ju.edu.jo

I. Al-Hadid
e-mail: issamfe@hotmail.com

R. A. Azawi
Faculty of Computing Sciences, Gulf College, Muscat,
Seeb, Sultanate of Oman
e-mail: rula@gulfcollege.edu.om

S. H. Al-Sharaeh
King Abdullah II School of Information Technology,
The University of Jordan, Amman, 11942, Jordan
e-mail: ssharaeh@ju.edu.jo

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components of ITS is adaptive traffic signal control (Cornelissen and Rudin-Brown 2010; Hahanov et al. 2017).

The infrastructures of smart traffic represent a binary system of active interaction to meet the needs of humanity. They implicitly formulate two topical approaches that can radically change the real world (Garouani et al. 2017). First, there are no traffic lights in the water and the airspace, so they should not be on the roads. Hence removing all signs from the road infrastructure means to create a green planet and clean cities. Second monitoring the violations of the use of mobile phones by sensing traffic means to reduce thousands of daily accidents on the planet. Third, enable controlling by the pedestrian to determine crossing status. In order to realize these trends, it is necessary to solve the following problems: first, replacing traditional traffic signals with wireless sensor signals or laser signals; second, increasing the capacity of wireless telecommunication channels using several orders to maintain the e-infrastructure; third, creating reliable, scalable computing services for digital monitoring and cloud traffic control; and fourth, making the population of the world believe in innovative cyberculture of transport control. Other smart mobile applications are designed to change traffic signals equipped with a preemptive sensor from red to green. These applications work similar to the Mobile Infrared Transmitter (MIRT), a device used by buses and emergency vehicles to control traffic lights. The homemade transmitters have led certain cities to use specially encoded MIRTs. The unsuccessful safe intersection act of 2005 had proposed a federal offense for an unauthorized person to use any traffic preemption devices. Subject to testing, however, if these applications are to work, then they pose a significant challenge.

Several studies in the applications of the transportation sector have been provided; the first use of mobile applications was primarily for navigation and location-based services. In 2016, the mobile applications were used for many related applications, including engineering education, traffic data collection, travel information, route planning, and ride-sharing. On the contrary, some applications create challenges, especially in areas of enforcement and traffic safety. For example, some of the applications can detect speed camera or radar gun and alert the user to slow down a certain distance before crossing the location. These applications work similar to radar detectors that are readily and commercially available.

Moreover, they are less much free cost. Several studies showed that radar detector users have more speed convictions compared to the general driver population (Cooper et al. 1992). Thus, increased availability of such applications may encourage some drivers to exceed highway posted speed limits, which could endanger the safety of the public traveling (Cooper et al. 1992).

One of the essential sensing means through sound wave being widely used in many medical, technological, and scientific applications. Acoustic Sensor Networks (ASNs) are especially crucial for communication in underwater and underground and in situations where the radio frequency signal is not suitable or unusable. Additionally, multimodal sensor networks incorporating acoustic sensors can augment the sensing scope and enhance the performance and functionalities of wireless sensor networks. This is particularly important given the fact that sensor networks are an integral part of the emerging Internet of Things (IoT) environment. The slow propagation speed, low bandwidth, and inherent noise in the environment require new or redesign of protocols and algorithms from the application layer to the physical layer. Hence, some of the unsolved issues might be exhibited, including high packet error rate, inaccurate channel modeling, inability of protocols to handle node mobility and environmental noise, high communication overhead, low reliability and high latency in data delivery, lack of efficient congestion control mechanism, weak localization in underwater/underground, and high energy consumption at low frequencies.

The future generation of smart cities, smart traffic sensing would depending on new sensing techniques as acoustic-ultrasonic sensors. So, our proposed paper discusses new trends in smart traffic industrials through presenting a novel model in traffic sensing by smart sensing approaches.

The rest of the paper is organized as follows. Section 2 presents an overall view of smart cities' services. Section 3 talks about traffic monitoring techniques: related works. The basic framework of Smart Traffic Sensing Approach (STSA) presented in Sect. 4. Section 5 concludes remarks and future work. Finally, Sect. 6 provides some recommendations.

2 Services Sectors in Smart Cities

A smart, sustainable city is an innovative city that uses information and communication technologies (ICTs) and other means to improve quality of life, the efficiency of urban operations and services, and competitiveness. It is ensuring that it meets the needs of present and future generations concerning economic, social, and environmental aspects. So, a smart city is not just a city that leverages new technologies; it is a complex ecosystem made up of many stakeholders including citizens, city authorities, local companies and industry, community groups. Further, it should be stressed that the geographical boundaries of what is called a

Fig. 1 Smart cities services

smart city may be more extensive than the city itself, gathering multiple government bodies and municipalities, to define services at the metropolitan or regional scale (Allam and Newman 2018). Many of categories for smart city services which arising is requiring co-infrastructure as in Fig. 1.

However, it is essential to ensure that when considering the application of technologies to solve problems, the human and institutional aspects are taken into consideration. In essence, a cardinal goal of the smart city is to create value for its entire ecosystem, whether this value is financial, quality of life, health, education, time, etc. The value created by a smart city can be assessed using both quantitative and qualitative metrics.

3 Traffic Monitoring Techniques: Related Works

There are two categories related to the traffic sensors (Chang et al. 2017), which are nonintrusive (or over-roadway) and intrusive (or in-roadway). Nonintrusive sensor "is traffic detection sensors that cause minimal disruption to normal traffic operations during installation, operation, and maintenance compared to conventional detection methods." Examples of these types of sensors include infrared, magnetic, radar, ultrasonic, acoustic, and video imaging. On the opposite side of the nonintrusive sensors are intrusive sensors, or traditional sensors, which are defined as "devices" that involve (the) placement of the sensor technology on top of or into the lane of traffic being monitored". Microwave radar (Chang et al. 2017) such as Wavetronix SmartSensor Matrix™ sensor, in Fig. 2, is used because it is the microwave the sensor used by UDOT for its SPMs and traffic counts were made lane-by-lane to reflect different turning movements because this sensor is capable to differentiate lanes and count the number of vehicles in each lane.

In detail, Fig. 2 shows the following:

- Intrusive sensors have a 90° horizontal beamwidth of view with a 65° vertical beamwidth. However, in Fig. 3 the horizontal beamwidth is not just one radar beam, but a matrix of 16 separate high-definition beams near each other. Sixteen separate send/receive antennas generate the beams and measure the distances to all targets in each beam, creating the two-dimensional image known as radar vision. This sensor is also able to detect nonmoving vehicles and can be used for presence detection.
- Position 1 is located on the backside of the opposing traffic's mast arm. This allows the sensor to be near the lanes of interest. Since this position is close to the lanes, it is considered best for significant multilane intersections. Position 2 is located on a pole on the far side approach. Position 3 can be located on the adjacent pole or mast arm of the signal.

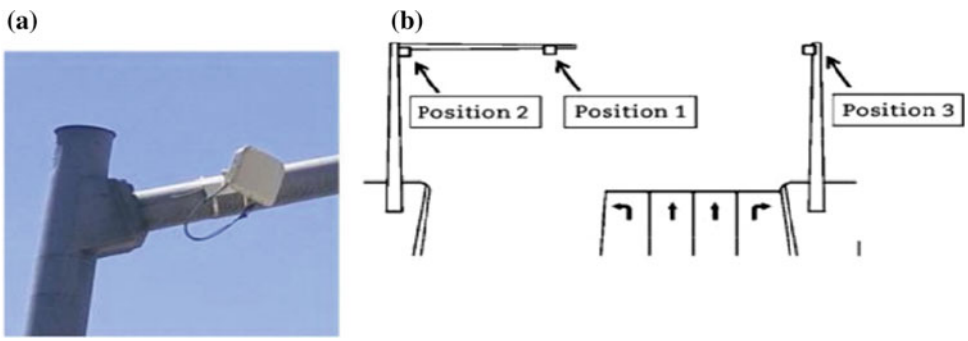

Fig. 2 Smart sensor matrix: **a** image of the sensor and **b** possible mounting locations

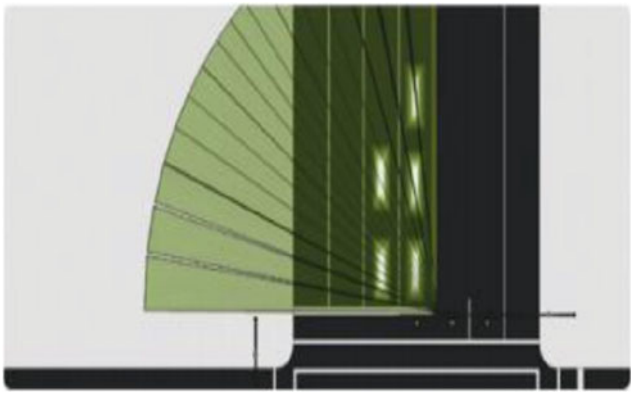

Fig. 3 Beamwidth of the microwave sensor

– The physical mounting location is essential to avoid occlusion caused by other vehicles. The sensor should be placed nearest the lanes that are most important if at all possible. If the left-turn movements are most important, the sensor should be placed on the left side of the intersection of the approaching vehicles. Other important installation information to consider is that the radar has a range of 140 ft and fans out to cover a 90° angle from the sensor, as shown in Fig. 3. It is vital that vehicles entering the sensor's field of view should enter on the arc rather than the straight sides.

The paper in (Chang et al. 2017) showed that the number of approach lanes and approach volume level significantly affect the accuracy of traffic volume counts while the sensor installation position does not exist. At a typical three-lane approach intersection, average accuracy ranged from 99.8% for low approach volume level (less than 100 veh/h/ln) to 98.7% for high approach volume level (greater than 250 veh/h/ln), at a five-lane approach intersection, average accuracy ranged from 94.6% for low approach volume level to 89.2% for the high approach volume level. Finally installing microwave sensors following the manufacturer's specifications is the key to get reliable data.

The smart cloud traffic light sequencer (Jeihani et al. 2015) focused on optimal control of traffic flows at the crossroads, is proposed within the framework of creating cloud traffic control. A logical architecture of the sequencer free of arithmetic operations, intended for generating control signals, depending on the number of cars on intersecting lines. The ways of increasing the traffic capacity of intersections through the decrease of the green signal downtime in the absence of cars on the permitted traffic Path are shown. Test and real experiments on the transport infrastructure, which confirm the effectiveness of the introduction of a smart cloud traffic light to reduce the time of route execution and save energy resources, were presented.

Fig. 4 Traditional traffic light ecosystems, Seoul Design

A traditional traffic light ecosystems, which presented in Seoul, Korea[1], introduced a limited model depending on a solar cell as an individual unit, as shown in Fig. 4. This model contains local switching on one screen for traffic light status [red, orange, green] on the same unit. In addition, include CCTV camera, solar panel, and sensor monitor an emergency vehicle.

All of the previous work focus on the ways of increasing the traffic capacity of intersections through the decrease of the green signal downtime in the absence of cars on the permitted traffic lane is shown, on the other hand the infrastructures which have been adopted within previous works depends on microwave sensors that have been placed on top of traffic lights or ground points. The previous strategies have constraints such as:

– Decreasing of green signal in the nonactivated lane will still limit to the fixed time metric, not to the nature of the roads and the density of the cars or Pedestrian movement.
– Outdoor microwave sensors may be affected by surrounding risks, environmental factors, noise or tampering. So, none carefully monitoring for the intensity of the car might be occurred. wherefore, increasing congestion chances.

[1] https://www.youtube.com/watch?v=96Q9bgOeISU (September 11, 2018).

- Beams angle that covers the lanes in the microwave sensor.
- Limited distance for microwave coverage over lanes reached to 140 ft.
- The absence of interaction with another requirement in the range, such as Pedestrian movement priorities.
- A high curve in regard to energy consumption.
- Limited sensing presented in Seoul, Korea only to observe the emergency vehicle without dealing with the intensity of the cars and flow control to solve congestion as a critical issue that is considered in the current study.

4 Our Proposed Work: Smart Traffic Sensing Approach (STSA)

Depending on the topology of intersections, our proposed framework to the Smart Traffic Sensing Approach (STSA) includes an ecosystem infrastructure to provide a smart traffic light that works on solar cell and built-in acoustic, Ultrasonic, and biosensors as shown in Fig. 5. Therefore, STSA framework is represented as follows:

- Suppose that Urban traffic light contains three lanes for the movement in each of the four directions. They provide maneuver of the car in three directions on the crossroad traffic signals define four intersection states, which provide two types of topologies as shown in Fig. 6, diagonal in Fig. 6a, and rectangular in Fig. 6b, for the formation of traffic, flows over the intersecting roads.
- Each traffic light in a specific direction considered as a node.
- Each node contains three lanes. So, we have 12 lanes in the overall directions.

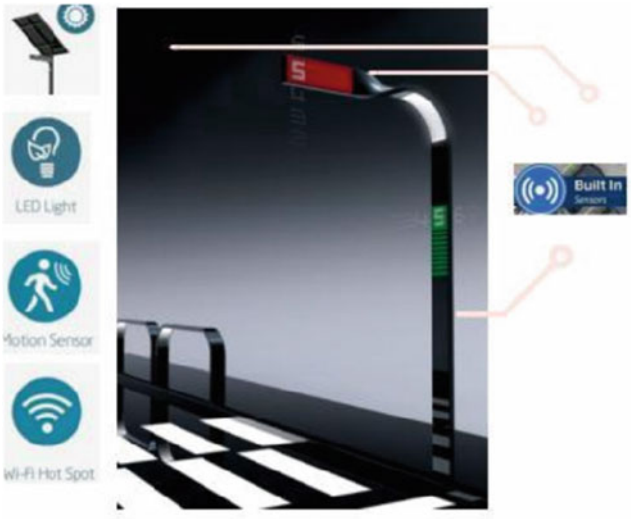

Fig. 5 Our proposed approach: smart traffic sensing via ecosystems

- Each lane is considered as a Queue. So, we have 12 queues in the overall nodes.
- Cars intensity is distributed naturally in all queues for each direction.
- STSA mechanism (i.e., Figure 5) depending on auto-sensing within each node via ultrasonic-acoustic and biosensors waves for all queues in the nodes.
- Sensing strategy is applied synchronically inside each node in an open distance depending on the cars intensity and pedestrian movement within each node.
- Digital timers in each node are connected to ultrasonic-acoustic sensors to manage vital time in regard to the probability of continuity of cars intensity in the specific node to make sure avoidance of delay on another node.
- The decision of switching in smart traffic light status [red, orange, green] for the lanes of cars or pedestrian actually will depend on the following criteria:

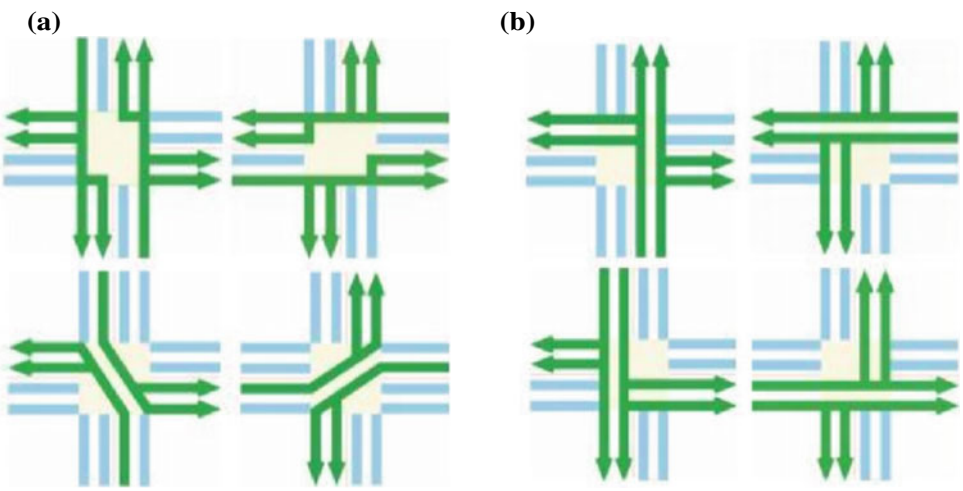

Fig. 6 Crossroad traffic signals topologies **a** diagonal topology **b** rectangular topology

The intensity of cars in the overall queues through all of the nodes.
Pedestrian movement.
Digital timers within sensors to all of the nodes.

5 Conclusion and Future Work

In conclusions, overall, the purpose of this study is to express the importance of innovation in smart traffic lights field. This is explained by suggesting a novel smart traffic sensing ecosystems to provide accuracy in traffic monitoring over intersections with acoustic and ultrasonic ecosystem sensors. Moreover, also, to identify positive impacts that influence the accuracy of sensing through built-in sensors to detect cars intensity. This due to make traffic decision within road intersection for the lane that contains large numbers of cars to keep on a context of vital traffic and avoidance of probably resulted in risks.

However, it is paramount that the built-in sensing sensors are installed carefully, consistent with manufacturer's specifications for smart traffic lights. During previous investigations, some of the microwave sensors were found to be weak and might be affected by noise and non-precision in cars intensity detections with a high rate of faults in outdoor microwave sensors. As well as, it is essential to implement this proposal to leverage opportunities in next generation of transportation services in smart cities through power saving, avoidance of autonomous driving risks or congestions in traditional traffic lights or delay with increasing throughputs of intersections by vital traffic. Our proposed work must be under continuing analyzing and development to implement it by a strategic framework for achieving expected sustainable goals. Next steps are being considered, which are:

- Starting with the miniaturization of sensors in designing and usage, to be consistent with traffic sensing and other innovations of new services in smart cities sectors. We proposed built-in sensing in our study.
- Developing capabilities of Built-in sensors in STSA to meet accuracy requirements in the detection of cars intensity regarding the depth of sensing dimensions within lanes.
- Build a novel algorithm which contains overall operational processes related to STSA framework.
- Developing AutonoVi-Sim to make an actually studies and apply different sensing cases depending on acoustic, ultrasonic sensors, and also biosensors to interaction with biometrics reversed in our studies like PH levels and electricity fields. Through the detection of cars intensity. In addition, applying different cases with gradually auto-random distribution in numbers of vehicles within each node for all lanes.
- Make different cases in regard to the acoustic sensing in emergency vehicle aspects.

6 Recommendations

Our recommendations in this research are discussed in the following points:

- Transforming the infrastructure of transport services and traffic systems through presents innovations in the areas of smart traffic systems as traffic sensor techniques.
- Adopting of smart ecosystems metrics enhances the strategic opportunities for development in sustainable smart cities through integrated multiservice systems, one of which is traffic sensing through advanced sensing technologies to ensure the accuracy and vitality of traffic detection in the city in the context of reducing the rate of energy consumption.
- Applying smart monitoring by transforming several a public street lighting poles into smart lighting ecosystems units including STSA and using it to monitor phone violations while driving through integrated Smart sensors also will be a unique opportunity into decreasing of energy consumption, time, and human resources. Thus, contributing to achieving an aspect of sustainable development.
- Establishing labs for sensing applications in the universities and academic centers and enabling their role to innovate new services contributing in the futurism trends of smart, sustainable cities and teaching of sensor networks materials and they are computational in academic paths.
- Exploiting sensing computing to provide applications that simulate the needs of a pedestrian for persons with disabilities. Using the QR Code via Auto STSA connection to enable a priority of movement for persons with disabilities.

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Corporate Social Responsibility in the United Arab Emirates: Principles and Communication Strategy

Khaled Zamoum and T. Serra Gorpe

Abstract

This study aims to identify the factors and principles upon which social responsibility (CSR) has been established in the UAE. Despite the recent introduction of CSR in the UAE, beginning in the early 2000s, the initiative has expanded in the Middle East and internationally into an active and innovative experience through various programs. The UAE experience is unique in the Arab region because it combines the specificity of the local community with the requirements of globalization, the market economy, free trade, economic competition, and e-governance. The Dubai Chamber CSR Label, launched in 2010, is one of the most important initiatives to lead organizations into adopting sustainability and CSR programs. The conceptual paper also discusses the communication strategy adopted by the organizations in the UAE to introduce programs and plans for sustainability and CSR.

Keywords

CSR strategy • Dubai chamber CSR label • Implementation of CSR

1 Introduction

In recent years, corporate social responsibility has become a popular concept with much scholarly debate revolving around several dimensions (Gorpe and Oksuz 2016). CSR discussions involve methodological approaches, integration of the CSR into management, reporting, measuring, and communicating CSR. Does the CSR literature also talk about the motivations for implementing CSR, barriers to its? Implementation, the domains of CSR initiatives, and the effect of the organizational size and the sector of the company on CSR practices. Because of the nature of the local and international economic and geopolitical context and the need for companies to participate in various programs, CSR has become increasingly important.

The United Arab Emirates is a young country which is unique in many aspects. It is a stable country in the region and an important business center. In this country, one can feel the multiculturalism: for example, the presence of large international companies in various strategic sectors has contributed to the adoption of global and modern practices in CSR and sustainability. On the other hand, Islam, the country's official religion, incorporates philanthropy. Therefore, there are a lot of philanthropic activities. However, CSR may include philanthropic giving, but is not the same as philanthropy. CSR involves governance of resources and the balancing of interests among different stakeholders, which is absent in Zakat. Zakat by corporations demonstrates corporate responsibility toward society as a whole. In the UAE, businesses are expected not to think of their shareholders only, but to fulfill their obligations to the society as well (Katsioloudes and Brodtkorb 2007). The government announced CSR as one of the three pillars of 2017 as the Year of Giving and the UAE government mandated for over 400,000 companies to allocate funds to be used for philanthropy (Zakaria 2017). CSR is context-dependent, and it is interesting to look at the integration of the contemporary understanding of CSR with the uniqueness of the culture as well within the socioeconomic context. It would not be wrong to claim that historical understanding of the CSR is integrated with the modern understanding of CSR. For example, the Dubai Chamber CSR Label, developed by the Dubai Chamber of Commerce and Industry in 2010, introduces itself as the first CSR Label in the region that "builds on international standards while ensuring local relevance" (http://www.dubaichamber.com/what-we-do/business-excellence/centre-for-responsible-

K. Zamoum (✉) · T. Serra Gorpe
University of Sharjah, Sharjah, UAE
e-mail: kzamoum@sharjah.ac.ae

T. Serra Gorpe
e-mail: tgorpe@sharjah.ac.ae

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business/the-dubai-chamber-csr-label/about-the-label).
Additionally, we can say that the division between the private and public is blurred in the UAE. The economic structure does not define whether employees work for the public, private, or semi-private sector, as many government officials own private companies. It is common for government entities to engage in CSR activities, and hire CSR managers" (Duthler and Dhanesh 2018). At the same time, nongovernmental organizations and charities are not clearly defined. A charity can be a state-run organization, as in the case of Red Crescent Society or the ruling families can run private charities making it harder to define what is an NGO in this context (Selvik 2013).

The study aims to review the underlying factors and principles of CSR exercised in the UAE. As stated, UAE is a unique case study, and the development of CSR reflects this uniqueness as well. This accumulated experience, the point where UAE is in terms of CSR understanding, practices documentation, opportunities, and issues can serve as a model for the Arab world.

2 Legitimacy Theory as a Theoretical Framework

Saulquin and Schier (2007) argue that CSR drives the organization to develop its performance, especially in areas such as quality and competitiveness, environmental protection programs, and institutional communication. Caroll's (1979) definition of CSR identifies four categories of responsibilities: economic, legal, ethical, and discretionary/philanthropic. These responsibilities are the expectations placed on the corporation by corporate stakeholders and society as a whole (Caroll and Shabana 2010). Caroll's justification for prioritizing economic responsibility was that if a business does not make a profit, then it will influence its survival, creating a discussion on the other responsibilities (Baden 2016). Coombs and Holladay (2011) confirm that CSR can contribute best to the societal good when it acknowledges and incorporates the concerns of the wider society.

Wagbara et al. (2014) argue that the for-profit support companies provide for education, culture, and environment, along with their support for sustainable development projects, is important because they reinforce their sense of belonging to the local community. "It is important that a company views itself as an integral part of the community in which it operates and is committed to a sound relationship built on respect, trust, honesty and fairness" (Arshad et al. 2015). Ortas et al. (2015) argue that social and political background and government programs have a bearing on the use of social responsibility. There is also a link between social responsibility programs and government priorities. The findings of the study show the importance of the experiences of industrialized countries, namely, Japan, France, and Spain. French and Spanish companies have outperformed in using social responsibility activities because of the nature of social and political philosophy that governs their economies. In contrast, Japanese companies were characterized by their activities are driven by respect for and protection of the environment.

This paper relies on legitimacy theory, which stresses the importance of studying the relationship between the organization and society (Suchman 1995), mainly as this organization derives its marketing legitimacy approval from its societal support, which is vital for its sustainability. This theory also emphasizes that institutions may try to legitimize their activities by publishing reports in the area of social responsibility. Moreover, this theory attests that the adoption of social responsibility by various social organizations is a social contract between them and the community in which they operate, which provides them with the necessary legal entitlement to own and exploit. On the other hand, those entitled organizations are required to provide services of public interest.

"The legitimacy theory is a mechanism that supports organizations in implementing and developing voluntary social and environmental disclosures in order to fulfill their social contract that enables the recognition of their objectives and the survival in a jumpy and turbulent environment" (Burlea and Popa 2013). Based on the social contract, the institutions must deliver on two main functions, production, which means the provision of products or useful and desirable services to the society and the distribution function, which is a fair distribution of royalties, and economic, financial, and social gains among groups and individuals in society (Suchman 1995).

In light of the legitimacy theory, and the review of the literature; the study aims to discuss two topics related to CSR in the UAE. One of them is the factors that trigger the development of CSR and its principles under the UAE CSR strategy. The second one is the CSR communication strategy that has been utilized in this emerging, relatively new experience. The discussion section of the paper will cover the discussion of these aspects with relevant literature and sources.

3 Discussion

3.1 Factors for the Development of CSR and Its Principles

In a study done in the UAE by Rettab and Ben Brik (2008), it was stated that less than 60% of the companies are aware of CSR, and the intrinsic incentives for CSR practices such

as traditions and efficiency are more important than external incentives such as regulations. Research that has been conducted in Dubai among SMEs state that most of the SME leaders agreed that the government should endorse and encourage the adoption of CSR. It should have a more active role in promoting CSR (Rettab and Brik 2008).

The companies in the UAE are aware of CSR, and their conceptualization of it is not as a "local" concept anymore, but generated from America and Europe (Arshad et al. 2015). In Dubai, social responsibility has become of great importance to the organizations due to the nature of the economic activities and the presence of major international companies there. Moreover, the economy has become much diversified: oil is no longer the primary source of revenue, as it represents only 5% of Dubai's income, while Dubai is visited by 14 million tourists annually. Hence, two-thirds of financial resources are derived from trade and tourism (Al Gurair 2016). This economic reality is one of the motives that incited private organizations to seek to build a reputation in order to be able to compete and develop investment. This leads to the Dubai Chamber of Commerce and Industry to intervene for helping organizations in the adoption of programs and activities of CSR.

The Dubai Chamber of Commerce and Industry social philosophy is linked to social values embraced by UAE society, which focuses on solidarity, interdependence, and generosity. The Dubai Chamber of Commerce and Industry strategy focuses on the importance of turning CSR activity from actions of donations, subsidies, volunteer, and outreach related to the values of the UAE society. As a practical strategy that is making for-profit organizations play a role in supporting public sector activities and local and federal government programs in the fields education, health, and environment, without abandoning their corporate goals of profitability (https://government.ae/en). This strategy also works to encourage corporate leaders and companies play social roles, which are reflected in supporting the development of all forms of programs, such as fights against all forms of corruption, the protection of the environment, youth employment, supporting the "Emiratization" of labor programs and providing positive work environment.

"The human development philosophy" in its humanitarian, social, educational, and environmental dimensions upon which the UAE was created 1971 is the locomotive that has led the social, economic, educational, and health policies. This is evident in the Human Development Program and objectives and the financial budget of the United Arab Emirates for the year 2016. In fact, according to a report, the UAE has allocated 48.5 billion dirhams to Human Development in 2016, following an economic growth rate of 3.5%. Also, half of the State's budget has been allocated for programs and services related to human development issues such as education 21.2%, social development by 15.5%, public services (11.1%), and health by 7.9% (https://government.ae/en). This reflects the government's orientation to build a social and humanitarian system based on providing various relevant services directly.

UAE is an Islamic country where multiculturalism and Western presence are dominant through multinational corporations. Socially responsible initiatives are not new to the UAE because it has an established tradition of charity and solidarity. The Holy Qur'an stated that every adult, stable, free, and financially able Muslim, should help people through a process ingrained in Islamic values called Zakat (Katsioloudes and Brodtkorb 2007). Organizations in the UAE used to practice CSR from the earliest Islamic times, in the form of Islamic-Sharia-compliant practices for organizations (Anadol and Thiruvattal 2015). Zakat is a common feature of corporations all over the Gulf region, including the UAE, where corporations donate money to different charity projects in a year more than once. The difference between Zakat and the CSR is that the former is a private and can be a nontransparent act (Katsioloudes and Brodtkorb 2007).

The United Arab Emirates relied on the oil industry at the beginning of its inception in 1971, especially after the discovery of the first oil fields in 1958 in the Emirate of Abu Dhabi. According to the report titled "The Economy of the UAE" (https://government.ae/en), the oil reserves represent about 97.8 million barrels, and the gas reserve is estimated at 83.8 billion cubic meters or about 5% of the world's reserves. The UAE has invested oil revenues in building a productive and diversified economy that is not dependent on oil revenues. In 2018, oil revenues accounted for only 30% of the national income, as the country adopts policies of diversification in the economy and reliance on alternative sources such as intertrade, tourism, real estate, and free trade zones. The volume of UAE's non-oil foreign trade amounted to 476 billion USD in 2015 with a growth ratio of 10% compared to 2014 (http://www.economy.gov.ae/Publications/MOE%20Anual%20Repoert%20English%202016.pdf). In this economic context, characterized by the search for solutions outside of hydrocarbons, corporate social responsibility is an essential approach in the strategy of the UAE government because of the relevance of this concept to social values. It focuses on the UAE community through solidarity and support of charity programs locally and abroad.

Since 2000, there has been an increase in interest in the employment of social and charitable activities in the context of the implementation of CSR-related principles and dimensions. This shift from charity to CSR is a turning point in the adoption of standards and norms by CSR companies in the UAE. The UAE government has realized the need to build a productive, dynamic, and competitive economy and create wealth outside of hydrocarbons, through the creation of competitive dynamics between companies to improve

their performance in the field of sustainable development and the service of the local and international community. There is a connection between corporate social responsibility and building a positive relationship between companies and their social and economic surroundings (Caroll 1979; Coombs and Holladay 2015). Generally, the business case for CSR is being made by documenting and illustrating that CSR has a positive economic impact on firm financial performance (Caroll and Shabana 2010).

The Dubai Chamber CSR Label is developed to help companies apply responsible business practices and inspire other organizations as well in the sphere of CSR and sustainability (Buamim 2015). The Centre for Responsible Business (CRB), initially known as the Dubai Ethics Resource Center, was founded in 2004. In 2007, it was renamed CRB to reflect its broader and broader role (Belaid et al. 2015). The mission of the center established by the Dubai Chamber of Commerce and Industry is to promote CSR and sustainability practices at all levels of the Dubai business community. This includes disseminating knowledge and information on CSR, sustainability of CSR practices, providing direct advice and feedback by evaluating the companies' CSR performance, stimulating companies to integrate CSR and sustainability in their strategy management operations and processes, developing radical CSR and sustainability management tools and guides, measuring and documenting responsible business practices in Dubai and the UAE (http://www.dubaichamber.com/what-we-do/business-excellence/centre-for-responsible-business/about-crb).
The CRB also aims to support the Dubai strategy 2015–2021 and is aligned with the UAE, vision 2021 which has a long-term approach for sustainable national development (Belaid et al. 2015).

The creation of the CSR Label in 2010 by Dubai Chamber of Commerce and Industry was a new strategy to encourage companies to adopt CSR in the UAE. The CSR Label is an important experience in the UAE and the Arab world, as it requires organizations seeking the label to comply with a set of conditions related to the allocation of part of their profits to serving the community in the field of education, health, environment, training, and employment of young people. Organizations are also required to comply with the international standards about environment, community, workplace, marketplace, and rational use of energy, recycling, and the use of electronic communication as an alternative to paper. Most of the CSR Label standards are identical to ISO 26000, ISO 14001 (http://www.dubaided.ae/PublicationsDocument/ShareBestPracticesBooklet2013.pdf; https://www.unb.com/en/information/about-us/csr).

Table 1 Companies awarded with the CSR Label H1 2018–2014 (http://www.dubaichamber.com/)

H1 2018	18
H2 2017	37
H1 2017	37
H2 2016	39
H1 2016	21
December 2015	19
September 2015	10
June 2015	15
March 2015	12
December 2014	19
September 2014	14
June 2014	11
March 2014	12

The number of CSR organizations granted with the CSR Label in 2017 (HI + H2) is 74 companies, compared to only ten companies in 2011. This constitutes an evolution in the culture of organizations in their quest for CSR Label. Tables 1 and 2 show the number of recipients of the CSR label across the years.

Also among the list of companies that are awarded the CSR label, we see that even though there are many multinational companies in the business sector in the UAE, most of the companies in this list are local companies. By looking at the list, we notice that commitment to CSR is an ongoing process as demonstrated by the companies. For example, Zuleikha Hospital received the Dubai Chamber CSR Label five times and Majed Al Futtaim six times.

Table 2 Companies awarded with the CSR label 2013–2011 (http://www.dubaichamber.com/)

Year	Number of companies
December 2013	13
September 2013	11
June 2013	11
March 2013	10
December 2012	7
September 2012	8
June 2012	8
April 2012	5
December 2011	3
September 2011	4
May 2011	3

4 CSR and Communication Strategy

Communication strategy is the essential pillar in the implementation of the CSR business sector in the UAE, especially since CSR standards are new to companies in the UAE and were recognized only at the beginning of 2000. Public relations has an essential function in the communication strategy as CSR is an essential tool in building and maintaining the organization's reputation. Public relations deal with all the stakeholders of the company and the media, and the meaningful visibility it creates on the companies help their clients or employees, not only with reputation but also helps the spread of CSR in general in the society. The members of the society, the companies all become aware of CSR.

The CSR concept is perceived and applied in many ways. Corporate social responsibility should not be narrowed to an image-making opportunity for the company. CSR, just for image creation, underestimates the business opportunities of the company. A business should look at CSR strategically, integrating it with the business opportunities since its sole function is not to be socially responsible, but financially sound as well. Therefore, the implementation of the CSR requires a clear vision from the institutions in terms of their role in serving the local community and the preservation of the environment. In addition, the businesses should fulfill the need to provide working conditions that will be the incubator of CSR plans. At the same time, they should inoculate their executives and managers the practices of CSR.

The main goals of communication strategy in the CSR activities in the UAE are twofold. One is communicating CSR for creating awareness. The other one as a consequence of increased awareness is to engage more companies in strategic CSR and provide multiple platforms for the already engaged ones to communicate it. That awareness creation is not only done by companies engaged actively in CSR, to promote themselves, but also this awareness creation is coming from the government itself. The government is dedicated to developing a thorough understanding of CSR and encourage its enactment in the UAE. The genre of CSR awareness is a collective one in the sense that even though the company actively communicates its CSR practices, at the same time we feel the unity, which is grounded in the CSR foundation as well. In other words, communicating for self-interest is minimal, but communicating for the greater good is prevalent.

We observe, as a tool for communication, the active use of social media, and its various platforms for creating awareness on CSR. A digital and social communication strategy exists for CSR. Moreover, the influencers, opinion leaders, the celebrities are used to convey the messages of different types and thus affect the people, as the literature and practice shows. Within the CSR context in the UAE, we observe it happening: CSR promotion takes place via the participation of important personalities in the UAE community.

The communicating for awareness strategy focuses on public awareness of CSR through several programs and plans, including awareness campaigns by some companies to promote their role in community service. For example, the Emirates Airlines Foundation's environmental education and education campaigns in Asia and Africa. Another program is about the nature reserves created in the UAE and the world, including the Dubai Desert Conservation Reserve. It covers 225 square kilometers, constituting 5% of the area of Dubai, and the program aims to protect the environment and wildlife. Dubai Desert Conservation Reserve is dedicated to conserving the natural beauty and biodiversity of the Arabia desert (https://www.ddcr.org/en/index.aspx).

As stated, the "digital age" has transformed the communication strategy in the CSR field. Organizations promote CSR via social media platforms and online community management. Social media is widely used in the business sector in the UAE, which ranks it first in the Arab world. For example, there are smartphone applications of organizations in the area of sustainability and CSR, which contributes to spreading the culture of sustainability and CSR in the business sector.

Many organizations active in CSR on social media, use Facebook, Twitter, and Instagram. Some of the companies active on these platforms are Emirates Airlines, Zuleikha Hospital, ADNOC, Etisalat, du, Etihad Airways. Social media helps these organizations in promoting their CSR activities and reach an audience that is difficult to reach through the traditional media. For example, Zuleikha Hospital is active on social media, especially on Facebook and Twitter, for promoting health awareness as well as the vision of the hospital concerning CSR & sustainability (https://www.zulekhahospitals.com/corporate-social-responsibility).

The diversification of the media to show organizations' activities in the field of CSR, such as the use of videos, photos, colors, SMS, group discussions and the dissemination of field visits and interviews, all contribute to educating the public about CSR. The nature of multimedia campaigns in the era of digital communication can take multiple forms ranging from pop up messages to digital screens, almost anywhere and at any time, making CSR awareness easier.

The participation of some crucial personalities from UAE community, whether from the public sector or the business sector, such as Sheikh Mohammed bin Rashid Al Maktoum, in various activities of sustainability and CSR, contributes to draw extra attention to CSR and attract big audiences. Also, the endorsements from the founders of the local businesses

which are active in CSR help to generate a culture that understands the framework of CSR.

Businesses that are active in CSR also publish their annual reports on sustainability and CSR, their future activities, news, and programs, along with their media coverage and they participate in local and international conferences to spread the knowledge. The idea of solidarity and community service is one of the most important messages that these organizations focus on. They try to disseminate the idea that they (these organizations) are part of society and that they must involve society in the process of building sustainable development.

We conducted an analytical study aimed to identify the most notable mediums of communication and information used by the companies in the field of CSR in the UAE. These local companies were selected on the basis that they have been granted with the Dubai Chamber CSR Label between the years 2014 and 2018.

1. Majed Al Futtaim (http://www.majidalfuttaim.com/about-us/overview/sustainability).
2. Zuleikha Hospital (http://zulekhahospitals.com/corporate-social-responsibility).
3. Union National Bank (https://www.unb.com/en/information/about-us/csr).
4. Emirates Gas (http://www.emiratesgas.com/about_emgas/Pages/Corporate-Social-Responsibility.aspx).
5. Viola (http://vpr.ae/services_item/csr).
6. Mashreq Bank (http://www.mashreqbank.com/uae/en/csr/csr-model).
7. Tristar Group (http://www.tristar-group.co/corporate-social-responsibility).
8. du (http://www.du.ae/about-us/corporate-social-responsibility).
9. National Bank of Abu Dhabi (https://www.unb.com/en/information/about-us/csr).
10. Al Ghurair Group (https://www.csrhub.com/CSR_and_sustainability_information/Al-Ghurair-Group).

Figure 1 shows that 90% of the mentioned companies have a CSR link on their official website dedicated to news and activities in the field of sustainable development and CSR. They also communicate the same content on their social media accounts.

The results also show that 60% of these companies publish their CSR Reports and CSR Awards consistently between 2014 and 2018 on their website and social media accounts thus helping to document and disseminate a culture of sustainability within and outside. For example, Emirates Gas in February 2019 has 7,424 followers on Facebook, 1,161 followers on Twitter, and 1,313 twitters. Its Instagram account has 568 posts, 527 followers, and has 86 subscribers on YouTube.

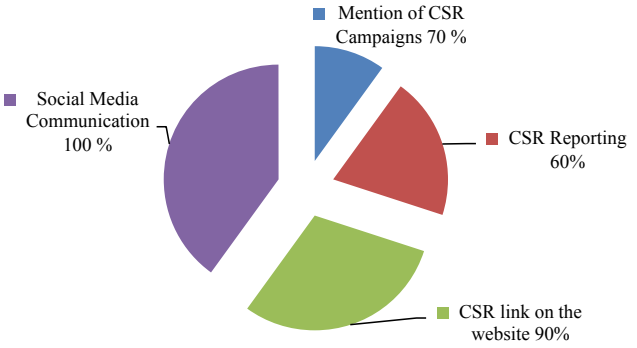

Fig. 1 Use of communication mediums by the companies who have been granted with the Dubai Chamber CSR label between 2014 and 2018 *Source* (Authors' own/using the official portal and social media accounts of the companies who have been granted with the Dubai Chamber CSR label between 2014 and 2018)

70% of these companies conduct CSR campaigns to raise awareness on sustainable development and CSR, which is an important step in the dissemination of CSR culture. To name some visible ones: the health campaigns conducted by Zuleikha Hospital, safety campaigns by Emirates Gas and education campaigns by Al Ghurair Group. Through the analysis of the websites of the companies mentioned above, it was observed that 80% of these companies announce their vision, goals, and programs for sustainable development and CSR on their websites and social media platforms. It highlights the interest of these companies in developing a local CSR and Sustainability strategy.

5 Concluding Remarks

Zakat is one of the pillars of Islam, and it is a religiously mandated charity. Each person calculates his/her zakat and can donate an additional amount as a voluntary one. Zakat is an Islamic practice/policy which helps to remove poverty in the community. In the Modern Muslim world, Zakat may be treated as taxes collected by governments or may be left to individuals, but when Sharia is maintained strictly, then it is the governments who manage Zakat (Dhar 2013). That tradition of supporting communities and people in Islam such as zakat (obligatory) and sadaqah (voluntary) are more of a charitable and philanthropic nature. These actions do not pay attention to their strategic alignment with business objectives and sustainability. Conceptually, there is a difference between zakat and CSR, the latter is a religious obligation, and the other one is a more pragmatic approach to gain acceptance of global issues such as anti-corruption, environmental protection, etc. However, all these issues are also in alignment with Islam (Dhar 2013). A study which looked at the compatibility between the beliefs of Islam and the United Nations' Global Compact revealed that the teachings

of Islam are in close conformity with the Ten Principles of the United Nations' Global Compact, and even exceeds the minimum standards (Selvik 2013). CSR comes with a profit incentive and an institutional responsibility/duty other than a specific duty as in the case of Zakat. In this respect, the motive to promote CSR, to profit from its impact on the reputation of the business can be perceived as self-serving. Zakat indicates a significant economic means for establishing social justice in society similar to CSR, but it is something that he/she has to do for God. It is an obligation and an act of respect for God.

The emergence and implementation of CSR in the UAE have been linked to three main factors: the First one is the political factor. Since the inception of the UAE in 1971, UAE has focused its internal and foreign policies on the philosophy of sustainability and CSR, which helped spread the culture of sustainability and CSR in the business sector in UAE. UAE Vision 2021 is a political project to encourage the private sector to contribute to health, education, environment, and sustainable development issues. UAE Vision 2021 was launched in 2010 by the UAE Government, focuses on building a development system based on the involvement of various organizations in the service of society (Abubakar 2016). The second factor for the emergence of CSR is linked to the nature of social and cultural values of the UAE community, which focuses on the need for individuals and institutions to contribute to society and to spend part of their profit on charity. The third factor is economical as the dynamics of the market in the UAE are linked to the freedom of trade and e-government and competition between local and international companies that seek to employ CSR in building their reputation. Many organizations in the UAE seek to build relationships with the local community based on the Legitimacy Theory, considering that it is their moral duty to participate in the education, health, and environment sector. Thus their activities are based on sustainable development and serving the needs of society. There is a relationship between social responsibility and ethics because this relationship is helping to increase competitiveness and the development of organizational strategies to respond to social and environmental requirements and the promotion of a culture of sustainable consumption. The communication strategy is twofold: to create awareness on the framework of the modern concept of CSR and to encourage the participation of businesses in CSR strategically, regardless of the size, nature, and industry of the company. CSR and solid attempts to institutionalize CSR is prominent. We conclude that the commitment of the institutions in the UAE for creating an understanding of CSR has been successful in such a relatively short period, when we look at the increasing number of companies engaged in CSR, their practices, reporting, and communication efforts, etc. We claim that attempts of CSR institutionalization are happening, including its promotion and communication strategically. A study with the CSR executives/Public Relations/Corporate Managers of the companies who are already actively engaged in CSR will guide us to the future of CSR in the UAE.

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Corruption-Specific Security Challenge

Dusko Tomic and Eldar Saljic

Abstract

Corruption in ancient Greece or Rome was usually expressed through bribes. It can even be said that as the state progressed and gained new forms, corruption developed alongside with it. This paper addresses the corruption-specific security challenge in Europe. Today, there are no societies that morally or lawfully accept abuse of power or think that the political position or public service should be used for personal gain through commercial contracts involving public interest. The moral categorization of this behavior is not questioned anywhere. However, the secondary efficiency of the legal system for the detection, prosecution, and punishment is being questioned. Newer times bring up something new: a large offer and the intent of global traders to get new business opportunities and sell products through corruption, destroying people with moral and circumventing legal barriers, making corruption the part of a system. Such behavior makes the public getting used to bribe and weakens the efficiency of the rule of law. Corruption is the opposite of all fundamental modern postulates in capitalism. Capitalism justifies wealth through hard work and property is considered sacred, just like the protection of private property and equity. Public services are considered something that does not belong to an individual but serves everyone else. Criminal forms of corruption occur through bribing and acceptance of bribes, as well as through abuse of power and financial frauds, unlawful mediation, and fraud. Someone using his function for personal gain threatens the foundation of the governmental and economic structures. In some countries, especially in developing countries, corruption is a serious economic and political problem. There are expression tendencies that characterize corruption: organization, participant's status, protection of individuals, important benefits of the unlawfully gained advantages, wealth without any fundamentals, connection to influential social factors, and problems in the detection and securing of evidence.

Keywords

Corruption • Security • Organized crime • Prevention

1 Introduction

Corruption and bribing traditions are as old as states themselves. Therefore, the fight against it is just as old. Simultaneously to the development of business activities and the involvement of states in the cities, as well as with the introduction of bureaucracy in society, corruption became more intensive and got to be one of the major problems of the modern world.

Corruption can be defined in several ways. It mostly means something degrading, bribing, paying off and adulteration (Ignjatovic 2015). This was the general meaning. However, today, a corruption most often means the unlawful abuse of social statuses and power for personal gain.

Corruption is the deviant behavior tied with a specific motive to gain private wealth on the back of public services. In this case, citizens may get certain benefits they do not have the right to.

The most all-around definition was delivered by Vito Tanzi. According to him, corruption exists if the purposely destruction of the principal impartiality for decision-making for the acceptance of personal gain exists as well. The principle of personal impartiality requires that the personal or other relations between participants do not influence the decision-making process. This part is a function of the modern society, which by itself is depersonalized. Based on Tanzi's definition, it is possible to conclude that there are

D. Tomic (✉) · E. Saljic
College of Security and Global Studies, American University in the Emirates, Dubai, UAE
e-mail: dusko.tomic@aue.ae

E. Saljic
e-mail: eldar.saljic@aue.ae

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two requirements for the destruction of impartiality in order to define or characterize something as corruption. At first, there must be the aim to accidentally destroy impartiality by, e.g., giving incomplete information. Second, there needs to be a consequence of impartiality in form of a benefit or gaining personal wealth.

The acceptance of advantages or the gathering of personal gain that is supposed to deliver partial decisions can take many different forms. The acceptance of advantages or the acceptance of personal gain can develop simultaneously to the making of a partial decision. However, these two types can also be timely separated. A partial decision from a corrupted individual creates an informal, yet very clear obligation of the corruptor to return the favor and offer something in return. This obligation is not timely limited, and the personal gain for the corrupted individual is set in the future. If the returned favor is, e.g., a well-payed job for a family member (even though the family member is still a student or unqualified, for example), it is obvious that the two favors are very different in nature. The given definition of corruption represents a solid analytical answer for the research of this phenomenon. However, applying the definition for the evaluation of the monitored activity can be difficult. It is hard to operatively define partiality in decision-making or the destruction of the impartiality principal. This can be defined as easy if a formal rule has been broken (Ignjatovic 2015).

2 Types of Corruption

According to the mechanism of corruption, e.g., their economic consequences, there are three types of corruption:

1. Small corruption, allowing the law to be executed—*small corruption without theft*.
2. Small corruption breaking the law—*small corruption with theft*.
3. *Large corruption* leading to changes and new laws to be passed.

The first two forms of corruption are considered administrative corruption. Here, it comes to bribing of state officials and their partial decision, making the full execution of state laws impossible. In this case, there is no law being broken, and the citizens pay these bribes for speed and efficiency in public services (where they usually have the right to these, for example). A corrupt official keeps the bribe from citizens and forwards the needed fee for certain rights to the state. In other cases, the corrupt official keeps the entire bribe to himself (Jelinic 2006).

Administrative corruption is the corruption of counter personnel. This is the lowest level of public service. Administrative corruption describes small amounts of money or material presents of small value in different public areas: healthcare, education, police, and customs.

2.1 Corruption Within Police

The customers in the police sector are the citizens, and the sellers are the policemen. The services offered consist of benefits the citizens get when the policeman is not on duty (Boskovic 2000). These services get various forms: not paying for ticket fees, no written reports about the certain person paying the bribe, no real reflections of the cases against them, etc.

2.2 Corruption in Education

In education, people paying bribes are the students or their parents, while teachers or other people in the school administration or in the education sectors are the sellers. Starting from the elementary school and going all the way to high education, corruption is widespread on all levels and is found in all segments, from buying grades to organizing field trips, student accommodation or buying diplomas or certificates (Stanic 2006). This points out that corruption in education is truly diverse.

2.3 Corruption in the Legal System

This time, the corrupted individuals are judges and prosecutors, but also lawyers, experts, and witnesses. Corruption in the legal system refers to decisions about an act or services for the benefit or perpetrators or no prosecution against one or more individuals who are criminal and ready to pay. The level of corruption in the legal system depends on the current state of this part of the government. In some countries, corruption is directly proportional to the politicization of the legal system, bad material status of officials in the legal system, discretional rights of judges or with the lack of an independent court system and a rule of law (Radovanovic and Bulatovic 2005).

2.4 Corruption in Healthcare

Corruption in healthcare is mostly involved in getting faster and more qualitative services (corruption without theft) from doctors, or services that an individual, as a patient, would

not be permitted to (corruption with theft). Illegal payments for healthcare services manifest in different basic forms. The first form is a donation. For many services, it is necessary that the individuals pay for the materials or medicine used to provide the certain service. Another form is the direct demand for money from patients or their family members. To get better healthcare, a faster necessary intervention or ER treatment, money is being demanded. The cause of corruption in healthcare is the inability of the state to fulfill demands and finance the treatment of the individual. An additional influence on corruption additional influence be a social anomaly, a moral crisis, drastically poor citizens, and fewer employees in healthcare.

The most dangerous form of corruption is **large-scale corruption**. Large-scale corruption leads to changes and the passing of new laws. This form is also called **political corruption**. It occurs when the highest state officials use their positions to form the public policy for personal gain and the interests of their close individuals and groups. Interest groups influence the decision-making process about public affairs of national interest through unlawful financial and other donations to political parties (mainly the governing one) and by buying votes in the parliament. Large-scale corruption occurs in closed circles, in so-called dark corridors, without the knowledge of citizens, and less often in stable and democratic societies. The consequence of this sort of corruption is the phenomenon called "The enslavement of a state". It occurs when the state is under the strong influence of domestic business oligarchies forming the state's economic policies and laws to their likings (Jelinic 2006).

3 Corruption as a Form of Organized Crime Worldwide

Whenever the topic of worldwide corruption is being researched, the findings are that corruption is omnipresent in all parts of social life.

The central mark of the institutionalized systemic frame allowing and supporting corruption in the world is the most common marks of statistical economics, widespread state interventions, arbitrary state decisions, discriminatory economy policy, but also economic sanctions toward certain countries. Many corruption mechanisms are universal and can be found in all countries in a similar fashion.

There is also the fact that the regimes in certain countries have reacted in a deviant way. There was a slight wave of support for private initiatives, but only in the private spheres that were interesting to the state. Everything outside of it was directly or indirectly controlled and made impossible (Boskovic 2000). This created a paradox situation in Serbia, e.g., where people in the business sphere were blocked on two sides—through sanctions on one side, which were imposed by the creators of the economic system and economic policies. In return, it created the breeding ground for crime and corruption.

The previously mentioned causes of corruption related to the state's intervention in markets, through measures that, without considering motives but results, hinder the free function of the market. Apart from that, there are important corruption sources not tied to the state intervening in markets in a classic way. These cases consider state affairs that must be conducted without the grade of interventionism in economics or the frame of interventions. The mentioned state affairs are potential sources of corruption. Criminal acts mainly secure funds through violent and criminal acts, but in this case, it can be said that certain states create a demand for corruption (Serbia, for example). Apart from the mentioned key factors of corruption, the former state policy (political causes) has had a big influence on the corruption in Serbia. This also includes the character of interactions within the society, the economy of the public sector, the character of state governance and others. During the 1990s, Serbia has built a specific political system, which was very prone to corruption. Maybe it was even conceived so that the political elite created possibilities to get wealth by hurting the state and society.

The legal causes for corruption are indicators found in characteristics of the legal system influential to the occurrence and the spread of corruption. Based on expert's questionnaires evaluating corruption in the public sector of 163 countries, Finland, Iceland, and New Zealand have the least forms of corruption. The lowest corruption rate in former Yugoslavia is in Slovenia, followed by Croatia in the 45th place. Serbia is in the 90th place, while Bosnia and Hercegovina come 93rd, and Macedonia taking the 105th place (State of Montenegro 2005).

3.1 Fighting Corruption

Fighting corruption is an international duty that originated from international conventions that Serbia has accepted. In this paper, we will only mention the most important ones. The United Nation signed the convention against corruption in New York on October 31, 2003. The increased importance of executive power is derived after a relatively short period of superiority by the parliament in the second half of the nineteenth century. The possibility to determine all similarities with the overruling of the executive power is characteristic of the earlier development of social formations and the first phases of capitalism itself. The convention states that corruption is an international problem since it is a threat to the stability and the security of a society because it infiltrates democratic values and institutions, undermines ethical values and the justice system, and threatens the

development and the rule of law. Corruption connects very often to other criminal forms (especially organized and corporal crime) on the international level. The goal of the convention was to improve and strengthen the measures for efficient and successful prevention and fight against corruption and ease the international cooperation and help in the fight against corruption. Many parts of the world have a council for the fight against corruption. These councils formed their bureaus for technical and administrative affairs, with the task to accept and work on certain cases reported by citizens. The council has the duty to act on citizen's reports. In the last three and a half years, these reports have been a vital source of information for further investigations and initiatives to improve the fight against corruption (Tanzi and Davood 1992).

The Bureau of the Council forwards the reports to the governing bodies and always demands feedback about the undertaken measures. This helps citizens in individual corruption cases. Depending on the individual case and the priority, passed in the annual working plan of the Council, the council's bureau follows the report status of official services. The council reacts through letters to the governments and statements to the public.

The role of the Council for the fight against corruption is:

- To follow and analyze the occurrence of corruption.
- To help the government and the governing bodies develop necessary measures to prevent and fight corruption.
- To coordinate expert groups for the preparing and adaptation of regulations to the international standards in the fight against corruption.
- To follow the work of national and international institutions, as well as the organizations and associations in the fight against corruption.
- To raise awareness about the presence of corruption.

The work of the council is entirely public. This initiative has a multidisciplinary approach in the fight against corruption and deals with questions like adaptation and implementation of international anti-corruption instruments, improving the function of governing bodies and the rule of law, as well as promoting transparency and integrity of business activities and developing an active society.

An increased role and importance of executive power is a new characteristic in the development of the modern state. This characteristic was expressed at the beginning of this century, yet it gained more importance in the last two decades. Other Scandinavian countries have deviations of this word, e.g., in Norwegian, it is called the Onibudsman, and Ombudsmand in Danish. A modern state, getting more involved in the domains of modern life, has increased contacts to its citizens (through governing bodies and public officials). The more contact a state has with its citizens, the more it requires them to do or not do something. An inevitable consequence of this is that citizens are in danger to have their rights and lawfully founded interests hurt in one way or another. There are three ways in which a state secures the lawful, complete, and qualitative work of government and public offices.

The first way is adequate, effective, and reliable personnel. These personnel are aware of their work and do not abuse or overstep their authority or abuse the power they had been given.

The second way represents procedural securities against mistakes and the possibility of corrections or other unlawful acts in the executive sphere. Finally, the third way is conducted through external monitoring by people from the outside not being a part of government services or the executive. This is the Ombudsman, or the public advocate.

Ombudsman (Rowat 1968) is a Swedish word representing an advocate. In other words, the Ombudsman is protecting the law and the citizens, a public advocate for protecting the public against possible abuse of power by the government of a certain state. The popularity of this authority led to similarly named services being named after this Swedish word, not only in literature but also in the law itself. The shortest definition of the Ombudsman was made by the Canadian professor Rowat in the prologue to his book *The Ombudsman–Protector of Citizens* (n.d.). According to him, there are three main characteristics of the public advocate:

- Evaluates the public complaints about administrative injustice and bad management.
- Evaluates criticizes and announces but does not denounce the actions of the management. There is a characteristic opinion of the Norwegian government in the explanation of its suggestion for the Law of the public advocate in 1961: "The system of the Ombudsman can be of great importance to anyone who thinks they were the subject of abuse of power by administrative officials. Reports to the court can either appear to be hard or expensive. Not everyone can have the possibility to have its case debated in Storting through interpolation and questions, and not many believe in the idea that this can be done in a simple and cheaper way [Rowat 1968, p. 25]."

There are many reasons for the introduction of public advocate. The premise was that the executive and government services, as well as officials cannot be left to themselves, to rule on their own and to be their own judge; management services, which have the closest contact to the public, can make mistakes and legally hurt citizens and laws created to protect citizens. The most mistakes can be corrected if the

citizens file a complaint, and the case is solved within the executive sector. Therefore, citizens are not left to fend for themselves when facing the management. The public advocate, or the Ombudsman, in this case, has several abilities:

- It is a parliamentary office with the right to monitor the executive sector; the parliament cannot monitor the office directly and does not have the possibility to dive into each of the office's businesses, hence this assignment falls to the Ombudsman.
- It is not affiliated to the current monitoring systems of government offices and officials, but rather an addition to it.
- It is only one of several organs monitoring the lawful work of the office or officials, and the only one paying attention to the treatment of citizens; sometimes, the Ombudsman even evaluates the discretion of used authorities.
- The office of the Ombudsman is free and informal for all citizens, and they can file complains to him to evaluate the situation; on the other hand, the Ombudsman has the right to act on its own and bring own initiatives.

As an office with the abovementioned, short cited physiognomy, the Ombudsman should have a dual function. On the one hand, the Ombudsman needs to be a protector of citizens, e.g., he needs to work for the citizens. However, on the other hand, the existence of an Ombudsman and the work are simultaneously conducted for the interest of the entire society (state and offices) and in the executive sector itself. If the work of government offices and officials is done according to the law, and if it is conducted in an efficient and more qualitative way, the entire system will function better, and the government will have less reasons to be unhappy and express critique, which is also of public interest. It is important to mention another explanation of the Norwegian government in 1961: "The system will probably be useful for government officials, since the Ombudsman will enlighten and disregard the complaints filed without probable cause. This way, the Ombudsman can protect government officials from threats by other people, and can contribute to ease the work of Storting, where complaints are being filed from individuals against administrative offices." (Rowat 1968).

A central question raised by researching the role of the Ombudsman is the question regarding its jurisdiction. What offices, facilities, and individuals can be monitored by the Ombudsman? By mentioning the categories of subjects monitored by the public advocate, we can conclude the following:

- The Ombudsman does not have the authority regarding the central representational body of a state. This is understandable since the Ombudsman is a part of this service and is elected and succeeded by the same office.
- The main authority of the Ombudsman, representing the main reason for its introduction, is the monitoring of ministries and other central offices. The Ombudsman can monitor all organizational units in this field. A certain question appearing in certain countries with different answers is if the Ombudsman monitors the work of the ministers. The minister is a member of the government and holds responsibility toward the parliament and is constantly monitored by it. This is how the introduction of this special form of monitoring through the Ombudsman has been questioned since it can deform the responsibilities of the minister (Anderson 1966).
- Until recently, all local governments, except for Finland's, were expelled from the Ombudsman's authority. The Ombudsman has been viewed as an organ of the parliament monitoring offices and officials responsible to the parliament. Since local governments have been formally independent for the parliament, the Ombudsman did not have any authority to monitor them.
- Courts and judges are an additional field where the Ombudsman in some countries has some sort of authority, while he is not allowed to monitor courts in other countries. The Ombudsman can monitor the courts in Finland and in Sweden, but not in other countries. Other countries believe that the Ombudsman's monitoring of courts would be incompatible with their independence. Not that these countries think that judges cannot make mistakes. They are simply looking for other ways to monitor the judicial system.
- Depending on whether a certain country has an Ombudsman for civilians and the military, military public advocates monitor the armed forces. This special Ombudsman field exists in Sweden and Norway.

Introducing the Ombudsman is very important for several reasons, as it has been concluded. However, its role in the fight against corruption could be critical, especially in Serbia.

The Ombudsman is the protector of the public. The Citizens come to him when they want to complain against the state administration and other institutions in cases with mistreatments and preventions of certain rights. The public advocate investigates unlawful decisions, other laws, and regulations, as well as unlawful procedures; partial, unjust, and discriminatory decisions; lack of certain decisions, prolonging certain procedures; and the lack of competence and awareness, as well as the inefficiency in administration. Additionally, the Ombudsman has access to public and government papers in order to conduct the research (Radovanovic and Bulatovic 2005).

Public advocates do not deal with classic researches and complaints. They try to evaluate the mistakes of the administration in order to correct them. In order to be

successful, the Ombudsman must be completely independent, especially from the executive power. This is especially important since he must have the trust of the public, which is the foundation for a successful Ombudsman.

In all states, the Ombudsman acts in two ways:

- after complaints have been filed;
- on own initiative.

The first question regarding the right to file complaints to the Ombudsman is if the complaint is some sort of *action popularism* or if it is connected to some sort of special personal interest. The first thing might be the case more often. In other words, the Ombudsman will represent anyone who is not even able to prove any sort of personal interest. However, practical reasons (the danger of getting flooded by baseless complaints without any legitimacy) led to the fact that in practice, the pure form of *action popularism* is not being implemented (Novakovic 2002).

In order to file complaints easier, there are no special requirements regarding the form of the complaint. It is enough to file a written and signed complaint. In other words, anonymous complaints are not being accepted. There are no other formalities or other requirements. Another advantage for contacts to the Ombudsman is that no country has imposed fees for complaints filed through the ombudsman. Hence, the Ombudsman is not obligated to act on all filed complaints. This is usually the case with complaints without any real legal foundation that have not exceeded the legal rights and where there is no case being investigated against. The Ombudsman does not consider other complaints but forwards them to the office they were originally meant for.

However, these rules do not have to be absolute. Cases in which the intervention of the Ombudsman would lead to more efficient processing, while the evidence and facts are still fresh, are still possible. Apart from acting on complaints, the Ombudsman can act on its own initiative. If the Ombudsman sees problems of public interests, he can file initiatives against the public offices or officials he has been monitoring. The Ombudsman can request files for the cases he is working on in two ways. The first way is the direct insight in the work and the procedures of the investigated office through inspections conducted by the Ombudsman or his office, and the second way is through sources like the press and other information media.

Facilities monitored and visited by Ombudsmen in their inspection especially refer to prisons and other facilities housing convicted felons. These visits are an opportunity to uncover invisible injustices that could go unnoticed. Prisoners can talk to the Ombudsman themselves and present complaints. The Ombudsman would then consider the most unjust cases and can start a procedure going against them but can also give legal counsel to the prisoner. Apart from prisons, the Ombudsman usually visits:

- police forces,
- mental hospitals,
- facilities housing alcohol addicts,
- orphan homes,
- courts, and
- government offices.

Different from the nineteenth century, the Ombudsman can start his initiatives based on press reports and press releases.

4 Conclusion

The previous analysis showed that corruption represents a lack of social structures, requirements, social norms, and values, which are necessary for the normal execution of capitalism. The lack of these norms causes corruption to grow and hinder the development of national and international economic relations. Therefore, Corruption is the negation against all morals of capitalism since capitalism values private equity and considers private service to be important to everyone. Criminal forms of corruption occur through bribing and acceptance of bribes, as well as through abuse of power and financial frauds, unlawful mediation, and fraud. Someone using his function for personal gain threatens the foundation of the governmental and economic structures (Stanic 2006).

In some countries, especially in developing countries, corruption is a serious economic and political problem. There are expression tendencies that characterize corruption: organization, participant's status, protection of individuals, important benefits of the unlawfully gained advantages, wealth without any fundamentals, connection to influential social factors, and problems in the detection and securing of evidence.

There are many warnings that corruption threatens to become a tradition and a culture. In certain countries, there has been a century-long tradition of bribing. Smaller or bigger bribes are considered normal everyday behavior. Yet, regardless of however small the bribing and corrupt tradition might be, in modern societies, it pathologically grows into a new situation and infiltrates economy and state public services, creating a situation that is completely different to the traditional one. Bribing traditions are mostly used as alibis and excuses of the people benefiting from it.

Corruption and bribing traditions are as old as states themselves. Therefore, the fight against it is just as old. Simultaneously to the development of business activities and the involvement of states in economy, as well as with the

introduction of bureaucracy in society, corruption became more intensive and got to be one of the major problems of the modern world.

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Developing a Green Curriculum for Introduction to Information Technology Course

Sanaa Kaddoura

Abstract

No one can deny that information technology courses can be an excellent initiative for increasing the awareness of environmental and health problems. Hence, information technology instructors play a critical role in spreading awareness of green technology and reinforcing sustainability. The Introduction to Information Technology (IIT) course contains many topics that can be directed in an intelligent way to spread awareness about sustainability. In this paper, we suggest a detailed curriculum for the IT course that converts a standard curriculum into a green one. The goal of this curriculum is to produce a new generation that is aware enough about the role of technology in our life and its impact on the environment. The course topics will be the answers to the following questions. First, how to avoid the negative impact of technology on health and the environment. Second, how to decrease the negative impact that cannot be avoided or find a solution for it. Finally, what are the alternative green computing techniques that can be used to increase sustainability? The proposed curriculum should involve the instructor and the students. Both should collaborate in a set of activities that will give society a generation with high awareness of green computing and sustainability.

Keywords

Sustainable information technology • Green computing • Higher education

1 Introduction

Technology and digitization is moving at a rapid pace. The challenge is how to keep it balanced with sustainability and environmental resources. Describing something as "green" implies it is environment friendly and has low usage of energy and negligible polluting footprint. The first usage of computers to shift toward green activity is the use of paperless documents such as PDF files. In addition, many individuals and companies started to use clouds and online storage areas to store data instead of printing them. Printer devices as well were shifted toward using less ink and less power while printing in order to go green while printing. Green computing means to use computers and their resources in an eco-friendly way. According to the International Federation of Global & Green ICT (IFGICT), green computing a.k.a. IT sustainability is the practice of environmentally sustainable computing. Green computing includes the production procedure of devices that save energy and safe disposal and recycling practice of electronic waste.

"Go Green" trend has a positive audience. A clear indication is revealed in the project conducted at Oxford University about Low Carbon ICT. The goal of this project is to develop techniques in order to reduce the consumption of energy consumed by desktop computers inside the university.

Information technology instructors are the most effective and powerful guides, who engine for achieving sustainability. The goal of this research is to suggest a curriculum that links information technology and sustainability. In other words, to promote sustainability and urge the new generation to consider sustainability in their work and daily life activity. The practical methodology is introduced with a detailed explanation about how to apply them inside classrooms.

This paper is divided as follows: the second section presents some related work done recently about green computing. Section three defines green computing. The fourth section presents the proposed curriculum with

S. Kaddoura (✉)
Zayed University, Abu Dhabi, UAE
e-mail: sanaa.kaddoura@zu.ac.ae

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detailed topics. Section five discusses the benefits and challenges of the proposed curriculum. Finally, section six is conclusion.

2 Related Work

In 1992, the green computing topic was issued in the USA when Environmental Protection Agency (EPA) started to recognize electronic machines that are energy savers (Ruth 2009) in order to reduce the emission of carbon dioxide in IT-related activities. Several types of researches were done to promote the importance of linking sustainability and information technology in educational organizations. Some related researches are summarized below.

The authors of Eriksson and Pragman (2014) focus on discussing the absence of an educational material that links sustainability and computer science, specially the lack of books that focus on these topics. The paper focuses on encouraging students to apply sustainability in their everyday practices.

In Cai (2010); Singh (2015), the authors discuss the responsibility of the educational sector toward ensuring sustainability through information technology education.

In Mann (2015), there is a demand for training information technology students to be a practitioner to achieve sustainability through information technology. There was a call for integrating sustainability in the curriculum.

The authors in Pargman (2013) point out the lack of curriculum material that links information technology and sustainable development. They focus on the importance of linking sustainability to the domain the student is studying so that it can be efficient.

In Easterbrook (2014), the author highlights the role that system thinking plays in sustainability development. System thinking urges the student to link computational thinking with sustainability.

In Özkan and Mishra (2015), the authors presented the sustainable ICT curriculum along with the learning outcomes. They point out some challenges that may be faced in this curriculum. The first challenge is how to engage the students and teachers in sustainability. Second, how to identify the borders of the IT activity. Finally, how to merge the topic in the syllabus.

3 Green Computing

Green computing can be defined as the study and practice of designing, manufacturing, using, and disposing of computers, servers, and associated subsystems for instance monitors, printers, storage devices, and networking and communications systems efficiently as well as effectively with low or no impact on the environment (Singh 2015). Green computing has the following positive impact on the environment:

1. Efficient and reduced energy consumption by computing resources.
2. Sources of energy should be eco-friendly.
3. Reduce electronic waste.
4. Utilize resources efficiently.
5. Reduce overall cost of resources.

4 Curriculum Development

4.1 Course Objectives and Outcomes

Introduction to Information Technology course is a general course that all students have to register when they join the university. Targeting this course means that all the students in the university will have the concepts of green practices in computing. In this course, the students will learn the normal course topic of the introductory course to information technology in association with thinking about this knowledge in a greenway. Each topic of the original curriculum will be extended and modified in order to support green computing. Some topics will be added in order to explain some concepts that are new to the students.

It is expected that at the end of the course, students will be aware of green computing. They will also deal with computer devices in an eco-friendly way. The students should apply what they learn in this course in their daily use of technology. Students will be able to apply alternative green computing techniques that can be used to increase sustainability.

4.2 Course Topics

In addition to the regular topic given in the course, the following topics should be added.

Green Computing. The topic does not currently exist in the course, and it should be added as a sperate module. In this topic, the student will learn the basic terms of green computing and the importance of going green. The students should understand, in contrast, how traditional computing habits are harmful to the environment and health.

Computer Hardware. The topic exists in any information technology course. However, it should be amended to include how hardware is wasting green resources. Students should learn the practical ways of saving energy from the hardware. Here is a list of best practices to be discussed in this unit:

1. If you are not using it, turn the device off: This action is the most straight forward action to be taken in order to decrease power consumption.
2. Power Saving Mode Device Property: All new computers have this feature. This feature is usually turned on when the battery is low. However, students can be guided to use it whenever they are not doing substantial activity on their devices.
3. Screen Saver: Screen saver increases power consumption, especially if it is designed as 3D animation. In this case, intensive graphics will be required; thus, more power will be consumed. Thus, the best way is to the turn-off screen saver.
4. Monitor Sleep Mode: This mode is efficient because it decreases the power consumption as the screen is not using any electricity.
5. Hard Disk Sleep Mode: the hard disk also needs electricity. Thus, when it is in sleep mode, energy consumption will decrease.
6. Hibernate Mode: This mode is a complete power-down mode. Before the computer goes into hibernate mode, the RAM copies its data to the hard disk and the computer power is off. This mode is similar to standby mode. However, standby mode consumes extra power.

Teaching students such practices with their implications and effects on our lives will make them a habit. We are preparing a new generation who are aware of how to contribute to saving the environment. They should feel the responsibility of creating eco-friendly computing practices.

Electronic Waste. Electronic waste, e-waste, is the old and non-needed electronic devices that turn into waste. This waste contains chemical components that should not be mixed with general trash. The way of treatment of general trash is different to the way to treat electronic waste. In addition, a large amount of e-waste can be recycled and turned into green gold. Students should be aware of the consequences of not disposing of e-waste properly.

4.3 Laws and Regulations

The students should be aware of the laws and regulations that exist locally in the UAE and around the world. There are international laws for supporting green computing and responsibilities. The European Union adopted the Waste Electrical and Electronic Equipment Directive and the Restriction of Hazardous Substances Directive. These laws mandate recovery and recycling of e-waste and restrict hazardous material content of new electronic equipment made by European manufactures (Green Grounds Well 2013).

In the UAE, there are many laws and actions that target sustainability. Students should be aware of them and understand their responsibility toward supporting them. Federal Law 24 of 1999 (Environmental Protection 2018) sets out the current legal basis for environmental protection and conservation in the UAE. This law targets the polluters in order to make them pay for their illegal actions toward the environment. The Ministry of Environment and Water is imposing penalties on polluters and also help push through recycling and waste reforms in the country.

5 Conclusions and Future Work

In this paper, we propose a modification of the information technology course curriculum so that it adopts green computing and sustainability. The students should be able to link this course to sustainability. One of the learning outcomes will be increasing the awareness of future employees in the industry toward saving energy.

These topics will be applied in the course in the next semester. The students will be subject to a questionnaire to test their knowledge about green computing and sustainability. Also, to ask them about the actions they take toward the environment. The same students will be given, at the end of the course, the same questionnaire and compare their answers to find the impact of the course on their actions and lifestyle.

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Eco-certification in the Montenegrin Tourism as a Response on Climate Change

Jelena Janjusevic and Nikola Perovic

Abstract

The adoption of eco-certification standards should provide for Montenegrin tourism industry positive effects both on supply and demand side. On the supply side, eco-certification should improve the efficiency of resource management in operations of all elements, such as energy, water, employee management, waste, cleaning as well as disinfection materials. At the same time, on-demand side, according to best practices, potential consumers are willing to pay up to 40% more for services of eco-certified units, since their principal benefit is in added value. To estimate the level of the low-carbon tourism development, its current level, and potentials for further development, the field survey was conducted in Montenegro during summer 2015, as a part of UNDP project "Towards Carbon Neutral Tourism in Montenegro," led by the authors of this paper. The survey involved three target groups: (1) relevant central and local authorities in the area of tourism and environmental protection; (2) the travel and tourism sector businesses; and (3) visiting tourists. Travel and tourism business entities were at a certain level using mitigation measures for the reduction of CO_2 emissions, but some incentives are needed and a systematic approach led by the national institutions. Relevant public institutions were aware of eco-labeling schemes, and there were some intentions for providing assistance to the travel and tourism sector in applying it in their tourism offerings. Most of the tourist business entities (89%) agree with the statement that ecotourism will be important in the future, as well as 81% of them agree with the statement that climate change has a significant impact on the tourism sector development. More than two-thirds (68.7%) of tourism business entities, did not apply any environmental standards scheme or have certified accommodation unit. However, more than half (58%) of them are willing to pay for eco-certification. Tourism industry representatives (66%) are interested to learn more about eco-certification in Montenegro, as well as to be further informed about climate change and tourism in the future (75%). For the transfer of general knowledge, this research was limited only to one country, but further research could show the potential spread of positive ideas from Montenegrin tourism to other countries, especially where UN or other global institutions have plans for implementation of the similar projects.

Keywords

Sustainability • Sustainable tourism • Eco-certification • Climate change

1 Introduction

The purpose of this paper is to investigate, research, and analyze characteristics, features, possibilities, and potentials for eco-certification and how it corresponds with the level of development, potentials, and future of Montenegrin tourism sector. Also, the paper analyzes the level of readiness and willingness of the Montenegrin accommodation industry as well as tourists to be part and invest in eco-certification.

The type of research that was used in this study was a combination of qualitative and quantitative research. Qualitative researchers aim to gather an in-depth understanding of sustainable tourism and eco-certification, its main characteristics, and benefits for the countries and tourism industry where they have been applied. This approach investigates the "why" and "how" of decision-making.

In order to assess the current situation toward the existence and development of the low-carbon tourism services, a field survey was conducted. Sample structure among the

J. Janjusevic (✉)
Heriot Watt University, Dubai, UAE
e-mail: j.janjusevic@hw.ac.uk

N. Perovic
Higher College of Technology, Dubai, UAE
e-mail: nperovic@hct.ac.ae

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tourists/visitors were addressed to 1,000 tourists/visitors in seven targeted municipalities. When it comes to the travel and tourism sector target group, the survey was conducted among 100 companies operating in the tourism and travel sector in seven target Montenegrin municipalities.

Evidence and findings from this paper are obtained for the first time for Montenegro and will create an important baseline for further plans and activities in this sector.

2 The Methodology of the Research

Authors of this paper, in cooperation with United Nations Development Programme (UNDP) office in Montenegro, have conducted a field survey among accommodation units in Montenegro in order to identify the level of awareness, as well as readiness and motives of the tourism industry in Montenegro to become a part of the eco-certification system. The paper is structured in three parts. In the first part, the authors conducted a review of essential eco-certification schemes in the world with a particular focus on EU Eco-label. In the second part, the background of the tourism industry in Montenegro was provided, in order to examine in more details the results of the field research in the third part.

The field survey was conducted during summer 2015, and the same questionnaire was repeated in 2017. The survey involved three target groups: (1) relevant central and local authorities in the area of tourism and environmental protection; (2) the travel and tourism sector; and (3) visiting tourists. When it comes to the travel and tourism sector target group, the survey was conducted among 100 companies operating in the tourism and travel sector in seven Montenegrin municipalities. Random sampling method was implemented within rent-a-car agencies, restaurants, and tourism agencies. Sample units for individual accommodation were based on the random sampling method according to the category of the accommodation facility (number of stars, which is widely used in Montenegrin tourism).

Sample structure among the tourists/visitors was addressed to 1,000 tourists/visitors in seven targeted municipalities. Sample among 1,000 tourists/visitors included respondents over 18 years old selected according to Kisch tables (random selection of respondents) with estimated statistical error ± 3%. The sample design was based on a three-stage stratified random sample that took into consideration the following categories: (i) distribution between domestic/foreign tourists; (ii) frequency of their visit in the coastal cities and (iii) tourist overnight stays. Field survey among the visiting tourists was aiming to provide information on the level of awareness, general knowledge, and tourists' preferences, including but not limited to low-carbon tourism concept, products and services (sustainable means of transport, eco-friendly accommodation facilities, application of environmental standards, and complementary tourism products), and eco-certification standards in accommodation sector and tourism supply chain.

3 Literature Review

The review of literature has been organized on three key issues: the positive impact of eco-certification on various stakeholders in the tourism industry, various international case studies, and an increase of awareness on sustainability among tourism stakeholders.

Numerous researches had shown benefits for countries, companies, and customers, both domestic (Cerqua 2017) and foreign (Capacci et al. 2015), after the adoption of relevant eco-certification standards in the tourism sector. Besides having positive impact on environment (particularly beaches in coastal countries (Lucrezi and Van der Merwe 2014)), economic subjects that operate under these standards experience positive financial outcomes, due to the increase of customers and higher prices of their accommodation, as well as to the increase of hotel investments (Blackman 2014), and overall improvement of competitive advantage. Implementation of eco-certified standards has also been very proactive from an environmental innovation point of view (Leroux and Pupion 2018). At the same time, companies that implement these quality standards, besides having economic savings due to energy and waste reduction, also accomplished a positive reputation as a result of corporate responsibility based on sustainable development principles. Business operators that have implemented eco-certified standards have been perceived by customers as better versus their competitors (Esparon et al. 2014). According to UNEP (UNEP 2011), the most significant development goal has been in addressing poverty and delivering a sustainable XXI century. That is why all economic sectors, including tourism, have to be guided by sustainable development principles, especially knowing the fact that tourism sector contributes more to the global GDP than oil or pharmaceutical industry (Lebe and Vrečko 2015). Globalization forces enhanced implementation of standardization in every field of the economy (Lee 2012). Knowing that services have the most significant growth among other sectors of the economy (Rakita 2005), tourism needs standardization, especially in its accommodation sector. Eco-certification is a global answer for the accommodation sector toward standardization in the tourism supply chain. However, at the same time, the industry should be concerned about potential "greenwash" that could come from eco-certification if green messages were not connected with the actual change in behavior (Font 2002). On the other hand, standardization in the tourism industry has an essential influence in the global climate changes combat, knowing that, as per the UNEP (UNEP

2012), tourism and travel jointly contribute 5% of total greenhouse gas (GHG) emission in the world. Important indicator of sustainable tourism is the level of eco-certification existence in the sector of tourism accommodation.

Examples in many countries had shown positive impact of eco-certification standards on the environment and stakeholders that participate in tourism industry, such as cases of Galapagos Islands (Black and Crabtree 2007) or United Kingdom (Jarvis et al. 2010), where companies have been encouraged to implement eco-certification schemes in order to improve competitive advantage, and also reduce negative environmental impact. The findings in Iceland (Karlsson and Dolnicar 2016) had shown the presence of customer segments that care about eco-certification when making purchase decisions. Research in Croatia (Sipic 2017), which belongs to the same region like Montenegro, had shown an increase of product differentiation of eco-certified tourism services and consequently priced premium ranging between 18 and 72%.

It has been explained (Pugh and Fletcher 2002) that the green economy in practice exists when a new value is added as per identified fields of innovation. Business operators need to analyze their supply chain in order to determine which factors can be reduced compared to existing industry standards (e.g., price); which new factors can be created (e.g., healthy and environmental style); which factors can be raised above industry standards (e.g., quality of products and exciting brands); and which factors could be eliminated (e.g., snobbish behavior and universal design). Greener lifestyle minimizes the carbon footprint of consumers (Lee 2012) and increases demand for green products overall. Researchers (Weaver 2010) have defined several factors that confirmed adoption of sustainable practices within the mainstream tourism industry: ethical considerations, the growth of the "green traveler" market, the profitability of sustainability, and motivation of large corporations to adopt sustainable practices. A prerequisite for sustainable tourism lies in responsible marketing (Jegdic 2014) since it defines consumer environmental wants and needs, her/his preferences, and demand for new tourism products.

4 Sustainable Tourism

Global climate change has influenced all sectors in the economy, creating the need for both adaptation and mitigation of these changes. Based on the UNEP Report (UNEP 2012), the sector of travel and tourism contributes 5% globally on total greenhouse gas (GHG) emission. The important indicator of sustainable tourism development is the level of eco-certification existence in the sector of tourism accommodation. Eco-labels can be understood as a product of overall environmental performance (Giridhar 1998).

According to the United Nations World Tourism Organization (UNEP 2011), there are three fundamental concepts behind sustainable tourism:

1. Tourism should be more sustainable in the way that it was developed and operated.
2. Sustainable tourism strategies and policies should reflect a two-way relationship: impacts on tourism and the impact of tourism.
3. Sustainability and competitiveness are interdependent.

Sustainable tourism is a complex concept since it underlines possible conflict of interest between tourists and their demand for comfort and luxury, and destinations' needs for long-term development by limitation of their caring capacity.

As stated above, there are several factors which stimulate sustainable behavior in tourism (Weaver 2010). In order to prevent negative public image or consumer boycotts, companies should respect socially responsible practices, since that is a field were ethical considerations play a significant role in the more significant implementation of sustainable tourism. On the other hand, global consumers express a more significant level of sophistication and responsibility in their purchasing behavior. Greenmarket is growing globally and continuously. There are approximately 25% of all consumers in the USA, UK, and Australia that could be described as "true green consumers" (Weaver 2010). Significant reasons for the business sector to be involved in sustainable tourism are due to the increase of profitability that comes as an effect of sustainable tourism coming from reduced energy consumption, reusing and recycling of certain materials, etc. It is essential that especially major multinational corporations (MNC) adopt sustainable practices knowing their significant influence on the creation of the destinations' image and the overall job market. Sustainable tourism is a tourism which concerns total economic, social, and environmental impact, by caring for the needs of tourists, economy, environment, and local communities (UNEP 2011). As a segment of the global economy, sustainable tourism has been deeply influenced by climate changes, as one of the most critical global development challenges. The only way to achieve sustainable development in tourism is to respect interests of macro and micro marketing environment, and to motivate all to mutually look at tourism as an integral activity, where almost every organization, regardless if it is governmental or nongovernmental, can mutually work to create better output of the tourist destination (Perovic 2013).

Table 1 Sustainable tourism actions

Action	Target group
Plan your trip in order to reduce costs and time	Tourists
Do not use plastic bags during your trip	Tourists
Reduce water consumption in your room	Tourists
Always print on both sides	Tourists and accommodation units
Install baskets for collection of recycling waste	Accommodation units
Install sensors	Accommodation units
Adopt space around your unit for walking and jogging	Accommodation units
Serve organic food, preferably locally produced, at least for one meal	Accommodation units
Open eco-shop in your unit for locally produced items and «green» gifts	Accommodation units
Serve meals in outdoors, if weather conditions allow	Accommodation units
Use more electronic tickets and confirmations for smartphones	Accommodation units
Compost food waste	Accommodation units
Connect your unit with public transport options	Accommodation units
Install solar panels for water heating and sinks for rain collection for garden irrigation	Accommodation units
Increase the presence of eco-certification standards and their control	Accommodation units
Purchase only equipment with energy efficiency standards	Accommodation units

List of recommendations for sustainable tourism activities that can change economic behavior could be summarized, as shown in Table 1 (Perovic 2015).

Table 1 describes the potential actions recommended being applied not only by tourists but also by business operators in the tourism industry. The role of accommodation units is especially critical in order to promote sustainable tourism in its supply chain and the creation of new tourism products.

Quality control mechanisms that assure that a particular accommodation unit is environmentally and socially sustainable relates to two main segments (Weaver 2010):

- Code of practice, and
- Ecolabels.

Codes of practice are the most visible mode of ethical behavior in order to have guidelines for sustainable tourism, like APEC/PATA Code for Sustainable Tourism, Environmental Codes of Conduct for Tourism (UNEP), Code of Ethics for Sustainable Tourism, etc. These codes are low-risk and low-cost mode for the inevitable transition to the higher forms of quality control (Bendell 2004).

Eco-labels or eco-certifications (accreditations) are the result of standardization for promotion of environmental claims based on a set of specific criteria defined by third party, usually international nonprofit organizations or national governments.

5 Eco-certification as a Global Trend

Eco-certification has been used by different models in history such as German Blue Angel program (1978); The Swan (Nordic Eco labelling); Environmental Choice (Canada 1988); Eco Mark (Japan 1989); Green Seal (US 1990); Eco-mark (India 1991); Eco-label (EU 1993), etc. In the Montenegrin tourism sector, only the last one has been introduced so far and therefore deserves more elaboration.

Eco-labels can be understood as a product overall environmental performance (Giridhar 1998). According to (Pugh 2002) the key of the green economy, which is a broader concept where eco-products and eco-certification belong, has been in the creation of added value by identifying critical fields for innovation.

Eco-certification is a global trend, and there are more than 300 different schemes, and many of them are focused on a particular region or product (Weaver 2010). For example, Blue Flag Eco-label certifies European beaches. On the other hand, EC3 Global and their Green Globe system concern all tourism products and regions. It consists of four phases: benchmarking-bronze, which is based on benchmarking exercise; certification-silver, which is a confirmation of compliance with relevant regulations, performance outcomes, audit, and monitoring; certification-gold, which recognizes continuous silver certification within five years, and certification-platinum which is granted after ten years of continuous certifications.

There are 463 eco-labels that are recognized in Europe (Alphabetical Index of 463 Ecolabels 2018). Due to the limitations of this paper, we shall describe only a few related to tourism activity. For example, Aenor Medio Ambiente is a type I Ecolabel system aimed at recognizing environmental friendly products or services. The certification procedure is based on auditing and lab test. The program marks those products with less environmental impacts. *ANAB—Architettura Naturale* is a certification scheme that assesses the sustainability of building products and furniture. Building materials must be made mainly from renewable virgin resources, mineral resources, and a secondary resource for which recycling is logistically and energetically feasible. Those should be made from raw materials, which are preferably obtained locally. *BIO Hotels* concerns certification that covers organic and regional products in hotels. BIO Hotels can use only certified organic products that meet the standard of Bioland or similar ecolabels. *Blue Angel* was initiated by the German government and awarded by an independent jury to products that are environmentally friendlier than others serving the same consumer needs and wants. Each label specifies that the product or service has a focus on one of the four different protection goals: health, climate, water, and resources. CarbonNeutral is the registered trademark of The CarbonNeutral Company and is a global standard to certify that businesses have measured and reduced their CO_2 emissions to net-zero for their company, products, operations, or services. Permission to display the CarbonNeutral mark among accommodation units is only given to clients whose carbon reduction program is implemented by The CarbonNeutral. ECO certification is an eco-label granted by the Malta Tourism Authority to hotels on the islands of Malta. Approximately 15% of the hotels on the Maltese Islands are ECO-certified translating to almost 30% of hotel rooms. Eco Hotels Certified is a certification that stands for more ecology, more sustainability, and more regionalism in a business. It is a certification of sustainable operated tourism businesses and takes account of their total resource use. The CO_2 data are collected and evaluated against similar businesses, using an anonymous benchmark system, and this means that they can be compared with the best in the particular segment/category. To be selected, hotels must comply with several criteria, all aimed at improving their environmental performance and increasing environmental awareness among employees. EU Ecolabel is a voluntary scheme designed to encourage businesses to market products and services that are friendly to the environment and the European customers, including both public and private, to quickly identify them. It is granted upon an audit of 90 criteria of business performance in accommodation units, and from which 29 parameters are mandatory to receive the first certificate. Green Key is an international ecolabel for tourism products, awarded as a diploma to companies within the tourism industry.

According to the European Commission (EU Ecolabel Logo on Tourist Accommodation Units 2015), the EU Ecolabel logo on Tourist accommodation units defines:

Limits of energy consumption (e.g., use of high-efficiency heat-generating capacities);

- Limits of water consumption (e.g., reduction of water flow from tap and shower/minute);
- Reduction of waste production (e.g., single-dose packages for food service shall be avoided);
- Favors the use of renewable resources (e.g., at least 50% of the electricity shall come from renewable energy sources), and of substances which are less hazardous to the environment; and
- Promotes environmental education and communication (guests are provided with tips on how to behave in an environmentally friendly manner).

6 Benefits of Eco-certification for the Tourism Industry

Eco-certification of accommodation sector promotes principles of sustainable tourism, as previously explained. Excellent explanation of potential benefits that come from eco-certification was given by Ecotourism Australia. Eco-certification assures tourists that service providers are committed to environmental best practices and highest quality of their services, which should increase efficiency in business operations. Those who respect eco-certifications have to be regularly audited by independent experts and have an opportunity to increase their brand value. Very important is to develop a network of eco-certified accommodation units in order to create synergy from participation in worldwide certification schemes. Exposure to social media (Facebook, Twitter, Instagram, etc.) is especially crucial for all contemporary tourists who make their purchasing decisions based on these online networks. Members of Ecotourism Australia also benefit from green exhibitions, trade events, media referrals, and editorials. Belonging to these eco-certification systems is proof of respect of the culture and protection of local products and services. Continuous dedication for climate change is in the essence of

any eco-certification scheme. In overall, we can conclude that an excellent eco-certification scheme creates the following benefits for the tourism industry:

- It increases efficiency and competitiveness of the business operations, based on benchmarking with the best market players;
- It increases brand value, based on the regular audit of independent experts and cultural recognition;
- It increases market exposure, based on enhanced offline and online promotion and networking; and
- It increases potentials for climate change adaptation and mitigation.

Additionally, based on UNDP (UNDP 2016) eco-labels:

- Increase the environmental performance of the certified units,
- Are connected with financial investments which lead to an effective reduction of operational costs, and
- Certified accommodation units have high reputation amongst consumers.

7 Case of Montenegro: A Survey on Low Carbon Tourism and Lessons Learned

UNDP, with its project "Towards Carbon Neutral Tourism" aims to adopt a comprehensive approach for reduction of GHG emissions and minimization of the carbon footprint of tourism industry in Montenegro, by promoting country transition toward a carbon-neutral travel and tourism, minimizing energy use and transport in and around new green-field development projects, helping tourism industry to identify and implement cost-effective mitigation options in travel and accommodation sectors, as well as introducing carbon offset scheme and other innovative financial mechanisms to compensate for the residual emissions and generate additional revenues for climate mitigation and adaptation actions in tourism. Further, the project shall directly support four out of the seven priority areas identified by the Montenegrin Strategy for Sustainable Development (MSSP): "sustainable mobility through appropriate management in transport, sustainable tourism as a leading sector of the economy, sustainable urban development and improved rational use of energy, and increased use of energy from renewable resources" (UNDP 2016; Janjusevic 2016).

The survey among tourism industry representatives had the aim to provide information on their level of awareness, general knowledge, and level of development and preferences in tourism industry regarding the low-carbon tourism concept, but also specific aspect related to the current stage and willingness to apply for eco-certification standards as new quality of business operations and new customer value proposition.

Below are presented results from the surveys conducted in 2015 and 2017, with a comparison of results and description of the progress that was made with regards to the eco certification-related questions.

8 Tourists Attitudes

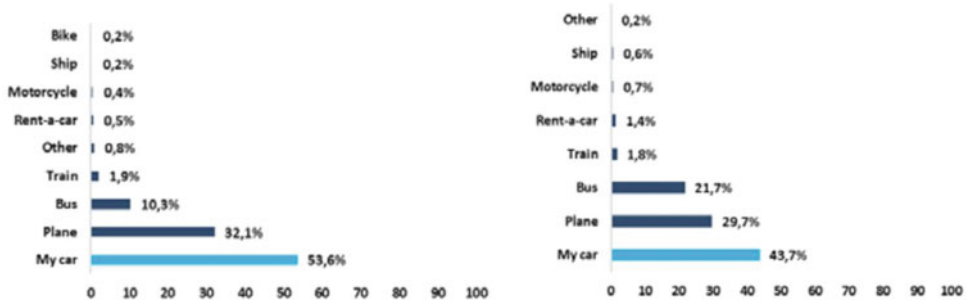
8.1 Visiting Montenegro, Tourists' Characteristics and Habits 2015–2017

Key reasons why tourists chose Montenegro as their summer holiday destination in 2017 were: quality of accommodation, food quality, and untouched nature, unlike in 2015 when their reasons for visit were untouched nature, affordable prices, and accommodation facilities (Graph 1).

Percentage of tourists who come to Montenegro by car increased by 10% in 2017, compared to 2015, while the percentage of the tourists who arrived in Montenegro via plane increased by 2% during the same period. It is indicative that the number of tourists who came to Montenegro by coach in 2017 decreased by 11%, compared to 2015 (Graph 2).

Passive tourism, as the dominant form of vacation during summer tourist season, was present both in 2015 and 2017, whereby, during both seasons, sunbathing and swimming represented the main activities which the tourists performed during their stay at Montenegrin seaside. Thus, in 2015, tourists engaged in cruising, tours around historic monuments, and national parks, while in 2017 98% tourists who participated in the research wanted to engage in sunbathing and swimming activities, 22% wanted to visit the national parks, 19% wanted sports and recreation, and to visit cultural-historical monuments.

Graph 1 Why you choose Montenegro as your holiday destination 2015



Graph 2 Which type of transport you used while you Which type of transport you used arrived in Montenegro-2017 while you arrived in Montenegro-2015

Tourists who visit Montenegro deem that the condition of the environment is improving with time, but they also point out that, both in 2015 and 2017, the problem of waste represented the key challenge Montenegro faced during the summer tourist season, which should represent a signal to the institutions on state and local level in order to come up with a long-term solution for the problem with waste disposal.

8.2 Transportation

Tourists mostly come to Montenegro by car (53%) or plane (32%). Foreign tourists mostly use planes as a means of transport while coming to Montenegro (Great Britain, Russia, and Germany), while a significant percentage of tourists from Serbia come by car (12%).

Tourists use their cars (54%) or rent-a-car (22%) to get around Montenegro.

In their home countries, the tourists use public transportation services (66%), while, on the other hand, most of them did not use public transportation services, and 83% of them considered that there was no need for the said means of transportation during their stay in Montenegro.

8.3 Carbon Footprint

Carbon footprint represents the total amount of GHG emissions (greenhouse gases—gases which cause the greenhouse effect) which are produced either directly or indirectly by individuals, organizations, events, or products. Carbon footprint is the measure of our impact on the environment and climate change, and it is expressed in tones (or kilograms) of CO_2 equivalents.

Research among tourists regarding their familiarity with climate change and global warming shows that tourists are somewhat familiar with this issue, which is purported by data that 59% of them consider that they have the necessary information about the climate change problem.

Analysis of foreign tourists by their home country shows that the highest proportion of tourists included in the research, out of those coming from Serbia, deem that they are entirely or insufficiently familiarized with the problem of climate change and global warming. The same applies regarding their familiarity with measures for reducing the carbon footprint, whereby up to 84% of the tourists who participated in the research were not familiarized at all or were not familiarized to the right extent with the measures for reducing carbon footprint.

In terms of the measures taken by them personally in their home/home country, in order to reduce their adverse impact on nature, the highest proportion of them always turn off the lights and AC when leaving a room (60%), while a high proportion of them often walks or rides a bicycle instead of using the car (54%). On the other hand, key activities which they do during their stay in Montenegro, and which are aimed at decreasing the adverse impact of an individual on nature, are also related to turning off the lights and AC while leaving a room (66%), as well as saving water—taking quick showers instead of taking a bath (52%), which leads to conclusion that the tourists who visit Montenegro apply their habits in terms of decreasing adverse impact on nature even during their stay in Montenegro.

8.4 Environmental Certification

Accommodation service providers in Montenegro are becoming increasingly more aware that the application of sustainable tourism principles and guidelines positively impacts the satisfaction of visitors, employees and the local community, as well as consumption of energy and water, waste reduction, and appreciation of tourists' feedback. Moreover, this leads to an increase in awareness about the environmental and social impact of accommodation facilities

and makes them work on the implementation of the principles of sustainability, both in management and in business. Thus, the availability of green and responsible hotels is continuously increasing, with or without certification plans.

8.5 Environmentally-Certified Accommodation

Tourist preferences (both domestic and foreign tourists) in terms of their interest in environmentally certified accommodation which do not "invade" the environment are pretty balanced. Namely, there are 48% of those who are interested in this type of accommodation, while 52% of interviewees have the opposite opinion. The highest degree of interest for environmentally certified accommodation is expressed by tourists from Russia, as compared to the tourists from Serbia. The highest proportion of foreign tourists who have calculated their carbon footprint are interested in environmental certification (87%), and they would be ready to allocate additional financial resources for that type of vacation (71%), thus they would be willing to pay up to 10% of the current price of package arrangement or plane ticket in order to contribute to financing the green projects in that way (72%).

The number of both domestic and foreign tourists who would be interested in choosing environmentally certified accommodation or pay extra to contribute to further development of green tourism by using services in that area is somewhat even. Additionally, tourists from Russia are predominant among 41% of the tourists who would be willing to allocate more financial funds within the current price of the package arrangement or plane ticket in order to use those funds for green financing projects which would contribute to reducing carbon footprint in Montenegro. Compared to the group of interviewees who would be willing to pay extra, 80% of them would be ready to add the extra 10% to the current price of the arrangement or plane ticket.

Tourists from Russia mostly belong to the group who would be willing to add the 20% to the current price of the arrangement or plane ticket. The presented data indicate that the necessary actions in the upcoming period include further support to the development and promotion of green accommodation, as well as emphasizing the provided offer which could become a brand of its kind, making Montenegro recognizable as a green destination.

9 Attitudes of Business Entities in the Area of Tourism

9.1 Characteristics and Habits 2015–2017

Hotel and private accommodation, tourism agencies, and rent-a-car agencies represent the core subjects of the Montenegrin tourism offer. By encompassing 100 tourism practitioners, the research was aimed at determining the degree of familiarity and direct involvement of these business entities in the field of implementation of measures which are leading toward decreasing the carbon footprint, such as improving energy efficiency, using renewable energy sources, and involvement in the process of environmental certification.

Although passive tourism was still one of the main motives for coming to Montenegro in 2017, business entities are continually expanding their offer toward ensuring a more diverse content related to the cruising, organization of eco-tours, cycling, wellness tourism, as well as different forms of active and cultural tourism, both on the South and North of Montenegro.

Business entities which were a part of the 2017 research increased the share of investments in measures leading toward energy consumption by additionally investing in the insulation of their facilities, cooling and lighting systems, whereby 70% of them invested up to 50.000 EUR in different forms of energy efficiency during 2017. The same trend was present in terms of introducing environmental certification in their facilities, whereby 42% of business entities are planning to introduce some of the available environmental certificates (EU Ecolabel and Travelife are the certificates which may be implemented by using the financial and technical support provided by the UNDP) in the upcoming period, which is indicative of the positive effects of numerous campaigns implemented by the UNDP among business entities, with the aim of promoting environmental certification, as well as sustainable tourism based on principles of low-carbon development in Montenegro. The number of business entities which have calculated their carbon footprint is gradually increasing as well, whereby the proportion of such entities increased by 9% in 2017, compared to 2015.

Opinions of business entities in the tourism sector regarding the perception of the condition of the environment

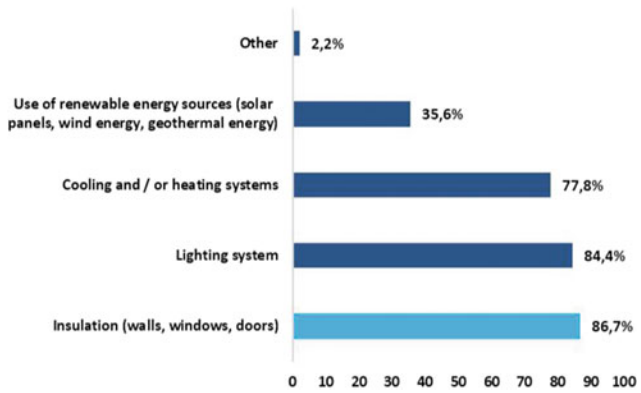
in Montenegro are divided. The critical reasons marked as indicative by the 50% who deem that conditions are non-satisfactory are illegal landfill sites, inadequate waste disposal, traffic jams, and noise.

Solving the issue of waste disposal is the crucial task which should be implemented in order to improve the condition of the environment in Montenegro, as stated by 70% of the tourism practitioners, which represents an additional warning sign that the issue of waste disposal in Montenegro should be solved systematically in the long term.

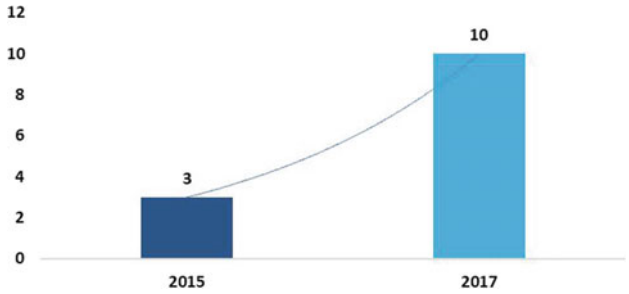
9.1.1 Energy Efficiency

Data from LCT 2017 research indicates that costs for electrical energy are dominant compared to other costs, such as fuel, water supply, or waste treatment. Thus, making investments in energy efficiency and projects aimed at energy consumption is imperative. Data showing that 62% of the total number of interviewed business entities invested in the energy efficiency of their facilities in 2017 indicates that the business entities have recognized the importance of investing in improving energy efficiency. Compared to 2015, there was an increase in awareness about that significance of investments, whereby the most investments in 2017 were made toward improving insulation (walls, windows, and doors) as well as lighting systems (Graph 3).

Interviewees engaged in hospitality industry recognize sustainable development and energy efficiency as the road toward achieving a balance between optimal guest experience and properly implemented hotel energy management system. Out of the total number of the interviewed business entities, 67% of them expressed willingness to provide further investments to reduce the impact of their business on the environment and climate change. More than 70% of business entities invested 50.000 EUR in energy efficiency projects in 2017. Around 80% of the business entities which invested funds into energy efficiency deem that they achieved partial savings.



Graph 3 How business entities increased the energy efficiency of their facilities during the period from 2015 to 2017



Graph 4 Number of environmentally certified facilities

9.1.2 Environmental Certification

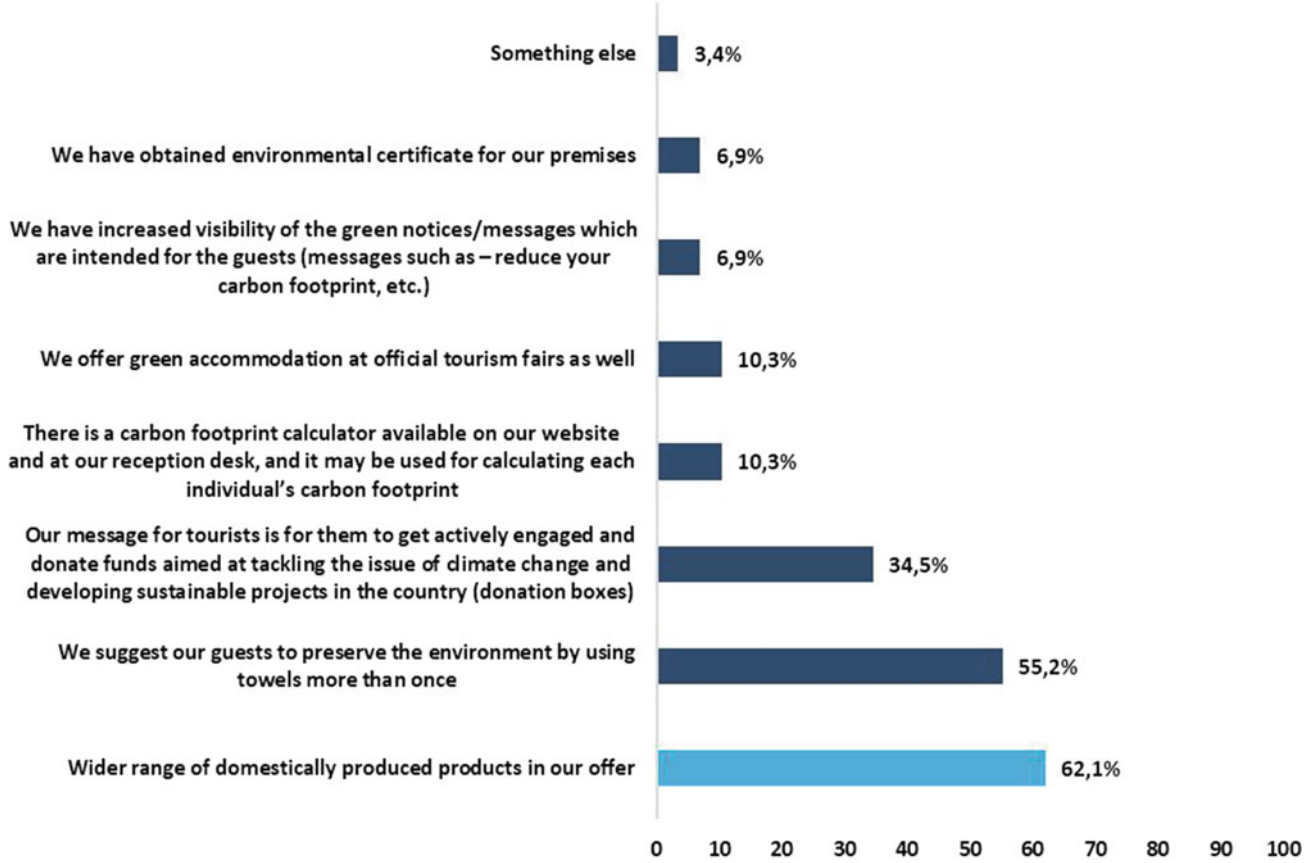
A relatively small percentage of business entities introduced environmental certificates into their business in 2017, even though the increase in the number of hotels which introduced environmental certificate during the period from 2015 to 2017 is evident (from three to ten certified facilities). Business entities which introduced environmental certificates in their business deem that it will improve their business either wholly or to some extent. The question "why business entities do not want to introduce an environmental certificate?" was posed to the business entities who do not plan to introduce that kind of certificate (51%). Lack of financial resources, as well as the lack of need, were stated as the most common reasons for this decision. It is interesting to mention the data that the uncertainty in terms of Return on Investment represents one of the reasons why business entities deem that environmental certification requires significant financial resources. There is a need for taking further actions in terms of keeping individuals and entities informed about the benefits ensured by environmental certification to business entities (Graph 4).

9.1.3 Tourism Offer in Tune with Low-Carbon Tourism

Although the highest percentage of business entities (68%) has not introduced any novelties in tune with green/sustainable low-carbon tourism, the following categories stand out among 32% of the ones who have introduced some novelties: food offer produced as part of domestic breeding, reduced use of towels, sharing messages about donating funds for fighting against climate change with tourists (Graph 5).

9.1.4 Environmental Certification of Hotels and Suites

According to the opinion of all representatives of institutions, environmental certification of hotels and suits represents a significant initiative for several reasons. The mentioned certification provides a possibility for attracting environmentally aware guests, mostly from Scandinavian countries, as well as from other countries from West Europe.



Graph 5 Novelties introduced by members of the industry into their tourism offer, in tune with eco, green, sustainable tourism

Additionally, measures of energy efficiency are implemented in facilities through environmental certification, and this leads to a decrease in the consumption of electrical energy, and it brings significant savings in the long term. A higher number of certified hotels is going to improve the promotion of Montenegro as a green destination.

In terms of choosing a certificate and bearing in mind the high number of globally available environmental certificates, as well as the three certificates which can currently be obtained in Montenegro, most representatives of institutions deem that EU Ecolabel is the most significant among them, considering the strategic foreign policy orientation of Montenegro toward EU membership.

Travelife was also popular in Montenegro as part of several projects, especially in municipalities Tivat and Cetinje, but this certificate did not achieve a prospecting success, primarily due to the lack of interest of tourism practitioners. Representatives of institutions deem that, while choosing a certificate, it is necessary to consider the cooperation between tour operators who bring guests with specific environmental certificates to Montenegro and that it is significant to choose precisely those environmental certificates.

Still, an aspect which will require attention in the further period is a continuation of informing and increasing awareness of business entities about the results they may expect in case they introduce environmental certification in their facilities. This is especially important if we take into account the willingness of tourism practitioners to introduce environmental certification in their business (around 40% of those who participated in the research), as well as the perception that implementation of environmental certificates is going to improve business. In this example as well, the lack of financial resources and incentives, as well as the lack of need, present the key barriers which prevent business entities from introducing environmental certificates. The fact that a part of local tourism organization is not familiar with the mentioned process at all, and the fact that majority of local tourism organization did not actively participate in the process represents an additional concern, and more attention should be paid to this aspect in the future period.

Promotion of environmentally certified hotels and suits should be taken to a new, innovative level, along with active involvement of the National Tourism Organization and local tourism organizations, which would provide a particular form of promotion of these hotels and promotion of the

significance of environmental certification. Apart from the local tourism organization Budva and Hotel Slovenska Plaža, which were defined as the ones who own a certain EU label, together with the other hotels, it is not possible to get information about the process and importance of environmental certification on web pages of the other organizations, nor is it possible to obtain information about environmentally certified hotels and suits, thus it is necessary to implement the measures and campaigns which would be aimed at promoting this type of green offer.

According to opinion expressed by most business entities, and with the aim of managing further development and achieving significant results in the process of obtaining environmental certification, it is necessary to organize consultation meetings with representatives of hotels and suits in each municipality one more time, at which municipalities and local tourism organizations would take part, and where the advantages of environmental certification would be presented, along with the particular form of promotion by the local tourism organizations and potential incentive measures provided by municipalities for environmental certification.

10 Conclusion

Tourism, more than any other type of activity, requires a preserved environment in which to operate. The tourism sector represents 5% of European Union GDP and accounts for over half a million tourist accommodation sites. Often located in pleasant but fragile locations, tourist accommodation can put pressure on water and energy resources and threaten local biodiversity through improper waste management. Tourism-related transport is a significant driver for climate change.

Tourism faces increased environmental requirements and awareness. Consumers are becoming more and more demanding in their quest for greener holidays. The Traveller Holiday 2005 Study showed that 51% of tourists opt for environmentally friendly resorts and accommodation, while 82% prefer an intact environment.

The tourism business reacted to this trend and increased its environmental performance in the last two decades regularly. Eco certification should provide guidance on this journey and a communication tool to allow environmentally and climate-friendly service providers to stand out from the crowd. Saving also money for increasing management abilities in the accommodation a win-win-win situation for the business, the consumer and the environment is created.

Process of environmental certification of accommodation facilities is still in the course of gradual development, which is purported by an increase in the number of environmentally certified facilities, whereby the further process of environmental certification should also be supported on the institutional level, i.e. through cooperation with the national tourism organizations, local self-governments and local tourism organizations. This offer is marked by a growth trend, but it is currently not generated nor unified.

The examples of the existing regional, national, and international Ecolabels in tourism and the brief assessment of the situation in Montenegro show in a conclusion that:

- Ecolabels increase the environmental performance of the certified units.
- The certification process is usually connected with financial investments. However, this investment leads—after the return of investment—to an effective reduction of operational costs. This is especially true in countries with high costs for electricity, water, and waste removal or disposal.
- Third-party certified Ecolabels have a high reputation amongst consumers, although the market provides an unmanageable mass of different labels.
- The total number of certified accommodations is rather small compared with the total number of tourist accommodations. The reason for this lies in the challenging criteria of most of the Ecolabels—a fact that is directly related to credibility and marketing effects.
- Nevertheless, labels have only minor direct marketing advantages (less then often expected); the effect is better if the label owner and the national tourism organization provide satisfactory marketing tools.

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Evaluating Application of Information and Communication Technology in Patronizing Guidance and Counseling Services Among Undergraduate Students in Selected North-Western Universities in Nigeria

Salisu Yunusa

Abstract

The paper evaluates the application/usage of Information and Communication Technology (ICT) in patronizing guidance and counseling services among undergraduates students in selected North-western Nigerian Universities. Three research questions were raised, and two hypotheses were formulated to guide the study. The population of the study comprised two universities with 351 students from the Department of Education, 190 students were sampled out proportionately. The researcher developed questionnaire tagged "Students questionnaire on application/usage of ICT in patronizing guidance, and counseling service (SQAICTGCS)" was used for data collection. The instrument was validated, and it has reliability index Alpha of 0.776. Percentage, frequency mean, and standard deviation were used to answer research questions while an independent sample *t*-test was used to test the hypothesis at 0.05 level of significance. It was found that the majority of the undergraduate students in North-western Nigeria universities are not applying/using electronic tools in patronizing guidance and counseling services with the highest frequency of 130, 70%, mean 1.3481, and standard deviation of 0.47788. It was concluded that there is generally low application/usage of ICT in patronizing guidance and counseling services by undergraduate students in Northwestern Nigerian. Based on the findings, the research recommends that awareness campaign should be made by Universities counselors to the students for them to understand the importance of application/usage of ICT in patronizing guidance and counseling service.

Keywords

Guidance • Counseling • Information and communication technology (ICT)

1 Introduction

Guidance and counseling service is an essential program in any part of the world particularly in North-western Nigeria in helping students or individuals at universities, colleges, or senior secondary school levels to handle day-to-day educational, psychological, and social problems arising from their day-to-day activities (Yunusa 2018). However, it was observed that the application of Information and Communication Technology (ICT) in patronizing guidance and counseling service is essential particularly the use of telephone or handset as one of the easiest and fastest ways of communication in the twenty-first century. Information and Communication Technology (ICT) is the acquisition and dissemination of information by a microelectronic-based combination of computing and telecommunication (Ivomi, U.M.O.: Utilizing the dynamics of information in counselling and care-giving. In: Keynote Address Presented at the Annual Conference of the Counselling Unit, University of Nigeria, Nsukka 2005).

In their view (Paisley and Hayes 2003) asserted that "counselors and students are obliged to join the globalization venture by applying/using the information and communication technology strategies in Guidance and counseling practice." In his study in the Enugu State of Nigeria on utilizing Information and Communication Technology (ICT) in counseling, (Okere 2007) discovered that "the counselors and students have knowledge of Information and Communication Technology (ICT), but the problem was in its application." The Internet can be used in a school setting for an electronic discussion forum, delivering counseling sessions, accessing information, and depositing research data for universal access (Nwamara 2005).

Information Communications Technology (ICT) refers to any device or system that allows the transmission, retrieval, storage, manipulation, and receipt of digital information. For example, personal computers, digital television, email, and robots (Okwudishu 2005). Traditional face-to-face

S. Yunusa (✉)
Department of Education, Sule Lamido University, Kafin Hausa, P.M.B. 048, Nigeria
e-mail: sykafinhausa@gmail.com

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counseling was by far the most common method of counseling that has been used for a long time before the emergence of Information and Communication Technology (ICT). Despite the existence of ICT methods of Guidance and counseling service, traditional face-to-face counseling is still practiced (Ralls 2011). Believed that traditional face-to-face guidance and counseling service may never be eliminated. Both methods need to exist alongside each other in order to complement each other where necessary. There are many methods for using ICT in guidance and counseling and each respective method is used based on the relevance and model for guidance and counseling. (Zamani 2009; Shiller 2009) Identified five e-Guidance and counseling tools: these are **email, chat, web-based messaging, video-conferencing and text messaging or short message system (SMS)**. Information and Communication Technology is one of the most effective strategies for learning and to develop career and life management. The increasing pace of technological change could see more of these technologies cropping up as a means of sharing information (Jarvis and Gangitano 2007).

Guidance and counseling as a professional activity are obliged to embrace these technologies as they develop and mature (Emmanuel 2014; Ojo 2005). Successful integration of Information and Communication Technology (ICT) in education system especially in guidance and counseling services depends mainly on the availability, competence and attitude of counselors, students toward the role of modern technologies in guidance and counseling services. Looking at the developing countries, (Beukes-Amiss and Chiware 2006) reported that there is generally limited access time per month using Information and Communication Technology (ICT) by both the teachers and students and even less time spent with reliable Internet access. This is not an exception in North-western Nigeria Universities where the majority of the students seem not to have access to Information and Communication Technology (ICT) components, which unfortunately do not possess a personal computer. Based on this observation, therefore, it is worthwhile to note that students role in the integration of ICT in guidance and counseling services cannot be overemphasized.

A study conducted by (Papanastasiou and Angeli 2008) revealed a shallow frequency of integrating ICT in guidance and counseling services by teachers and students. The average amount of use per week was found to have ranged from 0 to 0.86 times. Also, it was found that in a study conducted in Ibadan that most of the schools covered in the study do not have computers and school Internet, hence, they are not connected to the Internet. He added that those who have computers do not use them for guidance and counseling services (Fakeye 2010).

It was found that the unavailability of some ICT components in schools hampers students' and teachers' use of ICTs (Okwudishu 2005). Lack of adequate search skills and access points in the schools were reported as forces inhibiting the use of the Internet by students (Adomi and Kpangban 2010). In another study (Abdul-Salaam 2011) found that most teachers and students used as the sample for the study were not competent in the use of ICT in guidance and counseling. While there is a great deal of knowledge about how ICT is used in guidance and counseling services in developed countries, there is not much information on how students are using ICT in patronizing guidance and counseling services in developing countries. Based on these observations, the present study raised some questions to assess the application/usage of ICT in patronizing guidance and counseling services by undergraduate students in Northwestern universities in Nigeria.

However, guidance and counseling services in Nigeria was established to assist students in developing their potentials and to overcome academic and personal challenges. There are indications that many students in developing countries are left behind in the utilization of ICT in patronizing guidance and counseling services North-western Nigerian Universities are not an exception.

2 Significance of the Study

The results from this study may act as useful data to educational officials, students, parents, counselors, and other interested parties concerning the crucial role of ICT Integration in guidance and counseling service. The results may also enlighten stakeholders on the significant role that guidance and counseling program had on students' personal development. Using electronic tools will aid students and counselors to overcome and solve a wide variety of challenging problems and accomplish a wide variety of challenging tasks. Application/Usage of ICT in patronizing guidance and counseling service will continue to have a substantial impact on students, counselors, and human services. However, educational counseling coordinators will know and vary their counseling methods through the use of several ICT tools to augment guidance and counseling services.

The study evaluate the extent of application/usage of information and communication technology ICT in patronizing guidance and counseling service and to find out gender difference in application/usage of ICT in patronizing guidance and counseling among undergraduate students and To find out age group difference in application/usage of ICT in

patronizing guidance and counseling services among undergraduate students in North-western Nigeria.

3 Research Questions

The study sought to answer the following research questions:

1. To what extent undergraduate students in North-western Nigeria apply/use Information and Communication Technology in patronizing guidance and counseling service?
2. What is the gender difference in the usage of Information and Communication Technology in patronizing guidance and counseling among undergraduate students in North-western Nigerian Universities?
3. To what extent undergraduate students differ in terms of age groups in application/usage of Information and Communication Technology in patronizing guidance and counseling in North-western Nigeria Universities?

4 Research Hypotheses

The following hypotheses were formulated and tested at 0.05 level of significance

Ho_1. There is no significant gender difference in application/usage of Information and Communication Technology in patronizing guidance and counseling among undergraduate students in North-western Nigerian Universities.

Ho_2. There is no significant difference in terms of age groups in application/usage of Information and Communication Technology in patronizing guidance and counseling in North-western Nigerian Universities.

5 Methodology

The study used a survey research design which was found suitable in analyzing students Application/ usage on ICT in patronizing Guidance and counseling. Purposive sampling techniques were employed in selecting two Universities out of fourteen universities, Sule Lamido University, Kafin Hausa and Northwest University, and Kano were selected, 300 level students were selected at SLU (95 Male students, 56 Female students) making a total of 151 students. 135, male students and 65 female students were selected at NWU, making a total of 200 students. The sample sizes stood at 190 students, which are proportionally distributed across. The sample size was determined by the use of research adviser 2006 table of determining sample size.

5.1 Instrumentation

Students questionnaire on application/usage of ICT in patronizing guidance and counseling service (SQAICTGCS) was developed and used by the researcher, the instrument constitutes two Section A and B. Section (A) Entails students demographic information which includes sex and age, while Section (B) contained a series of closed-ended questions asking students to tick an appropriate answer. The questionnaire was developed based on the objectives of the study. The respondents were required to indicate the degree to which they applied or used ICT in patronizing guidance and counseling Services

5.2 Validity and Reliability of the Instrument

The instrument face and construct validity established by two Senior Lecturers in tests and measurement and the other one from the guidance and counseling Department both from Sule Lamido University, Kafin Hausa Jigawa State Nigeria. Twenty copies of the instruments were pilot tested. The purpose of this pilot study is to measure the reliability of internal consistency of the instrument, and the pilot study instrument result gives reliability index Alpha of 0.776, which shows that it is highly reliable.

5.3 Administration of Instruments

The instrument was administered to the students with the help of two research assistants. This facilitated maximum returns of the distributed instrument.

5.4 Analysis of Data

Both descriptive and inferential statistics were used to analyze the data. means, standard deviation, simple percentage, and independent *t*-test were used and at a significance level of 0.05.

6 Findings from the Study

Data obtained from the questionnaires were systematically analyzed using Statistical Package for Social Science (SPSS) Version 20. The results were presented as follows.

6.1 Research Questions Results

RQ1. What is the extent application/usage of Information and Communication Technology (ICT) in guidance and counseling among undergraduate students in North-western Nigeria?

Table 1 shows the extent on how undergraduate students in North-western Nigeria applied/used ICT in patronizing guidance and counseling. To a great extent have frequency of 32, 17% mean 1.3125, and standard deviation 0.47093. To some extent has frequency of 28, 13%, mean of 1.2505 and standard deviation. Never with highest frequency of 130, 70%, mean 1.3481 and standard deviation of 0.47788. By comparison to a great extent has high mean of 1.3125 and standard deviation of 0.47093 compared with to some extent with mean 1.2505 and standard deviation of 0.41293. The result shows that thus who never applied/ used electronics tools in patronizing guidance and counseling service has high mean of 1.3481 and standard deviation of 0.47788, which indicate that majority of the undergraduate students 70% were not applying/using ICT in patronizing guidance and counseling service.

RQ2. What are the gender difference in application/usage of Information and Communication Technology in guidance and counseling service among undergraduate students in North-western Nigeria universities?

Table 2 shows gender difference on application/usage of ict in guidance and counseling in north-western nigeria. Males students has frequency of 125, 66%, mean of 1.1760, and standard deviation of 0.38235 while female students has the frequency of 65, 34%, 34, mean 1.1538, and standard deviation 0.36361. This shows that male students applied/used electronic tools in patronizing guidance and counseling services more than their females counter part.

RQ 3. To what extent undergraduate students differ across age groups in application/usage of Information and Communication Technology in patronizing guidance and counseling services in North-western Nigeria?

Table 3 shows age group difference in application/usage of ICT in guidance and counseling in North-western Nigeria. 16–20 yrs students has the frequency of 79, 41.6%, mean 1.1261, and standard deviation of 0.33350 while 21-yrs above has the frequency of 111, 58.4%, mean 1.2278, and standard deviation of 0.42212 by comparison 21-yrs to above students has high mean and standard deviation compared to their counterparts meaning that 21-yrs to above students applied/used ICT tools in patronizing guidance and counseling services compared to their 16–20 yrs counterparts.

6.2 Hypotheses Testing

Ho_1. There is no significant gender difference in application/usage of Information and Communication Technology in patronizing guidance and counseling services among undergraduate students in North-western Nigeria?

Table 4 shows the calculated *t*-value of 0.388 with a *p*-value of 0.6985 tested at a level of 0.05 and the degree of freedom 188. From the table, it can be observed that the *p*-0.6985 is higher than a level 0.05. Therefore, the null hypothesis which states that there is no significant gender difference in application/usage of ICT in guidance and counseling service among undergraduate students in North-western Nigeria, is at this moment retained, which means that no significant difference was observed based on gender in the application/usage of ICT in patronizing guidance and counseling service among undergraduate students in North-western Nigeria.

Table 1 Shows the extent of application/usage of ICT in patronizing guidance and counseling services by mean, standard deviation, and simple percentage

Extent	N	Percent	Mean	Sd
To a great extent	32	17	1.3125	0.47093
To some extent	28	13	1.2505	0.41293
Never	130	70	1.3481	0.47788
Total	190	100.0		

Table 2 Shows gender difference in application/usage of ICT in patronizing guidance and counseling services among undergraduate students in North-western Nigeria by frequency, percentage, mean, standard deviation

Gender	N	Percent	Mean	Sd
Male	125	66	1.1760	0.38235
Female	65	34	1.1538	0.36361
Total	190	100.0		

Table 3 Shows differ across age groups in application/usage of Information and Communication Technology in guidance and counseling in North-western Nigeria by frequency, percentage, mean, standard deviation

Age group	N	Percent	Mean	Sd
16–20yrs	79	41.6	1.1261	0.33350
21yrs above	111	58.4	1.2278	0.42212
Total	190	100.0		

Table 4 Shows gender difference in application/usage of Information and Communication Technology in patronizing guidance and counseling services among undergraduate students in North-western universities in Nigeria *t*-test for independent sample

Gender	N	Mean	Sd	df	*t*-value	*p*-value	Decision
Male	125	1.1760	0.38235	188	0.388	0.6985	Null hypothesis
Female	65	1.1538	0.36361				Not Significant

Table 5 Shows difference across age groups in application/usage of Information and Communication Technology in patronizing guidance and counseling in North-western universities in Nigeria. *t*-test for independent sample

Age	N	Mean	Sd	df	*t*-value	*p*-value	Decision
16–20 yrs	79	1.1261	0.33350	188	1.818	0.475	Null hypothesis
21yrs above	111	1.2278	0.42212				Not significant

Ho_2. There is no significant difference across age groups in application/usage of Information and Communication Technology in patronizing guidance and counseling in North-western universities in Nigeria?

Table 5 shows the calculated *t*-value of 1.818 with a *p*-value of 0.475 tested at a level of 0.05 and the degree of freedom of 188. From the table, it can be observed that the *p*-value 0.475 is more significant than a level 0.05. Therefore, the null hypothesis which stated that there is no significant age group difference among undergraduate students in application/usage of ICT in guidance and counseling in North-western Nigeria is at this moment retained. Meaning that no significant difference was observed based on age differences in the application/usage of ICT in patronizing guidance and counseling service among undergraduate students in North-western Nigeria.

7 Summary of the Findings

1. It was found that the majority of the undergraduate students in North-western Nigeria do not apply/use electronic tools in patronizing guidance and counseling services.
2. It was found that there is no significant difference based on gender in the application/usage of ICT in patronizing guidance and counseling service among undergraduate students in North-western Nigeria.
3. It was found that there no significant difference in age differences in the application/usage of ICT in patronizing guidance and counseling service among undergraduate students in North-western Nigeria.

8 Discussion of the Findings

The study generally finds out low application/usage of ICT in patronizing guidance and counseling services in North-western Nigerian universities. This is in line with (Papanastasiou and Angeli 2008) whose study revealed that there is a shallow frequency of integrating ICT in patronizing guidance and counseling services among students and teachers. This low application/usage of ICT by students could be as result of low awareness of the paramount importance of ICT in patronizing guidance and counseling. By comparison to a great extent and some extent, the result shows that those who never applied/use electronics tools in patronizing guidance and counseling have a high percentage, mean, and standard deviation.

Research question two reveals that Male students in North-western Nigerian universities applied/ used electronic tools in patronizing guidance and counseling more than their counterparts. Male students have high frequency,

percentage, mean, and standard deviation compared to female students.

While the hypothesis revealed that there is no significant difference based on gender in the application/usage of ICT in patronizing guidance and counseling service among undergraduate students in North-western Nigeria.

Research question three on age group difference reveals that 21-yrs to above students applied/used ICT electronic tools in guidance and counseling compared to those below 21 yrs. 21 years and above have high frequency, percentage, mean, and standard deviation compared to their counterpart. Therefore, the hypothesis revealed that there no significant difference in age group in application/usage of ICT in patronizing guidance and counseling service among undergraduate students in North-western Nigeria.

9 Conclusion

The study concluded that there is generally low application/usage of ICT in guidance and counseling services by undergraduate students in North-western Nigerian. It also confirms that there is no significant difference in the application/Usage of ICT in guidance and counseling services across the gender and age group in North-western Nigerian universities.

10 Recommendations

Based on the findings of this study, the following recommendations were made:

1. An awareness campaign should be made by Universities counselors so as the students should understand the importance of application/usage of ICT in patronizing guidance and counseling service.
2. The Federal Government of Nigeria and nongovernmental organization should organize workshops, seminars, and conferences for guidance and counseling officers on the application/usage of ICT in patronizing guidance and counseling services.
3. The Federal government of Nigeria should provide ICT facilities in all universities to enhance access to ICT services. This will facilitate ICT application in patronizing guidance and counseling services.

11 Recommendation for Future Research

Based on the findings of this study, the following recommendations for future research were made:

1. It was recommended that the same research work should be carried out to cover the whole northern part of Nigeria since the scope of this research work covered selected north-western Nigerian Universities.
2. It was also recommended that similar research work should be conducted in some part of Nigeria since this research work was conducted at the northwestern part of Nigeria.

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Factors Affecting the Cost of Production of Electricity and Desalination Plant for Sustainable Operation at the Libyan Iron and Steel Company

Salim Mohamed Hebrisha and Ahmed N. Al-Masri

Abstract

This research addresses the contribution of proper and scientific management of the energy economy of the electricity and desalination plant at the Libyan Iron and Steel Company for a sustainable operation. A descriptive and analytical approach has been used to interpret and analyze the data on fuel consumption in combustion and obtained from the station. This paper presented several results related to the importance of the efficiency of combustion, the type of fuel used, the development of cadres, maintenance and attention to the environment, and other measures that contribute significantly to reduce costs and manage the economics of energy production. Besides, the development of the performance of maintenance teams as one of the essential factors to maintain the old equipments and extend the standard operational life of the equipment. Moreover, the emphasis on regular maintenance and prevention. The results address the sustainability of operation, which is affected by the absence of accurate readings of the company's registered emissions, and the gain of the generating units increases the size of the problem caused using heavy oil, especially with no real treatments for the environment adjacent to the station.

Keywords

Generators • Fuels • Generation efficiency • Emissions • Energy waste types

1 Introduction

Current energy systems rely on the burning of fossil fuels, which accounts for 76% "fossil fuel" as energy resources. However, its role in the Arab and global reign as a source of energy production in large commercial quantities is limited and will remain limited for many decades. As a result, the nature of these energies, and the availability of energy sources Fossilized in substantial quantities, which leads to economic impact. The choice of the method of producing electricity and its economic feasibility varies according to the size of the demand for electricity and the area to which the electricity is to be delivered. Hydroelectric power stations, nuclear power plants, thermal power plants, and renewable energy sources have pros and cons. The choice depends on local energy requirements and fluctuations in demand for electricity. Electricity is considered in the modern society more suitable forms of energy and utility infrastructure will not be without them greeting the current community process at all, the growing consumption of electricity in the world reflects the growing level of living. At the Saudi International Conference on Water and Energy 2013 held in Jeddah, specialists and officials at the Saudi International Conference on Water and Energy held a meeting of significant challenges facing water and energy production in Saudi Arabia, related to the high cost of production, the unsustainable natural resources of water and fossil fuels, and the growing consumption of the individual.

The demand for energy in consumer countries has led to the movement of two levels: first, to rationalize the current uses of energy resources, especially petroleum, natural gas and electricity, and second, to develop new sources of energy from nontraditional sources such as solar, wind and electric power, Winds and thinking about energy from the wind will be the first to walk in this way, which we hope to circulate and address other sources, such as solar energy, We belong to the climatic zone of sun bright, can be used to heat energy generation and rationalization of consumption.

S. M. Hebrisha
Libyan Iron and Steel Company (LISCO), Misrata, Libya
e-mail: salimhibrisha@gmail.com

A. N. Al-Masri (✉)
American University in the Emirates, Dubai, UAE
e-mail: ahmed.almasri@aue.ae

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The most important challenge facing civilization in the twenty-first century is the energy problem. The era of the scientific revolution is based on energy. In modern times, global energy consumption is based on fossil fuels, which include coal, oil and natural gas, solar, wind, hydropower, tidal, biomass energy, and nuclear power (nonconventional energy) are called.

2 Literature Review

The objective of this study was to analyze the maximum energy that can be produced in electric stations using two types of fuel (coal and gas). This study also included the recycling of unused thermal energy such as heat energy from cooling systems, transformers, and even generation turbines. Recent studies focused on how to increase the efficiency of electricity production by exploiting lost energy through recycling. The study concluded that global interest in energy affairs should focus on cost, environmental pollution, and adequate energy. Increase the cost of production and environmental pollution resulting from the combustion process by reducing the loss of the condenser as well as recycling thermal energy Exergy, and a comprehensive study was conducted on another type of stations. The results showed a definite improvement in the efficiency of the thermal station, using gas, where it gets higher operating efficiency than those obtained from coal-fired stations (Reddy et al. 2013). Venkata Kumar 2012 presented a study on how to improve the performance of the boiler by examined the methods of operation of the steam boiler and identified the factors that affect the performance of the boiler and thus reduce the amount of fuel used and the amount of carbon dioxide produced by the combustion process (Heat extraction process) and the proper use of thermal energy generated from each part of the plant (Karri 2012). Gilberto Francisco 2012 focused on the possibility of operation and reliability as the incidence of error leads to a significant loss in terms of operation and maintenance tested on a 500 MW plant, concluded, as a small failure in any part of the station or the inefficiency of some devices can increase the cost of energy production. The most important factors influencing the accuracy of operation were identified with increasing loads. The researchers acknowledged that in order to increase the use of reliability concepts in thermal power plants, it is expected that regulatory framework could have a decisive influence on the ways to reduce risk and increase reliability (de Souza et al. 2012).

Kumar et al. (2014) focused on the thermal and economic performance of the 210 MW coal-fired power plants in northern India. The analysis was carried out to calculate the coal consumption rate, total thermal efficiency, vapor mass flow rate through boiler and net produced value Net Present Value "NPV" for the constant load. The analysis considered the produced thermodynamic energy using the mass and energy equations, then predicted the mass flow rate of steam, the coal consumption rate, and thermal efficiency, which has applicable ratio with the plant operation data. The researchers also calculated the cost of operational activities, cost of fuel, cost of maintenance, revenue, and NPV of the plant. The authors recommended that the effect of the condenser pump has a more significant effect than the water pump supplied to the boiler as this change has an impact on the economy of the plant in terms of reducing the input fuel and obtaining higher thermal energy, Fig. 1 illustrates the scheme of thermal power generation (Kumar et al. 2014).

Genesis Mirhawa et al. 2012 study was to identify areas of loss of energy in the parts of the plant, by studying each part of the thermal power plant, as well as to reduce this loss and increase the efficiency of electricity production. Data

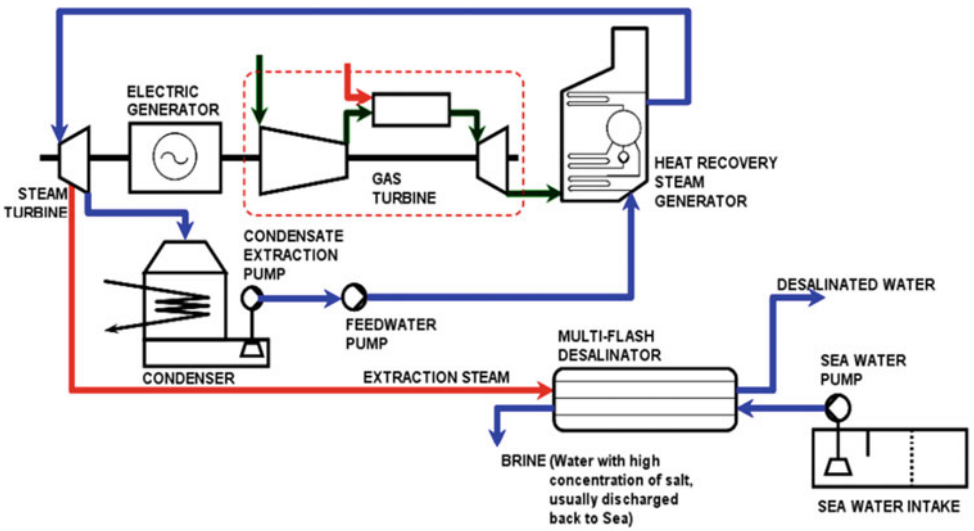

Fig. 1 Process diagram of thermal power generation

from a realistic station in Zimbabwe where the energy produced is less than the capacity of the loads, and the need is limited to finding alternatives to increase production and efficiency. Remarkably, the loss of untapped energy is about 48.92% of the total production capacity of about 81.66% (more than half of the producing energy). The researchers concluded their study with a set of recommendations covering all parts of the plant (Murehwa et al. 2012). The study of Ho et al. (2012) aimed to maximize the utilization of energy (Exergy) for the electric power production plant. This study was carried out using computer technology, Aspen Plus software). Different operating conditions were evaluated by changing the number of loads and determining the proportion of energy dispersed from the system. The operators focused on the following factors: combustion temperature, excess air coefficient, steam temperature, and vapor pressure. The results showed that energy loss occurs mainly in boilers and turbines. The efficiency of the plant is up to 21% with an error rate of not more than 10% from the actual station. It is possible to increase the efficiency of the plant by compensating for the shortage of boilers because of the thermal transfer process and to improve the work of the steam turbines by compensating for the lack of steam temperature. Through the previous recommendations of the researchers, we believe it is useful to monitor all the factors mentioned above, and each part is processed professionally and accurately considering the maximum load capacity for each part of the system (Hou et al. 2012).

Kevin Meal 2008 demonstrated the potential for solar energy production in Jordan and the Sahara regions, which include the Maghreb and Libya, where this energy is easy to produce at a much lower cost than building plants and has no environmental impact as renewable energy can last the life of the panels (20–25 years), as well as the cost of maintenance, the maintenance process is inexpensive and does not require the same number of workers to operate compared to conventional thermal stations. The study indicates that an agreement was signed between the EU and North African countries. On energy exchange note with a production capacity of approximately 20 gigawatts by 2020 (Ummel and Wheeler 2009).

Faraj Howaidi 2013 investigated the practical situation and the future perspective of the production of electric power in Libya by studying the data of the production of electric power for all power plants throughout Libya between 2005 and 2010. The researcher studied the increase of carbon dioxide emissions from different energy sources and the efficiency of power plants where the efficiency and the efficiency of gas stations ranged from 9% to 25%, which is a small proportion for the global scale, and the researcher concluded, as in the rest of the previous studies that the modernization in the thermal circulation system has an effect as seen on the efficiency of the power plant production, for example, it has been improving the efficiency of the North Benghazi plant for the production of electric power from 25% to 46.6% as well as Tripoli station from 22% to 34% between 2008 and 2010 (Ahwide et al. 2013).

3 Power Consumption Images

The energy economy in the economic concept is an expression intended to produce energy, investment, consumption, and the resulting revenues, including all means and procedures aimed at increasing the return of energy use and minimizing its loss without affecting the rate of economic growth. A quantity of goods or services without preconception to their specifications, and exploitation of energy better exploitation at the lowest possible cost, and the energy economy aims at the other hand to extract as much energy as possible from their primary sources while preserving the environment and minimize damage to the minimum. The validation of energy consumption includes the following procedures to reduce the waste of energy systems in different stages, from power generation and to switch to power-consuming peripherals. This applies to electrical power in generation and distribution and energy consumption from oil derivatives to consumers. The power plants are the most effective means in this area and maintain the readiness of power plants and strict technical adherence to the maintenance program of the essential means of energy conservation in the early stages of the systems of then comes to the load management system.

Janusz Cofala, Markus Amann, et al. simulate two possible scenarios of global anthropogenic emissions of global air pollution (Cofala et al. 2007), they considered the implementation strategy and control legislation in each country. However, they concluded that the emission levels could be reduced between 20% and 35% using the current emission control technologies, which have a high impact on reducing the emission level. Table 1 shows a comparison of the costs between the use of natural gas and crude oil in power stations.

4 Energy Conservation

There are several challenges that need to be considered for maximizing energy efficiency from the operations side. Most of these barriers focusing on the higher economic efficiency, institution management problems, financial problems, industrial, new technologies system adaption, and employees' awareness.

Table 1 Comparison between the use of gas and liquid fuel in power stations

Data	Crude fuel	Gas
Fuel and transport	49.37 SR/MWh	7.34 SR/MWh
Maintenance of the unit	92.5 SR/MWh	95.3 SR/MWh
Unit wash	Several hours of downtime for each unit every 350 h of operation	Units do not need to be washed
The energy produced from the unit	6.48 SR/MWh	1.5 SR/MWh

1 US Dollar = 3.7501 Saudi Riyal (11/04/2016)

4.1 Institutional Management Challenge

These issues summarized as follows:

1. Limited information and lack of expertise in the energy sector.
2. Week knowledge about available technologies that enhance efficiency.
3. Promote the energy supply without similar encouragement to improve operational efficiency.
4. Opposition to the taxes that enhance energy efficiency by the public revenue officials.
5. Poor interconnection between an electricity provider and consumers.
6. Lack of public awareness and operational efficiencies which impact the global emission level.

4.2 Financial and Economic Challenges

The financial and economic challenge is faced at every operational provider worldwide. These aspects are summarized as follows:

1. Difficulties in describing and calculating savings parameters in operational, strategic planning.
2. Calculating the accurate value of the existing assets and their proceeds.
3. Financial accounting and budgeting methods.
4. Low energy prices and alternative financial support.

4.3 Technical Challenges

The technical challenges can be summarized as follows:

1. The upgrade and updates of the new technological utilities.
2. The oldest of the plant, stations, and basic infrastructures.
3. Supplying new materials and other alternatives.
4. Need to consider more technical and managerial expertise.
5. Development research and experimental verification.
6. Staff needs yearly training and spread of the sharing knowledge culture.

4.4 Awareness Challenges

Among the most important and common barriers in achieving better efficiency is the missing of awareness about the efficiency in the current use of energy, and to what extent can enhance it. The awareness could improve efficiency, and how can apply the required power management in practice.

5 Raise Energy Efficiency

Based on research at both Harvard and Princeton University and the World Resource Institute (WRI), it is technically possible to achieve a real energy economy of more than 45% by following the rules and steps of energy efficiency.

Never intended here rationing the energy use, but increasing the energy efficiently, where many types of research and studies have been prepared on the subject of "Increasing the energy efficiency." However, the lack of reliance on specialists and efficiency in iron and steel company introduced the subject in the tunnel of routine, knowing that rich and advanced countries have achieved significant rates of energy saving by adopting techniques of efficiency.

The adoption of this strategy was reinforced by the introduction of the combined cycle system for electricity generation sectors, which was possible by the availability and replacement of natural gas, technological modernization in the use of large power generation capabilities. In addition, the self-directed measures to promote efficiency through the rebuild and improve the procedures in all departments, which enhance the overall generation efficiency of power plants. For example, the combustion system, the recycling system of exhaust gases, and other systems in the generation units contribute to raising the efficiency of power generation.

6 The Power and Desalination Plant of the Libyan Iron and Steel Company

The plant was constructed by Hyundai, a full power and desalination plant with a capacity of 6 × 84.65 MW and 3 × 10500 cubic meters per day of desalinated water, which includes the following:

1. Six Boilers with pressure cookers, burning both natural gas and heavy oil, and the type in which the water revolves natural cycle besides to the associated equipment. The average capacity of each boiler is 380.268 tons/hour, and the pressure is 91.34 bar under a temperature of 510 °C.
2. Six direct turbine generators with direct management and associated equipments. The average capacity of each generator is 84.65 MW and steam specifications 90 bar under 510 °C.
3. The primary and subsidiary cooling water group of the power plant, desalination, and associated equipments, as well as the supply of cooling water to the central water station of the Iron and Steel Complex.
4. Various auxiliary equipments including winches, hoists, pulleys, elevators, compressed air equipments, desalinated water production equipments, firefighting equipments, prevention and air-conditioning and ventilation equipments.
5. Electrical setup including cables and accessories, indoor and outdoor lighting, ground delivery equipment, rust prevention, cathodic protection, wireless communication equipment, and fire alarm equipment.
6. Control and monitoring equipments including local and central control equipment's for all parts of the station.
7. A complete gas turbine generator with an average capacity of 18 MW set to be used as an auxiliary generator for electric power and to start operation of the full power and desalination plant with all equipments and accessories.
8. The desalination plant and the associated equipments, which include three independent water desalination units and the single effect. The method of treatment is used by adding the chemicals in which the primary temperature of 91 °C, and each unit produces 10500 cubic meters per day of water.
9. The fuel and water group storage and distribution network, sweetened water supply network, equipments storage, and natural gas distribution.
10. The site works and structures for water cooling equipments, roads, parking slots, rainwater drainage systems, sewage and reservoirs, desalination plant bases, chimneys, drinking water distribution system, cable, substrates, and boilers spare parts.
11. The power and water desalination plant building which include the electricity generation building, the administration building, the workshop building, the entertainment building, the desalination plant control building, the pump building, the chlorine unit, the fuel pump building, the chemical store, the desalination boiler building, the parapets and the interior lighting of the nonindustrial rooms.

The power plant consists of six steam-generating units using turbine type called the reaction connect type. The steam in this type of turbine pushed to the fixed feathers and then reflected on the moving blades to spin the turbine. The condenser considered a part of the turbines, where the steam is reused as a water for the steaming process.

There are two daily tanks with a capacity of 1000 square meters for each tank supplied from the main tanks via the heavy oil pump Reprocessed Fuel Oil (RFO) Transfer Pump. The oil level is controlled by level control valve as the oil is heated by steam through the ground oil heater as well as the intake heater where the temperature is raised to 80 °C by steam. Natural gas pressure is controlled by a control valve where it is distributed to the power plant and desalination.

7 The Cost of Station Power Generating

The cost of power station operation and maintenance is an essential factor that reflected in the efficiency calculation. It is the engineer's role to achieve the desired technical results at the lowest costs. In the energy production industry, there is usually more than one option, either high-efficiency equipment at high cost or equipment at low cost and low efficiency, In the first case, cost would be higher because of the interest rate and used material and equipment are where the lower energy the total annual expenditure was as low as possible. Therefore, the composition of the annual expenditure and the factors influencing can be summarized as follows:

1. *Fixed cost*: They do not change with the capacity or operation of the plant, which is independent of the size of the plant production and mainly includes the wages of workers and land rents for future expansion.
2. *Half Varied cost*: Depend on the installed capacity of the station and independent of the power output of the plant which includes:
   - The interest rate depends on the capital costs of the station, the transmission and distribution network, buildings, and other civil works.

- All types of taxes and insurance, as well as the annual compensation, were given to employees.
- The salaries of field crews, which depend on the area of the plant or the area of the power distribution.
- The rent paid for the land.

3. *Varied costs*: depends on the number of operating hours or the number of operating units include:
   - Fuel costs.
   - Total salaries of maintenance and operating crews and supervisors of operation.
   - Total salaries of maintenance and operating crews and supervisors of operation.
   - In the case of the thermal station supply costs for the water boiler.

Figure 2 shows the amount of fuel used in the plant under this study, whether heavy oil or natural gas in the year 2007 where these quantities can be converted to values according to the oil price for the specified period.

Figure 3 shows the amount of energy produced during 2007 of heavy oil and natural gas on a separate basis at the station under this study. These quantities can be converted to values in kilowatt-hours.

8 Calculate the Cost of Emissions (CO_2) for the Station

It is a real fact that carbon emissions will be charge by cost in the next few years. Therefore, high trades and budgets should be allocated for the pricing of carbon emissions. However, that is including what has been implemented and could be doubled 20–40 times, worth about 50 billion dollars, and this was clarified in the progress of the International Bank (Kossoy et al. 2015).

The carbon emissions change the concept of climate to become a financial aspect that must be considered in all power system industry. However, the idea is designed to enable a secure environment for the global energy market by adapting climate change and the reality of financial measures.

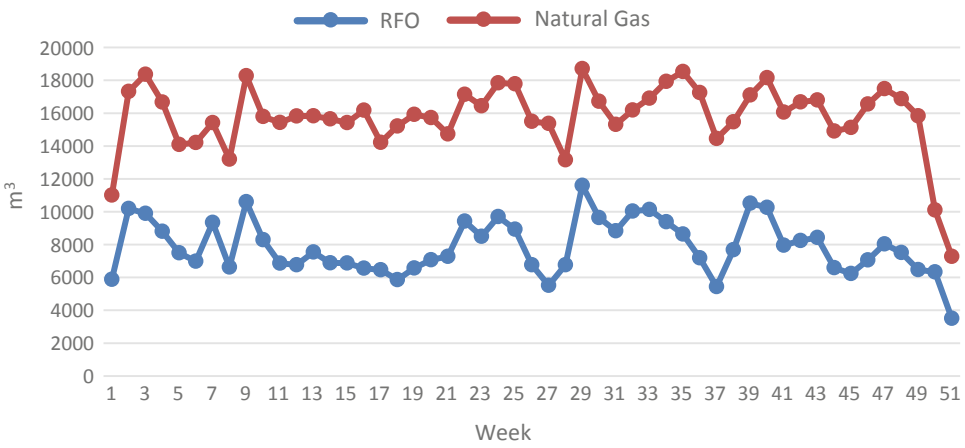

Fig. 2 The quantity of natural gas and heavy oil used in energy production for the year 2007

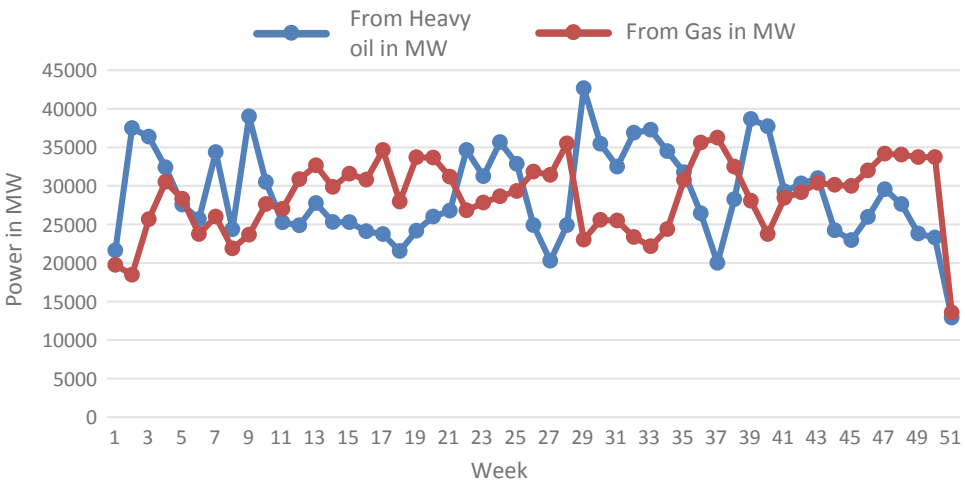

Fig. 3 The quantity of energy produced by burning each type of fuel for the year 2007

Table 2 Quantity of heat for each type and corresponding energy production (U.S. Energy Information Administration)

Fuel	Pounds of CO per Million Btu	Heat rate Btu per kWh	Pounds of CO_2 per kWh
Bituminous	205.300	10,089	2.07
Subbituminous	212.700	10,089	2.15
Lignite	215.400	10,089	2.17
Natural gas	117.080	10,354	1.21
Distillate oil (No. 2)	161.386	10,334	1.67
Residual oil (No. 6)	173.906	10,334	1.80

This study included the calculation of the carbon dioxide emitted from the station using the recorded data of the quantities of energy production for several years at the station. In addition to that, the presented cost and its impact on the environment were considered for the Libyan Iron and Steel Company focusing on two types of fuel in the Natural combustion gas (NG) and Heavy fuel oil (RFO). The percentage of the amount of natural gas and heavy oil used must be identified to calculate the amount of carbon dioxide emissions. Next step is to produce these quantities of energy and find the amount of emission from the combustion of each of these two types of fuel, as shown in Table 2. Therefore, the amount of heat for each type and the corresponding energy output was identified.

Figure 4 shows the thermal value in kcal corresponding to the production of one kilowatt, when heavy oil is used as combustion fuel by considering the values in Table 2.

By looking into the operation and maintenance manuals that were prepared by the manufacturer. The obtained thermal value of heavy oil is about 10,300 kcal/kg; therefore, all data are in cubic meters of oil, this value needs to be converted to kilocalories per cubic meter using oil density. Equation (1) depends on the heavy oil density of 930 kg/m^3 to calculate the thermal value of oil per cubic meter:

$$\begin{aligned}\text{Heat Rate (RFO)} &= 10,300\,\text{kcal/kg} * 930\,\text{kg/m}^3 \\ &= 9,579,000\,\text{kcal/m}^3\end{aligned} \quad (1)$$

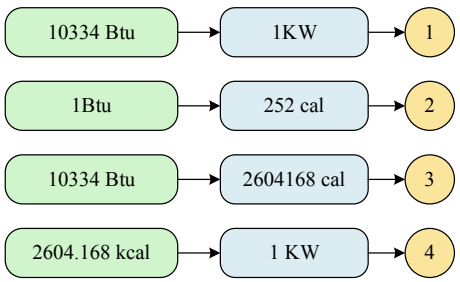

Fig. 4 The thermal value of producing one kW when burning heavy oil

Figure 5 shows the volume of heavy oil that produces one megawatt

Figure 6 shows the thermal value in kcal corresponding to the production of one kW when natural gas is used as combustion fuel by the information in Table 2.

The heat value of natural gas (9368 kcal/m^3) has been obtained from the operating and maintenance manuals. Figure 7 shows the natural gas required to produce one megawatt.

After calculating the amount of heavy oil and the amount of natural gas that has been used to produce power in the plant. This could be possible from the weekly reports and the station data from the production of energy for the past years, and then calculate the amount of carbon dioxide emissions from Table 2 including the CO_2 emission rate. Figure 8

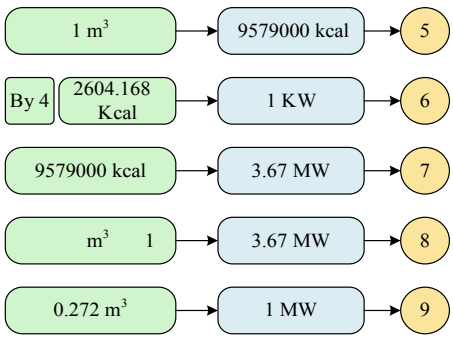

Fig. 5 The required volume of heavy oil to produce megawatts

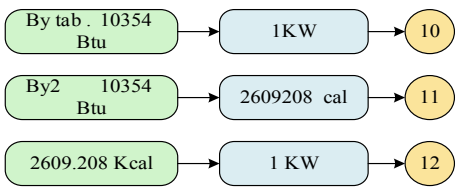

Fig. 6 The thermal value of producing one kW when burning natural gas

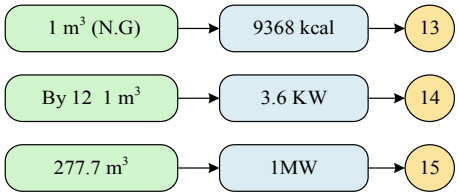

Fig. 7 The required volume of natural gas to produce one megawatt

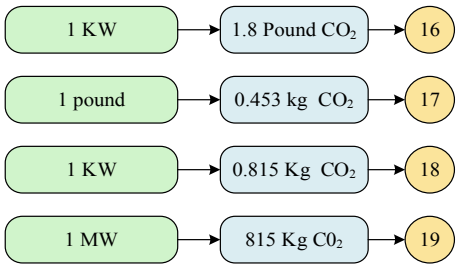

Fig. 8 The produced weight of CO_2 for burning heavy oil

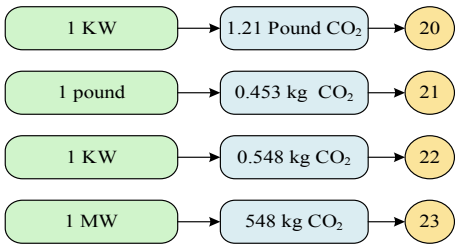

Fig. 9 The produced weight of CO_2 for natural gas burning

shows the weight of carbon dioxide produced by the generation of one megawatt when burning heavy oil.

Figure 9 shows the weight of carbon dioxide produced by one kilowatt and the production of one megawatt of natural gas burning.

9 Conclusion and Recommendations

Considering the theoretical side of this research and the results obtained after analyzing the data for the electricity and desalination plant at the Libyan Iron and Steel Company, we can conclude the following:

1. Choosing the method of producing electricity and its economic feasibility varies according to the type of energy resources available in the country.
2. Each of the stations that rely on fossil fuels or rely on renewable energy sources has pros and cons.
3. Although the workers' wages are fixed costs, the increase in the number of employees of the Libyan Iron and Steel Company has caused a change in this factor and hurts the total cost.
4. The increment in half-fixed cost occurred due to the oldness of transmission and distribution network, buildings, and other civil works.
5. The variable costs depending on the number of operating hours or the number of working units which have been decreased significantly due to the interruption of most operating units and the reduction in the number of hours worked.
6. Although Libya is an oil producer country, the fuel costs still calculated based on the price changing of the oil, which has been calculated for the period of this study conducted.
7. Reduce the operating and maintenance crews' salaries and supervisors because of the increases in the number of employees in the workstation.
8. Obtaining the information in Fig. 3, it is possible to convert the energy produced by weeks in comparison with the total cost. However, the thermal value obtained from natural gas is higher than the heavy oil; these results supported by Figs. 4 and 6.
9. Figs. 8 and 9 showed that heavy oil is causing more significant environmental impacts than natural gas.
10. The cost incurred by the Libyan Iron and Steel Company due to quantity CO_2 resulting from generation may cost a large sum and only on the assumption that the lowest emission tax paid by the company per Ton 22.8 euros according to the European Union.

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Guided Inquiry Strategy as Panacea for Students Poor Academic Performance in Biology for Sustainable Development

Abdulrahaman Ibrahim

Abstract

This study determines the effect of guided inquiry strategy as panacea for students poor Academic Performance in Biology for Sustainable Development in teaching and learning. The research design used for the study was quasi-experimental design. The study population consisted of one thousand two hundred and twenty five (1225) SS II Biology students drawn from the twenty nine senior secondary schools in Ringim Educational zone of Jigawa state, Nigeria. The sample of the study was made up of one hundred and thirty seven (137) SS II students randomly chosen from two schools in the population. The two schools selected were pretested to establish their equivalence in academic performance in Biology. One school was randomly assigned as experimental group and was taught using guided inquiry strategy while the other school was used as a control group and was taught using lecture method. The two schools were both posttest and post posttest to determine students' performance and retention of Biology. data were collected and analyzed using mean and standard deviation to answer the research questions and t-test to test the hypotheses at 0.05 levels of significance. Finding from the study revealed a significant difference between the students exposed to guided inquiry strategy (experimental group) and those exposed to lecture method (control group) with respect to academic performance and retention. There was, however, no significant difference in academic performance between male and female students exposed to guided inquiry strategy. Based on these results, it was concluded that the guided inquiry strategy enhances academic performance and retention of as well as gender friendlily among Biology students than the lecture method at senior secondary schools.

Keywords

Guided inquiry • Academic performance • Sustainable development • Biology

1 Introduction

Biology is defined as a life science that deals with the study of plants and animals and their relationship with the environment. It is a subject that permeates into all other science subjects (Kwachukwu and Nwosu 2009). The cardinal objectives of Biology education at the senior secondary schools level are that the students at the end of their study should acquire: adequate laboratory and field skills in biology, meaningful and relevant knowledge, ability to apply scientific knowledge to everyday life in matters of personal, community health, Agricultural and reasonable and functional scientific attitude (Tambiy 2012).

The importance accorded Biology in the School curriculum from senior high level to tertiary level reflects accurately the vital role played by the subject in contemporary society. The importance of the subject is not restricted to the development of the individual alone, but for the advancement of the social, economic, and political goals of countries all over the world. The general goals of Biology teaching are to equip the learner with the basic knowledge, skills, and attitude that will enable one to lead an independent and useful life, both to himself/herself and the larger community in which he/she lives. Furthermore, one primary function of Biology teaching is to help the students understand biology concepts, principles, theories, and laws. Hence, the Federal Ministry of Education (FME 2009), spells out the major objectives of the biology curriculum as

1. Understanding of the structure and function of living organisms as well as appreciation of nature.

A. Ibrahim (✉)
Sule Lamido University kafin-Hausa, Kafin- Hausa, Jigawa State, Nigeria
e-mail: ndutsereal0@gmail.com

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2. Acquisition of adequate laboratory and field skills in order to carry out and evaluate experiments and projects in Biology.
3. Acquisition of necessary scientific skills, for example, observing, classifying, and interpreting biological data.
4. Relevant knowledge in Biology needed for future advanced studies in biological science; acquisition of scientific attitude for problem-solving.
5. Ability to apply biological principles in matters that affect personal, social environmental, community health, and economic problems.

Looking critically into the above objectives, the teaching, and learning of biology should, therefore, be done using teaching methods that are activity oriented such as demonstration method, project method, laboratory instruction, and discovery method as well as guided inquiry teaching method.

Guided inquiry strategy is described by differences educators, Sola and Ojo (2007) stated that guided inquiry is a student's centered activities oriented teaching strategy in which the teacher direct students though problem-solving approach to discover answers to instructional topic at hand. It involves getting students to carry out investigation of natural phenomena through which meaningful problems are answered and new knowledge obtained. Inquiry-based teaching approach provides useful platforms for engaging students in practical, hands-on service science investigations that can bring them in interaction with living and nonliving aspects of the environment (Stella 2008). Students are able to explore materials, design investigation for testing hypothesis, and work with data (with the teachers support) to identify and interpret patterns.

The importance of inquiry in the science process cannot be overemphasized; the American National Research Council (NRC) created the standards around a central theme 'science standards for all students. This theme emphasizes the importance of inquiring in science process, allowing students to describe objects and events, ask questions, construct explanations test those explanations against current scientific knowledge and communicate their ideas to others. In teaching science with an inquiry emphasis, the assumptions of the diverse populace are considered and critical and logical thinking skills are fostered (Opara 2011).

The performance of students in senior secondary Biology in Nigeria has remained consistently poor. In recent times, observations on student's academic performance in Biology, over the years in results of the Senior Secondary Certificate Examination (SSCE) conducted by West African Examination (WAEC) revealed that a very few numbers of students performed better in Biology Examination compared with other subjects, and as a result affected the academic aspirations of many candidates (Ogundiwin et al. 2015). In support of this, statistical evidence reveals that the percentage of students that passed Biology at credit level and above (A1-C6) was consistently less 50% for the past 10 years between 2002 and 2012 in Nigeria (WAEC Chief Examiners Report cited in Ogundiwin et al. 2015). Also, according to the WAEC Chief Examiners Report (WAEC 2010, 2011, 2012), the senior secondary school Biology candidates have a number of problems associated with both cognitive and motor skills which have culminated in the poor performance of students in the secondary certificate Examinations (Umoke and Nwafor 2014) (Table 1).

Sustainable Development is defined as the development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Bruntland Commission (1987). Sustainable Development is also defined as a process of improving the range of opportunities that will enable individual humans and communities to achieve their aspirations and full potential over a sustained period of time while maintaining the resilience of economic,

Table 1 Statistics of result for may/June WASSCE biology for 2002–2012

Year	No. of. candidates sat	No. of credit passes A1-C6	Percentage passes (%)
2002	882,119	278,112	31.52
2003	909,101	392,249	44.15
2004	1,027,938	253,487	24.69
2005	1,072,607	375,850	35.04
2006	1,152,045	559,854	48.60
2007	1,238,163	413,211	33.37
2008	1,259,964	427,644	33.94
2009	1,340,206	453,928	33.84
2010	1,300,418	427,644	33.90
2011	1,505,199	579,432	38.50
2012	1,672,224	649,156	38.82

Source Statistics Section, West African Examination Council (WAEC)

social, and environmental systems (Munasinghe (2004)). As such, this paper is set to determine guided inquiry strategy as panacea for students poor academic performance in Biology for sustainable development in teaching and learning.

2 Statement of the Problem

A lot has been done by biology teachers to improve the teaching of biology in secondary schools in Nigeria. In spite of that, students continue to perform poorly in the subject. It then became necessary to explore effect of an alternative method of teaching that might redress this situation. Study has been done by Ibe (2004), Opara (2011), Duniya (2016), on the use of more effective teaching methods such as discovery method, laboratory instruction among others to enhance sustainable development in biology students academic performance, but there is no available empirical evidence so far, on the use of guide inquiry strategy in relation to learning retention.

3 Research Questions

1. Is there any difference between the performance of biology students exposed to guided inquiry strategy and those exposed to the lecture method?
2. Is there any difference between the performance of male and female biology students exposed to guide inquiry strategy?
3. Is there any difference between the retention level of biology students exposed to guided inquiry strategy and those exposed to the lecture method?

4 Research Hypotheses

1. There is no significant difference between the performance of biology students exposed to guided inquiry strategy and those exposed to the lecture method.
2. There is no significant difference between the performance of male and female biology students exposed to guide inquiry strategy?
3. There is no significant difference between the retention level of biology students exposed to guided inquiry strategy and those exposed to the lecture method?

5 Methodology

The research design employed for the purpose of this study was pretest posttest quasi-experiment design since intact biology classes were used. The pretest was administered to the subjects in the two groups (experimental and control groups) in order to determine their equivalence in ability before treatment. The experimental group was taught using guided inquiry strategy while the control group was taught using lecture method. At the end of the six weeks treatment, a posttest was administered to both the experimental and control groups in order to assess the effect of the treatment in promoting sustainable academic performance among experimental and control groups. The pretest and posttest administered were the same but test items were reshuffled at the posttest stage to limit the effects of "test-wiseness" (Mari 2001). Three weeks duration after posttest, the same test was also administered as post posttest to find out the retention level of the students. Simple random sampling technique was used to select two schools out of the twenty nine schools in Ringim educational Zone, Jigawa state Nigeria. Two schools selected were GDSS Yandutse and GDSS Kwalam.

6 Results

The results of this study are presented in tables and according to the research questions and hypotheses they addressed.

Research Question 1: Is there any significant difference between the performance of biology students exposed to guided inquiry strategy and those exposed to the lecture method?

The result in Table 2 shows that the experimental group with mean score of 12.300 performed higher than the control group with mean score of 10.965. This mean difference exists between the posttest mean scores of experimental group and posttest mean scores of control group. To test whether the difference is significant or not, null hypothesis one was formulated and tested using t-test statistic.

Hypothesis one HO_1: There is no significant difference in academic achievement between students taught using guided inquiry strategy and those taught using lecture method.

Table 3 results show t-test between the academic performance mean scores of experimental group and that of the control counterpart. The result shows that p-value of 0.000 is less than 0.05 level of significant, which indicated significant difference. Therefore, the difference between the experimental group taught using guided inquiry strategy and that of control group taught using lecture method is significant.

Table 2 Mean and standard deviation of posttest scores for experimental and control

Group	N	Mean	Std. deviation
Experimental	65	12.300	2.741
Control	64	10.965	3.040

Hence, the stated null hypothesis one $H0_1$ is thereby rejected, which shows that, there is significant difference in academic performance between students taught using guided inquiry strategy and those taught using lecture method.

Research Question 2: Is there any significant difference between the performance of male and female biology students exposed to guide inquiry strategy?

The result in Table 1 shows that the female in the experimental group with mean score of 10.17 and standard deviation of 6.005 is lower than the male counterparts with mean score of 10.32 and standard deviation of 5.930. From this two mean, there is a difference but the differences appear to be negligible. To find out if the difference is significant or not, null hypothesis two was formulated and tested using t-test statistic (Table 4).

Hypothesis two HO_2: There is no significant difference between the performance of male and female biology students exposed to guide inquiry strategy.

From Table 5, the result shows that the p-value 0.923 obtained is higher than 0.05 level of significance, which indicated no significant difference. Consequently, the null hypothesis two which state that there is no significant difference in academic performance between male and female students taught using guided inquiry strategy is thereby retained. This shows that guided inquiry strategy is gender friendly.

Research Question 3: Is there any difference between mean retention scores of students taught with guided inquiry strategy and those taught using lecture method?

The result in Table 6 shows the mean score of experimental group is 13.000 which is higher than control group with mean score of 9.234. This shows that experimental group has performed better than control group counterparts, which indicated that guided inquiry teaching strategy enhanced better learning retention in biology among senior secondary school students than lecture method.

Hypothesis three HO_3: There is no significant difference in the mean retention scores of students taught with guided inquiry strategy and those taught using lecture method

Table 7 results show t-test between the academic performance mean retention scores of experimental group and that of control group counterparts. The result shows that p-value of 0.000 is less than 0.05 level of significance, which indicated significant difference. Therefore, difference in learning retention between the experimental group taught using guided inquiry teaching strategy and control group taught using lecture method is significant. Hence, the stated null hypothesis three HO_3 is thereby rejected.

7 Discussion of the Results

The study sought to find out guided inquiry strategy as panacea for students poor Academic Performance in Biology for Sustainable Development in teaching and learning. The results of analysis presented in Tables 2 and 3 showed significant difference in the academic performance of the experimental group when compared with the control

Table 3 Result of t-test analysis of academic performance mean scores of experimental and control group

Variable	N	Mean	Std dev	Df	t-value	P-value	Decision
Experimental	65	12.300	2.741	127	10.409	0.000	Rejected
Control	64	10.965	3.040				

Table 4 Mean and standard deviation of posttest scores of male and female experimental group

Gender	N	Mean	Std. deviation
Male	45	10.32	6.005
Female	20	10.17	5.930

Table 5 Result of t-test analysis of academic achievement means scores of male and female students taught using guided inquiry strategy

Group	N	Mean	Std. deviation	Df	t-value	p-value	Decision
Male	45	10.32	6.005				
				63	0.097	0.923	Retained
Female	20	10.17	5.930				

Table 6 Mean and standard deviation of post posttest scores for experimental and control group

Group	N	Mean	Std. deviation
Experimental	65	13.000	2.492
Control	64	9.234	2.500

Table 7 Result of t-test analysis of academic achievement post-posttest mean retention scores of experimental and control groups

Group	N	Mean	Std. deviation	Df	t-value	p-value	Decision
Experimental	65	13.000	2.492				
				127	11.386	0.000	Rejected HO_3
Control	64	9.234	2.500				

group. The difference is in favor of the experimental groups with mean scores of 12.300 who perform better than their control counterparts with mean scores of 10.965. This means students taught with guided inquiry strategy performed significantly better than those taught with lecture method in their academic performance. The result confirms earlier findings of Awodi (1984), James (1991), and Bilgin (2009) who recommended that students should be provided with appropriate methods in science such as guided inquiry strategy in order to make abstract concepts better understood. The finding is also in agreement with that of Shittu (2013) who studies revealed that guided inquiry strategy facilitates meaningful learning of physics among low achievers at senior secondary school level.

Tables 4 and 5 showed no significant difference in academic performance of male and female students exposed to guided inquiry strategy. This finding concurs with those of Usman (2000), Shittu (2013), Duniya (2016), and Ibrahim (2017) who individual found out that there is no gender difference in the academic performance of students when exposed to activity-based method of instruction such as guided inquiry strategy. In addition, the finding is also in agreement with Ariyibi (2004) and Udo (2006) who observed that the type of instructional strategy used does not discriminate between male and female. These findings disagree with Ekeh (2004), Nicharam (2010), and Opara (2011) who reported male superiority in science academic achievement. The present finding also disagrees with the findings by Shuaibu and Mari (1997) and Galadima (2003) who reported female superiority in academic achievement in science. Tables 5 and 6 indicate that students taught using guided inquiry strategy have higher learning retention scores than those students taught using lecture method. This is also in line with findings of Ibrahim (2017).

8 Conclusions

The finding of this study concluded that guided inquiry strategy enhances students' academic performance and learning retention than the lecture method. Guided inquiry also found to be gender friendly for both male and female.

9 Recommendations

In view of the findings and implications in classroom instruction, the following recommendations were put forward:

1. In service training for teachers in forms of seminars, workshops and conferences should focus more on how to use guided inquiry strategy for teaching science particularly biology. The government or relevant professional bodies like Science Teachers Association of Nigeria (STAN) could do this.
2. Authors and publishers of textbooks materials for secondary school biology should expand the curriculum content to include the methodology used in this study on the use of guided inquiry, as enhanced sustainable development in teaching and learning.
3. This study showed that gender does not play a significant role in learning biology using guided inquiry strategy. Hence, the method is recommended, as it is gender friendly, both male and female could benefit during teaching and learning.

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HEIs Practices and Strategic Decisions Toward Planning for Delivering Academic Programs for a Sustainable Future

Esra Saleh AlDhaen and Mohamed Mahmood

Abstract

Higher Education Institutions around the world are facing various challenges with the dynamic market demand and quality assurance standards and regulatory requirements. The higher education sector is in dilemma of what should be the main focus of their operations, research, and community or fulfillment quality requirements and catching up with the ranking system. The similar argument took place by various authors, *should HEI develop researcher, innovators, employees, practitioners, or entrepreneurs. The arguments mentioned above lead to one questions do HEIs deliver education in a way that enables a sustainable future?* This paper demonstrates various HEIs practices in Bahrain and strategic decisions toward planning for delivering academic programs for a sustainable future, the paper also demonstrates strategic measures and outcomes with summarized facts and figures that enabled the HEIs to develop distinguished graduate with lifelong learning skills that allow sustainable future.

Keywords

Higher education institutions (HEIs) gulf cooperation council (GCC) • Higher education council (HEC) • National qualification framework (NQF) • Bahrain education and training authority (BQA)

1 Introduction

Higher Education Institutions (HEIs) around the world are facing various challenges with the dynamic changes of the market demand and many factors that influence the operations of HEIs such as regulatory requirements and seeking atonal intern ranking. In the United Kingdom (UK), there have been various calls for investigation in the area of strategic decision-making and issues that cause the failure of strategic planning toward sustainable education. Dayan and Elbanna (2011) highlighted that most of HEIs do not take their time to plan correctly and get disturbed by other external factors, which leads to ad hoc decisions and operates for a short term.

Hargreaves and Stone argued that senior university management sometimes confuses the excellence of research in teaching and focus of academic leadership, which is still leading to failure of strategic planning in UK universities. In Similar context, Hinton (2012) raised a concern that HEIs do not consider resources planning, including planning for delivering academic programs which lead to a lack of efficiency in delivering academic programs. For instance, with the new employability requirements, HEIs are requested to focus on providing practical components which are more of hands-on experience, this type of learning requires additional human resources and infrastructure that is not part of the HEIs planning.

Ladd (2016) indicated that HEIs are not conducting enough studies to forecast or predict the future requirements to curriculum or teaching methodologies that may involve some financial aspect. In the GCC region, the same problem occurs. Albalooshi (2013) mentioned that HEIs are not giving enough attention to planning their academic programs with explicit graduate attributes. Albalooshi (2013) is in line with UNESCO (2018) that HEIs and other education providers should be responsive to the environmental change, with a clear focus of the skills needed to be embedded as part of curriculum development taking into account the role of

E. S. AlDhaen (✉)
Ahlia University of Bahrain, Manama, Bahrain
e-mail: esaldhaen@ahlia.edu.bh

M. Mahmood
Brunel University London, London, UK

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technology and the lifestyle of the young generation. This issue is considered one of the main aspects that should be considered to allow graduating students with appropriate lifelong learning skills (Aldhaen et al. 2018).

From the above arguments, it is visible that there is a link between strategic decisions and objective planning toward sustainable future, it is also clear that there is a need to have a specific and measurable objective about academic programs. Strategic planning should include a transparent and systematic review process to maintain up-to-date employability skills.

This paper will identify best practices by successful HEIs toward their strategic objectives and planning toward sustainable future, by focusing on their mechanisms of developing programs with specific graduate attributes that are transferable and with lifelong learning skills.

This paper will demonstrate various HEIs practices in Bahrain and strategic decisions toward planning for delivering academic programs for a sustainable future, the paper will also demonstrate strategic measures and outcomes with summarized facts and figures that enabled the HEIs to develop distinguished graduate with lifelong learning skills that allow sustainable future.

2 Higher Education Institutions (HEIs) in the Kingdom of Bahrain

The Kingdom of Bahrain has (1) local university and (14) private universities, the private universities are established by an approved license from the Higher Education Council within the Ministry of Education Bahrain (refer to HEC website online, HEC 2018). The established HEIs are subjected to quality reviews to assure that the highest academic standards are maintained. Bahrain Education and Training Authority (BQA) was established in the year 2009 to conduct Institutional and Programme Quality Reviews on a cycle basis. The BQA conducted two cycles of reviews and updated their standards to support HEIs to maintain the minimum international standards. BQA regularly conducts capacity-building programs to help HEIs to mature in terms of academic and quality standards. In the year 2014 BQA established National Qualification Framework (NQF) in the Kingdom of Bahrain, NQF focuses mainly on the design of the program and its justification in terms of market needs, NQF is made compulsory, and HEIs should place their qualifications on NQF within a time refer to BQA NQF website online, NQF 2018.

Higher Education Council established a set of strategies and requested to align their strategic objectives with the government expectation. HEC has supported HEIs to streamline their annual strategic targets with HEC national research strategy and employability skills study.

HEIs in the Kingdom of Bahrain at this stage are prioritizing their objectives in line with HEC and BQA requirements rather than working toward their primary scope of objectives. However; until today, HEIs in Bahrain did not reach it is a full cycle of maturity despite the direction provided by regulatory bodies to HEIs. This is due to lack of proper strategic planning that leads to achieving the main aim which is developing researchers with lifelong learning skills that could transferable for a sustainable future and support the government toward transforming to the knowledge economy.

3 Strategic Planning and Execution Methodology

3.1 Strategic Planning Process

This study was investigated in a private HEI in the Kingdom of Bahrain established in the year 2001; the HEI operates with five Academic Colleges, (1) Business and Finance (2) Information Technology (3) Engineering (4) Arts and Science (5) Graduate Studies and Research. The HEI offers 14 local qualifications and three foreign qualifications.

The HEI has assured sustainability of education that is applied across all its academic program offerings through streamlining their operations with strategic planning objectives and institutionalizing them through annual planning.

At the governance level, the university established a standing committee to develop and review 5 years cycle strategic plan. The committee is supported by reports generated from strategic planning directorate that is responsible for assuring that all the strategic objectives are institutionalizing across all the colleges and administrative units across the university. The strategic planning directorate forward the report for quality assurance and accreditation unit for verification and recommendations before forwarding the final report for the committee discussions and decision-making. The purpose of this process is to provide credibility for the report and more accuracy for rational decision-making (Aldhaen 2017).

As a best practice, Dayan and Elbanna (2011) the university formed the committee comprising from leaders from every college and administrative unit. The plan was developed at committee level in consultation with external stakeholders such as advisory board members, experts from industry and leaders in governmental positions to assure

streamlining Bahrain vision 2030, the purpose of involving multiple stakeholders to assure that the plan is achievable and sustainable.

3.2 Execution Methodology

The university approved its strategic plan with 15 strategic objectives; all the strategic objectives are aligned with HEC and BQA standards. There are specific objectives related to program reviews for assurance of sustainable and up to date programs delivered that are justifiable in terms of program needs; this practice is sync with Albalooshi (2013) previous argument. The objectives are compulsory for academic colleges to be part of their annual operational plans and supported by program review and planning procedures that will be explained in Sect. 4 (Table 1).

4 Program Review and Delivery Procedure

The university developed a detailed procedure to assure execution of its strategic objective, and the university diverted their focus on developing and revising their academic programs to assure their education is sustainable, up to date and relevant to the market. This practice is in line with Hinton (2012) previous argument that HEIs should catch up with the dynamic changes with a clear focus on their primary aim.

The procedure should be conducted once every 3 years, which includes (1) benchmarking process (2) market needs analysis (3) stakeholder's input, such as alumni, employers and industry members (4) published studies by the government (Fig. 1).

Each academic program should undergo through the program review process, which is conducted at least once every three academic years. Wals (2014) highlighted that need to have a regular program review for sustainable learning and future of the graduates. Significant components of program review have been integrated.

As a significant improvement made to the programs is an integration of professional certification leading to exemptions from examination and several modules by the awarding professional institute. The HEI managed to integrate more than two professional exemptions in the program, which is in line with employability requirements.

In the Kingdom of Bahrain, there are calls for employability skills and studies by the HEC in the year 2014 was established to support HEIs to deliver more relevant programs to the market needs.

The HEI has integrated International Computer Driving Licence (ICDL) and Association of Chartered Certified Accountants (ACCA). This integration has led the students to successfully graduate with a Bachelor's Degree in the

Table 1 HEI strategic objectives and targets

Strategic objective	Strategic KPI	Annual, Target
Strategic objective 5 create an exceptional learning environment characterized by high quality academic and cocurricular programs, excellent and innovative teaching, to prepare students for success in the global labor market and to contribute to the prosperity of society	Optimal usage of virtual learning environment	10% incremental use per year
	Student retention	90% of admitted students
	Throughput rates, i.e., completion rates of undergraduates in four years of full-time study	80%
	Throughput rates, i.e., completion rates of postgraduates in a minimum time of study	75%
	Graduated students in employment (Employability)	80% in 2 years
Strategic objective 14 enhance the management of quality assurance across the university	Programs evaluated internally	Five programs per year
	Programs evaluated externally with a successful outcome	Five programs per year
	Benchmarking of programs	Three programs per year

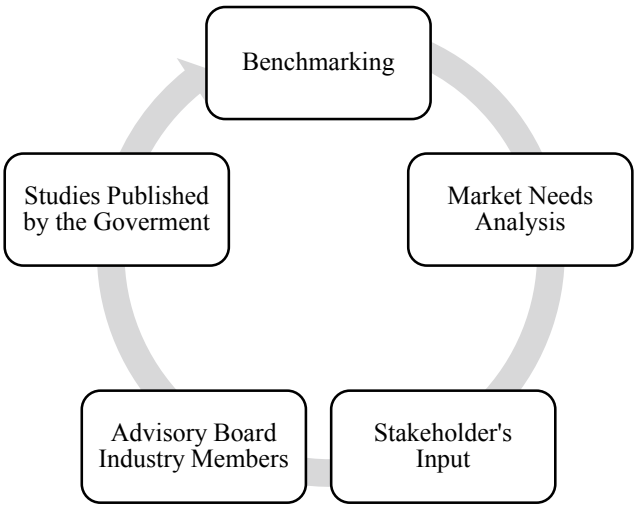

Fig. 1 Program review framework

Accounting or Finance field along with ACCA certification as well as ICDL. The integration supported increasing the employability rate up to 78%, which is considered very high, taking into consideration the context size. This practice was also in support of various researchers such as Czerniawski et al. (2018).

Taylor et al. (2008) highlighted the need for resource planning and leadership decision-making in HEIs. Similarly, Aldhaen et al. stated that there is a need to have enough resources to take any decision in HEIs. The HEI has established a Programme Planning for Delivery Committee, which conducts a regular review to assure that all the planned programs are supported with the required resources including human resources and other related issues.

One of the major decisions that were taken by the Programme Planning for Delivery Committee is to recruit faculty from an industrial background. This has led to the HEI to maintain high standards in delivering the required employability skills and supported delivering the professionally aligned courses.

5 Strategic Achievements and Discussions

The university has achieved strategic objective no. 5 by achieving all the related strategic performance measures in two different years (2016 and 2017) the following sections will discuss the achieved targets and further decisions taken to sustain better quality in delivering academic programs for sustainable future.

Strategic Objective No. 5 was 96% achieved for two academic years, and this is due to the achievement of more than 10 and 15% in the following year. The increasing percentage was found fair the target was set as a minimum line to improve. This is due to the culture of the use of virtual learning in the GCC region is not yet fully mature and HEI's need to consider this as a priority to sustainable skills as it embeds lifelong learning skills which is a key component for the graduates.

The university has kept its advising system at a very high level, which enabled retaining the students up to 92% over the two academic years. The advising system, including academic and nonacademic support system, was found useful and played a significant role in retaining the students as it provides them with a better understanding of real-life experience. Due to the student support facilities, the completion rate of the undergraduate programs was 89% and for the postgraduate programs was 72%; this is due to the majority for the students on the postgraduate programs are full-time employees with established responsibilities which had an impact on the overall length of the study.

Concerning the graduate's employability rate, the graduate's first destination varied from program to another, and two programs were close to achieving the overall target % this is due to the limitation of the market demand and size. However; the graduates from both programs had a higher percentage of graduates become entrepreneurs and established their own business.

Strategic Objective No. 14 was 100% achieved for two academic years, and five academic programs were evaluated internally as per the adapted quality management system, the programs were evaluated to comply with the national qualification requirements. As a classification, two programs were delivered by College of Engineering 2 programs from the College of Information Technology and one program from the College of Business and Finance. In the year 2018, all the programs that were evaluated internally were placed on the National Qualification Framework.

Finally, but not the least, the university was able to conduct five benchmarking studies with other international and reputable universities for one program delivered by the College of Business and Finance, two programs delivered by College of Engineering and two programs delivered by College of Arts and Science.

All the analysis mentioned above is discussed at the University Strategic Planning Committee headed by the President of the University, and decisions are taken based on the analysis. The decision took place related to adding additional performance measures to evaluate the strategic objective at a longer term, for instance, a KPI was added to propose new academic programs toward sustainability.

As an outcome of the conducted benchmarking, six academic programs were proposed for approval by the regulatory body. New decision taken by the committee was the integration of additional employability skills for the programs that did not achieve the targeted percentage of employability at the first destination.

Management courses related to Entrepreneurship has been proposed to be made part of all the undergraduate programs to support graduates to choose their pathways after graduating. In addition, a career counselor was recruited to support learners to decide on their targeted organizations for employability.

Internship placement was made 100% compulsory for the undergraduate programs to provide the students with the opportunity to practice real-life cases before graduating.

6 Conclusion and Future Research

HEIs around the world are facing various challenges to catch up with the market requirements, as it is dynamically changing, and technology is playing a vital role in the speed of change. This particular HEI has adapted the government-supported strategy and aligned their strategy along with the regulatory authority's strategies. The alignment was executed by streamlining operations with quality assurance and compliance for maintaining quality assurance highest academic standards.

The execution was activated by governance leadership and systematic monitoring and analysis, which was followed by strict decisions toward improvements and sustainable education. From the achieved performance measures, it can be found that this practice is successful and an extent of alignment with government strategies is significant as it allows the HEIs to remain focused. The alignment does not mean that HEIs have lost their autonomy; it is a support for HEIs to reach the targeted aim.

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Innovative Pedagogy for Higher Educational Institution: The Teacher Point of View

Fermin G. Castillo

Abstract

Information, communications, and technology change both teacher–learner experiences in the past 30 years. These trends and updates will forever transform how content delivery of teaching pedagogy will enhance and prepare millennial students. To use these tools, require knowledge, skills, and abilities on the part of the teacher in order to establish learning and development for students. This paper discusses the rationale of information, communications, and technology (ICT) while meeting knowledge, skills, and abilities (KSA) model for readiness and enhances the student experience. This will prepare millennial students for the next generation of learning pedagogy that is well equipped and in demand in the industry/corporate. Learning is continuous processes to the information, communications, and technology (ICT) which will determine their knowledge, skills, and abilities (KSA) in facing the real-world challenges and adversities. The next generation of learner needs innovative pedagogy that will adopt their generation as millennial learners.

Keywords

ICT • KSA • Teaching pedagogy • Student experience • Millennial teacher

1 Introduction

Information, communications, and technology change both teacher–learner experiences in the past 30 years. These trends and updates will forever transform how content delivery of teaching pedagogy will enhance and prepare millennial students. To use these tools, require knowledge, skills, and abilities on the part of the teacher in order to establish learning and development for students. Because of that shift, the pressure is more on the teacher to be more creative and innovative in their teaching pedagogy. Aside from that, the language and culture are becoming more of a challenge to the teacher, especially if they are teaching overseas. It is essential for the teacher to adopt and learn a new culture. This is a vital plus for his/her arsenal, especially in dealing with students coming from different age generations and not to mention the millennial students.

The role of the teacher started to evolve through the years. As a result, the teacher needs to be adaptive and responsive to those changes. There are many related research and studies that support that statement which the teacher role evolved. Pandey (2007) states that the role of the teacher has undergone a change from that of an imparter of knowledge to that of a facilitator. This change brings into focus the learner as the central figure. Teacher as facilitator role in the classroom makes the discussion more interesting and challenging because it is the students who are at the center of the action. Depends on the subject matter it will be even more explosives if not chaotic. Chaotic in a way that ideas are flowing and the challenging part of the role of the teacher is to control the emotions and parties involved. By setting up house rules, it will minimize the burden on the part of the teacher in dealing with students. Respect for cultural similarities and differences must prevail aside from learning to each one. There is no secret formula for any teaching pedagogy that can be done by the teacher. It will depend on his/her knowledge, skills, and abilities, which will make a difference plus the mastery of the subject matter require updating and continuous lifelong learning on the part of the teacher.

2 Significance of the Study

The role of the teacher in the classroom management started to evolve over the years. This is because we are dealing with information, communications, and technology in our daily

F. G. Castillo (✉)
University of Fujairah, Fujairah, United Arab Emirates
e-mail: fermin@uof.ac.ae

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lives. Those changes in our environment also affect the education and learning environment of our learners. As a result, they are more into knowledge and how it can be shared with others. Because of that role of the teacher is becoming more of a facilitator rather than the source of information. A teacher will always be a learner, and this is a never-ending journey towards lifelong learning. Teacher as a role model for the students remains to be the challenging part because our students are seen as the second parents outside their home. Therefore, the teacher should be conscientious in portraying his/her orientation.

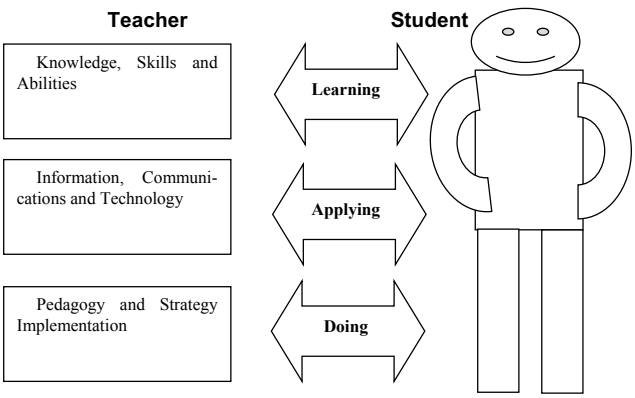

Fig. 1 Teacher–student learning model

2.1 The Teacher Role in Learning and Teaching Approaches: The Challenge

The role of the teacher is becoming more into a complex role than it is before. The teacher today needs to innovate and deliver lessons that must attract the attention of the students. Different teachers have different experiences and at the same time, coming different cultures and philosophies. Singh and Raju (2006) a teacher is a person who is directly engaged in instructing a group of students. That is the primary role of the teacher; however, over the years, the role of instruction grew over the years to come. A teacher is an adviser to students in terms of selecting courses and at the same time, serve as mentor and coach throughout their academic life. Teachers need to understand a subject enough to teach its essence to students. The goal is to develop a sound knowledge base on which the students will be able to build as they will be exposed to different life experiences. The passing of knowledge from generation to generation helps students to grow as ideal members of society. Good teachers can translate information, provide sound judgment, experience, and wisdom into relevant knowledge, that a student can easily understand, assimilate, retain, and also pass on to others. This is because education is lifelong learning, and the teacher does not stop learning the same as students as the case may be. Figure 1 shows the Teacher–Student Learning Model.

The teacher should follow the KSA Model of USOPM (2009), which is applicable across the profession, especially like education. The breakdown and relevance of KSA Model can be adopted in the academic environment for teachers. Furthermore, KSA features, as defined by USOPM, include:

- **KSA**: Required job attributes and qualifications based on service, education, and/or training.
- **Knowledge**: Information applied to performance and function history. On the part of the teacher s/he should possess the required degree/certificates in his/her of specialization. Aside from that, s/he should possess both academic and professional qualifications. In today's new qualification, the teacher must have a license, board exam, and/or certification in his/her field of specialization. This will give the teacher credibility and integrity. It is essential that teacher should possess that knowledge in understanding different platforms related to teaching and learning resources. Knowledge is something that is stuck in the brain where anyone cannot take it from you. Knowledge is power, as the saying goes, and this is true. It can take you to a different mindset if proper knowledge is acquired. Knowledge is something that we cannot take away to anyone because it is already in their brains. Education is something that no one can take it from you. Nowadays, teachers are no longer the source of information but a facilitator of information, and at the same time that knowledge we always impart to our learners.

However, what exactly knowledge should give and deliver to our students remains to depend on the experience of the teacher. Somehow, this will be the point of argument for the knowledge. Different teachers have different attitudes and behaviors which will determine if they are willing to contribute nor impart what they have to the learners.

- **Skill**: Measured competency of learned psychomotor activity. A teacher must be an excellent communicator; therefore, s/he must try to learn another international language(s) as the case may be. Other skills such as analytical and decision-making skills and technical skills are very relevant now a day. In a world of ICT (information, communications, and technology) do not be left behind is the magic word. Research skills are perhaps one of the most highly decorated pieces of scholarly gain a teacher should have. This is because the educational institution is looking for a teacher with research skills that can make a difference in society and beyond.
  Nowadays, we have seen a shift of teachers across culture, which started to work internationally and globally. Those teachers have different skills to showcase abroad

as this teacher represents their flag and country. When they land work overseas, we can say that those teachers may be the best their country can have. As a result, we can see different teachers bringing their skills to a different level. The most crucial part is that there are transferable skills form teachers to students. This is the most critical aspect of skills from the side of teachers that matters the most. The teacher should have this kind of philosophy in order that the skills be sustainable. Aside from that, the teacher must possess and hold those skills so that he/she can be able to share those skills. Constant updating and upgrading is a must for teachers so that the next generation of learners will be in good hands.

- **Ability**: Competency related to behavior or behavior resulting in an observed product. In an academic environment, adaptability and survival are perhaps the words that many teachers are dealing with in their profession. Multicultural diversity and globalization push the teacher to be more competitive in the international arena. Aside from that, the teacher's ability to adapt to any working environment at the same time working in another country/territory is essential. Just like knowledge and skills—abilities varies across teachers.

On the part of the teacher; knowledge, skills, and abilities is an integral part of his/her arsenal in educating the learner. The bottom line here is that the teacher must have learned from his/her experience because it is the only thing that can make him/her a better teacher. Learning is a continuous process, and the teacher must be in that track the same as the students being taught. The tricky part here is if the teacher does not have that experience but s/he can also attend training, seminars, workshops, and conference to attain self-development.

A teacher must continuously search for new and innovative teaching and learning pedagogy, which they can acquire it through various avenues like attending seminars, workshops, lecture, conferences, and other training and development activities.

2.2 Learning

Different teachers have different learning and experience. Once a learner will always be a learner as they said. Usually, what teachers learned in the past will also be applied to their future students as the case may be. Again this depends on the orientation and circa where this teacher came from. The teacher applies what they learn in the past; however, this kind of practice changes. We can say that there is a huge gap between traditional and modern.

Day teachers in terms of learning. Across discipline, you will see that traditional teachers usually stick to what they gained and rarely learn. While the modern-day teachers are always looking and searching for that knowledge. They believe that learning is part of life. They always think of opportunities to grow as a person. Knowledge once passed across generation will always be treasured. Learning is always a process, and to others, it is a journey to a more challenging experience. In learning, we see things differently but the bottom line is we grow from it. It can a good or bad experience, but the lessons we learned from it is very vital in our growth as a teacher. In learning, we acquire wisdom, and this wisdom will help us to understand more about the purpose of education.

2.3 Applying

Different teachers have different means and ways on how to get things done. Applying what you learned and shared it among communities is one of the most essential practices in educating people. In applying you will be able to learn best practices and a lot more. There are many online communities, blogs, and social groups that can be of help, mainly the exchange of ideas and solutions are just a click away. Many teachers learn things through applying because they can see the difference between theory and application. This is a very important part of the teacher's experience because applying what they have learned in the classroom is very significant and relevant. Usually, the teacher should be the source of knowledge in the application; however, millennials tend to be tech-savvy; therefore, the teacher should be knowledgeable to those new trends and updates.

2.4 Doing

Aside from learning and applying, the next step is doing indirectly. Many teachers have a phobia in doing it rather than giving them a try. Many teachers still doubt their capability that is why educational institution must provide them with the necessary tools, including training and development, in order for them to be competitive in their field of specialization and interest. There are many providers which the teachers can explore their learning process. Nowadays, we have seen that tech giant like Microsoft and Google are involved in teacher's skills in linking education to technology. Professional development remains to be the teacher's responsibility because it is part of his/her arsenal in today's competitive environment. Teachers must think proactively in order to reach their goal as a multicultural and competitive teacher in this fast phasing modern world. The teacher must try doing something because this will help them to see education beyond the four corners of the room. The teacher must know how to do it rather than speak on it.

As a matter of fact, in technical courses, especially in IT, the teacher must hold a certification, license, and/or board exam in his/her field. This will separate them from others because of that industry qualification, which will gain them the respect of the academic community.

2.5 Information, Communications, and Technology: The Know-How Approach

The transfer of information, communications, and technology is just a click away; therefore, as the teacher must be adaptive and responsive to those changes and challenges. In the classroom, we are dealing with students across ages with different multicultural and diversified backgrounds. On top of it, the Internet is becoming more and more into the picture which the transfer of the information; faster and efficient. Most colleges and universities invest in their infrastructure, including IT, Library, and other learning resources. Because of that Internet, Wi-Fi and other connectivity are being all over the campuses, which makes the students have access to information.

The big question here is that what they are doing with that information they have? Are they using the data nor learning resources for research or they use it for some purposes? For example, the use of social media as a past time and distraction to their studies. A significant number of millennials are into the social media hype, which is very difficult to control, especially in the amount of time spent with their mobile devices. The use of QR (quick response) can be a good option in terms of short activity as most students have a smartphone. Maximizing the use of the technology classroom is very important for the teachers. Powerpoint and Prezi still be a useful tool for the lecture.

From books to e-books to different formats to different sources and access. The use of smartboards, message board, and Swivl technology can give added help and assistance to the teacher. Using intelligent robot like Swivl will help to record or lecture at ease. Blogs and podcasts remain to be very popular across the teacher, and it depends on what platform they will use. The use of Moodle, Blackboard, and other platforms started to become part of the life of a teacher's day-to-day life. Aside from that, teachers must understand software for their grading as well as assessment. As most colleges and universities are moving forward to both Program Learning Outcomes and Course Learning Outcomes integrated into the grading system; it is empirical that the teacher must also adopt and learn to these new practices. In the end, the teachers must learn and learn; otherwise, you will be left behind. Beyond the use of technology, the knowledge of the teacher on how to integrate it is one of the critical ingredients in classroom management. The teacher must understand how to link technology and education at the same time. Adoptability of the teacher to technology remains to be the top priority of any teacher because this will be the trend in the coming years. Just like in IT they said, "Do not be left behind." This tech attitude should always be in the mind of the teachers in order to work better and improve the classroom lecture/discussion.

2.6 Pedagogy and Teaching Strategies: Unique Identity

Different teachers have different styles, personality, and pedagogy, as well as a teaching strategy in the classroom. There are many studies that proved that there is no secret to success in managing classroom management but adopting a combination of various pedagogy and implement. In the book of Li (2012), the author defined pedagogy as "more broadly to the theory and practice of education, and how this influences the growth of learners. Pedagogy, taken as an academic discipline, is the study of how knowledge and skills are exchanged in an educational context, and it considers the interactions that take place during learning." Pedagogies vary greatly, as they reflect the different social, political, cultural contexts from which they emerge. Pedagogy is more on practicing the teaching profession and beyond. The pedagogy adopted by teachers shape their actions, judgments, and other teaching strategies by taking into consideration theories of learning, understandings of students and their needs, and the backgrounds and interests of individual students (Blueprint for Government Schools 2012; Shulman 1987). Aside from teaching pedagogy, the teacher must understand multiple intelligence, which will help him/her to understand student learning curve and performance.

One of the early and well-known theories of pedagogy is the Blooms taxonomy, which was developed by Benjamin Blooms. In 1956 American educational psychologist Benjamin Blooms (1984) headed a group of educational psychologists who developed a classification of levels of intellectual behavior that is important in learning. The domains are the following; cognitive, psychomotor, and practical. Various authors contributed to educational philosophies, which are incorporated across education and learning.

Johann Heinrich Pestalozzi—was an educational reformer who advocates and believes the motto, "Learning by head, hand, and heart" and remain to be a key principle in twenty-first-century schools.

John Dewey—was a talented early developer of the philosophy of pragmatism and one of the founders of progressive education.
Maria Tecla Artemesia Montessori—was a physician and educator, a noted humanitarian and devoted best known for her educational method on a child-centered approach based on scientific observations of children.
Kurt Matthias Robert Martin Hanh—was a German whose philosophies are considered internationally influential because he believed in the need for real, hands-on practical challenges for the development of character.
Jean Piaget—contributed to the theory of cognitive development of the child.
Simon Soloveychik—believes in the philosophy of "Parenting For Everyone."
Paulo Regulus Neves Freire—he argues for pedagogy to treat the learner as a cocreator of knowledge which is known as the pedagogy of oppressed.
Peter McLaren—contributed to the theory of Critical pedagogy as to the philosophy of education and social movement.

Based on the latest developments in teaching pedagogy, we can conclude that teaching is becoming more like an activity that transforms knowledge, skills, and abilities to the next generations of learners/students. Moreover, the teaching profession is behind the success of other professions like a lawyer, engineer, accountant, scientist, and more. Overall the teacher plays an essential role in the success and development of its learners/students, which is very difficult to quantify nor measure. The following are the teacher's role in the process and beyond the call of duty and profession:

- Teachers are devoted to student/learner and their learning development progress.
- Teachers have mastery in the subject area(s) and possess knowledge.
- Teachers role in tracking and monitoring students well-being.
- Teachers know the science and art of teaching.
- Teachers make another profession possible.
- Teachers are the heart and soul of the learning process, while student learners are the fruit of success.

Teaching Strategies is perhaps one of the most crucial classroom activities that a teacher can be involved with. To some extent, this defies the teachers to experience in managing classroom management. However, before teaching strategy can be done, there are many principles and theory that a teacher must understand. As we said, earlier, Blooms Taxonomy is one of the essential principles that change education and learning practices. Multiple intelligence, according to Gardner (1983) defines intelligence as "the capacity to solve problems or fashion products that are valued in one or more cultural settings. The lists of the seven bits of intelligence are listed below:

1. Logical—mathematical intelligence consists of the ability to detect patterns, reason deductively, and think logically.
2. Linguistic intelligence—involves having a mastery of language.
3. Spatial Intelligence—gives one the ability to manipulate and create mental images in order to solve problems.
4. Musical intelligence—encompasses the ability to recognize and compose musical pitches, tones, and rhythms.
5. Bodily–kinesthetic intelligence—is the ability to use one's mental abilities to coordinate one's bodily movements.
6. Personal intelligence—includes interpersonal feelings and intentions of others.
7. Naturalist intelligence—designates the human ability to discriminate among living things (plants and animals) as well as sensitivity to other features of the natural world (Gardner 1983).

In the classroom, we may observe that many students want to finish and accomplish things in a group. This gives the teacher the understanding that group is, in fact, better as far as a group activity and seatwork activity in concern.

Collaborative learning is a method of teaching and learning in which students team together to explore an urgent question or create a meaningful project. A group of students discussing a lecture or students from different schools working together over the Internet on a shared assignment are both examples of collaborative learning.

Cooperative learning, which will be the primary focus of this workshop, is a specific kind of collaborative learning. In cooperative learning, students work together in small groups on a structured activity. They are individually accountable for their work, and the work of the group as a whole is also assessed. Cooperative groups work face-to-face and learn to work as a team (Gillies 2016).

Inside the classroom, the teacher observes his/her students and notice that all of them have similarities and differences. The Myers–Briggs Type Indicator (MBTI) is an introspective self-report questionnaire with the purpose indicating differing psychological preferences in how people perceive the world around them and make decisions (Myers and Myers 1995). By using a survey questionnaire from this model, will help the teachers to understand each students' personality and make the necessary adjustment.

2.7 Traditional Role of a Teacher

Teaching is a combination of science and art; these arguments remain the same as it is today. There are many traditional roles of a teacher which was passed across generations. This is perhaps the notion of our teachers in the past, which they learn from their teachers during their time. We have to understand that teacher across generations have a different perspective as far as teaching is a concern. Past teachers taught their students the same methodology as to the concepts and theories as to the case may be. This idea transforms to the next generation of teachers, which they also pass to their students. The teachers are grooming and molding the ethical values of their students. The teacher is like a father and mother the like in the classroom which the students gave them kind respect. Through the years, the same approach was given, and they prohibit any changes. Any changes they believe it is not ideal as it is not tested through the times. Moreover, they never listen nor embrace changes in approach or methodology.

Teachers value the efforts of the student rather than their performance because the teacher believes the student's determination is present despite the setbacks. The teacher is considered to be the parents of the pupils/students while at school. Therefore that role is incorporated as part of our responsibility. We have to ensure that adequate knowledge and skills gained by the learner. This responsibility helps us to create a pleasant sound learning environment that will educate future learners. It is not only grooming their minds but also providing them with the right attitude and conduct. Sometimes it is not only the knowledge and skills that matter but it is the ethical values within. This is perhaps the most essential part that traditional teachers taught their apprentice.

2.8 Modern to Next Generation Roles of a Teacher

Many teachers today learned from different teaching approaches as well as methodologies. Because of that the transfer of information it is easier for the teacher to do so. It now depends on the methodology and pedagogy of the teacher on how to convert those inside the classroom. Modern teachers are more into committed to understanding the student's situations in life. They became like a mentor and coach to some extent. Aside from that, they view their teachers as a role model in their life. The role of the teacher extended to career adviser to some extent because students across ages, including millennials, look for someone who can give them peace of advice in their careers, including work decisions. Part of the job of the teacher is counseling and helping them to understand their role in society. The teacher in the modern era is more prepared for their subject matter as they know other disciplines. Aside from that, the teacher has mastery in their subject matter as relevant tools are readily available around. They believe that the role of the manager in charge of the classroom is no longer their primary role. Because they believe that students should be the one to serve and everything lie beneath. The role of the teacher is becoming more prominent and more significant because education is now modern globalization.

Moreover, why globalization, this is because of the migration that is happening, which includes work opportunities for teachers. They carry such experience from their home country to the host country. Their ability to speak a foreign language and culture they possess is being carried away when they work abroad. In this stage, the teacher is becoming more into a diverse, multicultural teacher carrying their flag and country. This showcase that teacher must understand the learning tools needed backup with educational principles in order to deliver a competitive teaching experience. From lecturer to the facilitator to mentor/career adviser. The teacher is becoming more into an adviser for the career of our learner.

2.9 Teaching the millennials: The Teachers Role

Teaching students across generation may be a tough challenge to any teachers, but this is just an understatement. The millennials are the one who will dominate the next generation of learners, and this poses a significant challenge for teachers. Therefore, on the part of the teacher, they must adapt to those changes; otherwise, the teaching profession will be stagnant. Millennials, just like other learners, behave unpredictably; therefore, as a teacher, we must be ready with that kind of attitude. Understanding their personality and learning style remains to be the key. Millennials have different preferences as to the learning they want to gain. Because mobile phones and other gadgets are there, this remains to be the wall that separates learning and reality. They tend to become impatient, and they need results immediately. They have the confidence to do things, but as a teacher, we have to guide them. They are the next generation of learners that is willing to explore things, but as a teacher, we are there to motivate and empower them in order to achieve something remarkable. Millennials are the type of learner who wants technology to be part of their everyday life. As a teacher, we have to face that kind of mentality, but we have to tell them that technology has limitation and responsibility to do. Molding them ethically is one the best way to handle millennials plus reminding them about their contribution in the society they belong. We have to teach them that as a learner we have a responsibility to the society, government and to the people. That is sharing the talents we possess.

3 Issues, changes, challenges and beyond: The Call of Duty

The teacher role is becoming more sophisticated and complicated in the next coming years. The main issue is perhaps being a teacher learned from that shift or not? This may affect his/her role as a teacher because the profession may grow as well. The population is growing, and the demand for the profession will inevitably grow, and on the part of the teacher, he/she must be ready for that. In the teaching profession, we have seen teachers coming from different age generations at the same time from different culture and nationalities. There may be similarities and differences among culture, but still, it depends on the teacher per se. As a teacher, we are dealing with students across ages and not to mention the millennials, which are always packed with information and insights.

As an educator, we must be open to other new pedagogies and tools for learning in order to understand the meaning of learning as a continuous process and not limited to the four corners of the room as the saying goes (Castillo 2010).

3.1 Teaching Job: In Demand

Many countries may have demands of teachers across instructions; therefore, it will be up to the teacher to grab that opportunity. When we earned our degree(s) form our home country or outside there may be possibilities that the host country may ask for degree equivalency of such degrees. This is very much possible because they want to make sure that the degree is the same as in their local settings. This is now a practice in some countries, particularly in the Arab Countries. Aside from the degree earned, there may be a time that colleges and universities may look for teachers who graduate from a foreign institution with international accreditation like AACSB, EQUIS (EFMD), and ABET. Aside from that, the international experience will be a must for all universities; therefore, trying to get international experience is a plus. From business to medicine to engineering, there is always a job opportunity for teachers.

3.2 Research and Publication: Publish or Perish Mentality

As teacher lets have to face it that our intellectual well-being is our investment. Therefore, we must make sure we are on a roll as far as research is a concern. Research is one of the criteria for hiring in both the local and international level. They are looking for a talented individual that is active in research because this will help the academic institution to gain respect in the academic community. This also helps them to attain a better world ranking as far as competing with the best in the world. Frequently foreign institution is looking for teachers who have potentials to grow. Research is a significant part of the promotion and hiring process criteria. In the long run, research and publication is also the basis of academic ranking from Assistant Professor to Full Professor. We have to understand that different country has a different academic title like lecturer to senior lecturer to Full Professor or Fellow. Regardless of the academic rank, research, and publication will always be one of the essential criteria in the promotion and hiring teacher for local and overseas employment.

3.3 Culture Adaptability and Language: Multicultural Teacher

The teaching profession is an opportunity to impart our knowledge to our students. It is also the avenue for opportunities to work in another territory and culture. For the teacher, it is imperative that learning other culture is part of our learning process. Overseas teaching opportunities are another learning experience for the teacher. It helps him/her to understand other culture as well as learning from it. Language is perhaps one of the most important aspects of communication that a teacher should learn and understand. At least learning the basics will make a difference. However, the most challenging part of the teacher is understanding the similarities and differences at the same time live with it. Most countries which open its door for teacher have something in common like they have international restaurants and foods for them. Even churches and money exchange shops are available to them. It is also a bonus if the country is one of the tourist spots if not a destination. On top of those issues, changes, and challenges, it is the teacher who will be the one to deliver what is expected to him/her.

3.4 Quality Assurance and Accreditation

The role of the teacher started to evolve as many institutions are geared towards achieving quality and accreditation, respectively. Because of that, teachers must observe quality from the very start day of their work. Quality assurance is part of the teacher's life as we are trained to accomplish course files/course plan and teaching plan. Due to different competition institution are geared towards local and international accreditation wherein teachers are becoming part and parcel of that scheme. Teachers are an integral part of the process, which makes accreditation and quality assurance background very relevant and part of the work.

4 Conclusion and Recommendation

The teacher is the heart of the learning process; therefore, a good and kind heart must be established. We have to understand that knowledge, skills, and abilities may be acquired by the learner, but the most important part of learning is to impart them to people and society in general. Spreading the good vibes around the academic community is very important because students are the future managers and leaders of any country. We have to mold them in a way that ethical values and social responsibility are inside their heart and minds.

The teacher makes another profession possible, and this is true. Information, communications, and technology are just a click away, and for teachers, the role will be how to use them by developing their critical and logical skills, including problem-solving. Giving the student's case study will help them to evaluate proper decision-making and judgment. Aside from the other professional responsibilities assign to us, we have to take into account our relationship with our fellows, colleagues, family, and friends, and other parties involved. The teaching profession is a profession complex and challenging.

The Roles of the teacher in the coming years to come will surely be complicated and this is because of many factors that affect its profession. The roadmap of the teacher's path looks promising and as they say, "There is always light at the end of the tunnel." The following roles of the teachers below will undoubtedly help future student learner to be more responsible and educated.

4.1 Research and Publication

The teacher must advocate research and publication in his/her teaching arsenal by working with students in collaborative projects and assignments. Aside from that, the output of the study must benefit society at large in general. The teacher must mold students to be research-oriented and to explore possibilities. The teacher serves as a role model in research and publication and should advocate this kind of practice to his/her students. In higher education, research and publication is a must. Undergraduate and postgraduate must be exposed to this kind of practice so that they can contribute to the body of knowledge (BOK). There is a saying "Publish or perish" and this premise will be the trend in the coming years. Research can bring much experience to students as their research skills will be practiced and tested. By conducting the research study, the students will become more aware of issues that surround society and disciplines. Research creates the intellectual contribution of students to topics which may benefit the society at large.

4.2 Open Lecture Series

Guest lecturer and experts coming to the classroom will bridge the gap between theory and practice they said. This is true if the teacher can bring someone in the industry or corporate to bring reality in the classroom. It is like classroom experience at a different level. Theory to practice will help the student to learn the current trends and updates in their fields of specialization as they learned directly from the experts. This is a new learning experience for both learners and teachers. This will make the lecture to the next level as industry and corporate practitioner plays a vital role in educating the learner's mind by giving them the fresh hand of information.

4.3 Leadership and Social Responsibility

As a teacher, we have taught our students to be a responsible and law-abiding citizen. We have to unlock the leadership potential to them at the same time showcase their social responsibility and volunteerism initiatives. Activities that will benefit society and communities are what matters the most. This will show the humane side of the teacher in giving and caring to people, which is beyond the duty.

4.4 Educational Tour Series

This activity will promote camaraderie and fellowship among students and teachers as the chance and opportunity to interact with business experts and practitioners are there. The teacher is the vehicle that transforms valuable knowledge into a lifetime experience.

4.5 Student-Teaching partnership

As a teacher, we must try to ask our students about their choice of career and profession. We may find some students to think of becoming as one. We have to understand that there is a worldwide shortage of teachers. That means the teaching profession can be future demand. It may be a toxic and complicated work, but the fact that you impart the

knowledge will certainly help the teacher to be more of a mentor adviser to a future teacher. In this sense, he/she is part of nation-building.

5 Future Research Work

Teaching and innovative pedagogy always hand in hand on many occasions. This can be very challenging on a cultural perspective as different learners have different learning abilities and ways to learned. This varies even on the experience of the teacher, including his/her experience. Perhaps an excellent future research work and study can be about teaching strategy in a specific discipline across region/country. Teachers role and teachers adaptability in another country can be a useful research study.

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International Law and the Challenges of Transboundary Watercourses Governance: The Blue Nile Dam Controversy

Mahir Al Banna

Abstract

Water—as an international public good—is at the core of sustainable development, and it is critical for socioeconomic development, healthy ecosystems, and for human survival itself. Many of river basin international organizations have been established by riparian States with the purpose of more effectively and sustainably govern their shared water resources. However, their achievements in ensuring sustainability in the use of water resources in their respective basins vary considerably: while some seem to be more successful in solving water-specific collective action problems and sustainability challenges, another fail. In international law, States enjoy sovereignty to exploit natural resources on their territory, insofar as such exploitation does not cause harm to neighboring States. The 1997 United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses entered into force on August 17, 2014. However, three of upstream and downstream African States: Egypt, Sudan, and Ethiopia have not yet joined it. Sudan and Egypt have been advantaged by the 1959 Treaty signed between the two countries, thus totally excluding the other Nile Basin States. The construction of the Grand Ethiopian Renaissance Dam (Blue Nile Dam) is now a national pride for Ethiopia which will generate power and constitute a better supply in electricity. If it is considered as a significant step in terms of sustainable development for the country and Africa as well, it is regarded in Egypt as an imminent danger to its Nile water. This study analysis the principles of international law related to transboundary watercourses governance in analyzing the 1997 United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses (UNWC) (Part I), and in focusing on the impact of the Grand Ethiopian Renaissance Dam in the mutual relations between the Nile river riparian States (Part II).

Keywords

International water law • 1997 United Nations watercourses convention • Sovereignty • Grand Ethiopian renaissance dam • Nile basin states • Sustainable development • Countermeasures • Use of force

1 Introduction

For the States, water is a resource of the territory, and therefore the territorial sovereignty must be exerted on it in all independence. Like the oil deposits, it is part of the territory of the state. Like the mountain ranges or other elements of the territory, even if the rivers cross them without stopping there and here come across the difficulty of finding an agreement on how to share them with other states.[1]

The principle of sustainable development illustrates the will to respect both economic and ecological considerations. There is no unanimous agreement as to its definition, but its origins and evolution make it possible to better understand its usefulness. This concept was coined in the United Nations framework to try to reconcile the differing views of both industrialized and developing countries on the importance of environmental concerns in their respective economic policies. According to the report of the World Commission on Environment and Development entitled Our Common Future 1987, it also aims to make the needs of the present, particularly in developing countries, compatible with the interests of future generations. This requirement is repeated in Principle 2 of Rio de Janeiro Conference.

M. Al Banna (✉)
American University in the Emirates, Dubai, UAE
e-mail: mahir.albanna@aue.ae

[1]Boutet and Lasserre (2002).

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It is essential to mention this principle, not only because it deserves its place in reflections on the international law of freshwater resources, but also because it has already manifested peculiarities in the field of aquatic resources.

Regrettably, such a principle does not appear clearly in the 1997 UN Convention. This is not surprising, however, according to Mondange.[2] Indeed, States have always manifested their intention to limit their sovereignty. The concept of sustainable development necessarily requires the establishment of regional solidarity. Although this concept appears as such in other treaties, its absence in the 1997 Convention is not surprising.[3]

The concept could, however, have the advantage of going beyond or at least clarifying the limitation of sovereignty. Indeed, it seems to be more readily applicable to a global context of aquatic resources whose use is mostly related to economic activities, that theories of limited sovereignty and limited territorial integrity seem to be tied to a border context. Proximity. The idea of sustainability fits with this concept not only in space but also in time by taking into account future generations.

Permanent sovereignty over natural resources is one of the significant aspects of the right to development. The classic provision supporting this principle remains Article 2 of the 1974 Charter of Economic Rights and Duties of States, which states that "Every State has and shall freely exercise full permanent sovereignty, including possession, use, and disposal, over all its wealth, natural resources and economic activities. Concerning the right to development, the text of Mar del Plata, about the right of access to water makes it possible to better understand this notion from the UN General Assembly. Therefore, it is posed as a principle that "all peoples, regardless of their stage of development and their economic and social situation, have the right to have access to information. Drinking water of sufficient quantity and quality to meet their essential needs […] it is universally recognized that the availability of this element is essential to human life and the full development of human life. As an individual and as a member of society".

Such a right is claimed by the States to increase their economic growth. In international watercourses, this right has taken a conception. Proponents of the right to development "claim a rule prohibiting the damage resulting from preventing an upstream State from developing its economy, since the rule prohibiting damage to the territory of a downstream State is finding thus reversed".[4] While the right to development ignoring the environment was perceived as legitimate in the past, this is no longer the case today, and the right to development as it was perceived is no longer tenable.

The fundamental principle of international law is the absolute sovereignty of each State, as opposed to all others, in its territory. The jurisdiction of the State in its territory is necessarily exclusive and absolute. Its only limitations are those he imposes on itself. The State is, therefore, free to use the water found on its territory as it sees fit: the resource is not at all conceived as typical.[5]

This doctrine of absolute territorial sovereignty over the territory and its resources is still implicitly invoked nowadays by Turkey and Tajikistan in particular. The latter has even planned to charge to its neighbor downstream, Uzbekistan, the water of Syr Daria and Amou Daria crossing its territory. Both for the Turkish and Tajic governments, we are touching the extreme limits of the use of this doctrine, which led the first to consider exercising a certain control over the use of water made by other residents and the second to make payment for the simple fact that the current source is on its territory.[6]

To explain the challenges facing international law in transboundary watercourses governance, we will analyze the doctrines, principles and practices of international law through the 1997 UN Watercourses Convention, and the 4 legal doctrines of international watercourses law (Part I), before studying the impact of the Grand Ethiopian Renaissance Dam on the upstream and downstream riparian States in Nile Basin (Part II).

2 The 1997 United Nations Convention on the Law of the Non-navigational Uses of International Watercourses (UNWC): A Legal Framework to Regulate Water Share Problems and Settle Disputes?

It is essential to know that there are 263 international watercourses in the world,[7] which concerns 40% of the world's population and accounts for almost 60% of the global freshwater volume according to WWF. However, the rivers thus shared between several States invite the least harmful use and management of water for the various countries concerned by the watercourse in order to avoid any interstate tension. Downstream states are thus particularly vulnerable and dependent on upstream states. In this respect, the very fact that Ethiopia, India, China, or Turkey, the upstream states of major international rivers, abstained or

[2]Mondange (2009), p.70.
[3]Ibid.
[4]Sohnle (2006).
[5]Lazerwitz (1993).
[6]Boutet and Lasserre (2002).
[7]Veber (2014).

voted against the 1997 resolution and did not ratify the text is not surprising. More generally, the position of several States about water sharing and the right to water prevents us from finding, at present, satisfactory solutions to address the many water issues.

In 1970, as a response to the need for more explicit rules to govern transboundary waters, the UN asked the International Law Commission (ILC) to codify and develop the applicable rules to the development and management of international watercourses.[8]

Until the 1980s, international water law was limited to the specific uses of navigation and hydroelectricity.[9] The implementation of international water law, however, remains strictly dependent on the sovereignty of the shared watercourse States.[10]

More than 20 years later, the raised questions are the same: who has the right to use what water—when, why, and how? Is the UN Watercourses Convention an adequate instrument to answer these complex questions? How can watercourses States use the Convention to prevent and, if necessary, resolve international disputes over water?

This Convention has behind it a very long history. Already in 1959, the General Assembly of the United Nations had asked the Secretary-General of the United Nations to undertake a study on the problem of sharing international water resources.

In 1970, it recommended to the United Nations Commission on International Law, composed of 34 experts, to examine legal questions governing relations between States —to study the law relating to the use of railway tracks; water for purposes other than navigation.

It will take 27 years for the work of this commission to lead in 1997 to the adoption of this Convention, known as New York, and another 17 years to come into force.

The term "Watercourse" as expressed in Article 2(a) of the Convention, means that it applies, watercourse systems that cross international boundaries, including major watercourses, their tributaries, connected lakes and aquifers. Generally, components of freshwater systems that may fall under the Convention's scope, when connected include rivers, lakes, aquifers, glaciers, reservoirs, and canals.

By "Watercourse", the Convention refers to a system of surface water and groundwater constituting, because of their physical relations, a unitary unit and usually terminating in a common point of arrival. The Convention, therefore, seeks to fill the existing legal vacuum about international watercourses on the one hand and their use for purposes other than navigation on the other.

Before the adoption of this Convention, there was no international framework for shared watercourses. According to Marion Veber, at present, about 40% of international watercourses benefit from a cooperative management agreement. However, these agreements are often mostly limited, either in the rules of the foreseen, which may be unambitious or not very adapted to the evolving context of the watercourse in question or that it is at the level of the stakeholders, even which rarely include all States concerned by the watercourses in question.

The legal framework established in the 1997 Convention sets out several fundamental principles which are detailed in the second part entitled general principles, such as utilization and equitable and reasonable participation (Article 5). Moreover, the obligation not to cause significant harm (Article 7).

As Sylvie Paquerot[11] points out […] in terms of sustainable management of water resources, although the New York Convention includes a number of articles aimed at ensuring cooperation in pollution protection it is still only a perspective of good neighborliness between sovereign States whose interests may enter into conflict, and not of a common concern of humanity that freshwater resources are generally preserved, in quantity and quality. Moreover, it observes that the very title of the New York Convention is significant in this respect since it does not contain the term "protection", only that of "utilization".

Because the Convention deals with international watercourses, one could expect the text to adopt a vision of water as a common good to be used, managed, and protected in global concern for the good of the human. The Convention is devoid of any reference to the status of res communes.[12]

In his communication of the meeting of American Society of International Law, "***If Water Resects No Political Boundaries, Does Politics Respect Transboundary Waters***?" Mc Caffrey argues that: (to say that a State has sovereignty over natural resources (forests, coal, iron, and other forms of ore, etc.) within its territory is, of course, much different from saying it has sovereignty over shared freshwater resources).[13]

As Sylvie Paquerot[14] explains, […] the states must share with their neighbors not because it is a shared resource that no one should appropriate but because their neighbors are also (sovereign and owners) of their natural resources.

[8]Wouters (2002).
[9]Sironneau (2002).
[10]Sironneau (2012).
[11]Pacquerot (2005).
[12]Veber, M.
[13]Mc Caffrey (2008).
[14]Pacquerot (2005).

2.1 Limitations of the UNWC

The UN Convention on the Law of the Non-Navigational Uses of International Watercourses entered into force on August 17, 2014. This Convention is criticized for being limited in its application. Indeed, it does not propose the institutionalization of an intergovernmental authority which would have a free intervention capacity, and which would be charged with implementing in concrete terms the principles set out in this text. Instead, the Convention has stated on several occasions that the establishment of mechanisms or commissions to facilitate cooperation […] is in no way obligatory and depends on the choice of States.

Another important limitation of this Convention is the blatant lack of ambition on the issue of settling disputes and sanctions for non-compliance with the principles. In the event of a disagreement or the absence of an applicable agreement, the watercourse States concerned shall endeavor to resolve the dispute by peaceful means (Article 33). The parties may have recourse to diplomatic (including third-party) or jurisdictional settlement through a joint institution established for this purpose, arbitration proceedings or by the International Court of justice.

The Convention, therefore, does not impose the creation of a jurisdictional structure specific to each international water agreement, neither it proposes the establishment of an international water tribunal which would be able to settle disputes and to establish sanctions.

Finally, one of the significant weaknesses of the text resides in its Article 3, which states:

1. In the absence of an agreement to the contrary, nothing in the present Convention shall affect the rights or obligations of a watercourse State arising from agreements in force for it on the date on which it became a party to the present Convention. None of the Nile Basin States are signatories of the Convention. Ethiopia has expressed its dissatisfaction that the Convention is 'not balanced, particularly concerning safeguarding the interest of upper riparian States'.[15]
2. Notwithstanding the provisions of paragraph 1, parties to agreements referred to in paragraph 1 May, where necessary, consider harmonizing such agreements with the basic principles of the present Convention.
3. Watercourse States may enter into one or more agreements, from now on referred to as 'watercourse agreements', which apply and adjust the provisions of the present Convention to the characteristics and uses of a particular international watercourse or part thereof.

Although the position of Article 3 paragraph 1 of the existing conventions is clear, the representative of Egypt felt that it would be apparent to the UN General Assembly that the Framework Convention cannot in any way affect international bilateral or multilateral agreements related to rivers.[16]

As we notice, there is no obligation for States Parties to integrate the rules of the Convention: this legal text is thus reduced to a simple list of principles. Principles which, moreover, have nothing new, being for the majority only the codification of customary norms.

Thus, the international watercourse has become a convention governing the uses, protection, and management of its uses and has finally ceased to be the only primary natural resource that is not governed by an international convention and is dependent on customary international law. The Nile Basin countries, including Sudan and Egypt, did not ratify the Convention. The main reason for the reluctance of the upstream states to join the Convention is the right of the veto enjoyed by Egypt and Sudan under these agreements on the upstream projects. The upstream countries fear that any notification to Egypt and Sudan on their part under the agreement will be interpreted by these two countries as acceptance from the upstream countries of these agreements, including the veto.

Thus, 1902, 1929, and 1959 conventions are significant barriers to cooperation not only in the regional environment of the Nile basin but also in the international environment of the International Watercourses Convention.[17]

Sovereignty remains at the heart of the concern of States about water resources. Despite the establishment of a principle of "limited sovereignty", some continue to consider that sovereignty over natural resources remains the only relevant legal principle in this area. Even though others may be aware of the need to study and collectively implement appropriate solutions, cooperation remains subordinate to the political relations between them. The riparian States may, however, seek to coordinate the use of their shared resources by establishing institutions through which their rights and obligations could be strengthened and clarified. States are setting up such institutions because they realize that formalized coordination will be better for them than unilateral action.[18]

2.2 Legal Principles of International Watercourses Law

According to the principle of **Absolute Territorial Sovereignty**,[19] the State has the right to act as it wishes in the part of the watercourse in its territory, irrespective of the adverse

[15]Musa (2013).

[16]Ali Taha (2005).
[17]Salman (2010b).
[18]Mondange (2009).
[19]Mc Caffrey (1996).

consequences of this for the riparian States. This theory was most expressed in the opinion of the Attorney General United States Harmon in 1895 at one of the stages of the conflict between the United States and Mexico over the waters of the Grande River. Farmers in the states of Colorado and New Mexico have diverted part of the waters of the Grande River, affecting the flow of water to some parts of Mexico. The issue of the Harmon doctrine was that the United States was not bound by Mexico to restrict its use of the Grande River because its sovereignty over its territory allowed it to act in that region in any way it wanted, regardless of what it meant for Mexico.

Symmetrical with the principle of absolute territorial sovereignty, that of **Absolute Territorial Integrity** specifies that each State must allow watercourses to continue their course; they cannot interrupt the flow, nor increase or reduce the flow. This doctrine, of course, favors the downstream states, which are vested with a right to monitor the activities of upstream countries over the rivers. Egypt, in particular, avails itself of such doctrine, but that is not the main argument.

According to the Egyptian representations of the structure of the Nilotic basin, the government cannot evoke any other doctrine. Its situation at the end of the Nile, in other words away from its sources, puts the country in a position of total dependence on the upstream countries. The Egyptian government would, therefore, have little recourse if the other governments opted for water policies that could have severe consequences for the flow of the Nile, which has been the case so far, and this despite, for example, the open hostility of the Ethiopian government. Indeed, none of the riparian countries has yet been able to equal the power, even relative, economic, political, or military of Egypt.[20] (Annabelle Boutet—La question de l'eau au Proche-Orient-Thèse de doctorat Aix-Marseille).

The 1929 Nile Water Agreement seems to have been based on the theory of absolute territorial integrity. Under the terms of this agreement, Britain recognized Egypt's natural and historical sights in the Nile waters. Britain also agreed that Egypt would be a condition for any projects on the Nile and its branches or lakes originating in Sudan or the country under British administration, namely, Uganda, Kenya, and Tanganyika.[21]

The principle of **Restricted Territorial Sovereignty** is the accepted theoretical basis of jurisprudence and the rule and practice of the two main rules of international sewerage law. Namely, the rule that each State has the right to the equitable use of the waters of its watercourse and the rule that each riparian State is required not to cause harm to other riparian States. In turn, these two principles emanate from fundamentalist principles of the principles of general international law, namely, the principle of sovereign equality and the principle that imposes duties upon the State in the exercise of its territorial sovereignty.

By the principle of sovereign equality, States bordering an international watercourse within their respective territories shall enjoy equal rights to benefit from the course. In the river Oder case, the Permanent Court of International Justice referred to "the absolute equality of all riparian States in the use of the entire course of the river and the exclusion of any preferential advantage of any riparian State for other States".[22]

Lac Lanoux Arbitration illustrates how international law is capable of dealing with issues related to water shares issues.

The dispute between Spain and France is because the French Government, the deviation of a river from its natural basin to another, to build a dam. The waters for which hydroelectric development was the object were Lake Lanoux. The first manifestations of these intentions of exploitation date from the first quarter of the twentieth century, but it was only until 1949 when the intentions of the French government were lost to the interests of Spain. In 1949, the planned project for France provided for the diversion of one of the tributaries of Lake Lanoux, the Carol River, from its natural course to a hydroelectric plant located in the Ariège River. The natural course of the Carol River flowed across the Franco-Spanish border and finally threw itself into the Mediterranean Sea. On the other hand, according to the project of 1949 the waters of the Carol river would be deviated in the Ariège river and, once used for the generation of electricity, they would be released directly in the Atlantic Ocean without entering Spanish territory. As is evident, the project would produce; of a part, the diversion of the waters of a basin (that of river Carol), toward another (this of river Ariège), but the most important fact, and significant with respect to a fair use of network was the direct damage to the Spanish farmers who would no longer have access to the same amount of water as in the natural course of the Carol River.

Even though the Lac Lanoux case recognized France's right to use its water resources, it also established that a State is not the sole judge of its water rights, as suggested by the Harmon doctrine.[23]

Indeed, sovereignty serves only as a presumption. According to international law, a State cannot use its

[20]Boutet (1999).
[21]Ali Taha, F.A.
[22]Ibid.
[23]O'Connel (1970).

territory without taking into account the consequences of such use on other States. Likewise, a State is expected to tolerate a certain degree of interference by other States.[24]

As O'Connel notes: "Obviously, the law cannot tolerate the situation that one riparian might, through an irrigation program which diverts the greater part of the available water, turn its neighbor's territory into a dessert and destroy the livelihood of its people; but neither can it bar unilateral development of river resources when only minor inconvenience is occasioned the neighbor".[25]

In light of the above, it is legitimate that the State seeks to secure water-related interests by relying on its sovereignty. However, as illustrated by the Lac Lanoux arbitral award and other decisions, sovereignty is not absolute.

Regarding the principle that put duties on the States when exercising its territorial sovereignty, Max Huber stated in the Palmas Islands Case that

> Territorial sovereignty entails the right to exercise the jurisdiction of the State, and as a result of this right, the State must protect the rights of other States within its territory". This right has been applied in many cases, such as the Corfu Channel case, in which the International Court of Justice had stated that "under the principles of international law, a State should not knowingly allow the use of its territory for acts contrary to the rights of other States.

Thus, the theory of limited territorial sovereignty is characterized by absolutism as more practical, more just and balanced as it stems from a fundamental rule of international law that sovereign rights are not absolute but are bound by duties. Therefore, this theory tends to reconcile the interests of the riparian countries to the watercourse without distinguishing between these countries according to their geographic location.

The Community of Interests Principle. This Principle is based on the fact that an international river is a natural unit, which in its entirety is the common property of all the States in its territory. In the case of the Gabčíkovo-Nagymaros Project, the only decision involving an international watercourse rendered over the last 60 years, the International Court of Justice applied the theory of interests to non-navigational uses of international watercourses as evidenced by the adoption by the General Assembly to the Convention of 21 May 1997 on the Law of the Non-Navigational Uses of International of the law of international watercourses. The decision of the Court is essential in many aspects:

It explicitly referred to the 1997 UNWC as an authoritative statement on the law of international watercourses. It is particularly remarkable given the fact that by that time the 1997 Convention had not been ratified by a single State. The Court also implicitly endorsed the principle of equitable and reasonable utilization as a governing principle of watercourse law. The ICJ decision contained 'no mention of the sterile and misconceived debate over the relationship between Articles 5 and 7 of the UN Watercourses Convention'.

According to McCaffrey,[26] this theory does not contradict or even reinforce the theory of limited territorial sovereignty. It refutes the notion that the state's sovereignty over water in its territory is authorized to do whatever it wants. However, he cited some of the elements that characterize the theory of "The theory of limited regional sovereignty". Including that the principle of limited territorial sovereignty is imposed by one side only, while the concept of a combination of interests implies a joint or collective action. It, therefore, makes sense that this concept is reflected in the form of a standard system for the institutional management of the watercourse.

The 1997 New York Convention, flawed in some respects, only partially satisfied the management of freshwater resources from a legal point of view. Legal gaps remain in international law concerning the distribution of freshwater resources, including a binding dispute settlement system, environmental considerations, and the right to water.

The principle of peaceful settlement of disputes is affirmed by the Convention in Article 33 (1). At present, the obligation to resolve any conflict by peaceful means is an imperative standard of value. Absolute, affirmed by Articles 2 (3) and (33) of the United Nations Charter. The only mandatory mechanism, that is to say, accessible at the request of one of the parties to the dispute and provided for in the draft of the International Law Commission, is an inpatient investigation procedure (Article 33 of the Convention).

According to Sylvie Paquerot,[27] (in the absence of a negotiation between the parties, the absence of an obligatory settlement mechanism renders the entire agreement almost obsolete). This is a severe criticism of the 1997 New York Convention. This may be justified to the extent that the settlement of disputes is about the sharing of freshwater resources, and whether or not it is one of the objectives of this Convention. Indeed, in the absence of a compulsory jurisdictional mechanism in the event of failure of the negotiation, how can one claim to equity or a regulation in conformity with the principle of justice?

Faced with this lack of a binding judicial mechanism capable of settling a dispute, some authors do not hesitate to evoke a hypothetic international water tribunal.[28]

In fact, since the Convention of May 21, 1997 did not establish a dispute settlement system that could be triggered

[24]Cassesse (2001).
[25]O'Connel (1970).
[26]Mc Caffery (2007).
[27]Pacquerot, S.
[28]Mondange, A., p. 69.

unilaterally, some jurists reflected on the establishment of an international water tribunal, as was the case of the Law of the Sea Tribunal established by the 1982 Montego Bay Convention. It should be noted that States have rejected the possibility of a binding appeal to jurisdictional remedies in respect of international watercourses had accepted in the context of the 1982 Montego Bay Convention on the Law of the Sea.[29]

The establishment of such a tribunal would make it possible to cover the whole range of problems relating to the management of freshwater resources, thanks to the establishment of several chambers, each with their jurisdiction. Access to this Tribunal could be open to both state and non-state actors, unlike the above, whose jurisdiction is general, but which can only be brought before States. At present, however, States are no longer the only actors in the field of the protection and use of freshwater resources.

The UNWC itself has been criticized for being too vague or misleading and some argue that the application of the UNWC in the case of Nile ended up "institutionalizing conflict." The Convention has also been blamed for replicating in new areas the neoliberal economic and political foundations upon which it was created. The line of argument is that the law may be considered simply as a tool to promote the interests of powerful States, for instance, by facilitating treaties that are skewed in their favor.[30]

Many in the non-legal water community may hold up perceptions about which principles of law favor-up or down streamers. It is expected, for example, that developed downstream States like Egypt will promote the principle of no harm in order to protect against upstream hydraulic development. The upstream States like Ethiopia would be expected to push for fair and reasonable use as it provides some scope for use for water at a later stage in their development trajectory. However, International Watercourses Law is much more nuanced. Perhaps counter-intuitively, the no-harm obligation may support the development plans of upstream States, especially if the downstream State has extensively developed watercourse in question.[31] As McCaffrey and Salman point out, there is increasing recognition (reflected in practice) that upstream use of the flows can be foreclosed when downstream development of watercourse is so extensive that any action by upstream State will cause downstream harm or give rise to downstream claims for inequitable use.[32]

[29]Ibid.
[30]Zeitoun (2015).
[31]Ibid.
[32]Salman (2010), pp. 350–364.

2.3 Relationship Between the Principles of "Equitable and Reasonable Use (Article 7)" and "No Significant Harm (Article 5)"

The Convention did not expressly prohibit a provision on the relationship between the principle of equitable utilization and the principle of non-injury or where precedence or precedence prevails in case of conflict between them. The question of this relationship would not have arisen if the Convention had not provided for the absence of harm as an independent principle and had been guided by the Helsinki Rules, which incorporated the principle of non-harm into the factors used to determine what was fair and reasonable.[33]

States have taken their positions on this matter depending on their geographical location in the watercourse. The upstream States believe that the principle of equitable utilization always prevails and argue that the primacy of the principle of non-harm is profitable to the first users. For example, Turkey says that the Convention should have clearly emphasized the priority of the principles of equitable and reasonable utilization of the obligation not to cause harm. Ethiopia went on to say that the Convention was unbalanced because it did not guarantee the interests of upstream States and referred in this regard to Article 7. While Egypt—a downstream State-formulated a reservation on what it described as the absolute wording of Article 5 and called for a link between the principle of equitable utilization and the principle of non-harm and the necessity to make them equal.

There are many jurisprudences on the relationship between the two principles. Based on Articles 7 and 10 of the Convention and the case of Gabčíkovo-Nagymaros Project, in which the International Court of Justice confirmed the equitable utilization as a fundamental principle in international law for Non-Navigational uses of international watercourses, McCaffrey believes that the Convention gives priority over the principle of equitable utilization, nevertheless he concludes that the two principles complement each other and, therefore, need not be reconciled because they are opposite sides of the same coin.[34]

It is the question of the formulation of Article 7 and its relationship with Articles 5 and 6 which has caused one of the major confrontations in the elaboration of the Convention, and it still exists between the specialists. The opposition between these two articles is also the opposition between upstream states and downstream states. These two articles reveal problems of interpretation, and Joseph W. Dellapena, an Anglo-Saxon specialist in international water law refers to an implicit contradiction. In his view, the text of the

[33]Ali Taha, F.A.
[34]Mc Caffery (2001).

Convention made Article 7 subject to the principle of equitable sharing.[35]

It is necessary here to recall that in the case of the Corfu Channel, the ICJ emphasizes (the obligation of every State not to allow its territory to be used for acts contrary to the rights of other States.).

Similarly, the Arbitral Tribunal in the Lac Lanoux case admits that the upstream State has no right to harm the downstream State through the alteration of the waters of a river. However, the introduction of the principle of fair and reasonable use poses new questions. Is a fair and reasonable use of an international watercourse by a watercourse State found its limit when such use has a detrimental effect on other watercourse States?

The upstream states will tend to justify their use under Article 5, in order to have greater leeway to operate at different locations and thus to make further use of the international watercourse. On the other hand, downstream States will tend to privilege Article 7, in order to protect their uses through the obligation not to cause harm. Besides, the risk is that in the name of the fair and reasonable use of any new use is condemned by preexisting users. In the worst-case scenario, any State that requests use that it deems reasonable could be opposed by the other users, they need not cause appreciable harm, especially if this new use imposes a restriction of consumption in neighboring states. In a situation of water scarcity, or directly in periods of the tense political situation, attempts at negotiation may be aborted and the status quo maintained. The success of the Convention in such a situation would then be quite relative.[36]

Downstream states, or those who believe they enjoy (historical) rights, will insist on the prohibition of causing harm. On the question of sharing the waters of the Nile, Ethiopia, an upstream country, had refrained from valuing Article 7 and had, on the contrary, deplored the lack of explicit recognition of Article 5, which included favor. In its interests, Ethiopia would value Articles 5 and 6 and not Article 7.

On the contrary, Egypt would value Article 7. However, in the end, neither of the two States did sign the Convention. Egypt is already advantaged by historic rights based on the Nile agreements of which Ethiopia had been excluded, and with the construction of the Blue Nile Dam (the Grand Ethiopian Renaissance Dam), it is threatening Egypt's share of Nile waters!

3 Ethiopia and Egypt: The Blue Nile Dam Controversy

The Nile River is a valuable resource that can contribute positively to the economic development of Africa. After the Amazon, the Nile is the longest river in the world (6,671 km). Despite the tranquility of the river, its majestic look, the lush greenery it gives rise to throughout its passage, despite its immense quantity in freshwater, it hides a forest of tensions which, in recent years, have emerged and are likely to turn into regional war if we are not careful. Despite what the river provides the Nile basin is characterized by poverty and the degradation of the environment. Some Nile Basin countries are among the poorest in the world—Burundi ranks as the third poorest country on the planet—or the need to redefine the use and sharing of Nile waters.

With a flow of 84 billion cubic meters, the Nile is a low-level river. Each year, 10% of the water evaporates because the Nasser lake is located in the desert region.[37]

However, the Nile River can also be a source of heavy and costly international conflict among the various riparian States.

The 1959, Treaty was signed between Egypt and Sudan, thus totally excluding the other Nile Basin States, geographically concerned which are arguing that: "the Nile is ours too![38]". It was drafted as part of the construction of the Aswan Dam. The flow at this dam is estimated at 85 billion cubic meters of water, 55.6 will be used by Egypt and 18.5 by Sudan, representing a total of 87% of river flow for both countries. The other eight remaining countries share the rest, which represents 13% of the river's flow.[39]

Egypt and Sudan claim to have "a historical right" over the Nile by the 1959 Treaty. It should be noted that the other countries were not present at the signing of the Treaty, most of them not yet constituted as a country at that time.

Not only do the two countries reserve the lion's share, but the treaty also gives them a veto over all works likely to affect the volume that provides Egypt with 90% of its water consumption. In addition, upstream countries must imperatively seek approval from Egypt and Sudan before implementing any project to develop or exploit the waters of the Nile or its tributaries.

Although this river represents an important resource for the different countries of the basin, Egypt alone exploits most of the flow of the river to the detriment of other

[35]Dellapena (1996).
[36]Mondange, p. 57.
[37]Le Floch (2010), p. 495.
[38]Mwangi (2010).
[39]Abbe Kajuju (2010).

countries, given the size of its population, as well as its almost absolute dependence on the river. With regard to the water of the Nile for its water supply, that is 90% of its consumption, and any attempt to question the existing distribution hurts the country.

Is it useful to want to keep the 1959 Treaty? Upstream countries will never accept it because they consider it unfair and out of step. It takes a political will for a fair share, each according to his needs to avoid one more war in the region.

3.1 The Nile Basin Riparian States Controversy

International law is too general, while international rivers are too particularistic. International law tends to be objective, but State interest in international rivers is too subjective. International law tends to be too vague and ambiguous in its provisions, while State use of international rivers demands an approach which is clearer and realistic.

For Habatamu Alebachew, the Grand Ethiopian Renaissance Dam represents the fact that the State practice in the area of international waters is still guided by State practice through unilateral actions. As such, international principles, in this case, follow far behind State practice, in the political sense of the term.[40]

The government of Ethiopia's initiation of construction of the Grand Ethiopian Renaissance Dam in 2011 occurred outside of the Nile Basin Initiative (NBI) process and contain no indication of being guided by international water law, yet the Declaration of Principles, signed in March 2015 has certainly taken on board the obligations of significant harm and equitable and reasonable use.[41]

For Ethiopians, the Blue Nile Dam has become a kind of national idea. For them, this construction is part of megaprojects not only in Africa but also worldwide by becoming a source of national pride.

From an engineer's perspective, one diplomatic official quipped, Ethiopia would generate the electricity, Sudan would plant the crops, and Egypt would drink the water.[42]

As a matter of fact, the main source of the Nile is the Blue Nile which originates in Ethiopia. With the construction of the Grand Ethiopian Renaissance Dam (The Blue Nile Dam), Ethiopia can escape widespread poverty and achieve sustainable development as the dam will be the largest hydroelectric power plant in Africa.[43] (Maryanne Mundy). In fact, it will generate 6.000 MW of hydroelectric power, equivalent to at least "6 nuclear power plants" ("Ethiopia diverts the Blue Nile for controversial dam build."[44] It is important to notice that the use of Nile waters confirms the idea of sustainable development of all riparian States. For Egypt, it will be risky to approve the dam construction, so it opposes it. However, "the absolute denial of the use and utilization of the tributaries of the Nile by upstream countries denies their right to sustainable development, thereby preventing them from eradicating extreme poverty. This contrary to the global agenda set by the international community".[45]

For Maryanne Mundy, who asserts that ***the Nile is not just a river in Egypt***, treaties between Britain and upstream states Sudan and Ethiopia heavily favored the downstream availability of the effect of the British cotton trade. She argues that the British colonialists of Egypt felt they had a right to steer water rights toward maintaining their colonial power and economic interests. She adds "Although colonial powers no longer control the region, the effect of British water concepts can still be felt in the recent United Nations Watercourses Convention and Egyptian opposition to Ethiopia's plan for Nile use".[46] (Maryanne, Mundy).

D. Benaim and M. Wahid Hanna think that the dam's benefits for Ethiopia and Sudan are clear, but its consequences for Egypt, one of the poorest nations in the world in terms of water availability per capita, are potentially dire.[47] 85% of the water supply for nearly 100 million Egyptians travels through Ethiopia. If Ethiopia fills the reservoir in less than a decade, Egypt's short-term water supply is at risk.[48]

3.2 Sudan and Egypt Controversy

The Blue Nile dam benefits for Sudan are not in Egypt interest (Regarding the sustainable development of Sudan).

Midstream between Ethiopia and Egypt, Sudanese support for international water law is more ambiguous. The Sudanese government's refusal to sign the Cooperative Framework Agreement may have been based more on concern over reallocation of Nile flows than on direct opposition to international water law. Its participation in 1959, Egypt-Sudan treaty still assures the State the right to develop an additional 1–5 km^3/y much of which is likely to be made possible following the Ethiopian construction of the Grand

[40]Alebachew (2011).
[41]Zeitoun (2015).
[42]Benaim and Wahid (2018).
[43]Mundy, M.
[44]BBC News (2013).
[45]Cullet (2009).
[46]Mundy, M.
[47]Conniff (2017).
[48]Benaim and Wahid (2018).

Ethiopian Renaissance Dam further upstream. In this sense, the UN Convention on Watercourses appears to support the development interests of both upstream countries.[49]

Ethiopia's neighbor Sudan initially stood with Egypt in opposing any upstream dams, but its position on the project evolved as the dam's potential benefits to its farmers became evident.

In fact, the Blue Nile, which is the most important tributary of the Nile River, represents 50 billion cubic meters. After the establishment of the dam, the flow of the Blue Nile in Sudan will be uniform throughout the year. As Sudan currently has only one agricultural cycle, the dam will provide Sudan with three agricultural cycles which will lead to regular electricity generation in the Merowe dam. Sudan has wholly failed to take advantage of the 10 billion cubic meters of Nile water that has been going to Egypt since 1959 (Sudan has loaned Egypt 1.5 billion cubic meters which has not been recovered yet). The Blue Nile will keep this water in Sudanese territory, and it will not go to Egypt anymore. That means the Blue Nile dam will give Sudan the right to the sustainable use of Nile water and Egypt will lose 10 billion cubic meters annually. Therefore, Egypt will also have a problem with Sudan as it is fully convinced that Sudan may be more beneficiary than Ethiopia from the Blue Nile Dam.

In addition, the construction of the dam will stop the silt that engulfs turbines which cause power cut and will end the floods that occur periodically in Sudan.

When the downstream country gets the benefit of a dam constructed by an upstream country, the latter—according to the Convention of 1997—can oblige the downstream country to participate in the construction of the dam but Ethiopia asked nothing from Sudan and Egypt.

3.3 Sovereignty Over Water?

To speak of sovereign equality on the water in the framework of the Nile Basin is not logical. It is a simple observation of the natural reality of the river which reveals a de facto inequality in which the law seems powerless. Since the Nile is a successive river, the obligations incumbent upon the watercourse States are not the same. In this sense, the states upstream from where the river's springs are found to have their sovereignty limited in accordance with principles such as fair and non-injurious use. This limitation is based on the rights of successive States. While the states in the mouth of the river, if any, Egypt, retain their full sovereignty over the Nile, if not absolute sovereignty.[50] (Hekma Achour, p. 395).

The discrepancy between States in the exercise of their sovereignty over water in the context of a successive river bears witness to an undeniable sovereign inequality. Indeed, it is not enough to consecrate it in conventions for it to operate. At best, it may be better to speak of sovereign equity to be established by pooling the sovereignty of states.

In short, there is a de facto sovereign inequality due to the nature of the river. In addition, there is sovereign legal inequality due to certain deficiencies in the rules of law of international watercourses also included in the Nile Basin Framework Agreement. There is in the latter a differentiation between the obligation's incumbent on the States according to the successive or continuous nature of the river. Consequently, the mere consecration of sovereign equality by the right of international water rights cannot remedy this inequality. It could even accentuate it, which would not facilitate the overall governance of the Basin already marked by the conceptual divergences of sovereignty.

There is some conception of sovereignty over water downstream from the view of Hekma Achour. Egyptian sovereignty over water is probably the one that stands out most of its congeners. Indeed, Article 44 of the Constitution explicitly affirms this sovereignty by affirming the State's commitment to the protection of historical rights over the Nile. In addition, the State is committed to ensuring the safety of the water. In fact, this commitment cannot be isolated from Egypt's interstate relations with neighboring residents in the negotiation of its rights over the Nile. As a result, the scope of this article goes well beyond the national framework to reaffirm itself at the regional level. (Hekma, p. 396) The state expresses at the same time assurance toward its subjects as to their right to water and displays an attitude of rigor as to its sovereignty over the Nile vis-à-vis with respect to its residents. This translates into a firm call to the respect of its territorial integrity by the upstream states.

The provisions of Article 44 of the Egyptian Constitution attest to the desire to preserve almost absolute sovereignty and territorial integrity over water in the traditional sense.

Since Egypt is the last state downstream, this conception is more justified. In this sense, Egypt is keen to assert its status as a sovereign power, a message that she keeps sending to the States ahead. Now, this sovereignty would not be absolute without its corollary territorial integrity. The latter, although it was a time when Egypt prevailed in an absolute way to preserve its rights, today about the evolution of the law of international watercourses this eventuality is removed.[51] Moreover, given the political situation in the Nile Basin turned toward more cooperation, Egypt is forced to relax its conception of sovereignty over water and to

[49]Zeitoun (2015).
[50]Achour (2016).

[51]Achour, H., p. 397.

accept more limitation of its territorial integrity for the benefit of other residents.

As for Sudan, given the agreement with Egypt on the division of the waters of the Nile, it often displays the same positions and the same conception of sovereignty.

3.4 Conflict of Sovereignties

In 1906, a treaty was concluded between the British, then the tutelary power of Egypt, and Ethiopia, according to which the government of Addis Ababa could not modify the regime of the Blue Nile without the agreement of London. Similarly, during the first half of the twentieth century, the authorities of the various British colonies had agreed not to engage in hydraulic works in the basin without the agreement of Egypt.[52] Finally, in 1929 and again in 1959, the Egyptian government signed two treaties binding it to the Sudanese government on the distribution of all available river volumes from Sudanese territory, which included the waters of the White Nile coming from of the South and the waters of the Blue Nile coming from the East.

The doctrine of Ethiopia, which has still little value in its hydraulic potential, is based on the principle of territorial sovereignty: the waters of the Blue Nile in Ethiopia are part of the sovereignty of Ethiopia.[53]

To counter the threat posed by mass withdrawals in the waters of the Blue Nile, Egypt has constantly sought to recognize the principle of first in time, according to (historical rights) conferred on it by its secular use of land waters of the Nile. Cairo refers to the note E/ECE/I. 36 of the Economic Commission for Europe of 1952, which refers to such historical rights to exclude the application of the Harmon Doctrine and to preserve the "rights of other riparian states over international rivers". This argument seems weak according to Boutet because one can doubt the legal scope, in customary international law, of the invocation by Egypt of a note formerly emanating from a commission with a European vocation.[54]

Egypt has retained this note to counter the Ethiopian doctrine of absolute territorial sovereignty, but it has come to develop the argument of implicit sovereignty over the waters of the Nile, sovereignty that would flow from its alleged historical rights rooted in the "ancient history". The current legal validity of the Egyptian claims is however questionable:

1. The 1906 Treaty was denounced by Ethiopia in 1954, and a legal vacuum replaces it, while Egypt and Sudan believe that it remains valid even after its denunciation[55]
2. The 1959 Sudan-Egyptian Treaty allocates all the river's waters measured at Aswan but does not bind the other States of the basin and cannot limit their access to the waters of the White Nile or the Blue Nile. The drafting of the text does not objectively claim anything else, but no doubt it is precise because of the glaring absence of the other riparian States: Cairo and Khartoum have opted for wording which provides for the appropriation of all the waters of the Nile, and not a distribution of river flow at its entrance to Sudan. Moreover, one of the articles of the treaty stipulates, logically from an Egyptian point of view, that no work can be undertaken outside the territory of the two countries without the agreement of the third parties, thus clarifying the regional and binding nature of the other non-signatory countries that Egypt intended to give to this treaty.

Apart from the diplomatic aspects surrounding its elaboration, this text, according to Frederic LASSERE and Annabelle BOUTET,[56] is not so much a legal aberration from a technical point of view—it shares a resource based on figures that took place in 1959, but rather because the two signatory countries claimed, on the basis of a bilateral treaty, and lack of support from Ethiopia and other upstream countries, to impose on them sharing, to the benefit of downstream countries only.[57] Ethiopia argues that this treaty was concluded between Egypt and Sudan. Thus, it is a bilateral treaty involving Ethiopia. In principle, a treaty only binds those who subscribe to it. As per Article 34 of the Vienna Convention on the Law of Treaties (VCLT), "a treaty does not create either rights or obligations for a third State without its consent."

Egypt argues that States should and could not divert the natural directions and courses of the river flows, which would have always negative consequences on lower riparian States. For Egypt "diversion" over the Nile or any of its tributaries is said to occur if the activities of the upper riparian States result in any one of the following changes in its water positions: first, if it causes a shortage of water supply as different from the amount previously used and held; second, if it causes damage to the environment; third, if it results in a reduction in the level and quality of the groundwater; fourth, if it causes a shortage in hydroelectric

[52]Majzoub (1994).
[53]Boutet, A.
[54]Boutet, A., p. 505.
[55]Delapenne (1996).
[56]Boutet, A.
[57]Boutet, A (pp. 505–506).

power; and fifth, if it inflicts other impacts including like the interception of a large proportion of the sediment carried by that river and if the diversion might damage tourist sites of the lower riparian States.[58]

For Habatamu Alebachew,[59] there are usually four traditional ways of interstate relations to implement such principles of international law and let us see which one Egypt opts for:

A. States may sign a treaty providing for a total prohibition of "diversion";
B. States may sign a treaty allowing "diversion" under total freedom of action;
C. States may sign a treaty over "diversion" of specific rivers, volumes, time schedules, tolerable degree of damage, etc.; and
D. States may sign no treaty at all leaving "diversion" decisions to be based on accepted "principles of international law." The author argues that scenario D is the established policy basis of Egyptian water utilization policy toward Ethiopia.[60]

For Ethiopia, the principles of "no-diversion, equitable utilization of the Nile waters, and no-harm" arguments could be reconciled only through close interstate mutual understanding. Ethiopia capitalizes on the equitable utilization doctrine and prefers no-diversion and no-harm principles to being tabled to interstate technical verifications. In the absence of formal bilateral or multilateral treaties over the use of Nile River, the remaining legal option for Ethiopia appears to stick to Article 2 of the Helsinki Convention[61] on the Protection and Use of Trans Boundary Watercourses and International Lakes 1992, which states that: "the State Parties to the Convention shall take all appropriate measures to ensure that the Transboundary waters are used in a reasonable and equitable way". This principle originated as a middle position of reasonableness between the two extreme principles: the absolute territorial sovereignty assertion of upstream States (Ethiopia), and absolute territorial integrity claims of downstream States (Egypt).[62]

Many terms have been used for this principle, such as "equitable apportionment" or "equitable participation" where most propositions have proved to be the chagrin of Egypt.

4 Military Intervention to Protect Water Interests?

To justify the current use of water, Egypt constantly reminds of its strong dependence on the Nile, unlike the upstream states, which can benefit from abundant equatorial rains. It believes that if these states were able to live without the Nile, they should be able to continue to live without it. This argument, however, cannot justify the intransigence of Egypt and Sudan.[63]

An Egyptian politician, Sheikh Abdel-Akher Hammad, had claimed that the Grand Ethiopian Renaissance Dam and the diversion of the Blue Nile amounts to a "declaration of war by Ethiopia to Egypt"[64] In response, Ethiopia reiterated that the dam would generate electric power which will be exported abroad and shall prove beneficial to most downstream and upstream countries.[65] Sudan agrees with Ethiopian assertions that it "would get many benefits from the dam, including the better supply of electricity and year-long regulation of the Blue Nile's flow and called upon Egypt to stop provocations of a water war in the Nile Basin nations".[66]

When the Grand Ethiopian Renaissance Dam project was declared it was disclosed by WikiLeaks that Egypt was considering establishing a base for Special Force in Sudan tasked with destroying the Ethiopian dam if other methods of resolving the crisis fail. The Egyptian president had put forward a number of proposals by participants ranging from striking the dam militarily to objecting such hostile suggestions against Ethiopia. He highlighted his respect for Ethiopia and Sudan at the end with the remark that "all options are open.".[67]

If Egypt resorts to use military force or interfere in the affairs of Ethiopia, it will be illegal and violating paragraphs 4 and 7 of Article 2 of the UN Charter under international law and violating African Union law as well. This is so even if the dam violates some aspects of the law of international rivers. States can only use force in international law in case of self-defense if they are attacked militarily as set forth by Article 51 of the UN Charter.

Even if the Blue Nile dam will significantly affect Egypt's interests Ethiopia's duty will be to

[58]Arsano (1990).
[59]Alebachew (2011), p. 10.
[60]Ibid.
[61]Yaekob (2003).
[62]Utton (1996).
[63]Le Floch (2010).
[64](Ethiopia dam is declaration of war': Al-Gamaa Al-Islamiya' (Ahram Online, 30 May, 2013) available online at http://english.ahram.org.eg/NewsContent/1/64/72730/Egypt/Politics-/Ethiopia-dam-is-declaration-of-war-AlGamaa-AlIslam.aspx.
[65]Yihdego (2003), http://www.globalwaterforum.org/2013/06/18/the-blue-nile-dam-controversy-in-the-eyes-of-international-law/.
[66]Amin (2013).
[67]Yihdego, Z., Ibid.

> take all appropriate measures…., in consultation with the affected State, to eliminate or mitigate such harm and, where appropriate, to discuss the question of compensation.[68]

Ethiopia's Note Verbale of March 20, 1997, addressed to Egypt, on Toshka or New Valley Project that Egypt was constructing, and which draws water from the Nile River. The Note Verbale stated: "Ethiopia wishes to be on record as having made it unambiguously clear that it will not allow its share to the Nile waters to be affected by a *fait accompli* such as the Toshka project, regarding which it was neither consulted nor alerted".[69]

Countermeasures could be invoked by Ethiopia to breach no significant harm principles following decades of Egyptian thwarting of upstream development, though this may not be politically expedient under current circumstances.[70]

Countermeasures are measures which would otherwise be contrary to the international obligations of an injured State vis-a-vis the responsible State, legitimate breaches of law, to use non-legal terms. This principle could thus be used to assert that violation of an obligation under International Water Law by one State could lead to a legitimate proportional breach of a corresponding obligation by another State, so long as the initial violation consists of a "serious or material" breach. This means that upstream Ethiopia could be within its legal rights to proportionally breach the no-harm obligation if downstream Egypt had breached the obligation ensuring equitable and reasonable use in a "serious and material way."[71] Proportionality is all but guaranteed, furthermore, where countermeasure is taken by way of reciprocity. This approach has been recognized by the International Court of Justice in the context of transboundary waters in the case of the Gabcikkovo–Nagymaros Project (Hungary vs. Slovakia).

Commenting in this paragraph of the Note Verbale, and on the Toshka Project, Professor Waterbury noted that: "The creation de novo, of projects that use significant amounts of water, may, and probably will become the basis of asserted newly acquired rights founded in established use. Egypt's action in the New Valley (or in the Sinai through the Peace Canal) in Ethiopia's view, preempts Ethiopia's rights to harness the Nile water. If the principle of first in time, first in the right prevails, then Ethiopia will have to forgo projects of its own in order to protect Egypt's use rights in the New Valley or Sinai. Ethiopia will suffer appreciable harm in order not to cause harm to Egypt".[72] Clarifying those rights further, Professor Waterbury went on to state: "Debating this project with Egypt may establish that downstream States, contrary to geographical logic, can cause appreciable harm to upstream States by preempting their options, in short by foreclosing the future".[73]

To achieve a framework that ensures equity and sustainability of the Nile, we should agree that the current one is neither equitable nor sustainable. Some authors suggest that the all riparian States must agree to undo all the lousy precedent Nile agreements and organize an international summit on the Nile, "to put together a set of principles that will govern the negotiations between all the Nile Basin's relevant stakeholders to develop an effective legal framework."[74]

In 2013, the Ethiopian Parliament ratified a controversial law calling for the replacement of colonial agreements with new ones to allow the country to legitimately dispose the waters of the Nile and Lake Tana, the primary source of the Blue Nile. The Egyptian authorities at that time had other problems and declared that they did not want to get involved in a war with Ethiopia, but that they would not allow water supplies to be endangered in Egypt. So, many Egyptian politicians in 2013 openly and publicly called for the immediate declaration of war on Ethiopia.

The fear and panic of Cairo go back to the exponential. First, the Egyptians fear a sudden decrease in the flow of the Nile after filling the reservoir of the dam. Second, the concentration of water in the reservoir will lead to its reduction because of evaporations. For Egyptian authorities: "No one can touch Egypt's share of water because for them: 'water is a matter of life or death'".

Cairo is not yet inclined to a settlement of the situation, especially as its result is not obvious. Certainly, the army and the capabilities of the two countries are incomparable, but what is proposed concretely? Occupying the Ethiopian province of Benishangul-Gumuz? Installing in Addis Ababa, a puppet government? Both options are a real headache. In addition, one should not forget that a great part of Ethiopia is a Christian, and such a conflict would quickly turn to Egypt into another serious problem.

Despite past military threats, the prospect of outright war between Ethiopia and Egypt remains remote and lower still given the recent diplomatic warming. For one, scholars suggest that outright water wars have rarely come to pass because transboundary water supplies create interdependence (bombing an upstream country that can divert your water supply is unwise).[75]

Egypt, for its part, has sought to steer clear of regional adventurism, and its military would struggle to carry out a direct strike on the dam. Nonetheless, the stakes remain

[68]Yihdego (2012).
[69]Mc Caffrey (2003).
[70]Zeitoun (2015).
[71]Ibid.
[72]Ibid.
[73]Salman (2010a).
[74]Mwangi (2010).
[75]Benaim and Wahid (2018).

high. Much more likely than full-scale war is a destabilizing lapse into proxy fights in which each side cultivates local forces to aggravate the other's pressure points.

Egypt, for example, has been accused of training forces in Eritrea, which is only beginning to emerge from its prolonged conflict with Ethiopia (Egypt has firmly denied these reports). Egypt can also pressure Sudan via armed opposition groups operating in Darfur, South Kordofan, and the Blue Nile. Sudan, meanwhile, has emerged as a haven for Islamist opponents for the Egyptian regime.[76]

For D. Benaim and M. Wahid Hanna, "As Ethiopia prepares to operationalize the dam and divert the Nile waters to fill its reservoir, the international dispute over the river has reached a make-or-break moment. In the coming years, Ethiopia and Egypt will either set their difference aside and forge a cooperative path forward together with an outcome technically feasible but politically fraught or face a diplomatic downward spiral".[77]

A French firm conducting impact study reports has suggested that Ethiopia could prevent undue disruptions in the water flow to downstream countries if it fills the reservoir more slowly.[78]

For decades, Egypt was the preeminent Nile power, in part, due to historical treaties regarding water distribution (in international water politics, it is especially hard to take away water once it is given), which allowed it to dictate river policies.[79] Faced with the fact that it is no longer wields the same influence over its upstream riparian and unable to twist Ethiopia's arm through coercion, Egypt should inevitably change its strategy toward conciliation.

Despite the loose talk about destroying the Ethiopian dam, war appears highly unlikely. In 2015, Egypt, Ethiopia, and Sudan signed a mutual do-no-harm agreement.[80]

Ethiopia as we said above, could minimize the immediate downstream damage by lengthening the time it takes to fill the reservoir. But that means delaying the benefits of the dam, which Ethiopia may already have oversold. Some experts think that Egypt needs to invest in desalinization for freshwater, like Saudi Arabia, and water-saving drip irrigation, like Israel.[81]

5 Conclusion

In conclusion, it can be noted that the difficulties inherent in the sharing of freshwater resources are flagrant. International law, the primary purpose of which is prevention and, where appropriate, the resolution of interstate conflicts, must reconcile conflicting interests. Water is an element that states have for a long time considered a classic natural resource and thus considered that they could treat it as sovereign states. Can such an approach be conceivable nowadays? State sovereignty must be limited? To assert total sovereignty over its freshwater resources is not to deprive another State of a vital resource for its economic activity, its population?

The myth of the water war is to be relativized to the extent that the conflict situations around the shared water resources practically never degenerate into armed conflict, the sharing of water resources is only one element fueling certain conflicts among others, but in no way constitute the sole cause of the conflict. According to Jacques Bethmont, "there may be no foreseeable future of (war) water in the agreed sense of the term, with ultimatum and reminder of ambassadors, but border incidents, the internal struggles, the processes of intention, even the characterized exactions are there and will probably go by multiplying, the water is, in turn, the cause, the pretext or one of the components of these multiple troubles".[82]

International water law is an evolving right that is built in response to specific problems and hardly brings together a majority of states on many points. For Adrien Mondange,[83] water can somehow always be perceived as an issue of power, and the international watercourses of geopolitical spaces in which sovereignty competes against. This is, in any case, the most pessimistic view that can be adopted because it means that communities of interest do not work and do not apply when it comes to sharing freshwater resources. According to Sylvie Paquerot,[84] "the contradictions, always more critical with the diversification and the increase of the uses of the water, between particular interests of the States and requirements of integrated management of a resource by universal nature, have prevented the crystallization of coherent principles with reality, based on a community of interests of all residents, although these have found expression in the doctrine".

[76]Ibid.
[77]Ibid.
[78]Ibid.
[79]Egypt's Options to Counter Ethiopia's Grand Dam Run Dry. https://worldview.stratfor.com/article/egypts-options-counter-ethiopias-grand-dam-run-dry, 6 June 2018.
[80]Conniff (2017).
[81]Ibid.
[82]Bethmont, J.
[83]Mondange.
[84]Pacquerot, S.

In the framework of regional relations, the Governments of the riparian states of Nile Valley took a further step in 1997 by creating the Nile Basin Initiative, which aims to reach a regional cooperation agreement on exploitation of water resources.[85] This new initiative is to hail the will of the parties to find peaceful arrangements for their differences. It is part of a tradition that marked the second half of the twentieth century, in the course of which successive cooperation agreements, one of the most notable of which was the origin of the ***Undugu***.[86]

Created out of the Cooperative Framework Agreement (CFA), an aspirational document that has been influential in the UNWC,[87] the goal of Nile Basin Initiative (NBI) 1999 is the cooperation between the Nile Basin States, based on a shared vision: "Achieving sustainable socio-economic development through the equitable use and its benefits, common resources of the Nile." Thanks to its strong international support and success in raising funds, the NBI has rapidly evolved over the last few years and is now in the process of preparing and implementing projects.

Many of these projects represent an unprecedented opportunity to develop the river's waters and the basin environment, to maximize the benefits available to all countries. This can improve socioeconomic development within the basin countries while helping to reduce insecurity conflicts. The primary purpose of the NBI's federal guidelines is:

Target the eradication of poverty and promote economic integration;
Develop the water resources of the Nile Basin in a sustainable and equitable manner to ensure prosperity, security, and peace for all its peoples;
Ensure efficient water management and optimal use of resources;
Ensure cooperation and joint action among riparian countries, seeking win-win benefits.

Water sharing requires recognition of the right of every riparian State to obtain a fair and reasonable share of water. It is the right of any riparian state to expand irrigated agriculture to achieve food security for its people. It is not fair that Ethiopia, which supplies the Nile with 85% of its waters, needs food for its people, or that vast areas of Tanzania are exposed to a shortage of drinking water while controlling 49% of the surface of Lake Victoria.

According to Faisal Abdelrahman Ali Taha, the dispute over the standards of water sharing of the Nile is one of the reasons for the failure to agree on the legal and institutional framework of the Nile, especially about the existing uses of water and what can give these uses weight. It is established that equal rights do not mean that the waters of the Nile will be divided equally between riparian states, but that all states have the right to use and benefit from the Nile in a fair and reasonable manner. The extent of each State's right to equitable and reasonable utilization depends on the facts and circumstances of each case.[88]

According to Maryanne Mundy, the NBI is regarded as a "beacon of light" in the often-murky debate about water use in the region. One of the main functions of the NBI is a foster dialogue: A soft law arbitrament by the Nile Council of Ministers could be a good option for balancing the interests of both Ethiopia and Egypt, easing tensions and possibly resolving this dispute.[89]

The increasing influence of the Nile Basin Initiative (NBI) can promote and foster cooperation between Ethiopia and Egypt. If the two States join the UNWC, they can benefit from its dispute resolution mechanism. Although the Convention does not impose the creation of a jurisdictional structure specific to each international water agreement, neither it proposes the establishment of an international water tribunal which would be able to settle disputes and to establish sanctions, it is an instrument of awareness and prevention of disputes in this regard. In addition, the Convention has developed the obligation of cooperation between the Contracting Parties.

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Investigating the Function of DM "Like" in Authentic Discourse and the Importance of Incorporating It in ESL Curriculum

Heba Ibrahim Elbahwashy

Abstract

In daily communication, the lexical items "like", "well", and "you know" can serve as discourse markers (DMs). Research on DMs has revealed a various functions as different types of particles, such as the conjunctional use of "like" and the semantically unidentified phrase "you know". However, there are no formal indications in the ESL grammar books that address the function of the DM "like" as a conjunction. In their book *How English works: A grammatical practice book with answers,* Swan and Walter define "like" as a preposition that comes before nouns or pronoun (Swan 1997). Some given examples are as follows: He runs like the wind. She looks like me. However, they refer to the conjunctional function of "like" as informal and cannot occur in writing. This paper investigates the function of the discourse marker "like" in actual discourse and the possible criteria that determine the status of "like" in the present day. Additionally, the paper examines the prescribed grammatical function of "like" in ELS grammar books. Finally, the paper suggests specific pedagogical recommendations that could be considered in a sustained ESL field of learning and teaching.

Keywords

Discourse markers • Lexicon • ESL • Language learning • Sustainable education

1 Introduction

In daily communication, the lexical items "like", "well", and "you know" can serve as discourse markers (DMs). Research on DMs has revealed their different functions as different types of particles, such as the conjunctional use of "like" and the semantically unidentified phrase "you know" (Schourup 1999). However, there are no formal indications in ESL grammar books that address the function of the DM "like". In their book *How English works: A grammatical practice book with answers,* Swan & Walter define "like" as a preposition that comes before nouns or pronoun (Swan 1997). Some given examples are as follows:

- He runs like the wind.
- She looks like me.

However, they refer to the conjunctional function of "like" as information that cannot occur in writing. Similarly, Azar mentions the term "like" in the list of prepositions in her book *Fundamentals of English* grammar (Azar 1992). Additionally, there is no appearance of "like" in her list of conjunctions. Another grammatical function of "like" serves as a verb in the formal English discourse as pointed out in Greenbaum (1991)

On the other hand, research on ESL acquisition reveals that second language learners usually acquire the DM "like" from the authentic discourse. Thus, some pragmatic fossilization appears in second language learners at schools (Trillo 2001). The reason that leads to this fossilization to occur is the lack of convenient presence of discourse markers in the second language curriculum. A study by Polat (2011) implies that language learners are not aware of their use of discourse markers or their functional role in discourse. These results suggest that when second language learners left entirely on their own, they may pick up some discourse markers more than others without actually learning about their meanings. This may lead to pragmatic fossilization among language learners, as suggested earlier (Trillo 2001).

Although the discourse markers are considered a significant part of daily communication, they are not formally addressed in second language learning courses. In order to bridge the gap of the presence of the DM "like" in actual discourse and its absence in ESL textbooks, this paper investigates the frequent occurrence of the discourse marker

H. I. Elbahwashy (✉)
College of Education, American University in the Emirates, Dubai, United Arab Emirates
e-mail: heba.ibrahim@aue.ae

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"like" in the actual discourse and the possible criteria that determine the status of "like" in the present day. Additionally, the paper analyzes the possible functions of the utterances concerning what the literature elaborates on that concern. Finally, the paper suggests certain pedagogical recommendations to incorporate discourse markers in the ESL field of learning and teaching.

Discourse markers have an essential role in interpreting the discourse between two or more interlocutors. Although they do not have specific semantic or grammatical meanings (Trillo 2001), they still have a crucial function in interpreting the interlocutors' intentions (Fung and Carter 2007). In this respect, Wierzbicka (2003) explains that "their meaning is crucial to the interaction mediated by speech…If learners of a language failed to master the meaning of its particles, their communicative competence would be drastically impaired" (p. 341).

Discourse markers have been described and categorized in several manners over the past three decades. There is a range of alternative names that refer to them, e.g. discourse particles, pragmatic markers, discourse connectives, or cue phrases (Aijmer et al. 2011). Schiffrin defines DMs as dependent elements that support units of talk (Schiffrin 1987). However, the most recognized definition of DMs is introduced by Andersen (2000), as he describes them as "a class of short, recurrent linguistic items that generally have little lexical import but serve significant pragmatic functions in conversation." (p. 39). In the English language, items that belong to this class are: like, I mean, so, you know, and well. However, the lists differ from one to another, depending on the theoretical stances and the purpose of each study. For instance, Schiffrin puts forward a list of 23 DMs (Schiffrin 1987), while Fraser lists 32 of them, and the two lists share only five elements in common (Fraser 1990).

This study focuses on the instances of "like" as a functional discourse marker but not grammatically necessary to the meaning of the utterance. In other words, the study excludes the instances of "like" as a verb, adverb, or a preposition.

Linguistic research deals with DMs because of their high frequency, especially in spoken communication. Once the DMs are identified, research in the field exploits them to identify the purpose of their occurrence. However, in speech processing, DMs are considered as disfluency marker and therefore were removed before decoding an utterance. On the other hand, Lease and Johnson claim that removing the DMs increases the parser performance (Samuel 1999). On the other hand, Schourup argues that DMs should be decoded to a higher level of processing and suggests that making a parser aware of disfluency information could allow it to analyze errors made in previous utterance (Schourup 1999).

Some research studies in the ESL filed declare that the presence of DMs can be useful in inferring information about the role of utterances. For instance, Samuel researched the structure of discourse elaborate that DMs function as discourse connectives or clue words (Lease and Johnson 2006). Similarly, in Reichman's study (1985), original items as "because" or "like" are considered as a support move. Additionally, DMs function as indicators of rhetorical relations between discourse segments (Samuel 1999). Another function of the DMs that has been detected in the previous studies is inferring information on a lower structural level for the segmentation of spoken discourse, or the recognition of the dialogue acts as suggested by Samuel (1999).

"Like" is one of the most frequently used lexical items that can function as a DM, which makes its study challenging in terms of interpreting and identifying its role. Native speakers seem to use "like" more often in their daily conversations as a functional rather than a stylistic tool (Reichman 1985). It is difficult to interpret the meaning of the DM "like" because it could be elusive as it does not change the truth of the utterance (Schourup 1999). As a DM, "like" can function as legalized filler like "Ummm" while preparing for the next word of the utterance. Another more complex function is when the DM "like" could interpret the speaker's intentions a loose manner (Reichman 1985). For example, the utterance "sometimes I do not talk to my friends for, like, a week" does not have the same truth condition as the utterance "sometimes I do not talk to my friends for a week". The first utterance could be considered accurate if the speaker does not talk to their friends in 5 days. In this respect, Fuller implies that "like" functions as a DM only if DMs are "defined by the criterion of being grammatically optional, as they do not change the semantic meaning between elements" (p. 3) (Fuller 2003).

However, the function of "like" as a filler or an indicator of looseness of meaning is an incomplete description of its other qualities. The literature identifies five different categories in which the function of "like" can be classified as a DM (Popescu-Belis and Zufferey 2011).

The first function of "like" is used in hedging and approximation (Jucker and Smith 1998). As in the following example: "We just arrived here after dinner, so it took, like, thirty minutes—something like that". Mu'ller (2005) and Fuller (2013) suggest that "like" is used in focusing on or introducing the next word as shown in the example: "those are the two options: either, like, make an arrow directly, or put a new node." (Popescu-Belis and Zufferey 2011). The elements that are introduced after "like" are the center of focus as they might introduce new information or emphasize the significance of utterance that is related to what occurred before "like".

Additionally, Siegel (2002) and Andersen (2000) claim that "like" can focus on the approximation of the form rather than its content as in the following example: "they had to jump like about a meter away". The fourth function of "like" is when the speaker intends to modify the previous utterance

and introduces a correction: "It might be that if you add a new thing pointing to a variable you just, like… it just overwrites everything." (Popescu-Belis and Zufferey 2011).

Finally, "like" can occur just before a quotation or reported speech in the spoken conversations: "And he was like, yeah, I can make dogs, uh, raise their ears." (Popescu-Belis and Zufferey 2011).

2 Methodology and Corpus

To determine the frequency of the occurrence of the DM "like" in actual discourse, I examined a corpus of spoken and written texts: one interview, two novels, and two film script whereby the number and frequency of occurrence are computed. The main reason for choosing these resources as my corpus is because they are considered the most common source of authentic texts that second language learners can come across. The conducted analysis investigated the possible functions of the DM "like". The results constituted a significant use of the DM "like" in the actual discourse, which emphasizes the importance of introducing DMs in the ESL textbooks.

3 Findings

When I examined the occurrence of "like" in an informal interview, I found that it occurred 12 times with a frequency of 0.91% of the whole text. However, the occurrence of the DM "like" occurred only five times in the first film script in a length of 9480 words in total. On the other hand, the occurrence of "like" increased up to ten times in the second film script with a length of 18,592 words. As for the written text data, results showed that "like" occurred nine times within four chapters of the first novel in a length of 21,587 words. As for the second novel, the occurrence of DM "like" reached 14 times within a length of 8663 words (Table 1).

The findings, as seen in Table 2, reveal that the DM "like" functions for providing approximate information very frequently, as this function is interpreted 20 times. On the other hand, the DM "like" occurred 16 times to provide more focus on the following information and four times to introduces a following reported speech. Finally, there were ten occurrences of "like" that did not indicate any function as a discourse marker but rather a filler within the discourse

In order to investigate the function of "like" in the discourse, this study carefully examined the occurrence in the spoken and written corpus. It is essential to mention that all conversations took place in an informal frame in which the interlocutors were familiar with each other. The context in which the conversations occurred varies from interviews to the ordinary discourse between two characters in a film or a novel. The analysis is categorized according to the functions of the discourse marker "like" as mentioned previously in the literature.

- **Hedging and Approximation**

In examining the first set of examples below, I found that the DM "like" is used for hedging and narrowing down the focus of the discourse in order to provide more approximate details:

(1). So I was filling out job applications for just various – like video stores or anywhere, you know.

(2). Is it true you do not like being photographed?

DEPP: I suppose, like, for example when you're doing something organized like a photo shoot, essentially amid the faux pas of, you know—there was a piece in "Vanity Fair" where I should have used the word "violated." However, you know, in my—in my lack of vocabulary at the moment I used another word, which I've, you know, apologized for radically.

In example (2) above (see Appendix A), the DM "like" is glossed with "for instance" as the following information illustrates approximate details which are relevant for what was mentioned before the DM "like".

(3) One eye had been cut out when he was a kid, and now he wore the kind of thick glasses that made his eyes (both the real one and the glass one) preternaturally huge like his whole head was just this fake eye and this real eye staring at you.

Table 1 The number of occurrences of DM "like" in discourse

Corpus	Number of occurrences	Number of words in each text	Frequency
Interview	12	1314	0.91%
Film script (1)	5	9480	0.053%
Film script (2)	10	18,592	0.054%
Four chapters of Novel (1)	9	21,587	0.042%
Four chapters of Novel (2)	14	8663	0.16%
Total	50		

Table 2 The function of DM "like" in discourse

Corpus/function	Approximation	Focus	Reported Speech	Filler	Total
Interview	7	3	1	1	12
Film script (1)	3	–	–	2	5
Film script (2)	–	5	–	5	10
Four chapters of Novel (1)	5	4			9
Four chapters of Novel (2)	5	4	3	2	14
Total	20	16	4	10	50

(4) Okay, so that is the kind of guys she likes—Like, pretty guys.

Likewise, example (3) (see Appendix 4) and example (4) (see Appendix 2) illustrate the similar function of DM "like" as it provides specific explanation and details to what occurred before the DM. The speaker describes in detail how "his whole head was just this fake eye" as a reference to how the described person's eyes are "preternaturally huge". In example (4), more additional information "pretty guys" was provided to add specific descriptions to what occurred before the DM "like". The DM "like" occurred right after this description as an introductory tool to the following precise details. The previous examples coincide with the claim by Jucker and Smith (1998) in which they suggest that the DM "like" may introduce approximate information.

- **Focus**

There are examined cases in which DM "like" indicate different function than approximation or hedging. In these cases, the information after "like" provides a focus of utterance and is not any way an approximation. The following examples support the findings by Mu'ller (2005) and Fuller (2013) that claim that the DM "like" provides more focus on the utterance that occurs after it.

(5) He is a delicate, like, even refined handsome, you know?
Oh, and when he smiles, I can't stop looking at him.
You are weaving a tangled web. Like really, really tangled. Moreover, honey… you got to stop!

In the previous example (5) (see Appendix 3), speaker (1) uses the DM "like" to describe the magnificent physical look of the person, but she also wants to indicate how she feels toward him. Therefore, the manner in which she uses the DM "like" is to focus on her feelings rather than approximately describing how the person looks like. Similarly, the second speaker uses the DM "like" to focus on describing her reactions to the speaker (1). The occurrence of DM "like" and the repetition of the word "really" in "like really tangled", intends to focus on how the first speaker is making complications that lead to troubles and therefore, the tone of the second speaker sounds to be upset and negative.

(6) Mom reached up to this shelf above my bed and grabbed Bluie, the blue stuffed bear I had had since I was, like, one—back when it was socially acceptable to name one's friends after their hue.

In example (6) above (see Appendix 4), the speaker uses the DM "like" to indicate specific incidents regarding her age as she was a child. Therefore, the function of the DM "like" her is the focus of the time frame in relation to her age

(7) KING: What attracted you to that?

DEPP: Well, I had watched it as a kid, you know. Religiously. I remember sprinting home from school to see it. Didn't want to miss, like, a minute of it. Ironically, you know, Tim had gone through the same experience. You know, running home from school. Moreover, then back when we were doing Sweeney, we were doing "Sweeney Todd" a couple of years ago, it – one day we are just sitting there talking, and I said, you know, we should do a vampire movie sometime.

In example (7) (see Appendix 1), the speaker does not intend to give any attention to the given time duration "Did not want to miss, like, a minute of it." However, instead, he wants to emphasize how significant the film to him to the extent that he cannot miss watching any single minute of it. Therefore, the focus of attention is not in the given approximate form itself but instead on the importance of the content to the speaker.

- **Introducing a Quote or Reported Speech**

(8) And he said, 'It doesn't work that way,' and I was, like, 'Yeah, I realize it doesn't work that way; I'm just saying I'd rather be deaf than blind if I had the choice, which I realize I don't have,' and he said, 'Well, the good news is that you won't be deaf,' and I was like, 'Thank you for explaining that my eye cancer isn't going to make me deaf. I feel so fortunate that an intellectual giant like yourself would deign to operate on me."

(9) but the instructor was like, "Your driving is unpleasant, but it isn't technically unsafe."

(10) I told Augustus the broad outline of my miracle: diagnosed with Stage IV thyroid cancer when I was thirteen. (I did not tell him that the diagnosis came three months after I got my first period. Like: Congratulations! You're a woman. Now die.)

(11) She was like, "Yeah, but…" the but being but they will expose my hideous second toes to the public, and I said, "Kaitlyn, you are the only person I have ever known to have toe.

The previous examples (8, 9, 10, 11) (see Appendix 4) indicate the function of the DM "like" as an introduction to the following reported speech quote. The speaker uses the DM "like" to signal that the following utterance is his own words in a different conversation or a reported speech of a different speaker. Instead of mentioning the name of the quoted persons, each speaker preferred to signal the beginning of the quote with the DM "like". This gives the listener a hint that the following utterance is an actual reported speech by a different person than the speaker. The function of DM "like" in the aforementioned examples concur with the study that mentions the use of DM "like" as an introduction to a following reported speech or quote (Popescu-Belis and Zufferey 2011).

During examining the data, I did not find any utterance in which the function of DM "like" is to modify or introduce new information or in which the focus is on the form rather than its content (Fuller 2013; Andersen 2000). However, few examples suggest that the utterance of "like" does not have any function as a discourse marker but rather only a filler that indicates superficiality and lack of intelligence (Lease and Johnson 2006). See the examples below:

(12) People who like movies. People who supported me. I'll do that all day, all night, that is fine. However, the bombardment, you know, of the paparazzi is—it is like a—it is just—Depp

(13) Which meant there was quite a lot of competitiveness about it, with everybody wanting to beat not only cancer itself, but also the other people in the room. Like, I realize that this is irrational, but when they tell you that you have, say, a 20% chance of living five years, the math kicks in and you figure that is one in five… so you look around and think, as any healthy person would: I gotta outlast four of these bastards.

(14) Because he was, like, such a babe.

A close examination of example (12) (see Appendix 1) shows that the placement of "like" in the conversation is to function as a filler. The speaker in the interview fails to find the correct words to express his view about photo shooting as he first uses the discourse marker "you know" then starts losing the right words to utter. Therefore, the term "like" here does not function as a discourse marker as it does not serve any approximation or focus on given information.

In example (13) (see Appendix 1), the speaker starts the sentence with "like" as a sign of pause before the actual start of the sentence. However, literature does not mention any function of the discourse marker "like" as a "pause" or sentence starters eventually, if we removed the term "like", the sentence will not change or be affected in its form or meaning at all.

Finally, example (14) (see Appendix 2), "like" occurred right before the adverb "such" which connotes the meaning "so extreme a degree". Eventually the addition of "like" does not actually serve any approximation or focus on the following utterance. Therefore, it functions more as a filler in the provided example.

4 Recommendations and Pedagogical Implications

The findings of this research indicate how the functions of discourse marker "like" may vary according to the utterance and the intention of the speaker. These findings indicate the importance of introducing DM to second language learners. The presence of the DM in spoken and written English facilitates the smoothness of the conversation and makes it enjoyable and less formal (Trillo 2001). Based on these facts, ESL syllabus designers should include teaching these elements in ESL textbooks and relevant materials. As for teachers, it is recommended that they introduce the DMs to their students as prevalent part of the spoken and written text of any nature. Innajih explains that introducing the DMs in L2 course is to the advantage of second language learners as they will be familiar with their functions and avoid confusion in their usage (Innajih 2007). As an illustration, Non-native young adults' conversations are interaction-based and demands the use of DMs (Trillo 2001). The lack of this competence results in pragmatic fossilization of DMs, which may lead to weak and less effective communication (Trillo 2001). As DMs are absent in the ESL curriculum, the use of them among language learners may be fossilized both in the diversity and the quantity of them. In other words, ESL learners are deprived of learning about DMs and many practical resources during their learning process. To solve this issue, it is suggested to introduce the DM in L2 courses so that the ESL learners will learn the function of DMs in the same way native speakers do.

There are many ways that ESL teachers can introduce the use of DM "like". One suggested a way to learn about DM "like" in ESL courses is by comparing it to those in the students' first language. This technique will facilitate the learning of the pragmatic functions of "like" and hence, the students will be able to use it in the same way native speakers do.

Another exciting technique is to introduce the students to authentic texts and have them attempt to interpret the meaning of "like" in every utterance. To make this activity more interesting, the teacher could implement spoken or written data that is derived from interesting authentic materials, such as films, interviews with celebrities, and contemporary bestseller novels. Finally, another natural activity is to give students a text with misplaced discourse markers and have them try to place it correctly.

5 Conclusion

It is essential to draw the students' attention to pragmatic elements of language, such as discourse markers. Introducing the students to DMs and their function and raising their awareness on their logical function could facilitate the structuring and organization of the learner's learning progress as they may create an inviting atmosphere for active learners (Fung and Carter 2007). Giving the opportunity of the students to practice speaking the language and exposing them to authentic discourse will help them understand the purpose of discourse markers and use them effectively as native speakers.

The present study is by no means without its limitations, some of which may be addressed by future research. First, the examined corpus in future research could expand to include a more significant amount of examined data. Additionally, ESL language teachers and learners' attitude could be investigated to examine to what extent they are aware of using discourse markers.

As a second language learner and an ESL teacher, I believe that conducting this research helped me explore more information about discourse markers and their functions in the daily utterance. As I learned about those functions of DM "like" in particular, I am aware of how people employ it in their daily discourse. I try to interpret what they mean and if it has a function or it is just a filler. I believe that it is a definite fact that incorporating the study of discourse marker is an essential addition to the ESL curriculum.

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Machine Learning for Flipped Teaching in Higher Education—A Reflection

Vikas Rao Naidu, Baldev Singh, Khadija Al Farei, and Noor Al Suqri

Abstract

Machine learning is one of the revolutionary fields in present days that being successfully implemented in many areas. It enables a machine or a system to learn from various data input by the end-user and provides the next set of possible outcomes. Almost all the search engines and commercial sites have implemented various algorithms for commercialization purposes as well as customization of user data for prediction. Machine learning has a significant role in the education sector to explore various possibilities through which, the system can perform a cognitive analysis based on a given set of input data by the end-users, who can be the students or the teachers. Especially in a flipped classroom model, where the student-centric approach is adopted; machine learning can be a revolutionary approach to find the requirements of learner based on their existing skills. This paper provides an analysis of various types of machine learning that can be implemented through a learning management system for flipped classroom activities. In this paper, a new framework is proposed which can be implemented for effective flipped teaching in higher education in order to reduce the manual tasks of the teachers. The successful implementation of this approach can play a vital role in the community of learners.

Keywords

Machine learning • Flipped classroom • Education technology • Smart education

1 Introduction

Technology is always getting upgraded in almost every sector and field of implementation. Whether it is the healthcare sector, tourism, civil, or education; the technology has been enrooted in every domain in order to provide maximized benefits to the stakeholders in the least amount of time with fewer efforts. Since the beginning of the digital era and the evolution of computer-based machinery, the human is always putting lots of efforts towards minimizing human involvement in getting things done. The main factor behind this is to save time and maximize accuracy in delivering the results. Not only this, when the signing process is carried out by computers or robots or in other word, machines, the quality control mechanism becomes more comfortable to adapt and monitor. Because one can expect a better turnaround by investing in such setup at the beginning itself. Involvement of machines in various automation is not new. For many decades it has been a significant concern of machines taking over most of the part of social work, once they are self-directed to learn by itself. The education sector is no more untouched with this advancement. There are several ways machine learning is helpful in the enhancement of teaching and learning experience in the education sector. Implementation of this could enhance the grading methods, increased speed of the process, and removal of many manual operations such as performance analysis of a large number of students (Lynch 2019). Machine learning is a sub-domain of Artificial Intelligence. It enables a computer or machine to learn by itself, based on the given sets of user data. The more data the system is given in terms of user input, it recognizes that a combination of new patterns and learn in order to predict the next set of output (System 2019). The entire

V. R. Naidu (✉) · B. Singh
Vivekananda Global University, Jaipur, India
e-mail: vikasrn@gmail.com

B. Singh
e-mail: baldev.vit@gmail.com

K. A. Farei · N. A. Suqri
Middle East College, Muscat, Oman
e-mail: kalfarei@mec.edu.om

N. A. Suqri
e-mail: 14f13263@mec.edu.om

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process here takes place so autonomously that human involvement is needed only if a new set of data input is to be fed into the system. Otherwise, the machine gains enough experience that, based on past input of user data or preference of operations, it can predict the future action of the user.

The machine learning frameworks rely on algorithms, which can also be developed and modified by the experts as per the requirements in the field of implementation. In the education sector, machine learning implementation could be revolutionary due to predictive analysis. These days, most of the educational organizations have moved towards the successful implementation of their e-learning framework in the form of a virtual learning environment. Some educational organizations have developed their learning management system (LMS), whereas most of them have customized various available free and open-source LMS, which opens the possibility of customization to any extent without any boundaries.

The flipped classroom is the active classroom environment in which the teacher plays the role of facilitator, and student-centric approach is adopted in order to promote teaching and learning among the students. Here students learn to utilize various classroom activities, instead of traditional teacher-led classroom instructions (Ozdamli and Aşıksoy 2016). Various research in this field has proven that this is one of the most effective ways since it involves all the students to participate in the process of teaching and learning. Involvement of technology in facilitating the classroom activities provides an even better environment since students love to use various technical tools in the learning process. Many activities can be facilitated via LMS, through which a customized way of predictive learning model can be embedded, and machine learning can be used for predictive analysis. Later, the data can be used to predict and analyze the student's performance, and proper measures could be taken on time, in order to provide a proper support mechanism to the students in the areas where the improvement is needed.

The primary purpose of this study is to provide an insight into the implications of machine learning implementation to improve education techniques, especially technical education. Based on literature studies and reviews, this research paper highlights various methods in which machine learning can be used in order to enhance teaching and learning practices primarily in the higher education sector.

2 Classifications

Machine learning implementation in any system relies on the way it is implemented in the respective field. It has a different set of goals and objectives, based on a different area of implementation. For example, a machine learning algorithm implemented in an e-commerce website will try to track the user's preference. Moreover, next time, when the user opens that site, recommendations for new offers and products will pop up based on the previous purchase history and past search results. Similarly, in the education sector, machine learning usage may differ based on the purpose for which it is being implemented. Based on the algorithms, machine learning can be classified (Pappas 2017) into the following major categories.

2.1 Supervised ML

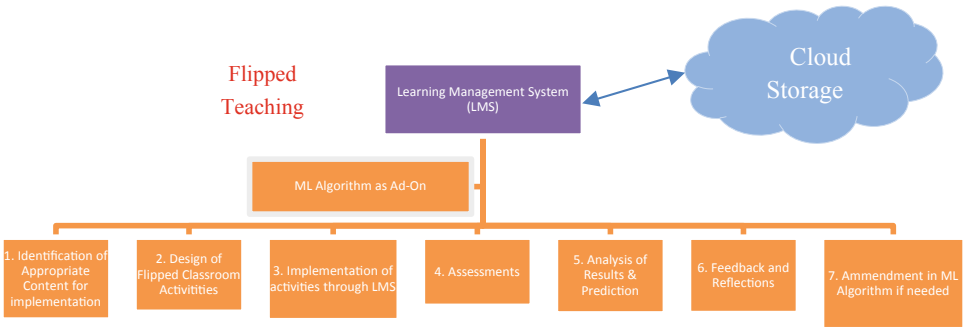
As the name suggests, this type of machine learning involves supervision of human or developer. Although the system records the past operations of the user and preferences, still the programmer must train the system with new sets of data to be prepared for the next level of prediction. The system uses this data, and while being trained, it can start constructing possible outcomes for new sets of output or data.

In a flipped classroom, this approach can be implemented easily using implementing some algorithms along with the LMS such as Moodle. For example, students can be given a quiz exercise based on the previous class. This can be given by the end of the class also. Based on the results of this quiz, students will be provided with suggested reading/study which is to guide the area in which they need to improve. During the entire process, the programmer/teacher can make modifications in the preferences, to train the system for new possibilities of problems which students might face.

2.2 Unsupervised ML

This approach does not involve any data classifications, and the system has a more comprehensive algorithm, due to which it can evaluate the data to recognize a new set of patterns. Later the system makes predictions based on these newly generated patterns. In some occasion, the intervention

Fig. 1 Proposed framework



of programmer is required for specific scenarios, in which the programmer provides training to the system for specific points. This is also called as semi-supervised machine learning (Pappas 2017).

This approach, although is required, for higher accuracy is not that easier to adapt since it requires a thorough knowledge of the system apart from monitoring, what the machine is doing from time to time. The teacher must ensure that the intention, due to which this type of ML is being adapted, is getting solved.

2.3 Reinforcement

This approach is the most appropriate approach which can be adapted in teaching and learning. In this, the machine is set with specific goals (tasks) which must be achieved by the end of implementation. Moreover, throughout the process, the machine has constant monitoring and feedback. Feedback is to ensure if the tasks are completed and goals are met. This feedback is given to the machine if outcomes are met or not.

In a flipped-classroom approach, this method of reinforcement can be implemented in order to make sure if the intended outcomes are met. If not, then feedback is given to the system utilizing reprogramming so that next time, it provides a favorable outcome. Only the favorable outcome of the system can ensure the successful implementation of machine learning in a flipped classroom.

3 Proposed Framework for Implementation

"Machine learning allows any software application to behave more intelligently and automatically improve on its own" (Anderson 2018). E-learning is one of the most powerful tools through which higher education field is getting benefitted. With the advancement in cloud-based services, many organizations have implemented cloud services as a part of their learning technologies. Following framework is proposed for implementation in the flipped classroom and to monitor the activities on learning management system using coupling machine learning algorithm as ad-on. Cloud-based LMS will be beneficial in order to expand the scope of implementation of this practice.

As seen in Fig. 1, in the proposed framework, the first stage is the identification of appropriate content, which can be implemented in the activities of the flipped classroom, through LMS, such as Moodle. At this stage, it is essential to identify only those topics and assessments, which are appropriate for this methodology. Some fundamental concept must be taken in the conventional format in the classes for better understanding among the students.

Design of flipped classroom activities comes next. Here the content is prepared and uploaded on LMS along with activities, through with students participating in the class. This involves group discussions and writing their reflections about the discussions, online quizzes, and other such interactive activities.

Once designed, these activities are checked and implemented in the class. Students take up these activities and prepare themselves for the assessments. Assessment designs are done in such a way that enough amount of Quantitative data could be generated from the entire cohort which should be good enough to analyze since every machine learning algorithm truly relies on the amount of sample data. More the amount of sample data, better accuracy could be attained in the prediction.

The next stage is the actual stage where ML algorithm plays a vital role, by providing all the predictive analysis based on the analysis of present data generated as a result of the current assessment.

Feedback is provided to the students based on the recommendations taken from the previous step. Apart from these, the teacher reflects on the current practice in order to identify any gap or scope for any amendment in the algorithm.

Finally, the algorithm is amended, if needed, as per the previous study or recommendations in order to prepare for the next set of a class activity or the next set of the cohort.

4 Advantages and Challenges

There are numerous advantages of implementing machine learning in the classroom (McGuinness 2018). Apart from reducing the workload of a teacher, in performing some routine operations, it can assist in multiple ways such as organizing the eLearning content in a more personalized manner, better resource allocation and many more. For a flipped classroom, it is always recommended to provide the learning materials to the students in advance, so that they can refer and come prepared for the class activities. Herewith the involvement of machine learning with the learning management system, the system can organize the content as per the need of different students, based on their previous performances. For example, for a student who is performing very well in the class, the system will recommend a higher and sophisticated level of reading. On the other hand, the student, whose performance is a quite average of below average, the recommendations can be given based on their level of understanding.

Although machine learning is opening a new horizon and bringing artificial intelligence (John Paul and Luca 2016) in the field of education, it is essential to make sure that teachers are monitoring the entire process. Complete un-supervised learning has a risk of undesirable outcomes. Another main challenge is knowledge of programming. Everyone accepts that implementation of machine learning will be a significant enhancement in teaching and learning process, but at the same time, the teacher must be aware of customization of the algorithm, from time to time, or whenever required.

5 Conclusion

Machine learning is a hot topic of these days, and with the involvement of the cloud, it can further be taken to the next level. Already several Massive Online Open Courses (MOOCs), has their way of implementing this in their portals. Some of them are even monitoring the progress of reading and reference that the user is taking from their site. Some of these service providers are doing it for data analytics, just in order to invest in the next set of their course, based on the demands raised by the learners.

After studying various types of machine learning and its classifications, authors conclude that in the flipped classroom environment, machine learning implementation could be helpful, if the teacher uses a supervised and reinforcement type of machine learning. Because with this, the teacher can ensure that students are getting the right content at the right time and right place. Not only in teaching and learning process, but machine learning can also assist the teachers in assessment evaluations where a large number of students have registered for the subject and thus minimizes the efforts of teachers along with increased accuracy in the evaluation process. However, at the same time, proper moderation process must be kept in place, in order to make sure that the results being generated by the ML algorithm-based assessment process, does not go directly to the students. Hence although ML should be used as a tool, the final decision should be taken by the teacher after the moderation process and before releasing the results. Such emerging technology in education should be used as a tool for assistance, only after a thorough test, without which student might get the wrong directions. Hence teachers' supervision is must in order to take the assistance of such advanced technologies in improving teaching and learning practices in higher education.

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Multiple Tools for Innovative Interdependent Learning Techniques in Higher Education to Foster Employability Skills

Zeinab Younis

Abstract

The need to use interdependent methods of teaching and learning in higher education institutions is becoming inevitable. As several undergraduate students face the problem of lack of job opportunities when they graduate arises from a saturated market that needs innovative generations of capacity building knowledge and spirits of lateral thinking that fortifies the talents of students on both the academic side and the soft skills required in our labor market century. An increasing number of employers criticizes the higher education institutions for failing to bridge the gap between theory and practice in real-life work experience. This paper investigates the employability skills that employers require trespass the academic ranking to a new benchmark in the market, relying on experienced and talented employees. The British University in Egypt—BUE—depends on knowledge delivery and assessment for the students from their foundation year to their graduation year on a set of interdependent learning techniques both in the lecture hall and outside the campus. Sustaining the BUE graduate with employability skills is an objective of the university and its staff members gifting the job market a generation who learn how to think not what to think.

Keywords

Employability skill • Interdependent tools of teaching • Blended learning • Innovation • And co-teaching

1 Introduction

Albert Einstein once said: "we cannot solve our problems with the same thinking we used when we created them", so innovation entails thinking out of the box in a lateral creative way to solve complexities. This type of thinking is needed at the level of higher education institutes to prepare students for future careers, and as no one is interested in the new idea than its initiator, so the real interest goes to the benefit of the idea. Therefore, institutions have to carry the process to make their students learn to change by building the new and fighting the old tools. Modernizing a tool of education or a technique is the name of the game now in our century as it entails deviating from the traditional ways of delivering information to students to the use of this information to enhance field experiences and practices for future employability. According to De Bono (2014), lateral thinking reflects on the origination of new ideas through creative thinking and not depending on the power of logical vertical thinking. So it is about an unusual way to solve the problem and not to face the problem itself. Lateral thinking interferes here to teach students to think backward and develop a new position of where they are and where they want to be in the future. It is not recommended to build from scratch just an invention without understanding the value of it, and one has to look to new inventions to upgrade the past tools and techniques used and construct a continuum to be used by future generations in an era of fast-growing modernization. Students have to learn how to find causal relationships between problems and reasons behind those problems to escape from old ideas and create originality. This is usually happening when there is an open venue for brainstorming, intuitive thinking, and creating a diversion.

Z. Younis (✉)
The British University, Cairo, Egypt
e-mail: zeinab.younis@bue.edu.eg

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2 Innovation Techniques in Higher Education

The need to use multiple innovative techniques in improving higher education field learning practices arises from the increasing records of unemployment worldwide that are invading the global market, which leads several undergraduate students to face the problem of lack of job opportunities when they graduate. Their thoughts usually were inclined that the magic wand to get them a job is in their certificates only. However, the truth is that they wake up to find a saturated market that needs innovative ideas and spirits of lateral thinking to ensure chances for work. Lauder (2013) identified that the jump in the working age, the skill shortage, the shift in the economic power, the gap between theory, and real needs for the market hit them as on one hand employers criticize the higher institutions for failing to produce the sets of skills needed by students to face global market challenges and on the other hand students complain for not being absorbed to the market. According to CBV survey in 2011, 70% of employers want to see the development of employability skills among students at both schools and universities in their higher education level. The urgency of the matter lies in the fact that employers look to trespass the academic skills to a set of employability skills in the field practices needed in today's market to display a wide range of attributes in innovation tools and methods to face a magnitude of job requirements that cannot be underestimated. The paradigm is shifting toward an era where acquiring employability skills in higher education stands out as some primary requirements if universities want to meet the competitive edge of the local and the international market for their graduates.

Employability is reaching to make closer links between education and the world of work. Since 1997, the report of the National Committee of Inquiry into higher education, Chaired by Lord Dearing (INCIHE 1997), raised the issue of employability and pointed to the need of enhanced opportunities for students to undertake all the skills of work-related environment in their curriculum of higher education. Among universities all over the world, there has been a cultural shift to the need to develop those skills to meet market needs through innovative techniques of learning in higher education to relate academic learning to fieldwork practices (Mason et al. 2002). According to Lankard (1990), employability is the set of transferrable skills needed by students to make them employable. Moreover, Hillage and Pollard (1998), employability focuses on the ability to acquire and maintain work. It can be broken to four categories: the asset which refers to knowledge, how the individual employs his assets effectively toward developing his self- awareness to make benefit of his knowledge, presentation which helps the applicant to demonstrate his abilities to his potential employer, and the context which relates to how the individual is influenced employability by personal circumstances and labor market. For Biggs and Tang (2007), complex learning is more likely to achieve graduates' attributes leading to employability which are listed as critical thinking, ethical practice, creativity, independent learning, problem-solving, communication skills, and teamwork. Glover (2002) and Yorke (2004) regarded the graduates' attributes that are a necessity to employability as field-specific, generic, and shared achievements.

The first refers to the knowledge possession particular to the field of study and the other two to the possession of general attributes to most graduates whether on the level of shared achievements or generically on the level of most graduates. Bell (1996) and walker (1995) advocated that tension might arise between Graduations as a state after the completion of a course and employability as an assessment of the value of the student economically in the market. The early work of Bagshaw (1997) and the Institute for Future education (CBV-EDI 2011) added to these another set of skills including novel and flexible, adaptive thinking patterns to complexities and design mindset for acquiring social as well as emotional intelligence. These findings were also driven from the early work of Dacre and Sewell (2007) regarding employability as a lifelong complex process involving several interlinking areas. As it is not about passing an interview or writing an excellent CV to be accepted in the job, but it is about becoming a major stakeholder in your career and position whom your managers would also expect to see achievements from you in a specific context. The set of skills that we give our students in their path of education is their tool, and it yields dual responsibility from both sides: the students as fresh graduates and the employer in his demand for specific skills. The career edge developed by Dacre and Sewell (2007), presented several approaches to develop employability skills in levels of higher education like students' engagement and innovation, experience including work and life, a degree which is subject knowledge, generic skills, and emotional intelligence. In most higher education institutes, the intended learning outcomes of most modules taught to try to meet these edge requirements for future career opportunities. In the Egyptian case, policymakers of the higher education sector are eager to involve academia in Innovative field practices to respond to international trends in education. According to Kirby (2015), the British university in Egypt, is one of 23 private universities in the country, holding in total 60,000 students competing as its peers with 20 public universities of over 20 million students, and trying to create the means to implement this cause trying to alleviate the quality of higher education and training.

3 The Practice

The implementation method is targeted for the department of business in the faculty of Business administration, economics, and political science, in the British university in Egypt. The target population is the students of the business department in their first-, second-, and fourth-year business students in different module applications. The target is to get students exposed as much as possible to real-life field practices during their academic studies, hence applying all the skills needed for the future job opportunities waiting for them upon their graduation. The process of preparation itself is evident to students during their orientation week where the entire junior and the senior staff members act as mentors for guidance to what students will expect in their four years study at the business department.

Moreover, the students get several induction sessions to explain the different specializations available at the business department and the requirements of the employability market for each. The schedules are prepared, and the modules' specifications are reviewed by our UK university partners—London South Bank and Loughborough universities—before the beginning of the academic year to supervise how the skills are inclusive into our programs. A set of multiple tools of innovative techniques in learning practices are used in the British university of Egypt, in the business department to ensure the delivery of employability skills for the BUE graduates, comprising as an umbrella the way of lateral thinking methods of solving complexities to ensure that emotional intelligence, blended learning, co-teaching methods, and case studies-based learning are used to improve delivery of knowledge.

Here is a collection of different tools used for applying innovative techniques to field study in The British University in Egypt inside the Business Administration department to ensure employability.

3.1 Emotional Intelligence

During the past 50 years, there has been a change in the curriculum of higher education as there is a growing interdisciplinary connection between theory and practice. The emotional intelligence tool as a paradigm shift in teaching and learning patterns of education creates a social bonding to feel connected with students and colleagues. According to Goleman (1996), emotional intelligence refers to the ability to perceive, control, and evaluate emotions also to understand emotions and emotional knowledge and to reflectively regulate emotions so as to promote emotional and intellectual growth, these skills involve how to handle oneself to get along to work in teams and they are also responsible for business success and job retainment. Panju (2008) saw emotional intelligence as the ability to monitor one's own and other feelings and emotions to discriminate among them and to guide one's own thinking and actions. According to Serrat, (Serrat 2009) the key factors for success in academic achievements and ensuring tenure as an employee lie in the essential components of emotional intelligence, which are:

- Self-awareness: implying an accurate self-assessment of capabilities, strengths, weaknesses, and develop self-confidence.
- Self-management: where self-control, honesty, and consciousness to take responsibility for actions the core of this component.
- Social awareness: entailing the development of several social characteristics as empathy, cooperation in developing and helping others, managing diversity, and ability to handle situations.
- Social skills: identify the capacity of the individual to exercise conflict management and negotiation in order not to create an adverse atmosphere in the organization and develop soft skills at the workplace.

Studies showed that E.I. is related to academic performance, because it involves a great deal of ambiguity, so the student has to possess this attribute to solve stressful situations. Teachers are required to develop activities for the student to enhance their self-image or in another word the "who I am" perspective, which creates a mind map for students to assess their strengths and weaknesses, roles, and qualities. The approach is to mainly acquire soft skills to let the feeling facilitate the action rather than making it difficult (kawarsky 2016).

In our previous year at BUE, emotional intelligence is an essential tool used to encourage students to fit in their first year and meet the transitional changes between the last year in high school and the beginning of university life. The high doses of using this concept both in assignments and projects in the first and the second year of university year proved a great success and are even considered as a therapy not only a tool toward breaking the ice between concepts learned and the way to approach these concepts in real-life situations. First, we do the induction week for both staff and students to get to know each other and exchange new knowledge and prospects for the new academic year and to embrace new staff members into the system. Second, we work in the first three weeks of the semester to have a door open to students at any time upon their convenience, and we do not stick to office hours. Third, in both introduction to management and organizational behavior modules, staff members gather with the students in most social events that are run by clubs during the first quarter of the semester. In the personal

effectiveness module, two lectures are dedicated to the topics of self-awareness and negotiation in order to prepare them for real-life situations of bargaining and presentations in their field of work in the future. Working into teams to prepare for their assignments and projects in all of the above three modules, paves the way for them for building knowledge capacity together with interpersonal skills.

The feedback that staff members give to their students after their presentations require a high degree of emotional intelligence to tackle the weak points without the accusation of being a failure. As by your inner psychological framework as a teacher, you can set for these students emotional and social skills that collectively establish how well they perceive and express themselves to cope with challenges. It also implies how we develop and maintain the relationship between us as educators and the students using constructs of meanings to different ideas: like convincing them that today's presentation is in front of your colleagues and teachers, but tomorrows ones will be in front of your managers and CEO's, so you learn today for the future which motivates them a lot. They are sometimes given the freedom to choose the topics that they would see themselves presenting in the future according to their areas of specializations. Moreover, these presentations develop their competencies for empathy, mutual understanding, team leadership, and managing diversity.

So, between the stimulus of giving the material of the module and the response of the students in the classroom session in the form of participation or in-class presentation, lies space for emotional intelligence to interfere. Lecturers were able to identify areas of angry feelings and weaknesses and analyze alternatives to stressful situations, special needs students were accessible to longer examination time, and specialized coaching in specific circumstances and feedback is given regularly to them. Students are given in these modules the open venue for lateral thinking where they get with their minds in areas outside the box, and It usually comes after the brainstorming techniques used in some sessions where a light is shed by the instructor to open the door for discussion and allow differences to prevail in a constructive way building an argument rather than arising conflicts. By working hard with the students in their first and second year using this technique the success arises from the notion that by reaching their fourth-level year they would have already passed the small areas of conflicts between them and mastered the talents of working in groups, talents of presentation skills enhancing effective communication, engaged in empathic listening and handling differences of multicultural environment of work ahead of them.

3.2 Blended Learning

It is what we call the name of the game where the instructor enhances the student to dig into the field of the real-work environment for answers to the questions and the assignments. According to Horn 2014, the traditional face to face instruction is replaced by web-based online learning, where 30–70% of instruction is delivered online. There are several kinds of blended learning techniques, but the most adopted one is the flipped classroom where the students participate in online learning off-site in place of traditional homework, and this is considered the best tool to ensure the delivery of employability skills of self-learning and relating theory to field practices.

At BUE, the blended learning tools were used for a variety of modules during the last couple of academic years. We used a technique called flex-model where online learning is the backbone of student learning, and the teacher is on-site providing face to face support for the student in their assignments which are usually uploaded on the e-learning site a week ahead, and students are given the opportunity to research the problem of the question before presenting it in class. What is unusual about this experience is that 70% of the material of blended learning study is researched first by the student then delivered by the teacher which opens the thinking patterns of the students to more ideas. It started as a pilot study experiment facing success and challenges, and then it was adopted in year 2 and 4. Blended learning as a tool for approaching theory to practice uses the stimulus of giving the material of the module and the response of the students in the classroom session in the form of participation or in-class presentation and provide a space for transferrable skills into interfere. Students are given the open venue for lateral thinking where they get with their minds in areas outside the box, and it usually comes after the brainstorming techniques used in some sessions where a light is shed by the instructor to open the door for discussion and allow differences to prevail in a constructive way building an argument rather than arising conflicts. It helped in developing a panel of discussion between alumni of the university and successful stories behind people in business, to expose students to more field experience and develop a construct of lessons learned that could be useful in real working life. A new

section of employability will be added starting next September to all lecturers' modules specifications in order to highlight the areas to be researched in blended learning. The modules that we are applying this technique were as follows:

3.3 Public Administration Module, Year 4

The instructor challenged the students to blend their exploratory learning competencies in answering two questions related to the process of Egyptian parliament's elections and lessons learned from the administration of the logistics of the electoral operation itself. This allowed the students to look for information needed in the field with the help of the university by organizing trips to the parliament and granting access to the students to discuss matters related to the election process with elected members. The number of students in this module did not exceed the 50, which was a significant advantage in controlling the experiment to a successful result. The students used innovative techniques of comparative analysis to answer the questions by presenting individually for ten minutes each what they learned from their field visits. They used small plays, theories of comparative administration to reflect on other countries' systems of elections.

3.4 Contemporary Issues in Leadership: Year 4

The blended learning tool was used in three intervals during the module: Week 4, 8, and 11. The students were asked to present blogs of 1000 words each describing a real-life experience of their summer training or an incident that they were involved in and how this experience reflected on their leadership skills on both academic and personal levels. The total of the three blogs carried 30% of their grade which was the first attempt to grade a blended learning experience, and it proved a great success as the students were highly committee with deadlines and the quality of the work presented. At this level, we asked for a peer review for their blogs from several teaching and lecturers' assistants, which was an added value to the work done and opened considerable prospects for future lessons learned. The idea was mainly to encourage a research-related field experience where the student is mixing theory and practice to prepare himself for a future career.

3.5 Organizational Behavior and Personal Effectiveness Modules: Year 2

The idea of blended learning was adopted in these two modules as they encompass a lot of theoretical approaches that have to be tackled on the practical field level. Two topics were chosen from the OB module "motivation and leadership", and one topic from PE one (Team building), the students were asked to relate how the management functions intersect in real life by reflecting on concepts, respectively, in assigned lectures. They were asked to review real-life companies that apply high motivation and team-building techniques to their employees, whether locally or multinationals, located in Egypt. Also, specifically in PE, they were addressed two online questions to research beforehand and give their answers in a panel discussion in class, reflecting on real-life experiences. The blended learning started in week 9–10 after the theories in both modules were discussed, and the functions of managers versus leaders well explained. The experiment was challenging as the number of students in these modules exceeded the 200, and it was a BUE decision to divide them into the team and to motivate them by bonus if they solve their assignment of blended learning.

The advantages of this experience of blended learning stated above as a part of our teaching patterns in the British university in Egypt is that it proved by evaluation on both sides of the staff and the students to be a way to promote intellectual skills of the students guided by the instructor. The questions were uploaded as an assignment on the e-learning as all the material of the modules and students set their timetable starting week 3 to manage their effort and time about other modules to promote the research capacities of the students. The BUE is planning to continue using these tools by developing a panel of discussion between alumni of the university, successful stories behind businessmen, and the winners from the start-up competition that was held a few weeks ago for students innovations in the business field to expose students to more field experience and develop a construct of lessons learned that could be useful in real working life. Blended learning is a new part of our module reports since two academic years now, and a new section of employability will be added starting next September to our modules' specifications in order to highlight the areas to research in blended learning.

3.6 Co-teaching

It is a handy tool in higher education teaching techniques as it allows the broadening of the module scopes through the mutual work of lecturers. Two minds are better than one in the co-teaching spirit, and the material covered is from all aspects and reflecting two or more different experiences and backgrounds. The co-teaching team share in preparing, planning, and delivering the material of the course both academically and practically. The expert, in theory, would complement the expert in the field to transfer both the hard

and the soft skills needed for the students for their future careers. At the same time, it can be a double-edged sword for some challenges when two different styles of teaching create preferences toward one instructor than the other. The idea is to complement each other to bridge the gap, not to widen it, and that is the challenge. The benefits will be to access more instructional support and increased opportunity for meeting students' needs, learning from peers, more social interaction, and more understanding of students' minds.

There are different approaches to co-teaching according to friend and cook, 1996, as it enhances personal effectiveness skills in students as teachers are actively involved in the management of the lesson and discipline and establishing rapport. One of these approaches is that parallel teaching is where two teachers plan jointly and split the classroom into half to teach the same information at the same time. This method proved very tedious, and the students lost focus in previous semesters in the middle of the topic of both OB and personal effectiveness. Another one is the alternative teaching way where one teacher manages most of the class while the other teacher works with a small group of students parallel to the central theme, and they alternate roles during the session. This method also was very ineffective in the past in both C second and fourth H levels as BUE students' number is enormous, so they lose concentration as well as both instructors. Team teaching is also used where both teachers are responsible for planning, and they share the information and instructions in material delivered and in course-work projects, and this is the technique used in BUE. This proved to be the best way, and it was highly appreciated by our supervisors when co-teach happened in personal effectiveness. Materials were uploaded two weeks ahead of the semester under headlines and subtitles agreed upon. We used to attend to each other each lecture to build upon both knowledge and skills, and the presentations were double marked and peer-reviewed by both of us in an alternating way to ensure subjectivity.

To ensure the effectiveness of the delivery of co-teacher material the department ran a survey among students in these modules where co-teaching was applied and the result was very challenging as the open-ended questions carried students comments as "it brought us to real-life as theory from one professor was completed by practice from the other," "we took the best from both to carry on in our future careers" and finally "one taught us soft skills and the other taught us the hard skills, and we will learn both the hard way in our future jobs.." Guest speakers in fields of leadership training were brought to lectures to complement the practical part. My role as head of innovation center in BUE was to try to mingle industry and academics at an earlier stage of student life and to bring guest speakers was the venue for that.

3.7 Case Studies

By case studies, students learn not only what but how as they are a part of the authentic learning experience to put theory into the context of practical applications. Case studies also work as a reflection for several intended learning outcomes where students can argue and develop analytical and logical skills to solve their complexities and discuss their problems acting in the shoe of the protagonist. According to halldorsdottir, 2013, higher learning institutions exist to change people mindset toward more employable skills for the market requirements, so how can case study change students? The answer lies in the concept of delivering transformative learning through case studies via the teachers who have to act as facilitators not only delivery knowledge person. The only disadvantage of this practice is that it might be not the base for generalizations in some specific situations, so the student can act as the student and not the real businessman who is asked to draft a presentation about the future of his company in an economic crisis.

Continued use of case studies applications to the modules taught at BUE is one of the very innovative teaching techniques in most academic institutions. In BUE, I experienced this technique in Organizational Behavior module, where I taught to level "C" students the certificate second level in the cohort. The technique was to bring examples of case studies to successful stories and provide an experience of learning via examples of how managers and leaders of several companies provided motivational schemes for their employees. The case studies were both national and multinationals, but most of them were located in Egypt so that the students would not have difficulty in visiting their site and get to interview their management staff. The case study works from inception to application in OB class, where it turned out to be a very good tool at analyzing business issues and strategies. Students who are very bright and articulate formulated a full business plan presentation from one of these cases discussed in class where they assessed the essential strengths and weaknesses that the business is trapped into, and they had the opportunity to invite the CEO of the related company understudy for a free consultation which led afterward to invitations from several of these companies for summer internships for those students and thus ensuring fieldwork during their holiday. The in-class experience is usually taught once a week in "OB" in one of the 2 h lecture frames that are left in week 11,12, and 13 after finishing the fundamental theories and models of the first 10 weeks of the module. Before that, the students are given free slots where they can go and interview management and survey the company. At this time, the application of case studies on concepts learned to provide a dynamic

selected working teams to solve the case and provides a strategy for solving complexities and gap in the business environment. They learn in class how to use lateral thinking and not the typical systematic one in solving some techniques in the business world where they have to work the problem in an innovative way. One of the challenges met in this practice was that we insisted that students have to work on a preselected team from our side of 4–5 members. The problem is that they were acquainted with a new technique in working and a new company of colleagues that they haven't dealt with before. We tried to give them break the ice sessions during class and organized their seating with their project team members convincing them that in a couple of years this is going to be the real situations implemented in actual working life environment. Still, we discovered some cases of unfriendliness and social loafing which created conflicts, but those who succeeded to work out their differences were good to go in their future, and they won a right summer internship too.

4 The Employability Framework in Higher Education

As employability skills embodiment inside the curriculum of higher education is becoming of higher importance, and many employers now are offering soft skills training to ensure that the graduates possess the skills they are seeking and are prepared to be able to bridge what most institutions and market suffer from a skill gap.

The framework of employability should be based on the following skills in higher education institutions:

- Academic skills, including reading, writing, numeracy, presentation skills, listening, and understanding.
- Thinking skills: analysis (problem identification), creativity, decision-making, problem-solving skills, logical versus lateral thinking, and critical thinking.
- Personal attributes: as leadership, teamwork, adaptability, self-motivation, self-management, honesty, and integrity.

The ideal teaching patterns relates to using different techniques and organized challenging work. The instructional goals should be clear in meeting the students' expectations and providing feedback. The classroom management entails, in this case, all the practices and procedures that allow lecturers to deliver and students to learn including practical guidance in time management and clear and challenging goals explained to the students through induction and mentoring week. Pre-study guide material uploaded on the e-learning should be at least 1–2 weeks ahead of the semester start, and a positive classroom atmosphere arising from a cooperative and productive collaborative work depending on resources should be provided by the university. As a practical example in BUE, there is a compulsory 20 credit hours personal effectiveness module that helps students to develop many of these skills, the coursework in several preparatory and second-year levels help to assess these skills as required by major companies locally and internationally in real-life workplace, they encompass knowledge acquisition with understanding subject-specific practical skills and critical transferrable skills. The BUE classrooms replicate the features of the workplace, as students are often required to work on real-world problems and if possible, in the real-world place itself. They can relate and appreciate the relevance of their learning and recognize the behavior required from them in the future.

Since December 2015, the strategy of BUE is designed to go parallel with employability requirements and skills helping students to broaden their experience about employment market, to get and retain a job after graduation, and to empower the students to develop critical learning skills. According to the UK Commission for employability and skills, universities have to recognize any students' initiative for innovation and creativity in work provided especially in the coursework and research and raise awareness of the staff lecturers to practice these skills embodiment in the modules curriculum.

The structure of the four basic modules taught at the business department mentioned earlier: Introduction to Management as preparatory level, Personal Effectiveness, and Organizational behavior as core business modules to year two, Contemporary issues in leadership and Public administration taught at level H which is year 4, is designed to meet the strategy of December 2015 and it is also modified to meet the postgraduate studies management department that started 2016. In applying the following on the level of postgraduate studies, the only challenge will be in the diversity management from the side of the students in their groups as most of them will be from a different working background, and meeting deadlines and time constraints in a conflict of interest between real-work commitment and MBA requirements. The advantage will be that these candidates can help in being a mentor from real field practices to their fellow undergraduates and guidance of how the skills are related to the actual work environment.

On the undergraduate level, the four modules provide the opportunity for students to master the following set of skills:

- Personal attributes: they are ready to participate make suggestions, accept new ideas, and constructive criticism and take accountability for the outcome, understand the importance of adaptability to ensure the acceptance of change and the lack of resistance to an ever-changing

working environment, and understand the importance of performance under pressure and inspiring a result-driven approach as a direct experience of the exposure that the modules require in their projects. They start acquiring these skills starting from the module of introduction to management level one to their graduation year modules as Public Administration and leadership.
- Functional skills: the students can express ideas clearly and convey information appropriately and demonstrate effective communication, presentation, and listening skills. This is mainly because of the different case studies-based learning experience that they were subjected to in both modules of leadership and organizational behavior.
- Self-management skills: students exercise time management, crisis management in overcoming challenges, and punctuality in delivery. They moreover develop self-awareness of their strengths and weaknesses during the feedback period given by their instructors.
- Organizational skills: the student graduate from BUE with the skill of understanding the concept of person-job fit and acknowledges the idea of relating academic theory to the reality of the organization. They succeed to manage conflicts and disruption because of the negotiation skills that they learned in Organizational Behavior and Personal effectiveness modules.

The modules taught at the business department helps them to generate imaginative ideas that can be applied in different situations and demonstrate effective planning and analyzing situations to determine the most appropriate way to solve complexities in real-life afterward. They encourage them to learn the concept of diversity and the respect of different perspectives in thinking laterally and demonstrate global awareness ineffective team leadership with academic staff colleagues and peers so that in the future they can organize their relationship in the workplace. (BUE strategy 2015).

5 Conclusion

In our modules at The British University in Egypt, in the business department, we infiltrate a link between industry requirements and academic standards of learning to create a proactive spirit of mutual cooperatives methods of teaching which results in the motivation of the students and guaranteeing a place for them in the market. The Research Center for Innovation developed a student research community to promote the spirit of success and positive direction toward research and entrepreneurial start-up in collaboration with the student union to create a firm body that can envision the needs of the students and act accordingly. One of the most proactive experiments lately was launching a collaboration for a CV writing workshop between the student union and the student research community which was highly welcomed by students in level H which is year 4 and almost graduating. They felt that they are delivering a benefit by themselves to themselves, and this increased commitment. Our students grasp the knowledge and can succeed in their working life experiences as they possess the articulate creative capacity in addressing problems and complexities that arise due to their exposure to real-life experiences of the working environment of the business field ahead of their graduation. This is a result of the innovative tools used in their teaching and learning through the 4 years spent at BUE. Their capacity knowledge building gets better every year, and they get marvelous job opportunities after graduation. Last month we launched the first Start-up week of entrepreneurship tryouts and our BUE students were in the first ranking places among other universities in Egypt, getting grants and funds from several local people in business to start their projects. As a result of these practices, the BUE University was ranked number one in the Middle East for the year 2014–2016. This rank is allowing us as a business department to launch a call for the partnership for postgraduate studies with several other universities in the UK for an MBA, and still, the attempt is there. Moreover, the Organizational Behavior module with the expansion is one of the core courses in both MBA and MPA (Master of Business Administration and Public Administration). Therefore, by implementing our tools for students in their undergraduate year in this course, we are preparing them for higher levels of talents, not only in their academic postgraduate careers but also in their future jobs. As a follow up to this theoretical assessment of the learning tools in the business department in BUE, further empirical attempts are recommended to assess the rationale of linking industries to academic through inviting business corporation from all specializations on the floor of the university to offer their insights and needs in the future generation of students after graduation as eligible candidates to invade the job market. Moreover, several internship opportunities have to be developed by higher education institutions to create a base of business sponsors to develop an interest in the university.

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Novice Learning Programming Languages in Omani Higher Education Institution (Nizwa University) Issues, Challenges and Solutions

Mohamed Aissa, Mouza Al-Kalbani, Saleh Al-Hatali, and Ahmad BinTouq

Abstract

In general, students do not know how to program, mainly due to their lack of general problem-solving abilities.This study discusses student difficulties in programming and propose possible solutions to enhance student learning pedagogy, use Omani higher education institutions as a case study. Several approaches and tools have been proposed aiming to support learning programming in different ways. Unfortunately, the majority of the reports, which we found in the literature, do not tackle the problem in its general aspect. In this paper, we conduct intensive questionnaires and research to discover the causes behind the weakness of novice learning programming languages in Omani higher education institutions focusing on Nizwa University. Based on these tasks and results, we will propose our solutions to overcome these problems and issues.

Keywords

Novice programmers • Programming • Learning styles

1 Introduction

It is well known that in many institutions in the entire world, many students have difficulties in programming learning. Programming with any programming language is a very complicated task that requires much effort and a unique approach in the way it is learned and taught. In general, to become a good programmer, a student must acquire a series of abilities and skills that go well beyond knowing the syntax of some programming language. Programming is considered challenging for significant numbers of novice programmers. As a result, high failure and dropout rates from introductory programming courses are reported after conducting exams.

At Nizwa University, the computer science instructors teach a computer science introductory programming course called "Introduction to Algorithms and Programming Languages". The main goal is to provide the most effective learning environment and skills that they can offer to our students. Consequently, the instructors are interested in understanding the processes of learning and teaching programming for new students who have finished the Foundation Institute. The question is why programming is considered as hard to learn? What are the cognitive requirements of the task? Are there successful and unsuccessful strategies for learners? What can instructors do to most effectively assist novice programmers?

The key challenge in learning programming is that several different sets of skills and abilities have to be acquired at the same time. Novices do not only have to learn the syntax and semantics of a programming language but also they have to develop appropriate problem-solving skills (Iqbal and Sohail 2016). Unfortunately, traditional approaches to teaching programming place more emphasis on the syntax and semantics of the language rather than problem-solving strategies to address programming problems (Iqbal and Sohail 2016). A new approach is required in the learning

M. Aissa (✉) · M. Al-Kalbani · S. Al-Hatali
University of Nizwa, Nizwa, Oman
e-mail: m.issa@unizwa.edu.om

M. Al-Kalbani
e-mail: m.alkalbani@unizwa.edu.om

S. Al-Hatali
e-mail: alhatali@unizwa.edu.om

A. BinTouq
U.A.E. University, Al ain, UAE
e-mail: abintouq@uaeu.ac.ae

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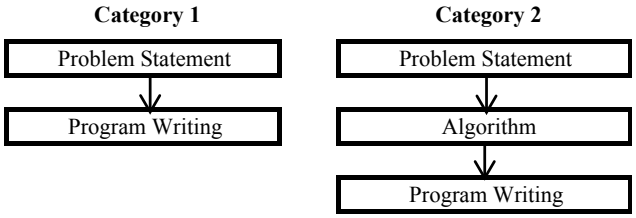

Fig. 1 Program writing phases

process of introductory programming, which emphasizes all the required skills that novices need to develop.

In practice, we distinguish two types of students as depicted in Fig. 1. The students involved in the first category, attempt to convert the given problem statement directly into a computer program by using a programming language without going through the problem-solving phase. However, the students of the second category, write their program based on an algorithm which they elaborate and which constitutes the plan which should be followed to solve the given problem. These students are following the right way for problem-solving.

In practice, the problem-solving phase contains the following steps:

a. Understanding the problem,
b. convert the problem statement into an algorithm by using problem-solving strategies such as pseudo-code or flowchart,
c. Calculating the output manually using selected input data,
d. Writing the program according to the developed algorithm,
e. Compile the program and correct the syntax errors,
f. Execute the program with the same input data (step c) and compare the output with the one obtained previously (step c),
g. If the output of the executed program matches the manual calculated, then the program is correct. Otherwise, the error may be logical (the written program does not match the designed flowchart or the pseudo-code). In this case, the student should return to the written program, compare its logic with the algorithm, and try to identify the error.

Several approaches and tools have been proposed aiming to support programming learning in different ways. Although we find reports of positive results as an outcome of some tools, none of them has a general use. The problem remains relatively unchanged as we continue to find reports about the difficulties many students experience when learning basic programming. The Experience of instructors gained in teaching programming languages reveals that the problem starts for many students in the initial phase of learning, when they have to understand and apply abstract programming concepts, like control and iterative structures, to create algorithms that solve concrete problems. Particular attention is necessary for this initial stage, not only in the development of programming specific abilities but also in the improvement and consolidation of knowledge and abilities. These include generic problem-solving abilities and logic reasoning. It is generally accepted that the teaching and learning of programming are usually characterized by some difficulties, which were mainly detected during the construction of an algorithm or program.

In Orfanakis and Papadakis (2016), Papadakis et al. suggest the combined use of appropriate activities and solving selected problems in a computer lab using real programming environments. A constructive approach to learning programming requires appropriate teaching environments that, on the one hand, help students to solve problems, and effectively address the aforementioned misconceptions and difficulties on the other. This approach emphasizes a pedagogical design for teaching novice programmers as the emphasis has shifted from teaching a strict language syntax to the development of critical and analytical thinking through problem-solving (Orfanakis and Papadakis 2016).

In Bouvier et al. (2016), the authors observed that novice programmers are challenged by the combination of problem understanding, finding a solution to the problem, expressing the solution in a programming language, and the environment in which this is all taking place. The ability to understand and describe the problem could be a significant factor in student success or failure.

Again in Bouvier et al. (2016), the authors state that adding context gives students learning to program more to read, requires them to abstract the relevant information from the problem description, and then requires them to translate the relevant information into code. For novice programmers, this is a big load.

There have been various views on various challenges been faced by new programmers at their earliest years of programming. Some of these challenges are, learning language syntaxes, gaining access to computer systems or networks, learning language semantic structure, learning other program constructs such as comments, control and iterative structures, data types and so on, learning procedures and functions, designing a program to solve a task, debugging, lack of competent tutors, lack of technical textbooks, and the complexities involved in integrated development environments (Owoseni and Akanji 2016).

In the next sections of this paper, problem specifications, study methods problems, student's ability and attitude, and social problems are presented.

2 Problem Specifications

2.1 Teaching Problems

A. Teaching Methods

Many instructors are using traditional and classical methods, which unfortunately are either not suitable for regular students or dull. It is essential to adopt new teaching methods to attract the student's attention and allow him to take an active part in lectures and lab works as well. For novice programmers, loops and conditions are in general a significant ambiguity. Using simple animations and examples may help them to understand these techniques.

B. Ability to Problem-Solving

Instructors are more concentrated on teaching a programming language and its syntactic details. We observed that many students in computer labs start directly with writing the code without tracing any algorithms. They may spend many weeks on this work.

However, an enormous amount of syntactic details are taught during the first semesters before the students have a good understanding of some essential programming concepts. To help novice programmers learn a new programming language, the introductory programming courses should be well selected based on pedagogic suitability and not popularity in the industry (Gomes and Mendes 2007).

C. Teaching is not personalized

It would be desirable to have a teacher always available at least during his office hours to allow more students to come to his office and beneficiate from his assistance and supervision. It is worth to mention that to get immediate feedback from an instructor, during problem-solving could probably help many students. However, in reality, it is impossible to give this type of support due to instructor teaching load and especially time constraints.

2.2 Study Methods Problems

We consider that the study methods followed by many students are not suitable for programming learning. We can identify several aspects where improvement could happen:

a. Students use incorrect study methodologies.

Many students, who are from other disciplines like mathematics and physics, solve problems, by memorizing the formulas or procedures. Unfortunately, some students memorize formulas without an understanding of the underlying concepts. It has been found that many students depend only on theoretical knowledge implying reading and some memorization. They know that a particular formula should be used to solve some problem. In practice, this may not be applied for programming courses. Some students believe that they can learn to program mostly through reading a textbook. Unfortunately, they fail to understand that their primary activity should be solving as many programming problems as possible.

2.3 Student Abilities

The most important cause of the difficulties many novice programmers feel about learning programming is their lack of generic problem-solving abilities. The students do not know how to design algorithms (ordered steps to solve a problem) which may be a flowchart or a pseudo-code to solve problems. Many times the students do not like to spend much time to understand a problem. This happens in general lacks the ability to understand the problem.

In general, the students do not test the obtained output, or they conduct superficial testing which may work for a specific set of data but may not work or produce erroneous results once it is tested with another particular set of data.

Students often give up solving a problem if they do not quickly find a possible solution. Usually, solving programming problems demands effort and persistence. However, when facing any difficulty, many students prefer to ask the solution to a colleague or give up, instead of keep trying solving the problem. This is especially important since learning is more effective when students find the solution, instead of merely reading the solution.

The misconception of programming is considered as one of difficulties which is facing the students. It has been found that students sometimes do not know how common programming structures work or have misconceptions about them. It is also common that students demonstrate difficulties to detect simple syntactical and logical programming errors.

2.4 Social Problems

Our contribution is to overcome some inefficiencies detected in literature. The social problems increasing the weakness of our students in programming are almost ignored in the

literature. Although our students are coming from high schools with a high percentage, they suffer from weakness in programming. We are interested to investigate the following indicators and evaluate their percentages:

- High school percentage rate,
- Visiting Instructor's Office,
- Student home,
- Finding time to study,
- Using laptops inside and outside the University.

3 Results and Discussions

To evaluate and assess the above indicators, we have conducted an extensive questionnaire. The number of respondents in this study is about 190 students. This survey has been conducted during the end of the Fall Semester 2016 and the end of Spring Semester 2017. Respondents are undergraduate students from the University of Nizwa who have recently finished programming courses or are still registered in the introductory programming language (C++). They are from the following colleges:

- College of Arts and Sciences,
- College of Economics, Management and Information Systems,
- College of Engineering and Architecture

D. What was your high school percentage?

The respondents are good students coming from high schools with a good percentage. However, the majority of them suffer from weakness in programming. We think that this might be classed as "life skills". Programming is usually taught as a fundamental subject at the start of a degree course. At the University of Nizwa, it is the primary required course and is considered as a prerequisite to register for major courses in the following semester. This is a difficult time for many students because it is a time of *transition.* During this period of time, they adapt to new life and study at university. They may well be living away from home for the first time, they may struggle to make new friends and find their feet in a new environment, and they may struggle to come to terms with managing their finances and their own private and study time (Jenkins 2002) (Fig. 2).

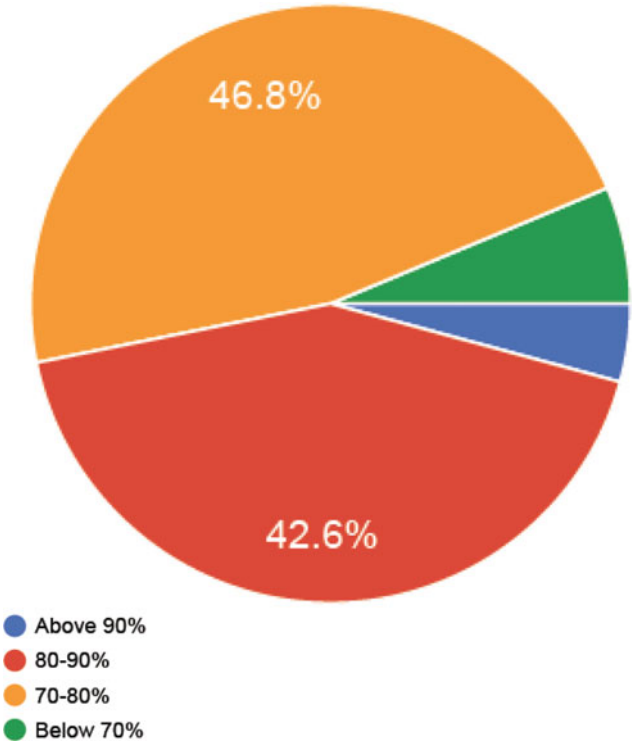

Fig. 2 What was your high school percentage?

E. Visiting Instructor's Office

At the University of Nizwa, at the beginning of each semester, every Instructor has to mention in his timetable at least three office hours for all the students registered in his courses. His timetable is attached to the door of his office. At University of Nizwa, the attendance of office hours is considered as an important procedure to support students. However many instructors stated that most students do not benefit from these office hours. According to our survey (Fig. 3), sixty-five percent of students visit their Instructors in programming less than five times not during the week or the month but during the semester of the registration of their programming course. It is obvious that the student does not take into consideration these office hours.

F. Student Home

Students are coming from different locations around Nizwa City. We observe that almost forty-six percent of students go home daily. Some are living many kilometers away from the university. Reaching home late, they do not have enough time to revise and prepare their exercises. Forty-one percent of students are living at the dormitory (Fig. 4). They are spending all their evenings discussing or visiting their colleagues to spend time on entertainment. They scarcely can find time for work.

G. Finding Time to Study

The results obtained in (Konecki and Petrlic 2014) indicate multiple reasons for dropout with the lack of time and the lack of motivation as the most frequent reasons. Both of

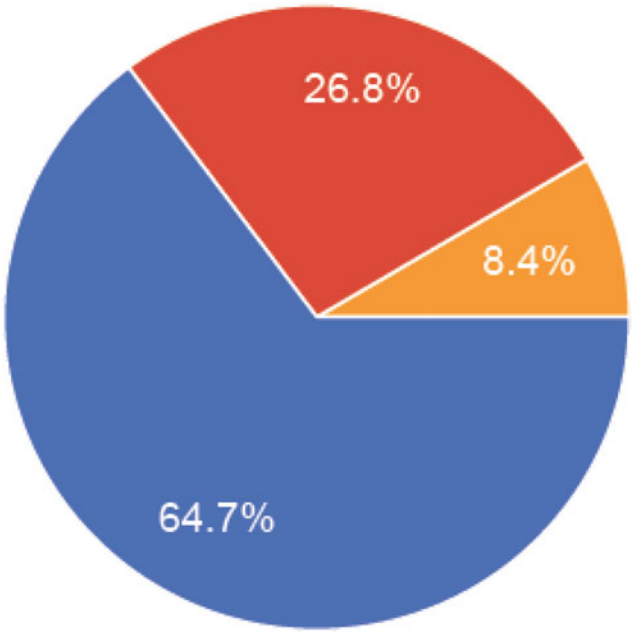

Fig. 3 Visiting instructor office

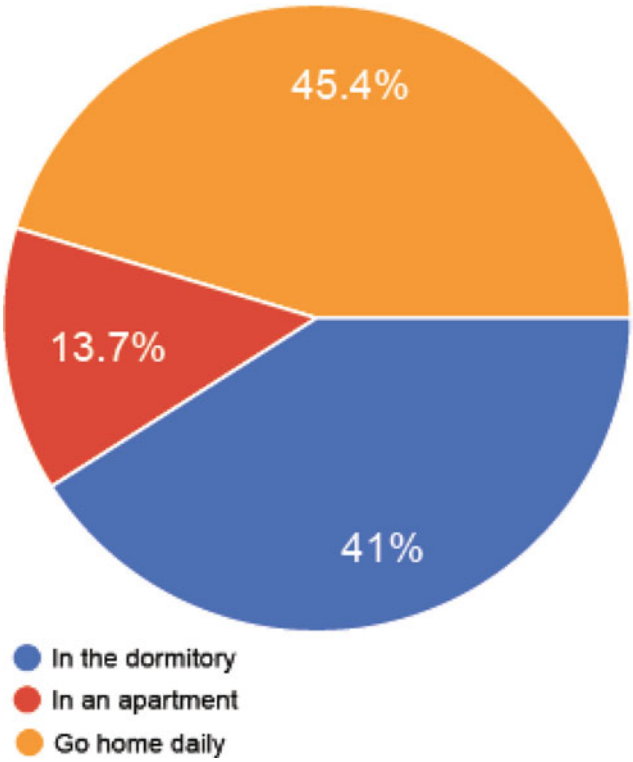

Fig. 4 Where do you stay?

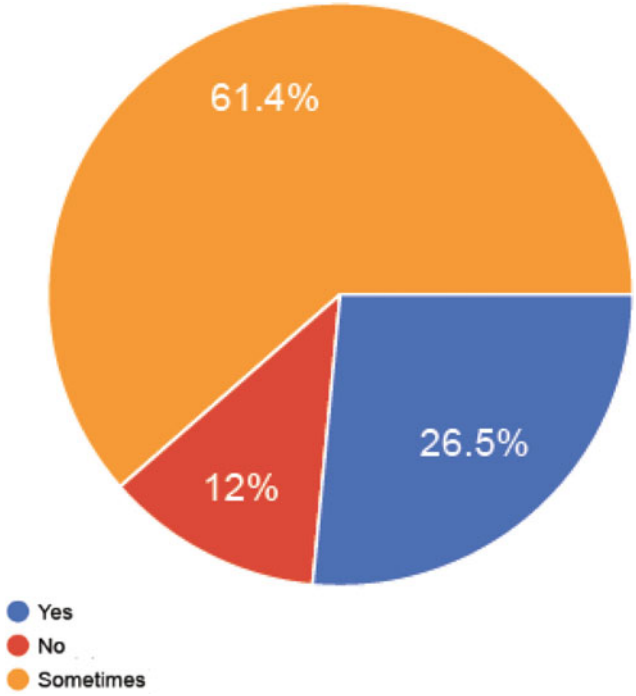

Fig. 5 Do you find time to study?

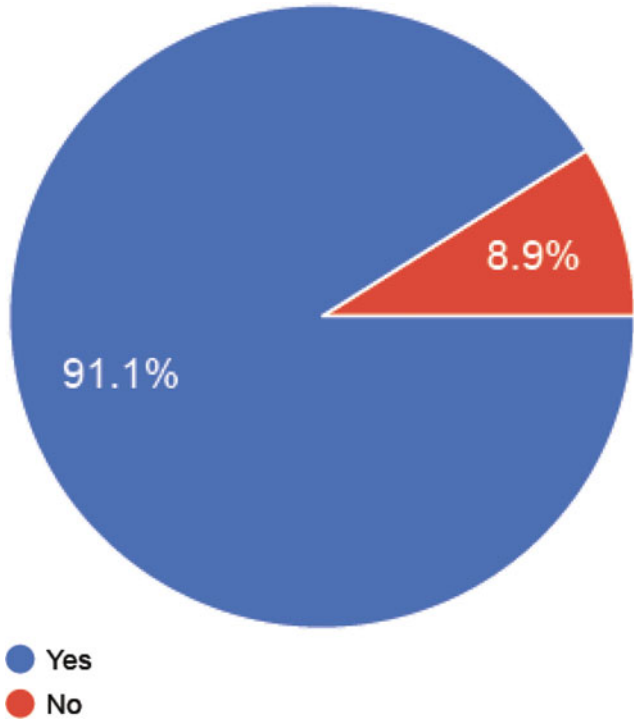

Fig. 6 Do you have a laptop?

these reasons were also affected by various factors: the perceived difficulty of the course, general difficulties with time managing and planning studies, or the decision to prefer something else, etc.

The results of our survey (Fig. 5) demonstrate that 61% of students do not find enough time to study and do their homework. 12% of students confirm that they do not have time at all.

H. Using Laptops

More than nighty, two students declare that their laptops. Unfortunately, they do not use these laptops to do write programs (Fig. 6).

4 Conclusion

Learning computer programming is an intellectually challenging and difficult endeavor. The present research focused on discovering the problems behind understanding and gaining skills and experience of novices who are attempting to learn computer programming for the first time. Our questionnaires reveal many social problems which may affect the progress of novice programmers. Our future work is to leverage the insights gleaned in this research to develop more effective solutions for novice programmers in higher institutions.

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Optical Simulations and Analysis for Single and Double Layer Antireflection Coatings on Si Solar Cells

Mohammed Alhashemi, Omar Albadwawi, and Ibraheem Almansouri

Abstract

Single and double layer antireflection coatings on silicon-based solar cells were simulated and tested using Lumerical software for optical analysis in this paper. Solar spectrum AM1.5 was used in the simulation. In addition, wavelengths of interest were 300–1100 nm to match the bandgap of the absorber layer Si. The simulated ARCs of theoretical values and original materials were built and evaluated in terms of average reflectance, weighted reflectance, and short-circuit current. Si_3N_4 based SLAR on Si cell achieved the highest J_{sc} of 39.42 mA/cm^2. The DLAR coated cells based on SiO_2/ZnS and SiO_2/TiO_2 obtained J_{sc} of 39.07 and 37.87 mA/cm^2, respectively. Through analyzing the results, it was concluded that the 2nd/bottom layers of both DLARs materials had noticeable absorption at short-wavelengths of the solar spectrum, which is considered optical losses. Thus, it was recommended to have DLAR's 2nd layer as an absorber layer in the solar cell, and ZnO is a candidate for this design.

Keywords

SLAR • DLAR • Refractive index • Transmission • Reflectance • Absorption • Weighted reflectance

1 Introduction

Ever since the invention of the 6% efficient solar cell by Bell Labs in 1954, there has been an increasing interest in the solar cells field by scientists, academic organizations and research centers (Chodos 2009). As such technology is a candidate for being a clean alternative energy source to fossil fuels. Nowadays, around 90% of the commercialized solar cells are silicon-based. In 2017, a team succeeded in making a 25.8% efficient crystalline Si cell (non-concentrator), keeping in mind that the maximum theoretical conversion efficiency for a crystalline Si cell is 29% (National Renewable Energy Laboratory 2015; Green 1987).

Solar cell enhancement includes optimizing two main aspects: the optical and electrical properties of the device. A large portion of the energy is lost optically through reflectance, transmittance, and thermalization. Therefore, efficiency is affected. For a bare planar silicon wafer, more than 30% of the incident photons are reflected due to Si's high refractive index compared to air (Chen and Wang 2011). Another issue with Si is that it is an indirect bandgap material. Thus, long-wavelength photons, especially IRL, have a higher chance of getting transmitted instead of being absorbed compared to a direct bandgap material of the same thickness. To minimize optical losses, there are several techniques that are proposed and even used, such as implementing antireflection coatings (ARCs), surface texturing, plasmonics, upconverters, and down-converters (Chen and Wang 2011; Atwater and Polman 2010; Strümpel et al. 2007; Melkonyan et al. 2013).

The main two parameters of ARC are the thickness and refractive index in which there are optimized in a way to minimize reflection at the solar cell surface. Works reported ARC reducing the reflection of the incident light to lower than 10%, and decrease the degradation of the solar cell by securing the cells from outside influencers (Kavakli and Kantarli 2002). For this paper, single and double layer antireflection coatings calculations and simulations were performed for silicon-based solar cells. Silicon nitride used as SLAC material. Silicon dioxide on top of zinc sulfide used for the first DLAC design and silicon dioxide on top of titanium dioxide for the second one.

M. Alhashemi (✉) · O. Albadwawi · I. Almansouri
Khalifa University, Masdar campus, Abu Dhabi, UAE
e-mail: mohammed.alhashemi@ku.ac.ae

O. Albadwawi
e-mail: omar.albadwawi@ku.ac.ae

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2 Theory

A simple and effective way to reduce reflection in optoelectronic devices is the use of antireflection coating (ARC) on the surface, in which the coating is designed with a specified refractive index and thickness to achieve its purpose.

According to Fresnel equations, when light travels from one medium to another of a different refractive index, a portion of the light will be reflected at their interface. The higher the refractive index difference between the two mediums, the higher the reflection, as in the following equations (Hecht 2018):

$$R_s = \left| \frac{n_1 \cos\theta_i - n_2 \cos\theta_t}{n_1 \cos\theta_i + n_2 \cos\theta_t} \right|^2 \quad (1)$$

$$R_p = \left| \frac{n_1 \cos\theta_t - n_2 \cos\theta_i}{n_1 \cos\theta_t + n_2 \cos\theta_i} \right|^2 \quad (2)$$

where n_1 is the 1st medium index, n_2 is the 2nd medium index, θ_i is an incident light angle in 1st medium and θ_t is the refracted light angle in 2nd medium. R_s and R_p are reflections of s and p polarized light waves. The total reflection is the average of the two reflections (Melkonyan et al. 2013; Hecht 2018):

$$R = \frac{1}{2}\left(R_s + R_p\right) \quad (3)$$

In the case of normal incidence, things become much simpler (Krepelka 1992):

$$R = \left| \frac{n_1 - n_2}{n_1 + n_2} \right|^2 \quad (4)$$

So, if we took light traveling from the air (n = 1) into Si (n = 3.85) then around 35% of the light will be reflected.

ARC design material type is based on the two mediums the light is passing through. In which an intermediate layer or multiple layers are placed between the two mediums (air and silicon in our case) and these layers shall have gradient intermediate refractive index values based on the two mediums indices resulting in minimized reflection. The optimum refractive index for SLAR is the geometric mean of the two mediums' indices (Krepelka 1992; Saylan et al. 2015):

$$n_1 = \sqrt{n_0 n_S} \quad (5)$$

where, in our case, n_0, n_1, and n_s are air, ARC layer, and Si indices, respectively.

While for DLAR, the following equations are used to get the optimum refractive indices for the two layers (Saylan et al. 2015):

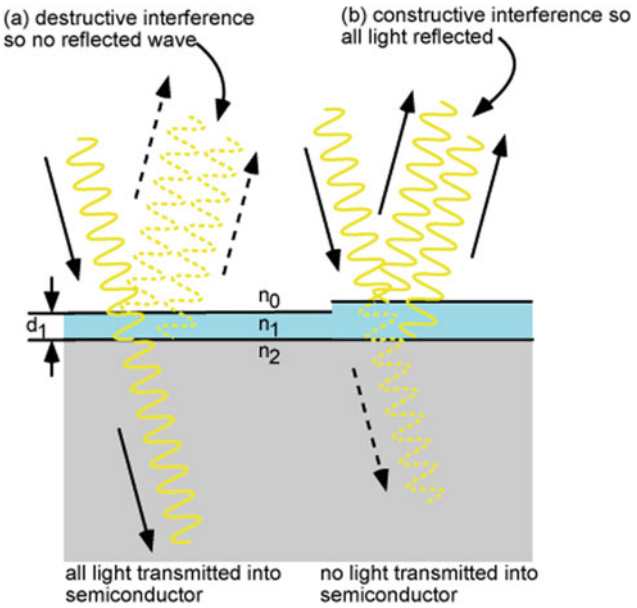

Fig. 1 Optimized ARC thickness to get zero reflection (Honsberg and Bowden 2018a)

$$n_1 = \sqrt[3]{n_0^2 \cdot n_s} \quad (6)$$

$$n_2 = \sqrt[3]{n_0 \cdot n_S^2} \quad (7)$$

The other aspect of the ARC is its thickness, to get zero reflectance at a specific wavelength the ARC thickness should be optimized to be quarter the wavelength of interest (let us call it λ_0) divided by the ARC refractive index. The thickness can be calculated by the following equation (Chen and Wang 2011; Honsberg and Bowden 2018a, b):

$$d_1 = \frac{\lambda_0}{4n_1} \quad (8)$$

In our situation, if the thickness was optimized based on λ_0, the reflected backlight of wavelength λ_0 at ARC/Si interface will be out of phase with the light reflected from the air/ARC interface. Thus, they will destructively interfere, and the clear reflection will be zero at that specific wavelength. Figure 1 illustrates this phenomenon.

In the case of DLAR, optimizing layers thicknesses will result in two reflection minima in the total reflection curve over the spectrum, thus lower overall reflectance.

3 Calculations and optical simulations

Analyzing ARC performance requires performing calculations before and after simulation such as computing optimum ARC thickness, refractive index and cell's maximum

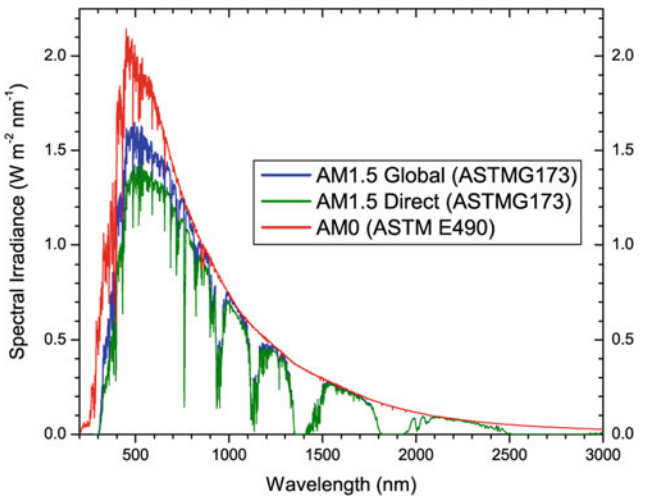

Fig. 2 Solar spectrum (Honsberg and Bowden 2018b)

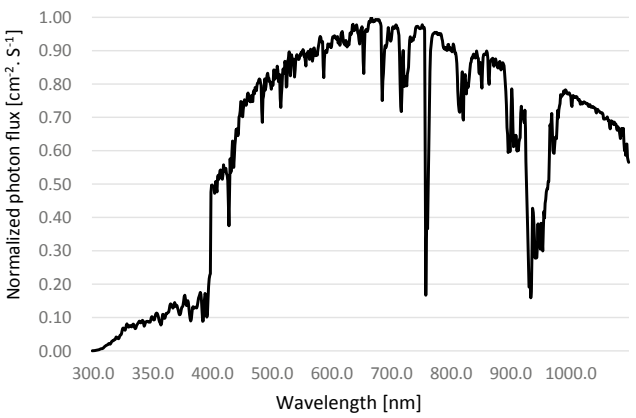

Fig. 3 Normalized photon flux from 300 to 1100 nm of the solar spectrum AM1.5G

photocurrent density (J_{max}). Since silicon (E_g = 1.12 eV) is considered the absorbing layer in our cell, the solar spectrum range of interest will be 300–1100 nm, as Si starts absorbing incident photons at around 1100 nm and lower. As the paper is an optical analysis, ideal conditions were considered in which no kind of recombination is considered and quantum efficiency is 100%, thus all transmitted photons to the Si will be absorbed and extracted as electrons. Short-circuit current J_{sc} will be equal to J_{max}. Initially, there will be no absorption in ARC layers as they will be calculated to have a constant refractive index n for all spectrum without absorption constant K based on equations in the previous section. Absorber layer silicon was set to n = 3.85.

The solar spectrum is not uniform in terms of radiation intensity (W/m^2) and photon flux (cm^{-2} S^{-1}) for all wavelengths, as it's a function of a blackbody. Also, some atmospheric gases absorb specific wavelengths such as CO_2. Check Fig. 2.

Therefore, solar cell's average reflectance over the spectrum is not a strong indicator of the cell's performance in terms of generating current. So weighted reflectance was added in the computations as it considers the photon flux at each wavelength. Its equation is as follows:

$$\overline{R}(\text{weighted}) = \frac{\int_{300\text{ nm}}^{1100\text{ nm}} R(\lambda)\Phi(\lambda)\mathrm{d}(\lambda)}{\int_{300\text{ nm}}^{1100\text{ nm}} \Phi(\lambda)\mathrm{d}(\lambda)} \tag{9}$$

where $R(\lambda)$ and $\Phi(\lambda)$ are the reflectance and photon flux at a specific wavelength. AM1.5G data sheet was used to calculate flux and J_{sc} through trapezoidal integration of solar irradiance to get light intensity H (W/m^2). The J_{sc} and flux equations are as follows (Nelson 2003):

$$\Phi = \frac{\lambda \times H}{hc} \tag{10}$$

$$J_{sc} \simeq J_{max} = q \int_{300\text{ nm}}^{1100\text{ nm}} EQE.T(\lambda).\Phi(\lambda) \cdot \mathrm{d}(\lambda) \tag{11}$$

where H, h, c, EQE, and T (λ) are light intensity, Planck's constant, speed of light, external quantum efficiency, and transmittance, respectively. It was found that total flux from 300 to 1100 nm is 2.7E + 21 cm^{-2} S^{-1} and J_{sc} are 43.53 mA/cm^2. Where in Detailed balance limit in Rühle (2016) J_{sc} at 1.1 eV (from 280 to 1127.1 nm) is 44.23 (mA/cm^2). Figure 3 shows a graph of the calculated photon flux along with the spectrum range of interest.

By using Eqs. 5 and 8 for SLAR, the optimum refractive index is 1.96 and its thickness is 76.5 nm, wherein Eq. 8, λ_0 was set to 550 nm as maximum photon flux region as per Fig. 3 is from 500 to 700 nm. Therefore, its desired to have zero reflectance in that region which is expected to result in low weighted reflectance and high J_{sc}. Lumerical Software was used to design the Si solar cell and run the simulations (Fig. 4).

Firstly, illumination on bare silicon simulation was performed then SLAR was added to bare silicon and both structures reflectances were compared in terms of average reflectance, weighted reflectance and J_{sc} as in Fig. 5 and Table 1. There was a 40% increase in J_{sc} when the SLAR was added to the cell.

For DLAR, the calculations using Eqs. 6–8 resulted in DLAR first (top) layer refractive index equals 1.57 and the second (bottom) layer index equals 2.46. As for their thicknesses, multiple $\lambda_0 s$ were plugged in the equations, due to

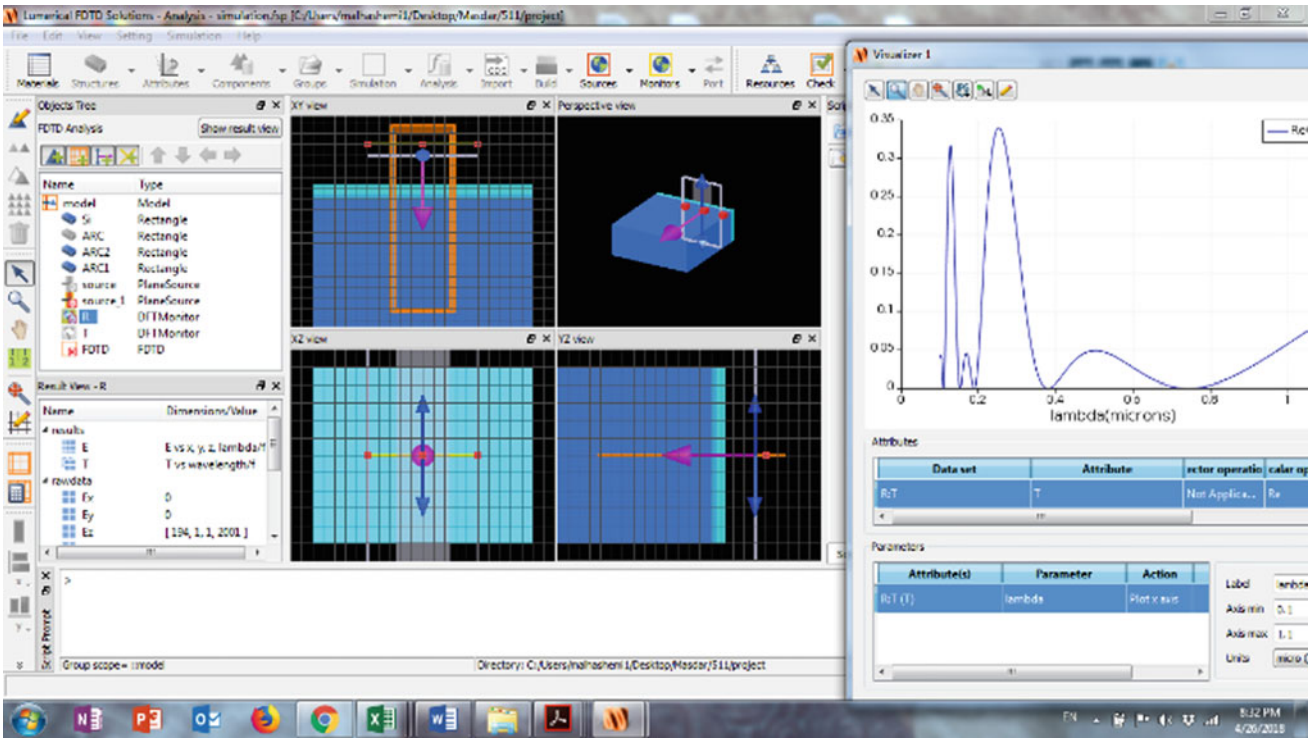

Fig. 4 Screenshot of solar cell design and its surface reflection on Lumerical software

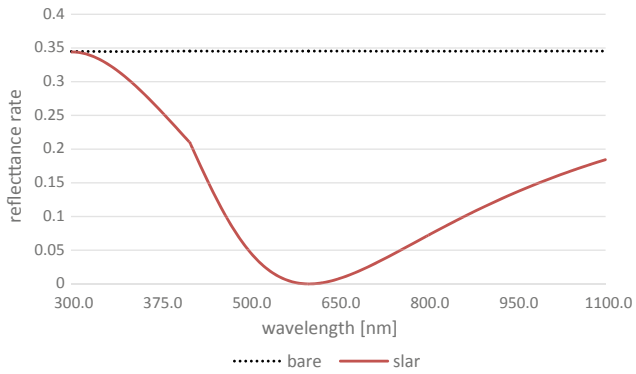

Fig. 5 Bare Si versus SLAR coated Si reflectance

DLAR having two minima in reflectance over the spectrum and its worth testing which λ_0 results in lowest weighted reflectance. Table 2 shows the calculated parameters and outcomes. Figure 5 shows the resulted reflectance over the wavelength range of interest. It was found that optimum λ_0 between the tested ones was $\lambda_0 = 550$ nm resulting in weighted reflectance dropping from 34.5% for bare Si to 2.5% when using DLAR and almost 49% increase in J_{sc}.

Table 1 Average reflectance, weighted reflectance and short-circuit current of bare silicon and silicon-coated by SLARC

Type	*R*-average (%)	*R*-weighted (%)	J_{sc} (mA/cm^2)
Bare Si (constant $n = 3.85$)	34.52	34.53	28.50
SLAR coated Si	13.11	8.19	39.97

4 Simulations based on real Materials

The next step was using the wavelength-dependent Si refractive index in simulations and choosing materials that fit the obtained parameters of SLAR and DLAR from previous section. But since the refractive index of real materials varies with wavelength, the chosen material will be based on its refractive index at lambda equals 600 nm which is in the highest flux region of the spectrum. For SLAR, the chosen material should be around $n = 1.96$. By using parameters of DLAR ($\lambda_0 = 550$) from the previous section which had the best results, the DLAR materials of 1st and 2nd layers should have $n_1 = 1.57$ and $n_2 = 2.46$ with thicknesses of

Table 2 Parameters and outcomes of DLAR coated Si of different zero reflectance points along the spectrum (λ_0)

Type	1st layer n = 1.57 thickness (nm)	2nd layer n = 2.46 thickness (nm)	R-average (%)	R-weighted (%)	J_{sc} (mA/cm^2)
Bare Si (constant n = 3.85)	–	–	34.5	34.5	28.50
DLAR (λ_0 = 500)	79.6	50.8	3.55	2.91	42.27
DLAR (λ_0 = 550)	87.6	55.9	4.67	2.50	42.44
DLAR (λ_0 = 600)	95.5	61	6.48	2.61	42.40
DLAR (λ_0 = 650)	103.5	66.1	8.23	3.17	42.15
DLAR (λ_0 = 700)	111.5	71.1	9.36	4.08	41.76
DLAR (λ_0 = 750)	119.4	76.2	9.67	5.21	41.26
DLAR (λ_0 = 800)	127.4	81.3	9.40	6.42	40.74

Table 3 Optimal refractive indices and chosen real materials indices

Type	1st layer calculated optimal n	2nd layer calculated optimal n	The chosen material for the 1st layer	The chosen material for 2nd layer
SLAR	1.96	–	Si_3N_4 (n = 2.04)	–
DLAR	1.57	2.46	SiO_2 (n = 1.46)	ZnS (n = 2.36) or TiO_2 (n = 2.61)

87.6 and 55.9 nm, respectively. There are common transparent conducting oxides and thin film materials used for ARC such as ZnS, Si_3N_4, SiNx, TiO_2, SiO_2, and MgF_2 (Chen and Wang 2011). Table 3 shows the theoretical constant n values and the chosen materials based on them:

Since there will be effective k values along with n values for some ARC materials, absorption will be considered in calculating the R-weighted and J_{sc}. It is equation as follows:

$$a = 1 - t - r \tag{12}$$

t is transmittance and r is reflectance.

In Lumerical software, four structures were built and tested; bare Si, Si_3N_4/Si (SLAR), SiO_2/ZnS/Si (DLAR), SiO_2/TiO_2/Si (DLAR). Reflectance and transmittance were measured, and absorption was calculated by Eq. 12. The results are shown in Fig. 6.

It is noticed that for both DLAR coated Si, there is a high absorption at short-wavelengths due to ZnS and TiO_2 absorption coefficients in that region. By using AM1.5G, R-weighted and J_{sc} were calculated for all four curves. Table 4 below displays the outcomes. Even though both DLARs lowered weighted reflectance to below 4% yet their high absorption came at the cost of J_{sc}. Where SLAR achieved highest J_{sc} recording an increase of 41.2% in comparison to bare Si, while DLAR (SiO_2/ZnS) and DLAR (SiO_2/TiO_2) achieved 36% and 40% increase, respectively. So, based on the obtained results, it is more practical in terms of the current generation and even cost-wise to use Si_3N_4 based SLAR on Si than SiO_2/ZnS and SiO_2/TiO_2 DLARs (Fig. 7).

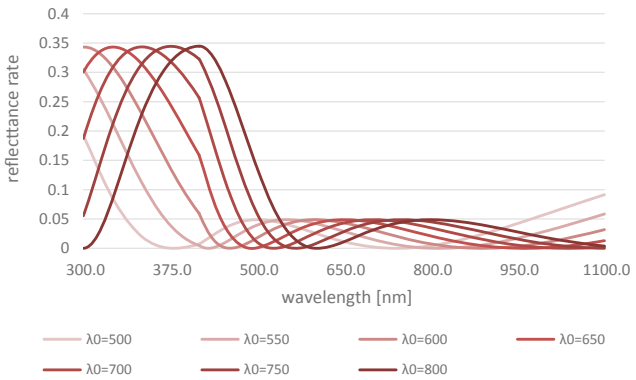

Fig. 6. DLAR reflectance of different thicknesses versus wavelength range 300–1100 nm

5 Conclusion

Finally, numerical calculations and optical analysis were performed in the design and simulation of SLAR and DLAR coatings on Si. For optimum parameters driven from equations, SLAR on Si (n = 3.85) increased J_{sc} by 40% and by using Si real n-k values with Si_3N_4 (n = 2.04 at λ = 600 nm) based SLAR, the J_{sc} has risen by 41.2%. However, when real materials were used for DLAR the J_{sc} dropped due to the introduction of absorption in the DLAR layers. It was found that for constant Si n = 3.85, the optimum thickness of layers is 87.6 nm for the 1st layer and 55.9 nm for 55.9 nm for 2nd layer, lowering weighed reflectance to 2.5%. Adding a third layer can slightly enhance performance yet it is more

Table 4 Outcomes of real materials SLAR and DLAR Si solar cells

Type	*R*-average (%)	*R*-weighted (%)	J_{sc} (mA/cm^2)
Bare Si (real *n*)	40.45	36.02	27.85
SLAR Si cell (Si_3N_4/Si)	19.25	9.45	39.42
DLAR Si cell (SiO_2/ZnS/Si)	5.71	3.45	37.87
DLAR Si cell (SiO_2/TiO_2/Si)	8.65	3.55	39.07

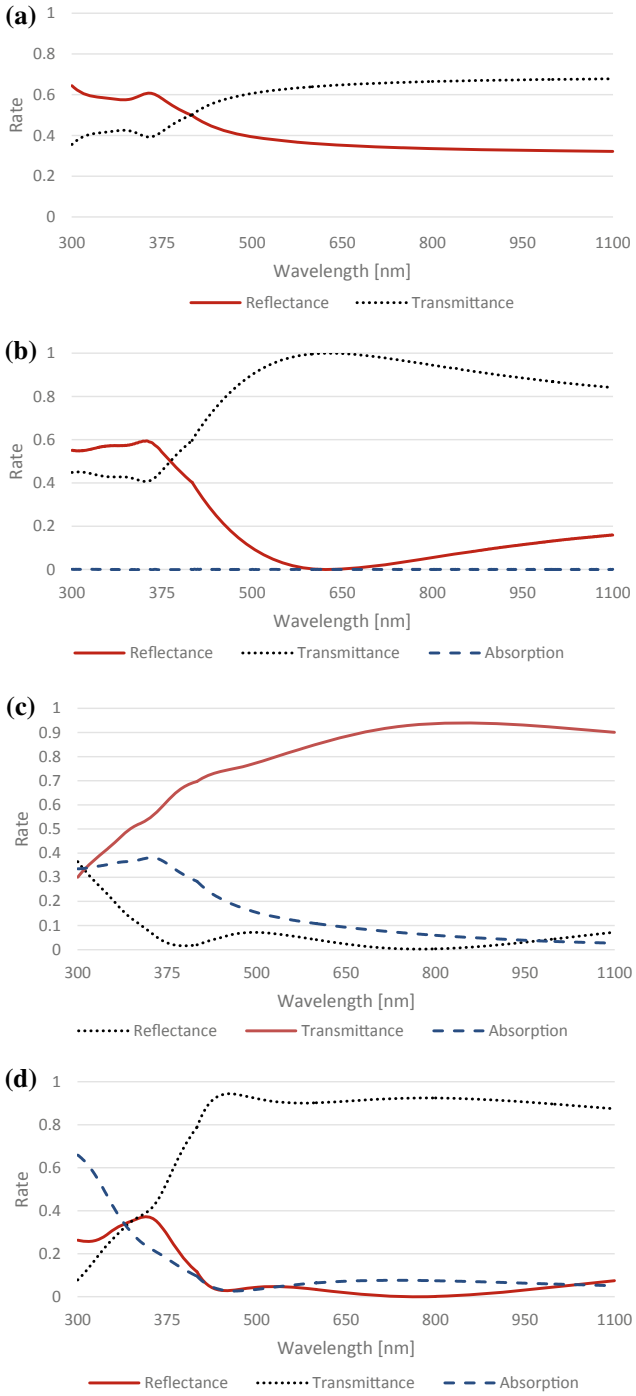

Fig. 7 Reflectance, transmittance, and absorption versus wavelength of **a** Bare Si (real n) **b** SLAR Si cell (Si_3N_4/Si) **c** DLAR Si cell (SiO_2/ZnS/Si) **d** DLAR Si cell (SiO_2/TiO_2/Si)

practical to tackle other losses in our Si cell such as absorption losses in non-absorber layers such as ARC and transmission losses of long-wavelengths for silicon.

6 Future work

SLAR and DLAR coatings were designed for Si to overcome reflection losses issue. Adding a third layer may further decrease reflection, yet tackling other optical losses is essential as well. In fact, it can be more impactful on the device performance than a 3rd ARC layer. As an indirect bandgap material, long-wavelength photons need relatively high optical path length to get absorbed by Si. One of the solutions to transmittance in Si is the use of surface texturing. Texturing can refract direct incident light beams into the solar cell at different angles, which increases its optical path; thus, the light will have a higher chance of being absorbed than transmitted. It can lead to designing thinner cells of equivalent efficiency, which lowers manufacturing cost. Also texturing decreases reflection through the multiple reflections of incident light between each neighboring textured structure till the light gets transmitted inside the solar cell while for a planar cell it can either being transmitted or reflected the atmosphere. Another enhancement is using the 2nd (bottom) layer of DLAR as an absorbing layer n or p to form a PN junction with silicon. This will take advantage of the high absorption of short-wavelengths in the DLAR 2nd layer as it was noticed in the previous section, thus this absorption will contribute to the current generation of the solar cell and will no longer be optical losses. Al Doped ZnO (AZO) can be used as a 2nd/bottom DLAR layer, as it has a relatively suitable refractive index (~ 2), and as a window n layer. So, for future works, the aim is to combine those solutions with our ARC design and do optical and electrical simulations.

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Patient-Centered Smart Healthcare Information System

Kamen Spassov, Denisa Chekresi, Gerta Dervisi, Enduena Lleshanaku, and Maria Velichkova

Abstract

Healthcare is a complex system with many actors involved such as Patient, General Practitioner, Hospital, and Pharmacy. The focus is on the Patient, however, actors collaborate to deliver the best healthcare service to the patient. Each of the elements of the healthcare system is a separate complicated system. This paper proposed a patient-centric smart healthcare information system (PCSHIS) integrates and orchestrates Patient Records Repository, General Practitioner Information System, Pharmacy Information System, and Hospital Information System to optimize the expenses of health service delivery and to ensure the best possible healthcare. All systems are built and integrated into a prototype PCSHIS with a software platform for building applications dOS of dWare company.

Keywords

Patient-Centric smart healthcare information system • Patient records repository • General practitioner information system • Pharmacy information system • Hospital information system

1 Introduction

Health care is one of the most critical sections in the economy of a country. New technologies are now affecting every sector, including the health care sector.

As Eysenbach (2001) proposes:

> e-Health is an emerging field in the intersection of medical informatics, public health, and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology.

According to the World Health Organization (2018):

> E-Health (Electronic Health) is the Use of Information and Communication Technologies (ICT) for Health.

e-Health involves the integration of information involved in the delivery of health care by using information systems and technologies. These information systems involve Patients and their data, General practitioners (GP) and doctors in general, Hospitals, and Pharmacies with their medical, management, and administrative functions and data.

All people are patients or potential patients with their medical history represented by their medical data stored in medical records. Medical records could be on paper or electronic. In this paper, we will consider all patient medical records are in electronic form. Patient's medical records are supposed to be kept in Patient Records Repository (PRR).

In many countries, patients visit GPs firstly. GPs prescribe patients treatments and/or medicines or recommend patients to a specialized doctor or hospital. GPs record their findings and prescriptions in the medical records of the patients. GPs use GP Information Systems (GIS).

Hospitals provide medical treatment of patients forwarded to them by GPs or visited directly by patients. For medical treatment, doctors in hospitals use medicines sourced from hospital pharmacies. Hospitals use Hospital Information Systems (HIS). Doctors and nurses in the hospital record their findings, treatments, and prescriptions in the medical records of the patients.

Pharmacies (also hospital pharmacies) provide medicines according to prescriptions of doctors (GPs or from the hospital). Pharmacies use Pharmacy Information Systems (PIS). Pharmacists record medicines purchased by patients in the medical records of the patients.

K. Spassov (✉) · D. Chekresi · G. Dervisi · E. Lleshanaku · M. Velichkova
Sofia University, FMI, 5 James Bourchier Blvd., 1164 Sofia, Bulgaria
e-mail: kspasov@fmi.uni-sofia.bg

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In some countries, GIS, HIS, and PIS are very well integrated. In other countries, they are partially integrated. In many countries, these systems are not integrated, or even some or all of them do not exist.

Access to and maintenance of the medical records of the patients is crucial to a successful patient-centric healthcare system.

The analysis started with a research on health care systems of Bulgaria and Albania—home countries of the authors. The transition from healthcare to e-Healthcare in other countries (Austria, Canada, Denmark, Estonia, Ireland, Netherlands, Norway, UK, and Scotland) was studied. The initial idea was to analyze successful implementations of e-Health systems in order to put together functional requirements for a patient-centric smart healthcare information system (PCSHIS) for Albania. During work, we decided to define and test PCSHIS in general.

2 Patient-Centric

> Patient-centered applications are defined as systems that enable a partnership among practitioners, patients, and their families (when appropriate) to ensure that procedures and decisions respect patients' needs and preferences. Developers should solicit patients' input regarding the education and support that patients require to make decisions and participate in their care (Demiris et al. 2008).

In an ideal world, Patients should be in the focus of all organizations, members of the healthcare industry. A patient-centric e-Health system empowers patients. Patients deserve more extensive involvement in making the decision, expressing an opinion about different health-related issues like problem-solving, information sharing, acceptance of health team instructions, etc. We assume that all involved parties use specialized information systems, e.g. GIS, HIS, and PIS.

3 The Goal

In our work, we defined the goal to create a prototype of an integrated Patient-Centered Smart Healthcare Information System (PCSHIS) that provides the functionality of GIS, HIS, and PIS at a common platform to avoid the challenges of integration of systems from different vendors based on different platforms.

The patient's medical records are the main integration element of GIS, HIS, and PIS.

4 PCSHIS Subsystems

PCSHIS is built around Patients' Records Repository and integrates GIS, HIS, and PIS.

4.1 Patients' Records Repository (PRR)

Once the only principle is a core around which patients' record repositories are built. In Norway, for example, they use "One citizen, one record" slogan (Accenture 2018).

Kjernejournal (Summary Care Record) is a collection of health records used when in need of urgent medical access. Kjernejournal was developed in strict compliance with statutory requirements for security and data privacy. Access to Kjernejournal is granted solely to patients and health care facilities authorized by the Norwegian Directorate of eHealth. Access is obtained in a secure health service network. Through Kjernejournal, the Directorate has enabled health care professionals in Norway to share information about patients across geographies and care levels. They have also given patients transparency about what health information about them is recorded and allowed them to update their information through a web portal, empowering patients to take an active role in their care.

The Austrian e-Health approach is also based on electronic health record—ELGA short (Bugnar 2010). In Canada, electronic health record (EHR) is also implemented (Canada Health Infoway 2018).

Patients' Records Repository (PRR) contains all data related to the patient's health; medical treatments; visits to doctors, hospitals, and pharmacies; results from laboratory analysis; prescribed and purchased medicines. Patients own their records and manage access to the data.

Medical records of each patient are unique. Each patient needs to have a unique electronic identifier (UEI). GPs register Patients at PRR with their UEIs. After the initial registration, patients can manage the access of health care providers to their medical records, but cannot delete records.

GPs, doctors, and nurses at hospitals and pharmacists can create and amend records relented to their findings, medical treatments, recommendations, prescriptions, medicines, provisioning, etc. They cannot delete medical records.

Patients receive notifications about any access to their medical records.

4.2 General Practitioner Information Systems GIS

Not all the countries have the same structure of primary health care system, but most of the health care takes place in primary care section, with a family doctor known as a General Practitioner (GP). Patients visit GPs firstly and later GPs recommend the patient to a specialized doctor or hospital. Very rarely do patients contact a specialized doctor without first going to the GP for a referral. In developed countries, GPs usually use computerized systems in their practices.

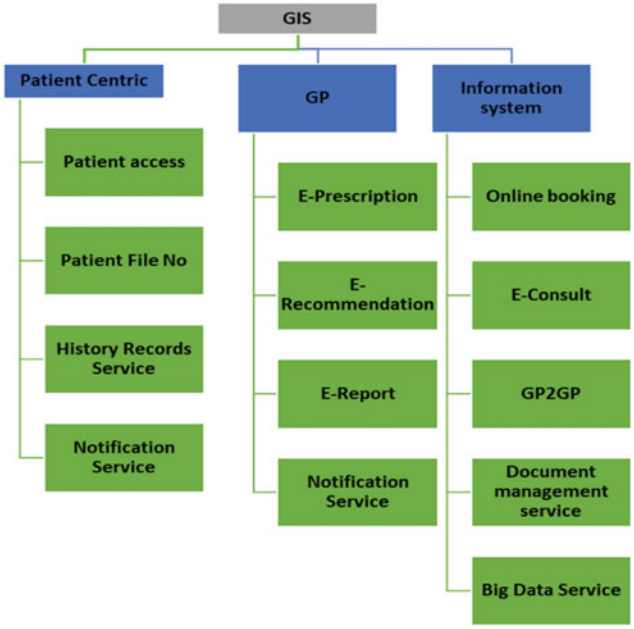


Fig. 1 General Practitioner Information System (GIS) structure and modules

Structure and the main modules of a GIS are presented in Fig. 1. GPs have access to the patient's records. They can send the patient to another doctor (s) or hospital, prescribe medicines and/or treatments, etc. GPs and patients can use the GIS to book a visit to the doctor. GPs can use GIS to as other doctors for consultation. GIS is a valuable tool to organize GP's documentation and to perform different types of analysis.

4.3 Hospital Information Systems (HIS)

Hospitals are very complicated systems. In Fig. 2 structure and modules of a Hospital Information System (HIS) is presented. In general, we can divide HIS into three central systems Patient Management System, Hospital Management System, and Hospital Support Management System.

Patient Management System relates to every piece of data regarding the patient's treatment in the hospital (medicines, procedures, clinical laboratory results, etc.).

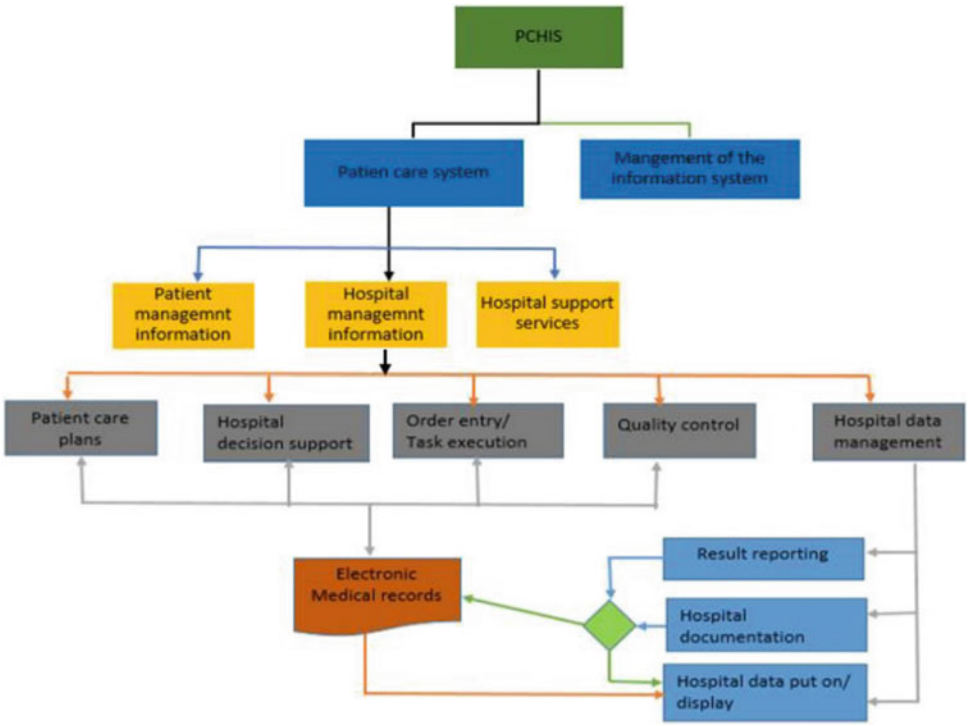
Hospital Management System relates to the overall management of the medical personnel and medical equipment employed for the medical treatment of patients.

Hospital Support Management System relates to the management of the hospital's facilities—similar to hotel management.

HIS was built following the standards established with the 5th edition of Joint Commission International Accreditation Standards for Hospitals (2014).

HIS needs to be divided into two main subsystems: one devoted to medical treatment of patients; and another Inpatient Admission and Catering Information System (similar to hotel management systems).

Fig. 2 Hospital Information System (HIS) structure and modules



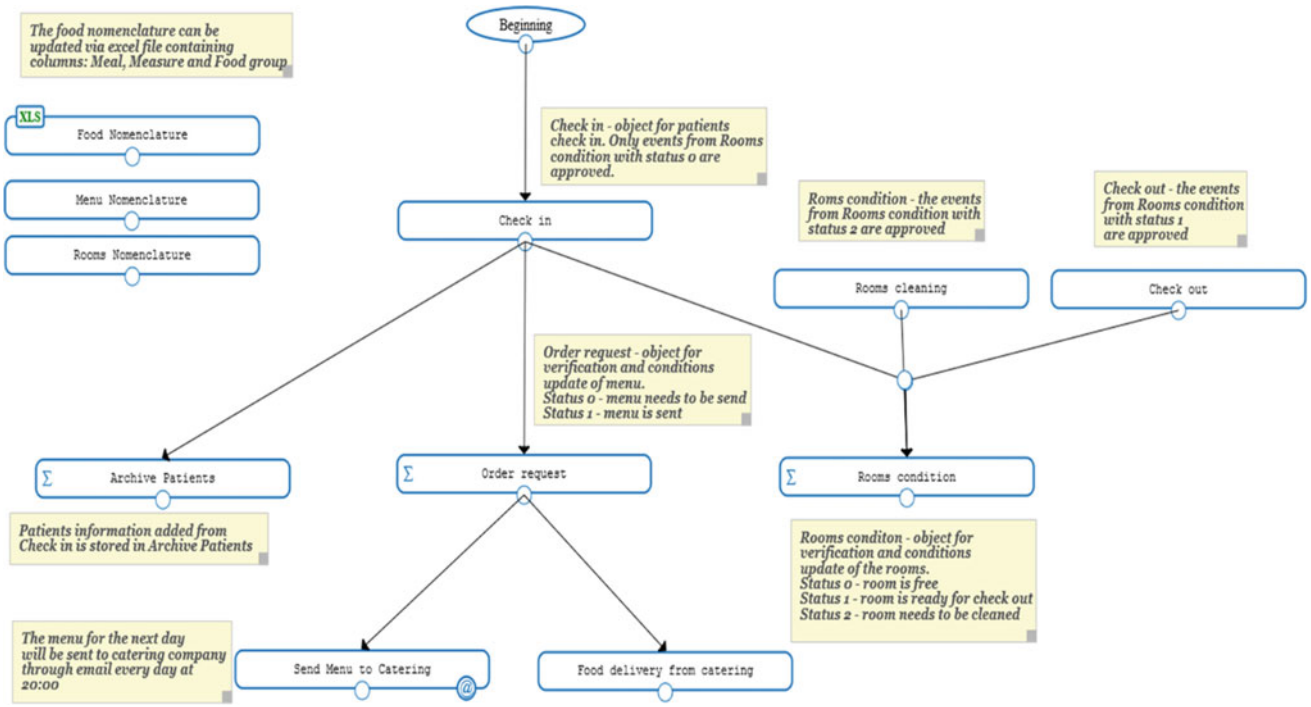


Fig. 3 Inpatient admission and catering subsystem

Objects of HIS were defined.

Inpatient admission and catering subsystem are shown in Fig. 3. This is an essential part of Hospital Support Management System. In essence, Inpatient admission and catering system is similar to a hotel with a restaurant management system. Specifics are related to the hospital clinics and their specific requirements to the beds and related equipment, capacities, etc. In a hospital, food requirements could be different for each of the patients and are dependent on doctor's recommendations.

4.4 Pharmacy Information Systems (PIS)

Pharmacies have been regulated heavily in the recent 100 years. In different countries, different regulations apply. For example:

The prices of branded prescription drugs have been regulated in the UK since 1957 under a voluntary agreement between the Association of the British Pharmaceutical Industry ("ABPI") and the UK Department of Health, which applies to all branded, licensed prescription drugs available on the National Health Service ("NHS") (2017). The arrangement is called the Pharmaceutical Price Regulation Scheme ("PPRS"). Other countries Germany, Netherlands, Canada, etc. have similarly their own regulations.

e-Prescription links patients, doctors, and pharmacists. Each e-Prescription is unique and contains the UEI of the patient. Each e-Prescription is part of the medical records of a patient.

Pharmacists register in the medical records of a patient all medicines distributed to the patient regardless they have prescription or not.

A pharmacy could be standalone, hospital pharmacy, or any other kind.

The inventory management system is part of PIS.

PIS needs to include reimbursement medication service.

Objects of PIS were defined.

Figure 4 represents a Pharmacy Information System structure and main objects.

5 Patient-Centric Smart Healthcare Business Processes

Business processes at GPs, hospitals, and pharmacies were analyzed and presented in general using BPMN.

Figure 5 depicts a clear picture of business processes in a patient-centric smart healthcare information system. It is supposed that GIS, HIS, and PIS are built on the same platform, and the integration is seamless.

Patients can access PCSHIS through their GP or going directly to a hospital. Eventually, they can purchase over the counter medicines going directly to a pharmacy without a prescription.

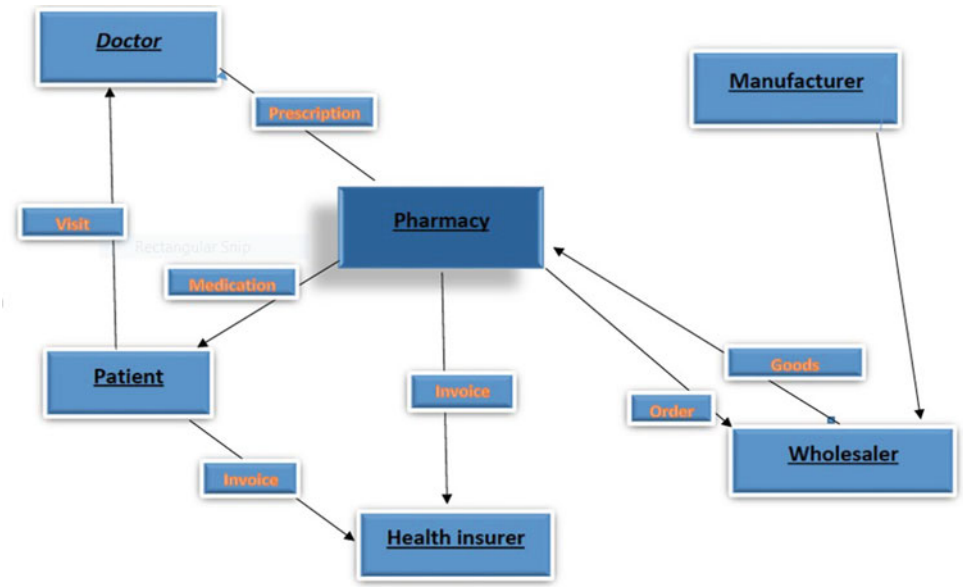


Fig. 4 Pharmacy Information System (PIS)

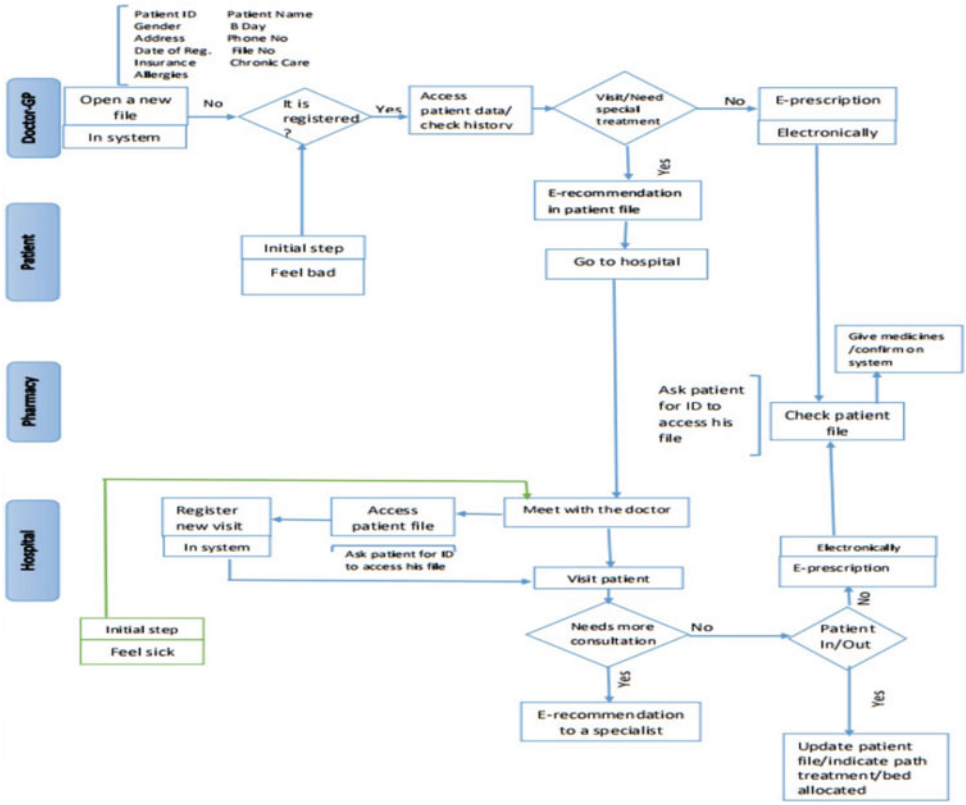


Fig. 5 A simplified business process in PCSHIS

GP checks the patient health status and either prepare e-Prescription or sends the patient to a hospital (independent doctors with their cabinets could be treated as hospitals).

At the hospital, the patient passes a healthcare check and eventually, a set of medical treatments (inpatient or outpatient). In most of cases, hospital doctors also prepare e-Prescription(s).

6 Functional Model

A simplified model of Patient-centric smart healthcare information system (PCSHIS) is presented in Fig. 6. Information systems of General practitioners, Hospital information systems and Pharmacist information systems are

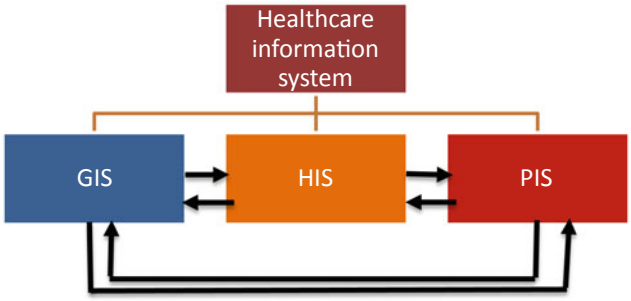


Fig. 6 A patient-centric smart healthcare information system integrates General practitioner information system, Hospital information system, and Pharmacist information system. All these systems are built around patients' medical records

connected and exchange data related to each of the patients. The common element of all these systems is the medical record of a patient. The essence of the Healthcare information system is the repository of patients' medical records. It is crucial that all other systems be able to read and write data to a patient's medical record following the will of the patient and the rules related to their roles as medical care providers.

As it was discussed earlier, in most of the cases GIS, HIS, and PIS are built by different vendors, using a variety of technologies, and in most of the cases, this requires significant effort and investment for integration. A special requirement to build this patient-centric health care pilot system was to develop GIS, HIS, PIS, and patients' medical records repository within the same platform with integration capabilities by design. In this case, semantic and technical interoperability of each of the systems to be agreed before the design of each of the respective information systems.

It is essential for all systems to protect personal data in compliance with the European General Data Protection Regulation (GDPR).

7 Technical Solution

dWare dOS platform was selected to develop the pilot PCSHIS. dWare company provided free documentation, training, and access to the platform. dWare Operating System is a business operating environment developed by dWare. dOS is the software implementation of an event model to reflect reality. Business processes can be presented in dOS as consequences of events. The system provides tools to define objects, attributes, spaces, and functions (2018). In dOS, the new application is generated in and admin site and then it is exported to user site. There is no need for software development.

Business processes in GPs, Hospitals, and Pharmacies were developed in details. For example, at Fig. 7, the business process of an existing patient visit is presented.

All business processes were created in dOS admin site.

Before that, objects derived from analysis and defined in functional requirements were created in dOS admin site. Each object consists of multiple layers that need to be configured a description, physical layer, logical layer, presentation layer, attributes, and functions. Figure 8 is shown an example of a configuration screen of Description of the object Patient data.

It Fig. 9, a screenshot of the configuration of the logical layer in dOS for the Patient data object is presented. At this stage object's attributes are generated.

After building the system in the admin site, it is exported and then imported to the user site. For example, in the user site, the Patient data object looks like it is presented in Fig. 10.

As it was mentioned above, dOS platform consists of admin and user sites. The new application, PCSHIS, in our case, was created on the admin site and then transferred to the user site. The configuration of admin and user sites is

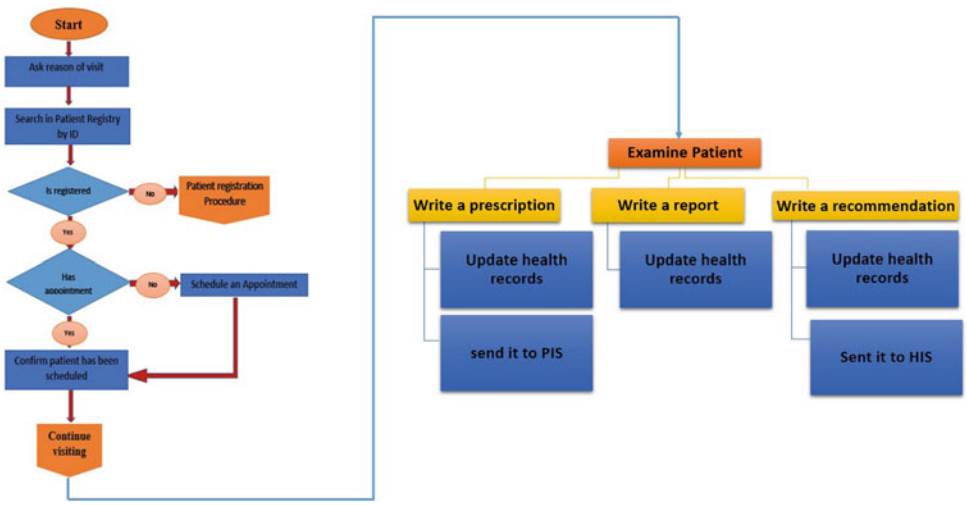


Fig. 7 The business process of an existing patient visit to General practitioner

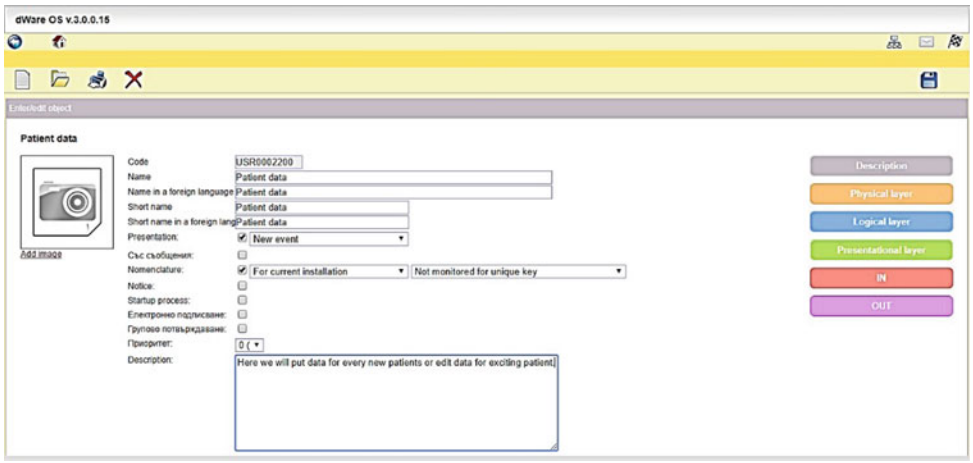


Fig. 8 A system view of Description in Patient Data object in dOS admin site

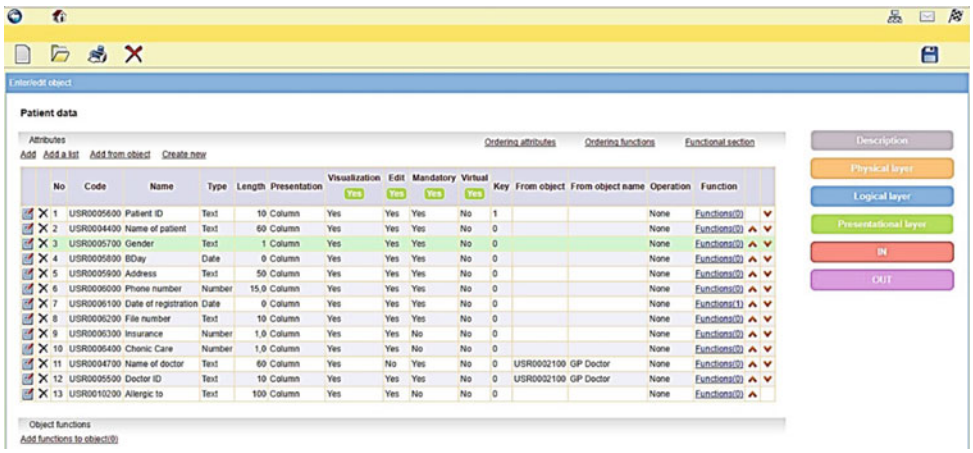


Fig. 9 A system view of Logical Layer at Patient Data object in dOS admin site

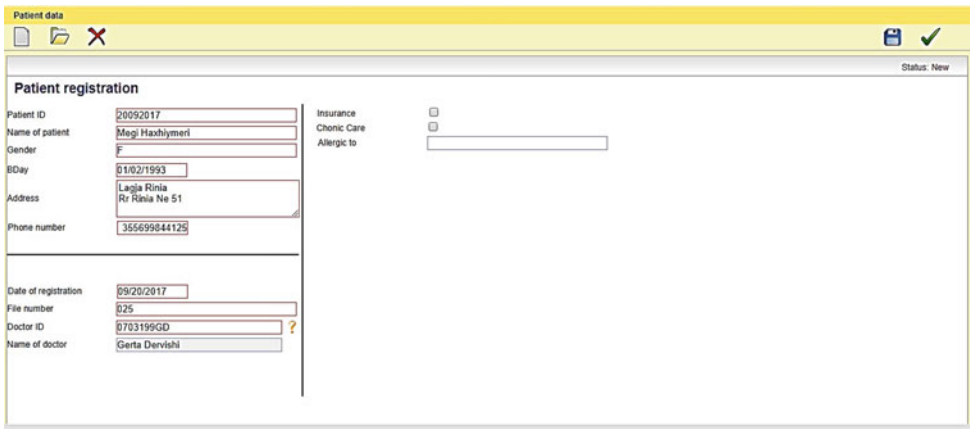


Fig. 10 A system view of Presentation of Patient Data object in dOS user site

presented in Fig. 11. Special measures are taken to ensure data security and system scalability. GIS, HIS, and PIS were created in dOS separately. After a successful testing GIS, HIS, and PIS were integrated into PCSHIS. Three complicated scenarios were created, covering real-life cases to test PCSHIS. All tests passed successfully and proved the viability of the pilot PCSHIS.

8 Conclusion

A prototype of Patient-Centric Smart Healthcare Information System (PCSHIS) was developed in the dOS software platform. The system integrates GIS, PIS, and HIS built around the patient medical records in Patients' Records

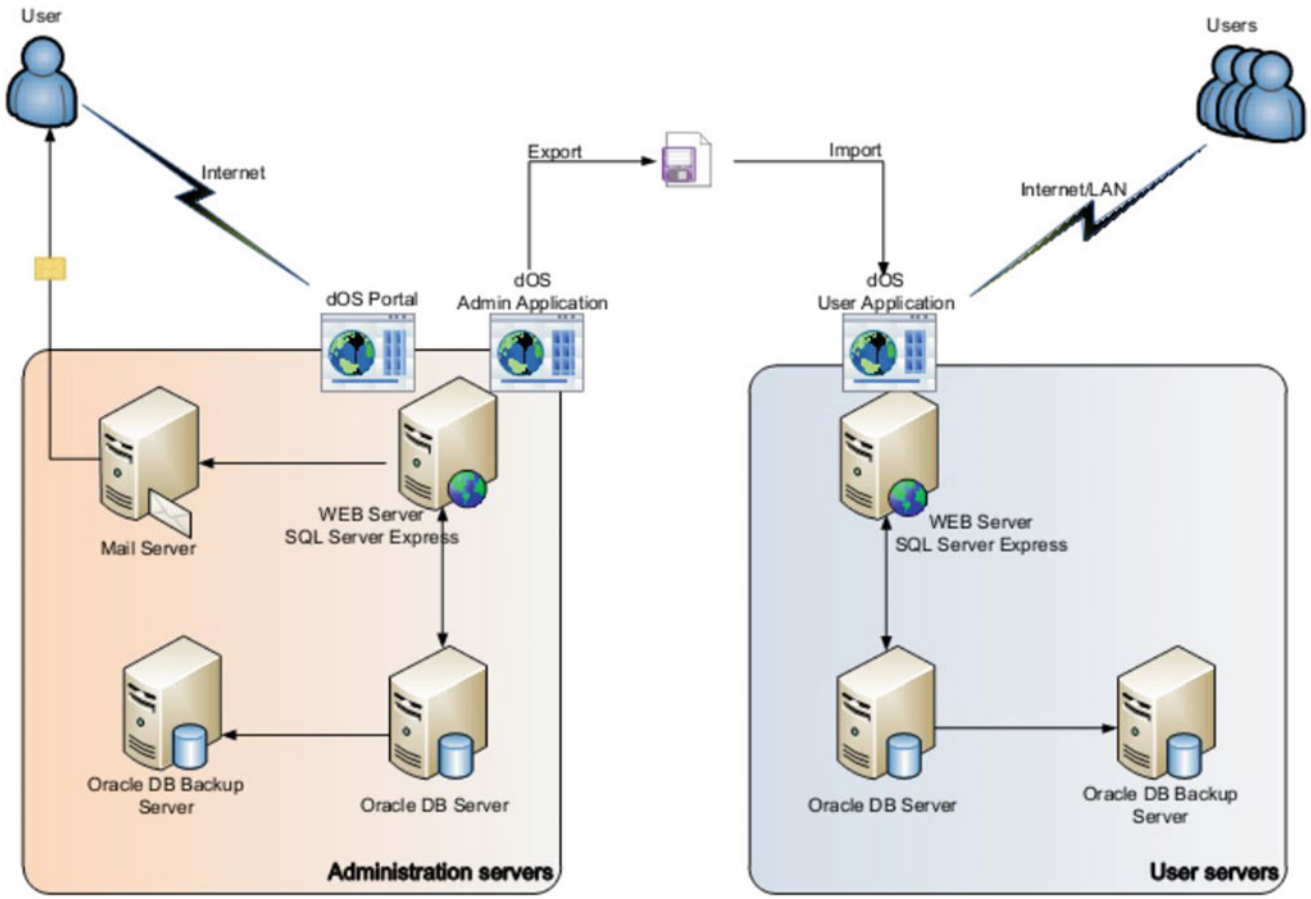


Fig. 11 Configuration of admin and user sites in dOS

Repository (PRR). General practitioners, hospital doctors, nurses, and pharmacists can access patient records and enter their observations, prescriptions, results from laboratory analysis procedures, etc.

Different scenarios of patient cases were tested successfully. It was proven that the pilot system meets the functional requirements. Tests were conducted with few patients, one GP one hospital and one pharmacy generated within the dOS platform. A real implementation will require the generation of multiple objects of General practitioners, hospitals, and pharmacies. In the core of such a system, thousands and millions of patients' records need to be supported.

Due to the centralized approach to building the patient-centered smart healthcare information system it is relatively easy to generate all kinds of reports and analysis to use them for policy making in general and decision-making at managerial level.

The use of dOS platform allowed Business Analysts to build the PCSHIS without any software development, just defining objects and business processes.

The development and testing of the pilot of the patient-centric smart healthcare system prove the viability of the described approach. To implement the PCSHIS in reality there is a need to build an ecosystem of patients, GPs, hospitals, and pharmacies at local, regional, or country-level who support e-Health. dOS platform was used to create software solutions at all levels and proved its scalability. It is not difficult to conclude that the development and implementation of a PCSHIS at local, regional, or country-level predominantly depends on the political will of the authorities.

Acknowledgements This work was made possible thanks to the kind support of Mr. Damian Ivanov, founder, and CEO of dWare, who passed away during the execution of this project. He and his company graciously provided documentation, training, and access to use dOS as a platform to develop the prototype of patient-centric smart healthcare system (PCSHIS) presented in the article.

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Proper Use of Concord in the Written English Essays of Diploma Students as a Means of Sustainable Development in Nigeria

Sani Jafar

Abstract

The purpose of the study was to identify and analyze the concord errors committed by part-time Diploma student of Jigawa State College of Education, Gumel and Jigawa State Polytechnic. It examined the error types, frequency of occurrence, and provide strategies and recommendations to minimize their reoccurrence. One essay test and one structural test were administered, and the identified errors analyzed. The concord errors by the sampled students were obtained. For data analysis, the percentage was used. A descriptive research design was also used. The study area has a population of 265 for 2016/2017. A sample size of 155 (Diploma 1 students) was used for the study. Two researcher-designed instruments were modified and used from J.S. Digga (1990); Concord Error Structural Test (CEST) and Concord Error Written Test (CEWT). The data were presented in tables and simple percentages accompanied by explanatory and descriptive analyses based on which conclusions were drawn. Students tended to avoid the use of passive voice and phrasal verbs. The frequencies of errors committed have a direct negative effect on the academic achievements of students. The study concludes that the remedial measures and strategies could be used to improve the situation were recommended.

Keywords

Error analysis • Concord • Use of concord • Sustainable development

1 Introduction

Error analysis is a type of linguistic analysis that focuses on the errors learners make. It consists of a commission between the errors made in the target language (TL) and that TL itself. Pit Corder is the father of Error Analysis. Systematically analyzing errors made by language learners makes it possible to determine areas that need reinforcement in teaching (Corder 1974). EA received considerable attention and finally became a recognized part of applied linguistics in the 1970s. This is because the stable version of CA turned out not to be a productive pedagogical tool. James (2001: 62) defined the notion of EA as "the study of linguistic ignorance, the investigation of what people do not know and how they attempt to cope with their ignorance". Concord in English Grammar means the agreement between the subject of a sentence and its verb, between the subject and its complement, etc. When such an agreement is not there in construction, it then becomes an error of concord. Quirk and Greenbawn (2004) defines concord as 'a relationship between two grammatical elements such that one of them selects a singular verb while a plural subject selects a plural verb. The knowledge of the rules of concord in English grammar is necessary for speaking and writing good English. Ill-formed sentences irritate the linguistic wary or corrupt the English language acquired by learners. A lucid and convincing piece of writing must be grammatical for complete acceptability. 'To develop the needed competence and to ensure a high level of performance, one has to internalize the rules of concord to the point of automaticity' (Ubahakwe 1979: 46).

Any violation of the rules of grammar can lead to concord errors which should be avoided. Kwofie (2011: 23), citing Yankson (1994) argues that when second language learners commit concord errors, it reflects poorly on their personality and that tells listeners something about their educational background and shows their interlanguage as "developing grammar" that borders on illiteracy. This comment shows that one's poor knowledge of English grammar can

S. Jafar (✉)
Sule Lamido University, Kafin Hausa, Jigawa State, Nigeria
e-mail: sanijafargumel85@gmail.com
URL: http://www.jsu.edu.ng

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embarrass one in the eyes of one's audience. In this regard, care must be taken by ESL learners to escape the dangers posed by the wrong use of concord in their verbal and written communications.

2 Statement of the Problem

Performance in the use of concord in the written English essays of Part-time Diploma students in Jigawa State College of Education, Gumel and Jigawa State Polytechnic Dutse are considered to be generally poor. This can lead to poor academic achievement of Part-time Diploma Students. It has been observed by Dauda (2004), Nwokoro (2009), Olugbodi(1995), and Mangvwat (1997) that most students admitted into tertiary institutions, in the country, were ill-prepared for their communication roles in these institutions. This is attributed to the inconsistency in the use of concord in English.

It is sad to mention the fact that the College of Education in Gumel and Jigawa State Polytechnic do not teach concord in English separately (even though it is included in the curriculum of Diploma students). Therefore, students who come into these institutions without a good knowledge of the rules of concord graduate without getting the knowledge. Since the primary purpose of teaching and learning is the provision of knowledge and skills, concord should be taught effectively to students. This is important because concord gives way for constructing correct sentences; good essay writing and achieve communicative competence and performance in the English language.

Students' performance in the use of concord can be seen as a reflection of their performance in school. The consequence of this is manifested in students' poor performance in language and communication skills in the college, more particularly in the areas of concord. It is as a result of this, Diploma students of Jigawa State College of Education, Gumel and Jigawa State Polytechnic, Dutse produced some sentences that violate concord rules in their examination scripts. This is also observed by the researcher in the college's Diploma section in 2011. The sentences include:

(1) Musa, you really surprises me
(2) I woke up early in the morning and take birth and prepare.

The above sentences found in the written essays of Part-time Diploma students of Jigawa, Gumel and Jigawa State Polytechnic, Dutse are a result of lack of teaching of concord in the institution. This eventually led to a lack of mastery of the rules of concord guiding the use of the English language. It also causes the mass failure of diploma students in the two institutions. There is, therefore, the need to use appropriate and adequate teaching strategies, approaches, and techniques to teach concord in English.

This study is conducted with the hope that the findings and recommendations would provide solutions to the concord errors committed among the Part-time Diploma Students.

3 Objectives of the Study

The primary objectives of the study are to:

1. identify the extent to which Jigawa State C.O.E Part-time Diploma 1 and Jigawa State polytechnic Diploma 1students commit concord errors in their written essays;
2. verify the extent to which Jigawa State C.O.E Part-time Diploma 1 and Jigawa State Polytechnic Diploma 1 students commit subject-verb concord errors in filling blank spaces.

4 Research Questions

The study intends to address the following research questions:

1. To what extent do Jigawa State College of Education, Gumel Part-time Diploma 1and Jigawa State Polytechnic, Dutse Diploma 1 students commit concord errors in their written essays?
2. To what extent do Jigawa State College of Education, Gumel Part-time Diploma 1 and Jigawa State Polytechnic, Dutse Diploma 1 students commit subject-verb concord errors in filling blank spaces?

5 Significance of the Study

1. This study focused its interest on analysis of concord use errors in the written English essays of Diploma 1 students in selected institutions in Jigawa State. It will also recommend teaching and learning strategies to reduce errors.
2. The study could be of immense importance to the students, teachers of English, researchers, and research in TESL, educators, and curriculum planners. It could also be of great importance not only to the categories mentioned above of potential beneficiaries but also to other professions that require writing skills as a prerequisite.
3. It is expected that this study will help the diploma students to identify and reduce the concord errors they commit in their written essays. This can be done through the use of the effective teaching and learning strategies

that the study provided. Also, other students in our different institutions of learning and schools could benefit from the results of the study. When they are exposed to concord use errors, they commit in their written essays and how to overcome them. This will make them produce quality essays in the future by exposing them to different rules of concord. They will also become the right users of concord while writing their essays in their various fields of endeavors.

4. Teachers of English language in our schools could benefit from this study towards their classroom teachings. Because it is evident that making an error analysis is a form of self-education or a type of self-imposed in-service training. It may show a teacher where his or her teaching has not been effective. A systematic study of errors may lead to improved teaching methods through greater awareness of the nature and causes of the errors which learners make (Etherton 1977: 69). Therefore, teachers of English could learn how to improve their techniques, strategies, and approaches to tackling concord errors and teaching of concord in the English language.
5. The study could provide reference materials to be used in the pursuit of further research in TESL. Error analysis can provide valuable materials for use when researching by other researchers in similar areas. Other researchers in various fields could also benefit from this study's research procedures and the instruments used in the collection of data. They can be used for the analysis and reduction of other errors in English.
6. Educators, who will use this study to organize seminars, workshops, talk shows, etc. for the teachers of the English language on how to teach concord for good essay writing. This can be done by using the strategies recommended in this research work.
7. Curriculum planners could find this study relevant. It could help them to put more emphasis on the teaching of concord and essay writing.

6 Methodology

The descriptive survey research design was used in this study. According to Ngu (2009), survey research is defined as a systematic collection of data from the population or sampled, through interview or questionnaire techniques. It is a type of design that does not involve an experiment. It is aimed at identifying variables and their relationship to one another. It is used to obtain data to enable the researcher to test hypotheses and answer research questions. The population used in this study was diploma I students of Jigawa State College of Education, Gumel and Diploma I students of Jigawa State Polytechnic, Dutse. Therefore, the population is two hundred and sixty-five (265). These two institutions were chosen because they have the same curriculum for the Diploma program. They also receive the same instructions in the art of essay writing in their Language and Communication Skills. Given the large size of the population of diploma l students in the two institutions, a representation of 155 of the total population was used for the study. That is, 80 students from Jigawa State College of Education and 75 from Jigawa State Polytechnic, Dutse, respectively.

Table 1 Number of students selected from each institution and level

Levels	Total no. of students	No. of students sampled	% Sampled
Diploma 1 of J.S.C.O.E, Gumel	138	80	30
Diploma 1 of Jigawa State Polytechnic Dutse	127	75	28
Total	265	155	58

Simple Random sampling was used to select a sample size from the population (Krejcie and Morgan 1970). Therefore, the study used a sample of 155 students from these institutions. The entire population cannot be used because the study aimed at an in-depth, using the whole population will be detrimental to the efficiency of the analysis. The sample is representative because it cuts across the diploma one student from the two institutions. Table 1 shows the breakdown of the sampled population (subjects) distribution as follows:

The instrument used for data collection for this study was obtained by administration of concord use structural test (CUST) and concord use written test (CUWT) to the sampled population.

7 Discussion of the Major Findings

a. The study seeks to identify, analyze, and compare concord use errors of Diploma 1 students of Jigawa State College of Education, Gumel and Jigawa State Polytechnic, Dutse, in Jigawa State. The frequencies of errors and whether a significant difference exists among the types of concord errors committed across the two institutions. The results of this study are discussed below;
b. The finding from the first research question and hypothesis indicated that the study had established the fact that the Jigawa State College of Education students have committed many concord use errors in their written essays. Therefore, the mean concord use errors committed in the written essays of Diploma 1 students of Jigawa State College of Education, Gumel was 6.00 and that of

Jigawa State Polytechnic, Dutse was 3.57. Moreover, standard deviations were 4.953 and 4.722, respectively. This finding, however, shows that the Diploma 1 students of Jigawa State College of Education, Gumel committed more concord errors in their written essays. This is when compared to Diploma 1 students of Jigawa State Polytechnic, Dutse with the mean difference of 2.427. The result also showed that there was a difference in the mean concord errors committed in the written essays of Jigawa State College of Education, Gumel and Jigawa State Polytechnic students', respectively. Also, independent sample t-test analysis was used, and the hypothesis which says no difference was rejected.

c. The study also discovered that there was no significant difference in the mean Subject-verb concord use errors in filling the gaps. Descriptive statistics of means and standard deviations were also used to answer this. The mean of subject-verb concord used by Diploma 1 students of Jigawa State College of Education was 8.98, and that of Jigawa State Polytechnic was 8.45 with standard deviations 3.214 and 3.43.8. The difference was 0.522 in favor of Jigawa State College of Education. In testing the hypothesis independent sample t-test was carried out. The result indicated that concord errors are prevalent among Diploma 1 students of Tertiary institutions in Jigawa State. This result justifies the claim of Galadi in (2004). In the end, the null hypothesis is retained, which says no difference. The study also found that Diploma 1 students always avoided the use of passive voice and phrasal verbs. This avoidance nearly scored zero percentage in Concord Use Written Test. It is observed that students tend to avoid passive structures because of the difficulties they are likely to encounter when they attempt to use the structures. This avoidance phenomenon is one of the weaknesses of EA noted by earlier researchers (Duskova 1969, Scatcher 1974, Klassen 1991 and Dauda 2004), which has been confirmed by the present study.

d. This finding has also established the fact that the frequency of concord errors committed had a direct negative effect on the academic achievement of students. The more the students commit the poorer their performances. Moreover, this causes the mass failure of students in Language and Communication Skills in English. As teachers, we should strive hard to reduce the number of errors committed by our students, if we mean to improve their performance. That is as performance increases, error decreases, and vice versa.

e. On the communicative angle, the study reveals that most of the students' essays are not even readable completely. This is because they are incomprehensible, containing a lot of concord errors and other errors such as spellings, mixed ups, or muddled thoughts. Paragraphs do not contain dominant ideas or apparent cohesive devices, and ideas do not flow smoothly. Similarly, most essays lack text structures, such as introduction, conclusion, topic sentences, supporting details, and linkers.

8 Samples of Concord Use Errors Committed from the Actual Scripts

The following are samples of concord errors observed in the scripts of students.

8.1 Subject-Verb Concord Use Errors

Subject-verb concord errors were observed in these sentences:

(1a) I will never forget the day of my marriage. I inviting all my friendRevised
(1b) I will never forget the day of my marriage. I invited all my friends
(2a) all my friends was happyRevised
(2b) all my friends were happy
(3a) someone called me in my phone he ask me about my fatherRevised
(3b) someone called me on my phone. He asks me about my Father
(4a) it is day that my father gave me somegiftRevised
(4b) it is the day that my father gave me some gifts
(5a) However, I take promise I will read hard to pass all my exam that I am looking forRevised
(5b) However, I took a promise that I will read hard to pass all my exams

9 Summary of the Study

The study was conducted to identify and analyze the concord use that the Diploma 1 students usually make in their essays in Jigawa State. A survey design was used. Seventy-five (75) were chosen from Jigawa State Polytechnic, Dutse, and eighty (80) students were chosen from Jigawa State College of Education, Gumel as the sample for the study. These students were randomly selected. The data was collected using concord error structural and concord error written tests. Four research questions answered in this study are restated below:

1. To what extent do Jigawa State College of Education Diploma 1 students commit concord use errors in comparison to Jigawa State Polytechnic Diploma 1 students in written essays?

2. To what extent do Jigawa State College of Education Diploma 1 students commit subject-verb concord use errors in comparison to their Polytechnic counterparts in filling blank spaces? The following are the summary of the findings emanating from the analyses undertaken in chapter four:
   1. Jigawa State College of Education students commit concord use errors in comparison to Jigawa State Polytechnic students in the written essays as follows:
      i. misuse of subject and verb in a sentence;
      ii. A significant difference in the concord use errors of Jigawa State College of Education students and Jigawa State Polytechnic was found in their written essays.
   2. Jigawa State College of Education students commit subject-verb concord use errors in comparison to their Jigawa State Polytechnic counterparts in filling blank spaces as follows;
      i. inappropriate use of subject, verb, and object in a sentence;
      ii. Poor use of noun subject-verb concord: pronoun subject singular and verb plural
      iii. Improper use of compound subject as singular subject
      iv. Inappropriate use of the verb 'to be'. Poor use of gender concord
      v. There was no significant difference in the subject-verb concord use errors in filling blank spaces among College of Education and Polytechnic students in Jigawa State.

10 Conclusion

In concluding this research report, it must be stressed that the paramount objective of conducting Error Analysis (E.A) is to provide practical information about students' errors. It is also used to suggest ways to remedy them. Therefore, the concord error patterns identified in this study would provide a useful guide to the formulation of an improved English language curriculum. This is for Diploma 1 students more particularly in the areas of concords. Beyond that, these patterns should be tackled right at the secondary school level. If that is done, there will be no need for addressing them at the tertiary level of education. It should also be stated that even though the study is based on concord errors observed in just two institutions. There are sufficient grounds to believe that these concord error patterns can cut across many institutions in the country. At last, the study has established the fact that the Diploma 1 students commit many concord errors in their concord use. These errors have direct adverse effects on the academic achievements of students in English language and communication skills courses.

11 Recommendations

Based on the magnitude of the concord errors found and the findings of this study, the researcher recommends the following:

(a) Students should be encouraged to read widely because a lot of their errors can be eradicated if they read extensively from a variety of literature sources. Students should change their attitudes towards errors. They should realize that it is always good to go over whatever one has written. As teachers, we should make it a point of duty that, our students must edit their work individually, at times collectively. This is before they handle them over to us for marking. They should establish literary and debating societies as well as dramatic club and writers' clubs to help them develop in the use of concord. In addition, these clubs can help them in their verbal and written forms of English. Students also should be encouraged to listen to programs in English such as BBC, VOA, and Cable News Network every day.

(b) Teachers of English should use the identified errors to teach the students. He has a significant role to play in addressing the various errors observed, as committed by the students in this study. He should expose the students, while teaching, to the different rules of concord as well as exceptions to the rules of grammar to avoid the further occurrence of concord errors. However, the students should be exposed to the error patterns before they find themselves making the same mistakes. This will help in reducing the gravity of errors committed. The teacher should organize extracurricular activities. This includes creative writing, editing, proofreading, and publishing in order to improve the linguistic and communicative competence of his students. The situation where teachers give written exercises to students and refuse to mark or mark carelessly with lots of concord errors should be discontinued.

(c) Curriculum developers and textbooks writers should undertake a periodic review of the contents and styles of course materials. This would help them to address the various types of concord errors identified in the structural test and written essay of students in this study. They must provide exhaustively adequate lesson series, drills, and spiral curriculum provisions particularly in the areas of tense concord where students committed many errors. And some structures avoided by them like passive voice and phrasal verbs should equally consider.

(d) The role of the institutions concerned about the findings of this study. They are expected to organize seminars or workshops, especially for lecturers in English and General Studies Departments. The seminar should be organized in order to share ideas on how best to tackle the concord errors found in the study. If the lecturers in these two institutions are exposed to the students' misuse of concord, they will direct their attention towards those areas. By doing this, they will improve the quality of their product. The institutions would provide library facilities to enable the students to have access to relevant textbooks and encourage them to read beyond the recommended text. They should be encouraged to read widely, such as Journals, Magazines, Newspapers, and Reader's Digest- through many concord errors can be reduced.

(e) The need for remedial drills due to several areas of weaknesses. Such concord errors, as earlier noted, found to pose a severe problem to students. Errors include the misuse of tense concord for using present tense as past tense, S-V concord, and pronoun-antecedent concord. And the avoidance of some structures example passive voice and phrasal verbs etc. The above information obtained from EA would help the teacher focus attention on these areas, which need reinforcement. It avoids the teacher for wasting time and energy on areas, which pose little or no problem to students.

(f) More language and communication skills courses should be introduced. There should be an improvement in the use of concord by students in both spoken and written forms.

(g) Jigawa State government should supply enough and updated books that address such concord problems to schools for the teaching of students.

Finally, if the above recommendations were taken into cognizance, students of English as a second language will produce essays that are error-free and such qualitative education and **development would be sustained**. **Sustainability in education** could be achieved in Nigeria when the students make correct sentences, produce excellent and comprehensive essays that will enable them to achieve perfection in their academic pursuit.

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Proposing Revised KHDA Model of School Improvement: Identification of Factors for Sustainable Performance of Dubai Private Schools

Muhammad Azeem, Leonardo Jose Mataruna-Dos-Santos, and Rabeb Ben Abdallah

Abstract

This paper investigates the school's organizational environment and identify the missing links in the current Knowledge and Human Development Authority (KHDA) framework. It is an identification of the new factors which can contribute toward better employees' performance and students' achievement. A high score on these factors justifies the high standards of educational service and the low score indicates the presence of conditions disabling the school improvement efforts of schools. Initial investigation on the KHDA school's data has indicated the inconsistent performance pattern among Dubai private schools. The presence of at least five distinct performance patterns has encouraged in conducting a study to identify the reasons which promote such inconsistent performance behavior. Three cultural factors—the sub-culture of collective leadership, sub-culture of creativity and innovation, and the sub-culture of the learning organization—were identified from the past literature, and the proposed model was examined by applying structural equation modeling techniques. Therefore, two research hypotheses that the performance of employees in good schools is better than the employees working in the struggling schools, and that the difference of the performance is due to the difference in the success factors of organizational culture in schools, were established. Findings have confirmed that school culture plays a vital role in the success of KHDA efforts of school improvement. Good Quality Schools (GQS) are successful because they can provide an environment to its employees which enables them to perform effectively, whereas the employees in Poor Quality Schools (PQS) are struggling due to the unfavorable organizational culture and work environment. The study provides valuable information to struggling schools on how to come out of the vicious circle of poor performance quality. It also highlights the importance of the preexamination of the cultural conditions in the schools before applying any systemic school improvement framework. It is recommended that extending advise and support to underperforming schools for promoting conducive cultural conditions in the school environment will help them to obtain better performance results on the KHDA inspection framework.

Keywords

KHDA • DSIB • Employees' performance • Sustainable school improvement • Organizational culture • Collective leadership • Creativity and innovation • Learning organization

1 Introduction

The Dubai Government established the Knowledge and Human Development Authority (KHDA) by Law No. (30), 2006, to address the National education objectives. Dubai School Inspection Bureau (DSIB) was then established as a subsidiary of KHDA by Decree Number 38 of the Executive Council of Dubai in 2007. The objective of DSIB was to take the responsibility of providing an independent, comprehensive, and reliable assessment of the quality of the education available in Dubai schools. Since 2008, KHDA with the help of its subsidiary DSIB has been evaluating the performance of each private school throughout the year and by the end of each academic year a comprehensive report is published explaining the performance of schools in the State of Dubai

M. Azeem · L. J. Mataruna-Dos-Santos (✉) · R. B. Abdallah
American University in the Emirates, Dubai, United Arab Emirates
e-mail: leonardo.mataruna@aue.ae

M. Azeem
e-mail: muhammad.azeem@aue.ae

R. B. Abdallah
e-mail: rabeb.moalla@aue.ae

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Table 1 DSIB rating scale during 2008–15

Outstanding	Exceptionally high quality of performance or practice
Good	The expected level for every school in Dubai
Acceptable	The minimum level of quality required for Dubai. All significant aspects of performance and practice in every school
Unsatisfactory	Quality not at the level acceptable for schools in Dubai. Schools will be expected to take urgent measures to improve the quality of any aspect of their performance or practice that is judged at this level

along with the rating level as Outstanding, Good, Acceptable, and Weak. At the beginning of the academic year 2015–16, the unified school-improvement program, titled "United Arab Emirates School Inspection Framework 2015–16" was introduced. The new framework has not brought significant structural change and added the two new rating levels: "Very Good" and "Very Weak" in the existing four-level scale. The current study is covering the scope of data during 2008, and 2015 and the old four-level school rating scale was used. Table 1 shows the difference in each level.

For this study, two terms are introduced to simplify the case. One is "Good-Quality Schools" (GQS) and the other, "Poor-Quality Schools" (PQS). GQS are those schools that are rated as "Outstanding" or "Good" and PQS are those rated as "Unsatisfactory" or "Acceptable—with many weak features". The following figure shows the distribution of GQS and PQS from 2008 to 2015 in Dubai (Fig. 1).

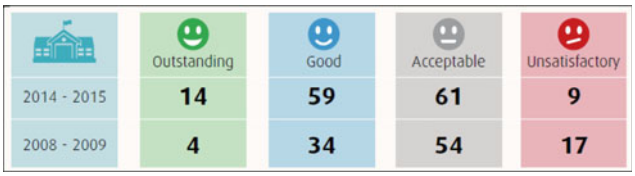

Fig. 1 Number of schools with respect to KHDA rating during 2014–15 and 2008–09. *Source* A Collaborative Journey, 2008–15 Key Findings, KHDA

1.1 Problem Statement

The KHDA school performance data was analyzed to study the performance pattern from 2008 to 2015, and the following five distinct patterns were identified (Fig. 2).

The school improvement pattern was assumed as "Dubai School Improvement Path" (DSIP). Five color-coded patterns are showing the way a typical school has gone through the improvement path. Each pattern is representing a set of schools with almost similar pattern characteristics. For example, 23% of schools were found following the pattern-A. These schools have taken about 4 years to develop the system to achieve the desired success. There are 13% of schools following the pattern-B and have been successfully maintaining the highest rating throughout the 5 years of inspection period.

Similarly, the schools in pattern-C (15%) have improved from "Unsatisfactory" rating level to "Acceptable" rating during 2011–12, but still unable to reach "Good" rating level. Schools in pattern-D persistently restricted at the

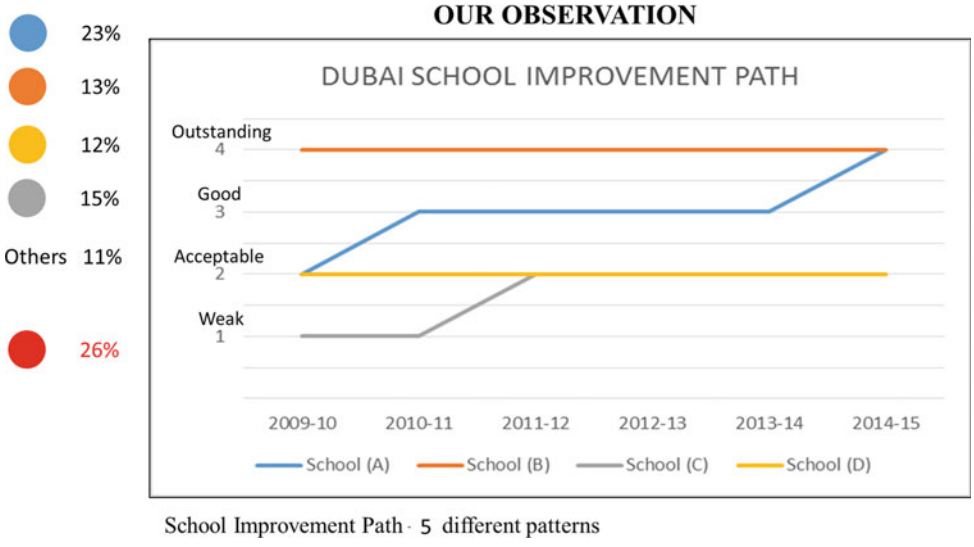

Fig. 2 Comparison of DSIP among a sample of schools including school A, B, C, D

"Acceptable" level. On the other angle, there are about 26% of schools which even could not maintain their achievements during these years and started moving downward. In the presence of a common denominator, which is the KHDA framework of school improvement, the difference in the improvement pattern is the clear indication of intervention from the other factors which are not explicitly explained by the model. Thus, there is a difference between GQS and PQS from their performance in meeting KHDA standards of quality of education services. There is no unique pattern of improvement in these schools over the years. The poor quality of performance is due to the lack of knowledge about those factors which are disabling the systemic efforts of school improvements according to KHDA framework.

1.2 Research Objective and Research Question

The objective of this study is to know, what are those enablers and disablers of KHDA framework, which are not directly observable, but hidden in the organizational culture of the schools.

In order to achieve the research objective, the following research questions were formulated:

1. Is there a difference in the performance of employees in GQS and PQS?
2. What are those factors which affect the performance of employees working in Dubai private schools and disable the KHDA school improvement framework?

2 Literature Review

2.1 Performance Drives Job Satisfaction, Organizational Commitment, and Work Motivation

The DSIB inspection handbook 2015–16 has mentioned that the key objectives of inspection are to see what the student's achievements are, and then the bureau tries to find the reason of such achievements by studying the school education processes. Therefore, in the context of the performance of the school, success means both student's achievement and effectiveness of the performance of employees and underlying organizational processes in the school. Human resource plays a vital role in school effectiveness. It is a value addition to the pupil (Lawan 2012) and the creation of student achievements (Calman 2010). The quality of performance of the human resource is explained by substantial input and purposeful' output of staff (Goh 2003). It could be the individual's behavior (Campbell 1990; Kanfer 1990; Roe 1999; Cerasoli et al. 2014) or the outcomes, or both. From the individual's behavior point of view, it describes the actions people take during jobs (Sonnentag and Frese 2001). From the output point of view, performance is reflected through productivity, and productivity is a basis of performance (Reece 2016; Currall et al. 2005). There is a correlation between school culture and the quality of performance of school staff. Highly ineffective people create highly ineffective school cultures, and highly effective school cultures are created by the highly effective people (Covey et al. 2014). Researchers in organizational behavior have discussed three types of attitudes relating to job performance. They are "job satisfaction", "job involvement", and "organizational commitment" (Robbins and Judge 2009). Positive feelings about the job are the outcomes of satisfaction which an employee drives out of his experience in the workplace. Job satisfaction and job performance are highly correlated (Judge et al. 2001). When people in organizations are comfortable and enjoy their work, they perform better (Margulus and Melin 2004). Such employees can maintain their focus towards the job in hand instead of non-work issues. Performance is also a function of the motivation of employees (Campbell 1990). Satisfied and motivated workers have a direct influence on business performance, profitability, and growth. When employees are not motivated, there will be no growth, no productivity gain, and technological development (Senge 2006). Job satisfaction and motivation are essential criteria for measuring the performance of employees in their job (Cerasoli 2014). Organizational commitment is a prerequisite condition of employees' satisfaction and helps to increase employee performance (Meyer 1989). It is the strength an employee identifies and involves in the organization (Uygur and Kilic 2009). Job satisfaction is highly correlated with the organizational commitment of an employee, and both are considered good predictors of productivity (Papazisi et al. 2005). The performance also has a reciprocal effect (Judge et al. 2001) on job satisfaction, organizational commitment, and work motivation. In other words, it is like producing such behavior that drives productivity, and in reciprocal, it is productivity or performance which drives behavior. From the above discussion, we can conclude that job performance influences and influenced by job satisfaction, organizational commitment, and work motivation.

2.2 Visible Practices in School Organization Which Impact the Job Performance

There is a number of manifest variables or indicators in schools that correlate with the school's effectiveness by influencing the performance of school staff. In the following section, the evidence is being provided from past researches

that explain the relationship between day-to-day practices among employees and their performance.

2.3 Shared Vision Among Employees

Individuals on their jobs have visions, which guide the shared decision-making process in the organizations. According to (Senge 2006), shared visions are emerging from personal visions. When schools have common goals, it is reflected in the students' achievements (Rutter and Maughan 2002). Successful schools clearly articulate their vision, missions, and goals among school staff and leaders extend support towards the building of the shared vision and its implementations (David 2004). Employees are involved in the decision-making process (Bernhardt 2004). Visible practices are such schools for shared vision including involvement of employees in the development of school's mission (employees' involvement), presence of understating about school's purpose and objectives (clarity of purpose), and the clarity about the objectives in their jobs (clarity of objectives).

2.4 Staff Commitment to Achieve School Goal

Clear and committed employees are found participating in the decision-making process (Bernhardt 2004). Such commitment releases the desired energy, which is enough to achieve school vision, and it brings a sense of achievement and ownership among staff. They participate in developing school curriculum, policies, and other developmental activities (Mortimore 1991). The consensus among employees can be achieved through effective collaboration (Bernhardt 2004). The principal can improve the performance of employees by putting himself as a mentor, facilitator, and be available to people in day-to-day affairs (Covey et al. 2014). Such leadership involvement in decision-making will promote the culture of collaboration and trust, which will provide a platform for collective problem-solving in the organization (McNamara et al. 1999). Staff commitment can be found through the visible practices; employees feel ownership in organizational objectives (sense of ownership); there is consensus among all employees on what actions institution is taking to achieve its goal (consensus among employees), and the principal is seen as a facilitator, mentor or coach in day-to-day affairs, leading towards the common goal (leadership support).

2.5 Collaboration and Teamwork

For the collaboration among employees, the shared leadership plays an important role in the development of relationships among employees (Willcocks and Wibberley 2015), and it is essential for the achievement of organizational objectives (Senge 2006; Bernhardt 2004; Carless and Paola 2000). According to Fausing (2015), interdependence among team members and vertically empowered leadership are positively related to shared leadership, and it encourages teamwork. It also mediates in the relationship between shared leadership and team performance (Hoch 2014). Trust among employees is the central element for the sustainable team effectiveness, and the role of leadership is crucial in this case. Thus, effective collaboration among employees can be seen through the visible practices in the organization; trust among employees, the system in place, which keep all members connected with each other (communication system in place) and teamwork at various levels.

2.6 Presence of Challenge in Job

Every organization must meet specific goals in the short and long run (Dubrin 2007). Easy to go work life will not encourage the employee to exercise its creative practices (Sternberg 2003). It requires the work challenge, risk-taking, and experimenting (Goh and Richards 1997). When a person is faced with a challenging problem, he or she will often increase the probability of finding a creative solution (Dubrin 2007). Meeting the academic quality standards in teaching and learning also possesses a challenge for teachers and students, respectively (Calman 2010). When colleagues interact, they compete. If this competition is healthy, it will help in the improvement of their performance. Think win-win (Covey et al. 2014) is one of such characteristics among employees that can help in building an active culture. Visible practices showing the presence of challenge in work include performing within quality specification standards (the challenge of outcome), students' set goals for their next achievements (the challenge of performance), and healthy competition among employees (the challenge of competition).

2.7 Motivation to Take up Challenging Work

Organizational culture can make people more creative (Amabile 1998; Gardner 1994), by cultivating the readiness among staff to deal with new challenging organizational goals. When employees are not motivated, there will be no growth, no productivity gain, and technological development (Senge 2006). Those employees who are motivated to face the challenge are encouraged to be risk-takers. Leaders extend help in solving problems instead of trying to solve the problems themselves (Hanzager and Alexander 1991). The supervisory encouragement for experimentation will help in

provoking creativity among employees (Sternberg 2003). In the effective organization, there is a culture of cooperation among employees in order to deal with challenges. It means that the whole group is engaged in working on a creative idea, as joint ownership (Sternberg 2003). As a result, members of the group or colleagues go out of the way to help each other during a challenging situation. Peer support eases out the decision-making during difficulties, which enhances employees' creativity (Amabile et al. 1996; Politis 2005). The day-to-day practices among staff show that they are found motivated and ready to take up the challenging task which reflects in their risk-taking behavior (they are taking a moderate risk in the job). They enjoy supervisory support (that the supervisor encouragement deals with the challenge) and peer support (that workgroup supports during challenging situations).

2.8 Freedom and Flexibility in Doing Work

Freedom and flexibility in doing the job mean that employees are enjoying enough freedom in their jobs to adopt alternative ways of doing work, and they have flexibility in taking different decisions regarding their work. They have the freedom in planning, a way to do the work, and innovating. It provides a sense of ownership and control over their work (Garavelli and Gorgoglione 2006). Freedom of planning has its roots with the encouragement for creative ideas (Gardner 1994; Amabile et al. 1996; Adams 2005; Johansson 2004) in the organization. For developing creativity, employees must be given a chance to come up with their solutions to the problem in planning as well as during the work themselves, especially for those who have passion in that area or field, as it fosters the creative process (Sternberg 2003). The management needs to purposefully analyze all sources of new opportunities (Drucker 1999) and must support experimentation in work in order to convert the problem into an opportunity (Goh and Richards 1997). Visible practices of autonomy and freedom in an organization includes freedom of planning, freedom in the way the work is to be done (freedom in work), and freedom to innovate.

2.9 Enough Resources to Experiment with New Techniques

Staff requires equipment, stationery, furniture, and enough space to execute their responsibilities. When leaders equip their staff with enough resources to experiment, they are helping their organization to solve challenging problems of the welfare of students, teachers, parents, and the institution's community (McNamara et al. 1999). Time is one of the essential factors for creativity (Amabile 1998). Creative idea and the underlying process have time lags involved, and it comes in bits and pieces (Sternberg 2003). Active organizations allocate enough time to teachers to balance increasing curricular demands (David 2004). Perceived work environment does make a difference, and when employees feel that working on a creative approach will negatively affect their performance, they will never innovate, and continue with traditional practices (Amabile 1998). If employees lack enough knowledge in their domains, they will not be creative (Politis 2005). The presence of the expert opinion among staff also helps employees to take the right actions in various problem-solving situations (Sternberg 2003). Visible practices showing the availability of enough resources to employees include the budget adequacy, nonfinancial resources are in the access of employees, and the expert advisory system is in place to help employees for innovation.

2.10 Leadership Commitment to Encourage Learning

Organizational learning is strongly influenced by the behavior of leaders (Garvin et al. 2008). Leaders must be committed to achieving learning goals in order to achieve organizational objectives (Goh and Richards 1997). Staff development and performance are positively correlated, so are the institution's effectiveness (Calman 2010), and it creates a positive effect on students' outcomes (Mortimore et al. 1988). For that, and to accomplish the present and future tasks successfully, employees need to be willing and able to engage in continuous learning processes (Sonnentag and Frese 2001). Employees are encouraged when their mistakes are considered as another source of learning (Sternberg 2003). Leaders should identify the performance gap among employees, give positive feedback (Rutter and Maughan 2002; Mortimore et al. 1988), help them in setting learning goals by identifying learning needs, in order to minimize those gaps, and create opportunities to learn. The practices which explain the leadership role encouraging learning include encouragement for learning, giving feedback to employees, and creating opportunities for learning.

2.11 Research and Development Practices

Institution as a learning organization makes teachers, researcher, etc., who understand, care, and work for students (Bernhardt 2004). They are encouraged to reach the root

cause of the problem using the scientific approach. Research and development practices mean that employees are involved in the scientific way to approach the goals. Their arguments are based on the real hard evidence and not mere subjective judgment. In such institutions, student's assessment results are frequently used to improve individual performance (David 2004). The effective use of data (Calman 2010) and analyzing information for improved decision-making (Garvin et al. 2008) contribute to the effectiveness of institutions. Data or the right information is a vital element in scientific inquiry. Training on how to gather information and how to process it helps in the development of the culture of scientific inquiry. Visible practices among staff regarding research and development include employees use a scientific approach in making decisions (scientific approach), rewarding research practices, and training in the use of data/research (use of data).

2.12 Knowledge Management Practices

According to Debowski (2006), knowledge management is the process of identifying, capturing, organizing, and disseminating the intellectual assets critical to the organization's long-term performance. Huber (1991), in his model of the learning organization, explained that information distribution, acquisition, interpretation, and storing are vital elements of the learning organization. Dissemination of intellectual assets covers both knowledge sharing practices in the organization and its application to solve day-to-day problems and to meet future organizational challenges. Knowledge management practices visible in organizations act as an enabler of the learning organization (Sanchez 1996). Leaders should create an environment of trust where people can approach each other to share learning (Goh and Richards 1997). Visible practices among staff regarding knowledge management: knowledge acquisition, knowledge application, and knowledge sharing.

2.13 School Organization Culture Is a Set of Many Sub-cultures

A holistic view of school culture has been dropped since 1990 (Houtte 2005). Therefore, school culture is now seen as a set of different sub-cultures, and each sub-culture has subcommunities, which are associated with intricacy (Laksila 1985). Sub-culture should not be taken as parts of a school culture which can be summed up to make the overall culture. They are different concepts of the school's overall culture. They are different angles to investigate the school environment. They are the layers of the environment, and set in a hierarchical order, such that one sub-culture is weaving the other sub-culture.

2.14 Systems and Cultures

Systems are designed or adopted in order to meet specific objectives. Culture creates boundaries for the systems to work. Between culture and system, there is an intervening concept called "Habits". Covey et al. (2014) used the word "habitat" for school culture. They developed an implicit relationship between habits and habitat by relating one to the other. When systems are taken over for a long period, they become habits, and these habits continue, even laws are revoked. Systems are designed and run based on the deliberate efforts of the people who are critical stakeholders of the system. At a single point of time, cultures appear to be a set of distinct elements, whereas, the system is a mechanism of interconnected elements that are placed in hierarchical order. The new system is written according to the culture, and the same system if it persists for an extended period, becomes another feature of the culture. The three sub-cultures identified in the school organizational culture with the help of literature review are sub-culture of learning organization (LO), sub-culture of creativity and innovation (CR), and sub-culture of collective leadership (CL).

2.15 Sub-culture of Learning Organization (LO)

Learning organization is a form of the organization (Garvin et al. 2008) and is referred to as a professional learning community describing institution (Williams et al. 2012)—the community with shared leadership, collective creativity, shared vision, and shared personal practices (Hord 1997). According to (Senge 2006), organizations learn when people working in such organizations are learning, and it allows its members to see the whole together by putting efforts to enhancing their capacity and capability to generate the desired outcomes. It is like keeping the focus on all students and all teachers and determining how to improve everyone's learning (Williams et al. 2012). Becoming a learning organization means that institutions are keeping themselves up-to-date with the given pace of societal and educational change (Hopkins et al. 1994). Three visible practices are considered as the indicators for the presence of the culture of learning organization in schools: leadership commitment to encourage learning (Goh and Richards 1997), research and development practices (Bernhardt 2004), and knowledge management practices (Debowski 2006).

2.16 Sub-culture of Creativity and Innovation (CR)

According to Amabile (1998), creativity is "*the production of novel and useful ideas in any domain*", and innovation is "*The successful implementation of creative ideas within an organization*.". Innovation depends on the ideas, and the primary source of ideas is talented individuals (Leavy 2005). Sternberg (2003) has mentioned various strategies to foster creative practices among children, which can equally be applied in the organizational context. For example; challenges in jobs, risk-taking approach, freedom in work, encouragement for creativity, etc. The KEY model (Amabile 1998) distinguishes between Stimulant and Obstacle scales, which are directly and indirectly related to the creativity, respectively. The conditions supporting creativity include supervisory and workgroup support, autonomy or freedom, availability of resources, and work pressures like challenging work or workload. The conditions unfavorable to creativity include cultural factors like politics among workers and unrealistic work pressure. Four components of the culture of creativity and innovation, which are seen as a regular practice in the organization are the presence of challenges in jobs, motivation to take up the challenging task, freedom to experiment in jobs to exercise creative ideas, and the availability of enough resources to support creative practices in the job.

2.17 Sub-culture of Collective Leadership (CL)

Collective leadership is a concept related to the team instead of the characteristics or style of a person. It is the rational process of an entire team, group, or organization (Hunt and Ropo 1997). Collective leadership is a shared leadership (Covey et al. 2014; Bernhardt 2004; Carson et al. 2007) and it is a dynamic process of achieving common goals through collaboration and teamwork among employees. In this culture, the organization keeps focus on building teams, improving communication, and collaboration among employees (Hoch 2014). The three important components of the culture of collective leadership, which are regular practices in organizations, include shared vision, staff commitment to work for the common goal, and collaboration.

2.18 Meaning of Success for Dubai Private Schools

For DSIB, the effectiveness of the school depends on how better students are making achievement. Therefore, the essence of the school improvement lies in the working conditions and school environment, which creates the desired outcomes among students. When schools are taking up the case of school improvement based on the recommendation of DSIB inspection, they are focusing on the planning about the actions to be taken up by the human resource working in schools. It may include the quality of teaching services, policies, and procedures, curriculum, leadership, and governance, etc. It is necessary for human resources working in the school to perform at or above the expected level of service quality as prescribed by the DSIB. While assessing the quality of education in schools, DSIB keeps focusing on three key areas: Product: What is the quality of learners? Process: How learners are developed? Alternatively, how achievements and personal development of students are acquired? Moreover, Contents: What pedagogy/or resources are employed to equip the process. DSIB evaluates the performance of schools through above six standards by answering the following seven questions.

1. How good are the students' attainment, progress, and learning skills?
2. How good is the students' personal and social development?
3. How good are the teaching and assessment?
4. How well does the curriculum meet the educational needs of all students?
5. How well does the school protect and support students?
6. How good are the leadership and management of the school?
7. How well does the school perform overall?

The first two questions, which are addressing the first goal of KHDA's rating of schools as to "what is the quality of the product?" The second goal as to "how the system is responsible for that quality of outcome", will be answered through the question no 3, 5, and 6. Response to the seventh question is developed with an overall judgment of school performance by using the matrix in the framework.

3 Proposed Framework of School Improvement

The figure below explains the rationale behind this research model. Three sub-cultures, CL, CR, and LO, are linked with each other. The initial level of sub-culture is assumed as the sub-culture of collective leadership (CL). School with this culture has developed a shared vision among school staff, and they collaborate to face common challenges. Understanding of the overall organizational goal will enable employees to align their own work goals with the organizational objectives. This will bring the challenge to their desks, and by this, the culture of CL will be transformed into the sub-culture of creativity and innovation (CR). When

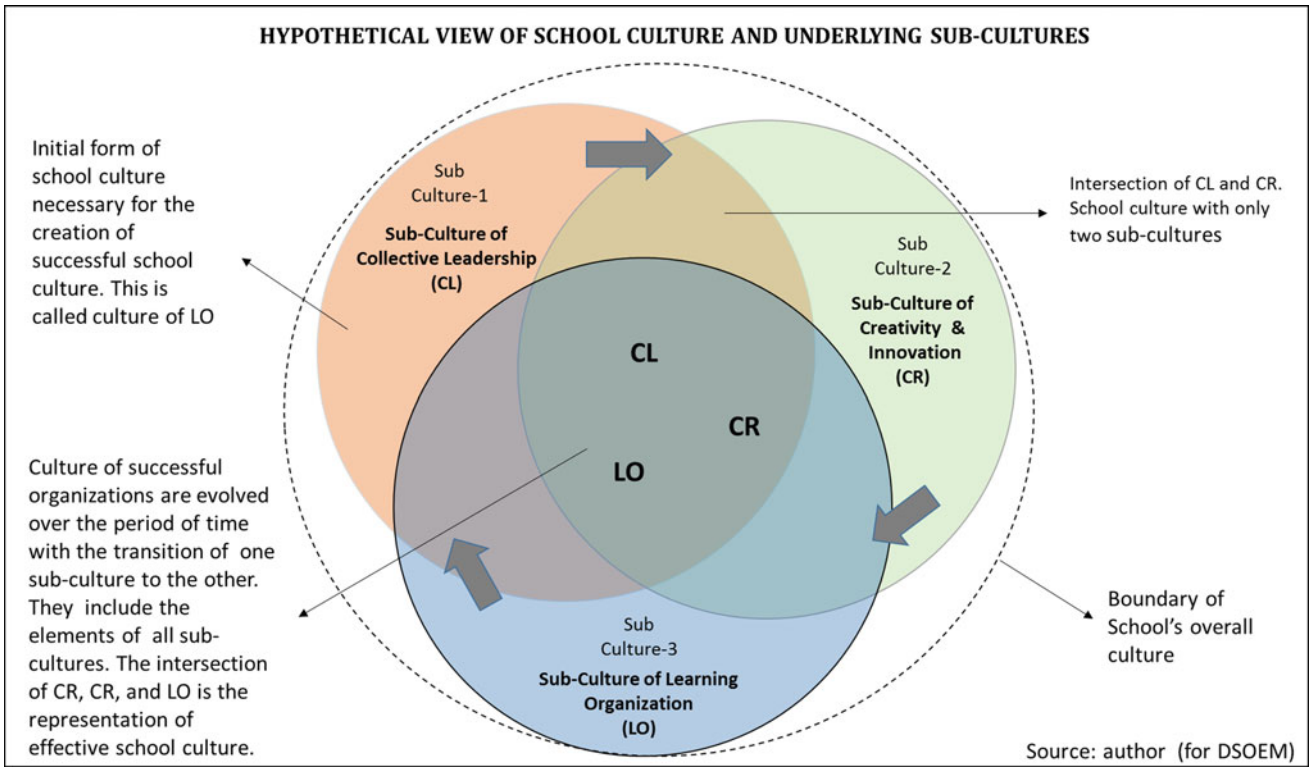

Fig. 3 Hypothetical view of school culture and underlying sub-cultures

school leadership equips them with enough resources to experiment and apply innovative ideas in their work, school culture will enter the domain of learning organization. Competition among staff to innovate and take the lead in helping the school to achieve its objectives will pave the way toward the management of critical knowledge resources present in the organization for the current and future use. Staff training and leadership encouragement for learning will help the school to reach the maturity of sub-culture of the learning organization (Fig. 3).

The presence of three sub-cultures side by side complementing each other will enable school organization to achieve success. The following figure shows the addition of the cultural elements of the current DSIB framework. It shows the cultural as a prerequisite condition for the success of the DSIB framework. Authors have named the proposed model as "Dubai School Organization Effectiveness Model (DSOEM)". The scale items and manifest variables in each construct are given in Appendix 1 (Fig. 4).

The current study assumes that school organizational culture provides the foundation for the employee's performance and achievement relationship. It explains the visible practices of employees during their jobs. The World Bank report (Thacker and Cuadra 2014), has mentioned that high-quality schools are improving because they can do that, while weak schools are not. The report says that "*weaker schools are caught in low equilibrium trap*" The capacity of human resources working in those schools and the quality of resource they use, may not allow them to meet the desired standards despite all their efforts to improve. The following diagram explains the overall picture of the framework. There are three components in the research model: (1) Manifest variables, (2) Latent constructs, and (3) The criterion variable (Fig. 5).

There are three independent latent variables (Appendix 1) measuring the sub-cultures in the school organizational environment. The implicit criterion variable (PR) is a latent dependent variable. It is the behavior measurement of performance influencing the behavior of the employees in the school. The success of the school is considered an organizational success, which is measured with the help of an explicit criterion scale (DSIB rating). It is assumed in the model that the performance of employees and the DSIB rating of the school are highly correlated. Two latent independent variables, including CR and LO, are mediating and are considered as endogenous latent variables.

4 Proposed Model

The following path diagram of the proposed model assumes that the performance of employees (PR) working in Dubai private schools depends on the combination of sub-cultures of CL, CR, and LO (Fig. 6).

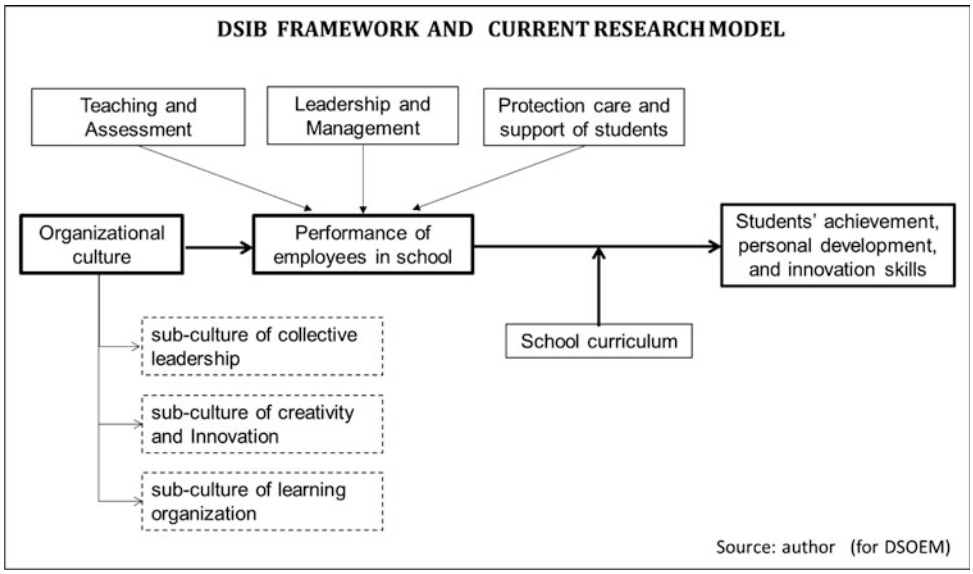

Fig. 4 DSIB framework and current research

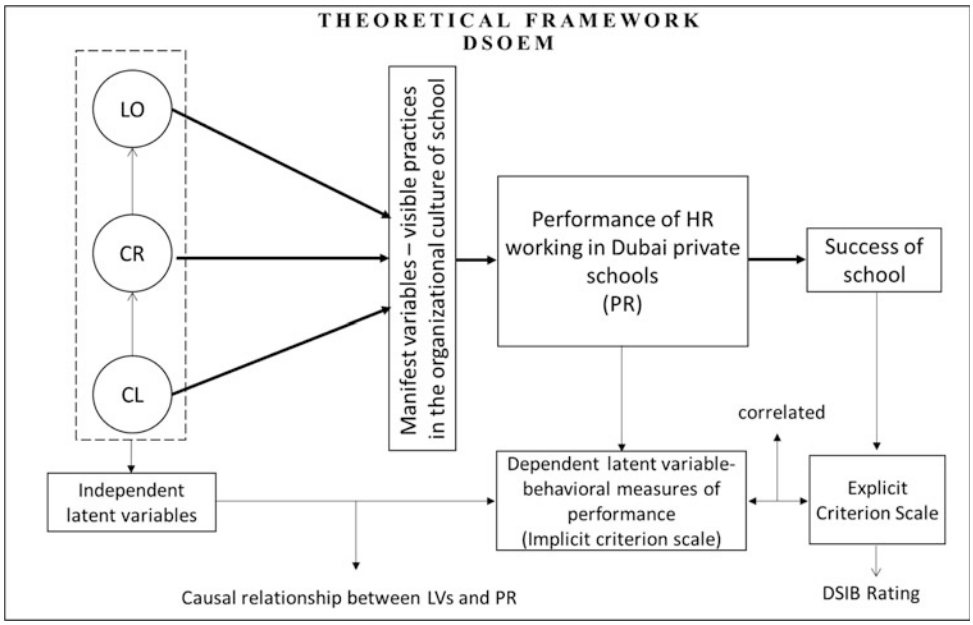

Fig. 5 The theoretical framework of DSOEM

The figure explains the interrelationship among different constructs and corresponding 22 hypotheses framed in this research. There are four latent constructs and 13 manifest variables.

5 Research Methodology

The objective in this research is to understand the underlying cultural factors which determine the performance of human resource working in DPS. There were four constructs which were included in the model, and their interrelationship was studied to test the hypotheses. These hypotheses were explaining the strength and direction of the relationship among variables or factors in the model. The quantitative methods (Hair et al. 2010) are used to obtain generalization by applying statistical analysis techniques. The population in this study includes all staff (teaching and non-teaching) working in Dubai private schools. The study focused on the population of schools that were included in the DSIB report published in 2015 covering the inspection of the academic year 2014–15. According to the report of 2014–15, there were 169 schools, out of which 143 were those whose report was published, and the rating was awarded. The schools which were not included in the report were those which could not meet the prerequisite requirement of inspection, for example, newly established schools.

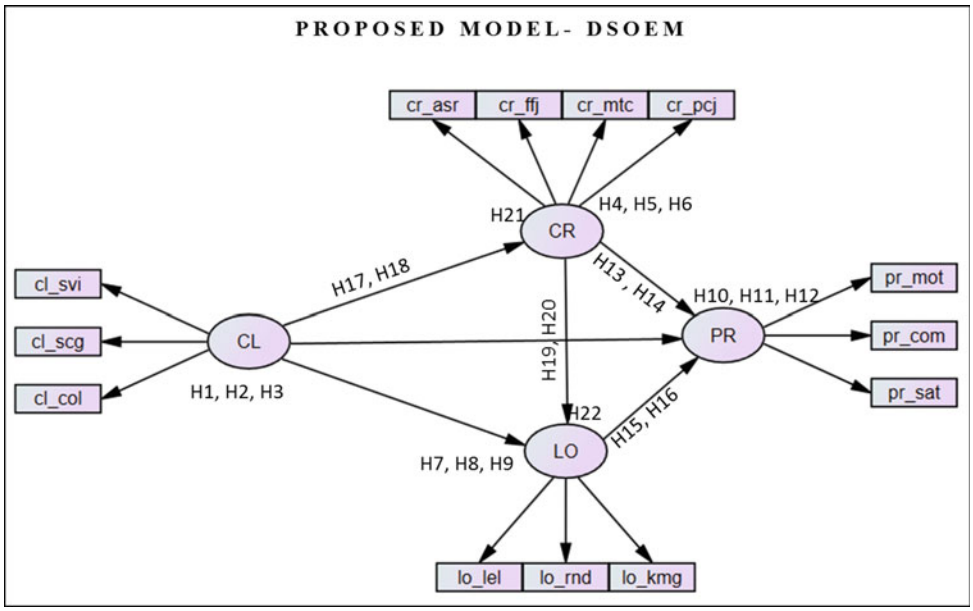

Fig. 6 Propose model—DSOEM

Respondents in this population consist of the following three categories:

(a) Teaching Staff: Those who are appointed as teachers in any class from K-3.
(b) Non-Teaching Staff: Those who are not teaching but involved in school jobs like supervisors, coordinators, admission staff, and examination department staff.
(c) SLT: Senior Leadership team: this category includes principals, vice principals, and other members of the senior leadership team.

Current research is an empirical study and requires establishing the generalizability of the proposed model with the sample data. Therefore, survey research was considered a suitable strategy for data collection. One random sample is drawn from each of the two target infinite populations. Among sampling methods, probability sampling was preferred where each element of the population has an equal probability of being chosen. The research instrument was distributed electronically and analyzed on SPSS and AMOS software.

Upon the face validity test, the experts reviewed the items and recommended a few items to be removed from the scale. The final instrument was carrying 39 items (Appendix 2, Table). There were five choices on the Likert scale with 5 as "strongly agreed" to 1 as "strongly disagreed". The reason to include a five-point Likert scale was to achieve the status of a continuous scale (Cohen et al. 2003). In the academic year 2014–15, there were 14 outstanding schools, 59 good schools, 61 acceptable, and nine unsatisfactory schools. Thus, total GQS was 73, and PQS was 70. Five schools were selected at random from each population, and the data was collected. From GQS, 342 responses were received, and from the population of PQS 329 responses were received. The issue of missing data was handled by imposing a condition on the survey setting, as the questions were made mandatory to be replied. The only concerned was the unengaged responses. To address this potential issue, the responses from each subject were analyzed by calculating the standard deviation among responses, and all such cases were removed from the data where SD was zero. It was decided to keep the sample size equal in each population, and 300 samples were finally included in the analysis. The multicollinearity was examined by measuring the variance inflation factor (VIF) and the tolerance ratios. The outcomes of the normality and multicollinearity all are given in Appendix 3. The proposed model was initially examined through the exploratory factor analysis to verify whether the hypothesized factors coexist with the underlying manifest variables (Appendix 4). The decision about the number of factors was taken based on the eigenvalues greater than 1. By default, SPSS uses the KMO criterion of retaining factors with eigenvalues greater than 1 (Field 2013). As a rule of thumb, factor loading above 0.50 is enough to make a claim for the convergent validity, and on average, it should be above 0.70. In EFA, pattern matrix is quite helpful to determine the discriminant validity. We can also use the factor correlation matrix for studying discriminant validity. According to this matrix, the correlation between factors should not be greater than 0.70, which is the indication of shared variance. By calculating R2, the percentage of the share can be found. Pattern matrix can also help in determining the face validity, though it is subjective; variables loading on one viable can be explained for some common theme. CFA is used to examine construct validation and

whether a measure is invariant across groups, population, and time (Harrington 2009). According to Hair (2006), there are different criteria to examine the convergent validity. First is by looking into the factor loadings. They should be significant (p-value < 0.05). Second, all standardized regression coefficients should be greater than 0.50. Third, the average variance extracted (AVE) should be more than 0.50 for all factors. According to Fornell (1981), discriminant validity can be examined by calculating the square of the correlation between the two constructs, and this should be less than the corresponding AVE. Hair et al. (2010), have provided a threshold to examine the reliability and validity of the constructs. The measures used are Composite Reliability (CR), Average Variance Extracted (AVE), Maximum Shared Variance (MSV), and Average Shared Variance (ASV). The proposed model has qualified validity tests (Appendix 5).

The data was loaded on AMOS to run CFA on all 39 items. The goodness of fit indices was examined for model chi-square, CFI, TLI, and RMSEA. CFA confirms the loadings of all scale items on the four factors as they were hypothesized (Appendix 5). The Structural Equation Modeling (SEM) was chosen as the primary technique due to its capability to deal with multivariate models. SEM is a quantitative method for testing theories by explicit accounts for measurement error—which is ever-present in most disciplines (Harrington 2009). SEM has two parts. The measurement model is used to examine the relationship between manifest variables and their underlying constructs, whereas the structured model examines the relationship between the latent constructs.

5.1 Measurement Model

In CFA, it is assumed that the variance in each indicator was caused by the latent factor. The error term with the manifest variable shows the unique variance which explains measurement error, error variance, or indicator unreliability (Harrington 2009). The following diagram shows the proposed measurement model in SEM (Fig. 7).

The objective of CFA is to obtain estimates for each parameter of the measurement model including factor loadings, factor variances and covariance, variable error variances, and possibly error covariances, that produce a predictive variance–covariance matrix (Σ) as jointly as possible (Brown 2006). Multiple fit indices are suggested to explain the fitness of the CFA model. The proposed model has qualified the goodness of fit tests and can be seen at Appendix 6.

5.2 Structured Model

Once the proposed constructs were analyzed through EFA and CFA; the structured model is required to be tested for studying the relationships among constructs and to test the model hypotheses. The four latent variables used in this structural model are CL, CR, LO, and PR. LO is an independent latent variable. The initial form of the proposed model (Appendix 7, Fig. 1) shows a weak relationship from CL to PR and from CL to CR. Therefore these two paths were omitted, and the alternate form of the model was tested (Appendix 7). The model was then examined for the best fit.

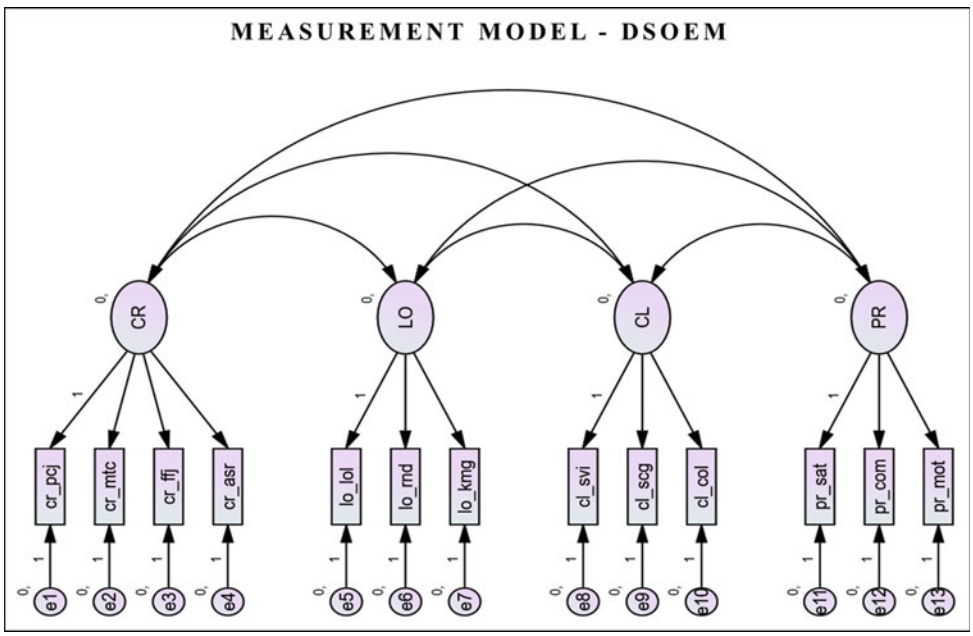

Fig. 7 Proposed measurement model

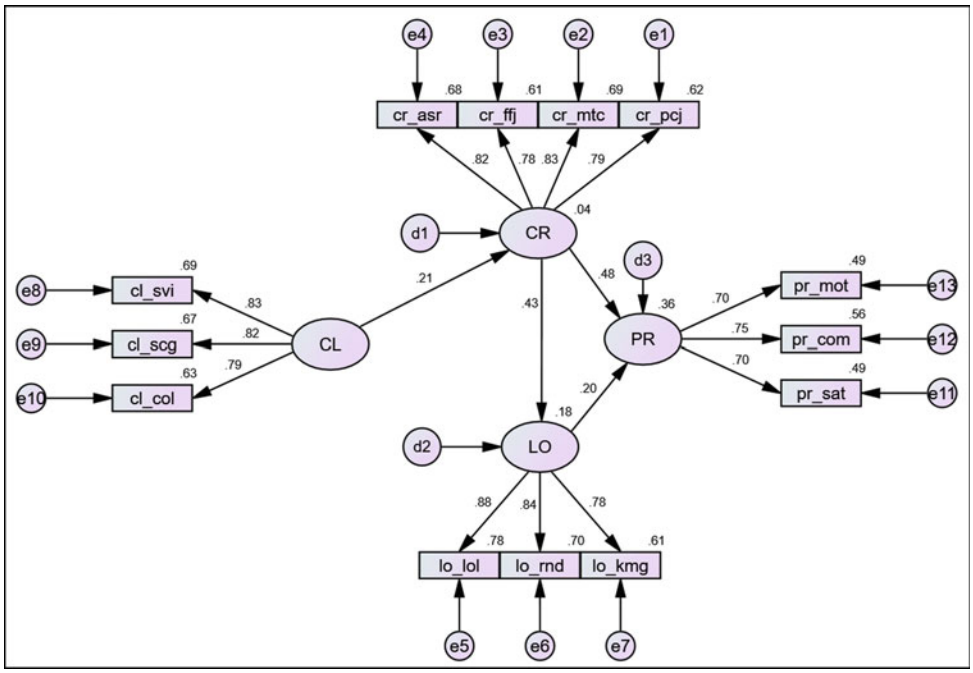

Fig. 8 Proposed structured model (final form)

CR and LO are two latent mediating variables are and called endogenous variables. PR is the dependent latent variable. It is also called endogenous variable, which depends on the other three latent variables. CR is mediating in the relationship between CL and PR, and similarly, LO is mediating between CR and PR. The arrows go out of the CL and CR to show the independent position. Moreover, arrows entering LO and CR show the dependent positions in the structural model (Fig. 8).

The model is recursive, which shows a unidirectional relationship between the variables. With each endogenous variable en, the error term is also attached. There are three error terms, d1, d2, and d3 associated with CR, LO, and PR, respectively. These error terms cater to the influence of factors other than the independent variable in the relationship. The same fit indices can be used to judge the fitness of the structured model, as they were in the CFA. The final form of the structured model has qualified the goodness of fit test, and the AMOS outcome is given in Appendix 8.

5.3 Multigroup Analysis

One of the significant advantages of CFA is the ability to examine the equivalence of the measurement and structural models across multiple groups (Brown 2006). As the current study is the comparison between the performances of schools in two different populations, it is essential to examine the compatibility or equivalence of the proposed model for the sample drawn in each population. The multiple groups CFA compares groups within the latent variable measurement model context, adjusting for measurement errors, correlated residuals, and it involves simultaneous CFAs in two or more groups using separate variance–covariance matrices for each group (Harrington 2009). We are considering equal sample size and the same metric in both groups in order to achieve simplicity in the model. For this purpose, the 5-point Likert scale was used to measure the response from both samples. The measurement and structured model were examined for the difference between the configural-invariance model and the metric-invariance model. In configural-invariance assumptions, the parameters of the model can estimate freely. It means that the factor loadings in the measurement model are free to take any value based on the sample data in two sets. The metric-invariance model is a fully constrained model and the parameters are set to equal for two groups. The imposing constraint will add the control in the analysis, and the two samples would be considered for the standard model configuration. The $\chi 2$—difference test was used to test the invariance across the groups. In other words, $\chi 2$—difference test examines whether adding constraints significantly changes the fit of the model. Appendix 9 provides the AMOS output of the group analysis of the proposed model, which shows that the model fits equally well to both populations.

5.4 Mediation

There are a few paths which contain the mediating variable. Mediating or intervening variables are those which stand in

between the relationship between two variables. In order to study the mediating effect of any variable, the analysis is run at two levels. In the first place, the direct effect is studied between two variables without including the mediating variable. In the second stage, the direct effect between the two variables is studied by including the mediating variable. If the significant difference appears, it confirms that there is an indirect effect on the relationship. The proposed model was studied for the mediation, and AMOS output is given in Appendix 10. Results show that CR mediates between CR and PR, and LO mediates between the CR and PR.

5.5 Testing for Mean Difference in Variables for Two Population

In this section, the statistical comparison will be provided to study the difference in the populations of GQS and PQS with respect to the means of the model variables. There are 13 manifest variables and four latent variables. Each manifest and latent variable was examined for the mean difference by assuming samples from two independent populations. The *t*-test at *p*-value less than 0.05 confirms that there is a significant difference in two populations for the mean value of the variable. The output of the mean difference test is given in (Appendix 11).

5.6 Hypothesis Testing

Table 2 provides evidence of the model hypothesis for acceptance or rejection; it also provides the statistical evidence of the hypothesis tests used in the model.

6 Discussions

The purpose of this study was to identify the success factors of the performance of the employees working in Dubai private schools, which guides them to obtain success for their school. The proposed research framework was designed to help struggling schools by increasing their understanding of the factors which stops them from entering the domain of good quality schools. The literature review has helped in identifying the factors of organizational culture, which provides the playfield to obtain success by creating the school organizational culture from basic to the adequate performance level. These factors were identified as the sub-cultures prevailing in schools' overall organizational culture. They coexist, and one gives birth to the other. By looking at these factors of organizational culture, school leadership and other stakeholders can find the performance status of their organization. It also identifies the gap between the desired and current state of affairs in the day-to-day practices among employees. The key objective in this research was set to develop the model of the effectiveness of the performance of HR working in Dubai private schools. The aim in the current study was to understand the reasons for inconsistent improvement pattern among schools, and what are those factors which are disableling the DSIB framework to create success in many PQS. The study has examined that the difference in the school's organizational culture causes a difference in the performance of the employees, which is reflected in the overall rating of the school?

The influence of employee's performance was measured with the help of three manifest behavioral variables: job satisfaction, organizational commitment, and work motivation. The following hypotheses were examined to test the presence or absence of the three manifest variables in GQS and PQS. Data analysis has provided evidence that a majority of employees in GQS are highly satisfied and the majority of employees in PQS are dissatisfied, and there is empirical evidence of the significant difference in the level of job satisfaction between employees working in GQS and PQS. Similarly, a majority of employees in GQS are highly committed to their organizations, and the majority of employees in PQS are highly non-committed with their organizations, and there is empirical evidence of the significant difference in the level of organizational commitment between employees working in GQS and PQS. For the motivation, data analysis has provided evidence that a majority of employees in GQS are highly motivated in their jobs, and a majority of employees in PQS are highly demotivated in their jobs, and there is empirical evidence of the significant difference in the level of work motivation between employees working in GQS and PQS. Thus, we can conclude that empirical evidence supports the hypotheses that effective behavior is due to the adequate performance of the employees, and ineffective behavior is the reflection of the reduced performance level of employees. This result confirms (Covey et al. 2014) that the highly ineffective people create highly ineffective habitat (school culture) and highly ineffective habitat creates highly ineffective people. It is also confirming Goh (2003), (Goh and Richards 1997) that the quality of performance of the human resource is explained by substantial input and purposeful output of staff.

Sub-culture of collective leadership was measured with the help of three manifest variables: shared vision, the commitment of employees to achieve school vision, and collaboration among employees. The number of hypotheses was examined to test the presence or absence of these three manifest variables in GQS and PQS. Data analysis has provided empirical evidence that employees in GQS have a shared vision, they are highly committed to achieving school vision, and they collaborate in order to achieve common

Table 2 Summary of the research hypotheses

	Hypothesis	Empirical support
H1	In GQS, there is evidence of effective practices among employees that are followed and adopted due to the presence of the sub-culture of collective leadership	Supported
H2	In PQS, there is evidence of ineffective practices among employees which are followed and adopted due to the absence of the sub-culture of collective leadership	Supported
H3	There is a difference between GQS and PQS concerning the sub-culture of collective leadership	Supported
H4	In GQS, there is evidence of effective practices among employees that are followed and adopted due to the presence of the sub-culture of creativity and innovation	Supported
H5	In PQS, there is evidence of ineffective practices among employees which are followed and adopted due to the absence of the sub-culture of creativity and innovation	Supported
H6	There is a difference between GQS and PQS concerning the sub-culture of creativity and innovation	Supported
H7	In GQS, there is evidence of effective practices among employees that are followed and adopted due to the presence of the sub-culture of the learning organization	Supported
H8	In PQS, there is evidence of ineffective practices among employees that are followed and adopted due to the absence of the sub-culture of the learning organization	Supported
H9	There is a difference between GQS and PQS concerning the sub-culture of the learning organization	Supported
H10	In GQS, there is evidence of active behavior among employees which is due to their effective performance in jobs	Supported
H11	In PQS, there is evidence of ineffective behavior among employees which is due to the influence of their ineffective performance in jobs	Supported
H12	There is a difference between GQS and PQS concerning the employees' performance	Supported
H13	There is a significant direct positive relationship between the (CL) and (PR) in GQS	Not supported
H14	There is a significant direct positive relationship between the (CL) and (PR) in PQS	Not supported
H15	There is a significant direct positive relationship between the (CL) and (LO) in GQS	Supported but weak
H16	There is a significant direct positive relationship between the (CL) and (LO) in PQS	Not supported
H17	There is a significant direct positive relationship between the (CL) and (CR) in GQS	Supported
H18	There is a significant direct positive relationship between the (CL) and (CR) in PQS	Supported
H19	There is a significant direct positive relationship between the (CR) and (PR) in GQS	Supported
H20	There is a significant direct positive relationship between the (CR) and (PR) in PQS	Supported
H21	There is a significant direct positive relationship between the (LO) and (PR) in GQS	Supported
H22	There is a significant direct positive relationship between the (LO) and (PR) in PQS	Supported
H23	There is a significant direct positive relationship between the (CR) and (LO) in GQS	Supported
H24	There is a significant direct positive relationship between the (CR) and (LO) in PQS	Supported
H25	The variable (CR) mediates in the relationship between the (CL) and (PR)	Supported
H26	The variable (LO) mediates in the relationship between the (CR) and (PR)	Supported

goals. Whereas, the employees in PQS lack in keeping the shared vision, commitment to achieve school vision, and collaboration. There is empirical evidence that a significant difference was found in the presence of a sub-culture of collective leadership between GQS and PQS. Data analysis has provided valid evidence that the performance of employees in Dubai private schools is influenced by the degree to which sub-culture of collective leadership prevails in the school's organization. Research findings confirm Senge (2006), Bernhardt (2004), McNamara et al. (1999), David (2004), Hoch (2014), Covey et al. (2014, and Fausing et al. (2015) that for greater success among students the institution should be moving toward the common goal, which is clearly articulated and shared among all staff, which should be motivated and committed to achieving common goals through proactive involvement in decision-making and trust among each other.

Sub-culture of creativity and innovation was measured with the help of four manifest variables: the presence of challenges in jobs, employees' motivation to face the challenges, flexibility, freedom in jobs, and availability of enough resources for experimentation. Data analysis has provided empirical evidence that employees in GQS are having a challenge in their jobs, they are motivated to face the challenge, they have freedom and flexibility in their work, and they are provided with enough resources to

experiment. Whereas, the employees in PQS lack in all four variables. They are not keeping the challenge in the jobs and avoid entering challenging situations because they are not encouraged to do so, and they maintaining a low level of motivation to face the challenge. They are also not empowered sufficiently in their jobs, and not equipped for exercising creativity in their work. Thus, there is empirical evidence that a significant difference was found in the presence of a sub-culture of creativity and innovation between GQS and PQS. Data analysis has provided valid evidence that the performance of employees in Dubai private schools is influenced by the degree to which sub-culture of creativity and innovation prevails in the school's organization. Current findings support the views of Amabile (1998), Goh and Richards (1997), (2006), Calman (2007), Dubrin (2007), Lynch and Smith (2016) that the challenge in jobs and experimentations provokes creative practices and increases the organizational ability to succeed.

Sub-culture of learning organization was measured with the help of three manifest variables: leadership commitment encourages learning among employees, research and development practices, and knowledge management practices. The number of hypotheses was examined to test the presence or absence of these three manifest variables in GQS and PQS. Data analysis has provided empirical evidence that employees in GQS have found their school leadership motivating them toward learning during their jobs; they are involved in research and development practices, and found acquiring, applying, and sharing knowledge in the organization. Whereas in the PQS, employees did not find their leaders motivating them for learning, they were not encouraged to involve in research and development practices and sharing, applying, and acquiring critical knowledge in their jobs. Thus, there is empirical evidence that a significant difference was found in the presence of a sub-culture of learning organization between GQS and PQS. Data analysis has provided valid evidence that the performance of employees in Dubai private schools is influenced by the degree to which sub-culture of learning organization prevails in the school's organization. The current findings confirm the views of Senge (2006), Bernhardt (2004), Preuss et al. (2003), Sternberg (2003), Debowski (2006), Calman (2007), Calman (2010), Garvin et al. (2008), Lawan (2012) saying that leadership must realize the importance of creating a learning organization, and they should encourage employees toward research and development activities, experimentation, data-driven decision-making, and knowledge management practices.

The study has provided empirical evidence that there is no direct positive relationship between CL and PR in both populations. This indicates that the sub-culture of collective leadership requires the presence of some intervening cultures, which ultimately will determine the performance of employees. The study has confirmed that the culture of collective leadership invites the involvement of senior leaders toward the development of the cultures of creativity and innovation and learning organization. The study has provided empirical evidence in support of the hypothesis in the population of GQS, whereas such support was not found for PQS. Study indicates that even in PQS, the relationship is just significant and cannot be treated as a strong significant relationship. Therefore, it is justifiable to say that the sub-culture of collective leadership will not create a visible impact on the creation of sub-culture of learning organization unless there is a mediating culture of creativity and innovation exist. The indirect relationship between CL and LO was found to be significant and shows a considerable effect on the performance of employees. The study has provided strong evidence supporting the direct positive effect of the presence of sub-culture of collective leadership on the creation of sub-culture of creativity and innovation. This finding also justifies the mediating role of sub-culture of creativity and innovation in the relationship between CL and PR as well as between CL and LO. The study provides strong empirical support for the direct relationship between the sub-culture of CR and the performance of employees. The employees in PQS are underperforming because of the absence of the visible practices influenced by the sub-culture of creativity and innovation. Whereas in GQS, such practices are very much evident in day-to-day activities in school. The study provides strong empirical support for the direct relationship between the sub-culture of LO and the performance of employees. The employees in GQS can perform at the expected level because of the presence of the visible practices influenced by the sub-culture of the learning organization, in PQS such practices are absent or very weak. The study has provided empirical support in favor of the relationship between the sub-culture of creativity and innovation and the sub-culture of the learning organization. Both variables are also causing an impact on the performance of employees. The relationship between CR and LO justifies their role as a mediating variable in the relationship between CL and PE, which was weak otherwise in the absence of these two variables.

The study has provided empirical support in the mediating role of CR and LO in the relationship between CL and PR. Sub-culture of collective leadership is the foundation layer of the organizational culture. The study has shown a weak impact of CL on LO and PR. However, these impacts are high when the sub-culture of creativity and innovation intervene between them. This justifies the presence of layers of sub-cultures in the organizational environment. The sub-culture of collective leadership leads to the sub-culture of creativity and innovation. The shared vision among employees and their motivation to achieve school vision produces the challenge in front of them. When school

leadership equips them through enough resources and encourages them for experimentation by allowing freedom and flexibility in their jobs, the culture of creativity and innovation is inevitable. Ultimately this transforms the school culture into the sub-culture of the learning organization, which is the highest in the hierarchy in the proposed model. Freedom and culture of experimentation will force employees to search for the critical knowledge centers in the organization. They will participate in the activities which will help them in the identification of critical knowledge, manage such knowledge resources, and use them further to enhance their performances. The culture of learning organization will take the organization to the level where employees will be proactively engaging in the success of the school. Therefore, the mediating role of PR and LO is according to the hypothesized constructs and their interrelationship in the proposed model. This role is also confirming the views of Hord (1997), stating that the community with shared leadership, collective creativity, shared vision, and shared personal practices will be a learning community. It also confirms Senge (2006) that organizations learn when people working in such organizations are learning, and it allows its members to see the whole together by putting efforts to enhance their capacity and capability to generate the desired outcomes. Similarly, Williams et al. (2012) said that learning organization is like keeping the focus on all students and all teachers and determines how to improve everyone's learning.

6.1 Theoretical and Managerial Implications

The goal of this study was to provide a framework for struggling schools which can be used as a success model and can be understood within the context of the current DSIB inspection framework. The three success factors CL, CR, and LO, are providing the foundation to the school's organizational environment which affects the practices and behavior of employees in teaching and assessment, governance, leadership, management of school operations, protection, care and support, protection to students, staff and other members of the school community. Current research shows that in order to be effective in the efforts to obtaining a higher rating, these schools must build their capacity to improve instead of short-time fixes or bought templates of other organizations (Kaplan and Norton 1996). The understanding of primary factors of improvement can increase the sustainability of the organization (Campbell et al. 2004). For managers, it is necessary to understand the interaction between three sub-cultures. The current study has proven that the presence of collective leadership is a foremost step towards success, but it alone cannot guarantee the improvement in the quality of performance. Schools must allow sub-culture of collective leadership with enough time so that it grows to maturity and transforms into the sub-culture of creativity and innovation. Sharing leadership role with other members of the organization will lead to information sharing and motivation to face the common challenge of organizational success. When these employees with leadership qualities are equipped with enough resources and freedom to experiment, the efficiency and innovation will be inevitable at every level in the organization. Leadership encouragement for learning during the job will be a doorstep to creating a learning organization (Goh and Richards 1997).

6.2 Limitations of the Study

The number of limitations was associated during the study. It is essential to list such limitations so that readers can understand the perspective of current research.

1. The qualitative data was not gathered, which could have increased the quality of the research findings.
2. Many schools were reluctant to provide information through the survey, and the response was very poor.
3. The current study covers the scope of the DSIB framework 2014–15 only.
4. This study is limited to private schools in Dubai.
5. Many factors like the type of curricula, gender difference, age of the organization, nationality, and income group of families whose children are studying in schools, were not included in the study which could influence the research findings.

6.3 Significance

The current research provides significant support to all stakeholders of Dubai private schoolsand how they can relate their performance and success with the organization's culture. It also enables school leaders to focus on those critical cultural factors which matter and affect the performance of their employees, which ultimately will affect the students' achievement. The KHDA framework lacks in explaining exclusively the cultural factors which can affect the performance level. The current study has filled that gap, and DSOEM provides an additional angle to the performance and school improvements. When it is seen in the context of the KHDA framework, the model provides comprehensive ground to schools for making progress.

6.4 Future Research Direction

1. Current research can be reexamined on the larger population of schools in other states of UAE, and in other countries.
2. The current model can be studied on the population of institutions of higher education.
3. The current model can be tested on the non-academic organizations to see the scope of the model.
4. The current model can be revisited for the latest 6-point scale of the DAIB framework.
5. The study can be extended to other countries and other school improvement models which do not cover the cultural elements in their framework.
6. Qualitative data would increase the validity of the findings in current quantitative research.

7 Conclusion

School culture plays an essential role in the effectiveness of employees' performance. GQS are successful because they can provide the environment to its employees, which enable them to perform effectively. The employees in PQS are unable to perform effectively because the school environment or culture lacks in the key feature. The proposed model assumes that the sub-culture of the learning organization is the outcome of the sub-culture of creativity and innovation in school. The environment of creativity and innovation has emerged when the school organization has developed the sub-culture of collective leadership, where all employees are working for the common goal. This will guide them to set their own goals in their jobs. The setting of goals will set the challenge, and leadership skills along with the presence of challenge will be leading steps towards creativity and innovation. The creative behavior of employees is reflected through the innovation in their work during problem-solving. Employees start realizing the importance of critical knowledge, which will help them to efficiently meet the goals in their jobs. The presence of three sub-cultures in the overall organizational culture of the school will increase the capacity and capability of employees to the level where they can achieve organizational goals including the goal of obtaining the DSIB rating of GQS. The culture of collective leadership will not produce significant improvement in the performance of the employees unless it transforms into the sub-culture of creativity and innovation. Moreover, this will lead to the emergence of a learning organization.

Appendix 1

Variables in the proposed model

Construct (LV)	MV and their definition	Items	No. of items
Habits and practices constituting the sub-culture of Collective Leadership (CL)	Measures of shared vision prevail among employees (SV)	cl_svi	3
	Measures of staff commitment to achieve shared vision (SC)	cl_scg	3
	Measures of collaboration among employees (CO)	cl_col	3
Habits and practices constituting the sub-culture of Creativity and Innovation (CR)	Measures of presence of common challenge among employees (CW)	cr_pcj	3
	Measures of staff motivation to face the challenge (MC)	cr_mtc	3
	Measures of autonomy or freedom employees enjoy in their work (FJ)	cr_ffj,	3
	Measures of degree to which resources are made available to exercise innovative ideas in work (SR)	cr_asr	3
Habits and practices constituting the sub-culture of Learning Organization (LO)	Measures of leadership commitment encourage learning (LC)	lo_lel	3
	Measures of degree to which research and development practices are prevailing among employees (RD)	lo_rnd	3
	Measures of degree to which knowledge management practices are prevailing among employees (KM)	lo_kmg	3
Behavior of employees influenced by their performance (PR)	Measures of influence of performance on job satisfaction (JS)	pr_sat	3
	Measures of influence of performance on the organizational commitment (OC)	pr_com	3
	Measures of influence of performance on the work motivation (WM)	pr_mot	3
3 LVs	13 MVs		39 items

Appendix 2

Scale	No. of items	Mean	Variance	Cronbach's alpha		Reliability
				GQS	PQS	
Performance scale (PR)	9	34.88	15.598	0.782	0.764	Acceptable (good)
Collective leadership scale (CL)	9	30.15	27.084	0.871	0.899	Acceptable (very good)
Creativity and innovation scale (CR)	12	47.96	29.319	0.890	0.888	Acceptable (very good)
Learning organization scale (LO)	9	32.51	27.829	0.870	0.896	Acceptable (very good)

Appendix 3

See Tables 3, 4, 5 and 6.

Table 3 Descriptive statistics of composite variable "performance" (GQS and PQS)

	GQS	PQS
Mean	34.88	19.72
Std. deviation	3.949	3.863
Skewness	–0.588	0.413
Kurtosis	1.131	1.212

Descriptive Analysis of the Sub-culture of Collective Leadership (CL) Scale

Table 4 Descriptive statistics of composite variable "collective leadership" (GQS and PQS)

	GQS	PQS
Mean	30.15	24.31
Std. deviation	5.204	5.816
Skewness	–0.445	0.740
Kurtosis	–0.260	0.096

Descriptive Analysis of the Sub-culture of Creativity and Innovation (CR) Scale

Table 5 Descriptive statistics of composite variable "creativity and innovation" (GQS and PQS)

	GQS	PQS
Mean	47.96	25.61
Std. deviation	5.415	5.879
Skewness	–0.648	0.784
Kurtosis	–0.865	–0.521

Descriptive Analysis of the Sub-culture of Learning Organization (LO) Scale

Table 6 Descriptive statistics of composite variable "learning organization" (GQS and PQS)

	GQS	PQS
Mean	32.51	21.18
Std. deviation	5.275	5.284
Skewness	–0.487	0.528
Kurtosis	–0.005	–0.051

Appendix 4

Exploratory Factor Analysis on the Sample of GQS

The following table shows the KMO and Bartlett's test measuring the sample adequacy for the multivariate analysis on the sample of GQS.

See Tables 7, 8, 9, 10, 11, 12, 13 and 14.

Table 7 KMO and Bartlett's Test (GQS)

KMO and Bartlett's test		
Kaiser–Meyer–Olkin measure of sampling adequacy.		0.832
Bartlett's test of sphericity	Approx. Chi-Square	1873.298
	df	78
	Sig.	0.000

Table 8 Total variance explained (GQS)

Total variance explained							
Factor	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	
1	4.633	35.635	35.635	4.240	32.616	32.616	3.554
2	2.212	17.015	52.650	1.863	14.333	46.949	2.903
3	1.662	12.783	65.432	1.375	10.579	57.528	2.205
4	1.221	9.395	74.827	0.821	6.314	63.842	2.680
–							
Extraction method: maximum likelihood							
a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance							

Table 9 Pattern matrix (GQS)

	Factor			
	1	2	3	4
cl_svi			0.849	
cl_scg			0.814	
cl_col			0.774	
cr_pcj	0.770			
cr_mtc	0.818			
cr_ffj	0.806			
cr_asr	0.809			
lo_lol		0.864		
lo_rnd		0.868		
lo_kmg		0.762		
pr_sat				0.583
pr_com				0.832
pr_mot				0.674

Table 10 Factor correlation matrix (GQS)

Factor correlation matrix				
Factor	1	2	3	4
1	1	0.413	0.198	0.537
2	0.413	1	0.210	0.393
3	0.198	0.210	1	0.077
4	0.537	0.393	0.077	1

Table 11 KMO and Bartlett's test (PQS)

KMO and Bartlett's test		
Kaiser–Meyer–Olkin measure of sampling adequacy		0.819
Bartlett's test of sphericity	Approx. Chi-Square	2006.862
	df	78
	Sig.	0.000

Table 12 Total variance explained (PQS)

Total variance explained							
Factor	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total
1	4.358	33.523	33.523	3.928	30.219	30.219	3.294
2	2.355	18.114	51.637	2.073	15.946	46.165	2.781
3	1.900	14.613	66.250	1.680	12.925	59.091	2.318
4	1.310	10.074	76.324	0.907	6.975	66.065	2.465
–							
Extraction method: maximum likelihood							
a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance							

Table 13 Pattern matrix (PQS)

Pattern matrix				
	Factor			
	1	2	3	4
cl_svi			0.852	
cl_scg			0.855	
cl_col			0.858	
cr_pcj	0.771			
cr_mtc	0.861			
cr_ffj	0.800			
cr_asr	0.789			
lo_lol		0.885		
lo_rnd		0.869		
lo_kmg		0.821		
pr_sat				0.590
pr_com				0.853
pr_mot				0.632

Table 14 Factor correlation matrix (PQS)

Factor correlation matrix				
Factor	1	2	3	4
1	1	0.329	0.169	0.473
2	0.329	1	0.127	0.383
3	0.169	0.127	1	0.066
4	0.473	0.383	0.066	1

Appendix 5

CFA Fit Indices

See Tables 15, 16, 17, 18, 19, 20, 21, 22 and 23.

Table 15 Model adequacy indices for scale–item CFA on sample of GQS

CMIN	CMIN/DF	CFI	TLI	RMSEA
Chi-square = 883.632 Dof = 696 *p*-value = 0.000	1.270	0.953	0.950	0.030

Table 16 Model adequacy indices for scale–item CFA on sample of PQS

CMIN	CMIN/DF	CFI	TLI	RMSEA
Chi-square = 761.843 Dof = 696 *p*-value = 0.042	1.095	0.984	0.983	0.018

Validity and Reliability Analysis

Convergent validity on the samples of GQS and PQS

First, we examine the factor loadings on the sample of GQS.

Discriminant validity on sample of GQS and PQS

The following table provides comparisons between AVE and corresponding MSV in the samples of GQS and PQS. The findings show that MSV is less than AVE in all variables and it is true for both samples.

Table 17 Regression Weights (GQS)

			Estimate (unstandardized)	Estimate (standardized)	S.E.	C.R.	P
cr_pcj	<	CR	1.000	0.788			***
cr_mtc	<	CR	1.096	0.828	0.072	15.259	***
cr_ffj	<	CR	0.979	0.784	0.070	13.926	***
cr_asr	<	CR	1.097	0.826	0.075	14.710	***
lo_lol	<	LO	1.000	0.881			***
lo_rnd	<	LO	0.758	0.834	0.046	16.451	***
lo_kmg	<	LO	0.811	0.784	0.053	15.169	***
cl_svi	<	CL	1.000	0.826			***
cl_scg	<	CL	1.146	0.818	0.081	14.189	***
cl_col	<	CL	1.004	0.793	0.073	13.808	***
pr_sat	<	PR	1.000	0.700			***
pr_com	<	PR	1.073	0.750	0.109	9.815	***
pr_mot	<	PR	0.944	0.699	0.101	9.310	***

Table 18 Regression weights (PQS)

			Estimate (Unstandardized)	Estimate (Standardized)	S.E.	C.R.	P
cr_pcj	<	CR	1.000	0.784	0.073	15.208	***
cr_mtc	<	CR	1.114	0.834	0.066	13.872	***
cr_ffj	<	CR	0.916	0.778	0.071	14.815	***
cr_asr	<	CR	1.058	0.833			***
lo_lol	<	LO	1.000	0.887	0.044	18.281	***
lo_rnd	<	LO	0.796	0.859	0.049	17.453	***
lo_kmg	<	LO	0.851	0.828			***
cl_svi	<	CL	1.000	0.846	0.062	16.928	***
cl_scg	<	CL	1.058	0.847	0.063	17.161	***
cl_col	<	CL	1.074	0.868			***
pr_sat	<	PR	1.000	0.706	0.112	9.371	***
pr_com	<	PR	1.046	0.742	0.100	8.863	***
pr_mot	<	PR	0.889	0.671	0.073	15.208	***

Table 19 Calculating AVE (GQS)

LV	MV	Squared multiple correlation	Sum of the squared multiple correlations	Average variance extracted	Convergent validity criteria (AVE > 0.5)
CL	cl_svi	0.683	1.981	0.660	Passed for the convergent validity
	cl_scg	0.669			
	cl_col	0.629			
CR	cr_pcj	0.62	2.602	0.6505	Passed for the convergent validity
	cr_mtc	0.685			
	cr_ffj	0.615			
	cr_asr	0.682			
LO	lo_lol	0.776	2.086	0.695	Passed for the convergent validity
	lo_rnd	0.696			
	lo_kmg	0.614			
PR	pr_sat	0.49	1.541	0.514	Passed for the convergent validity
	pr_com	0.562			
	pr_mot	0.489			

Table 20 Calculating AVE (PQS)

LV	MV	Squared multiple correlation	Sum of the squared multiple correlations	Average variance extracted	Convergent validity criteria (AVE > 0.5)
CL	cl_svi	0.715	2.186	0.729	Passed for the convergent validity
	cl_scg	0.718			
	cl_col	0.753			
CR	cr_pcj	0.615	2.609	0.652	Passed for the convergent validity
	cr_mtc	0.695			
	cr_ffj	0.606			
	cr_asr	0.693			
LO	lo_lol	0.786	2.086	0.736	Passed for the convergent validity
	lo_rnd	0.738			
	lo_kmg	0.685			
PR	pr_sat	0.499	1.541	0.501	Passed for the convergent validity
	pr_com	0.551			
	pr_mot	0.45			

Table 21 Discriminant validity (GQS)

GQS				PQS		
	MSV	AVE	(Criteria) MSV < AVE	MSV	AVE	(Criteria) MSV < AVE
PR	0.329	0.514	Pass	0.251	0.501	Pass
CR	0.329	0.651	Pass	0.250	0.625	Pass
LO	0.181	0.695	Pass	0.160	0.737	Pass
CL	0.043	0.660	Pass	0.028	0.729	Pass

Composite Reliability for the sample of GQS and PQS

Table 22 Composite reliability (GQS)

Construct	Manifest or observed variables	Standardized regression weights	Squared multiple correlation	Error variances (1 – R^2)	Composite reliability	
		(l)	(R^2)	(d)		
CL	cl_svi	0.826	0.683	0.317	0.853	Pass to meet criteria
	cl_scg	0.818	0.669	0.331		
	cl_col	0.793	0.629	0.371		
	Sum	**2.437**	**Sum**	**1.019**		
	Square	**5.939**				
CR	cr_pcj	0.788	0.62	0.38	0.881	Pass to meet criteria
	cr_mtc	0.828	0.685	0.315		
	cr_ffj	0.784	0.615	0.385		
	cr_asr	0.826	0.682	0.318		
	Sum	**3.226**	**Sum**	**1.398**		
	Square	**10.407**				
LO	lo_lol	0.881	0.776	0.224	0.872	Pass to meet criteria
	lo_rnd	0.834	0.696	0.304		
	lo_kmg	0.784	0.614	0.386		
	Sum	**2.499**	**Sum**	**0.914**		
	Square	**6.245**				
PR	pr_sat	0.7	0.49	0.51	0.759	Pass to meet criteria
	pr_com	0.75	0.562	0.438		
	pr_mot	0.699	0.489	0.511		
	Sum	**2.149**	**Sum**	**1.459**		
	Square	**4.618**				

Table 23 Composite reliability (PQS)

Construct	Manifest or observed variables	Standardized regression weights	Squared multiple correlation	Error variances (1 − R^2)	Composite reliability	CR should be greater than 0.7
		(l)	(R^2)	(d)		
CL	cl_svi	0.846	0.715	0.285	0.890	Pass to meet criteria of composite reliability
	cl_scg	0.847	0.718	0.282		
	cl_col	0.868	0.753	0.247		
	Sum	**2.561**	Sum	**0.814**		
	Square	**6.559**				

(continued)

Table 23 (continued)

Construct	Manifest or observed variables	Standardized regression weights	Squared multiple correlation	Error variances ($1 - R^2$)	Composite reliability	CR should be greater than 0.7
		(l)	(R^2)	(d)		
CR	cr_pcj	0.784	0.615	0.385	0.882	Pass to meet criteria of composite reliability
	cr_mtc	0.834	0.695	0.305		
	cr_ffj	0.778	0.606	0.394		
	cr_asr	0.833	0.693	0.307		
	Sum	**3.229**	Sum	**1.391**		
	Square	**10.426**				
LO	lo_lol	0.887	0.786	0.214	0.893	Pass to meet criteria of composite reliability
	lo_rnd	0.859	0.738	0.262		
	lo_kmg	0.828	0.685	0.315		
	Sum	**2.574**	Sum	**0.791**		
	Square	**6.625**				
PR	pr_sat	0.7	0.499	0.501	0.755	Pass to meet criteria of composite reliability
	pr_com	0.75	0.551	0.449		
	pr_mot	0.699	0.450	0.55		
	Sum	**2.149**	Sum	**1.500**		
	Square	**4.618**				

From the above discussion, we can conclude that the proposed measurement model is qualifying all criteria of the validity, reliability, and goodness of fit for both samples GQS and PQS. Therefore, we can now run the structured path model.

Appendix 6

Structural Equation Modeling (SEM)

Measurement model

See Tables 24, 25 and 26.

Table 24 Parameter summary (AMOS Output)

	Weights	Covariance	Variances	Means	Intercepts	Total
Fixed	17	0	0	0	0	17
Labeled	0	0	0	0	0	0
Unlabeled	9	6	17	0	13	45
Total	26	6	17	0	13	62

Table 25 Model fit indices (GQS)

CMIN	CMIN/DF	CFI	TLI	RMSEA
Chi-square = 70.99 DOF = 59 *p*-value = 0.136	1.203	0.993	0.991	0.026

Table 26 Model fit indices (PQS)

CMIN	CMIN/DF	CFI	TLI	RMSEA
Chi-square = 59.795 DOF = 59 *p*-value = 0.447	1.013	0.999	0.999	0.007

Appendix 7

The Structured Model

See Tables 27, 28, 29 and 30.

Table 27 Paths in the initial model

	Effects on PR	Effects on CR	Effects on LO	Effects on CL
Direct effects	CL to PR CR to PR LO to PR	CL to CR	CL to LO CR to LO	NIL
Indirect effects	CL to CR to PR CL to LO to PR CL to CR to LO to PR CR to LO to PR	NIL	CL to CR to LO	NIL

Table 28 Parameter summary (initial path model)

	Weights	Covariance	Variances	Means	Intercepts	Total
Fixed	20	0	0	0	0	20
Labeled	0	0	0	0	0	0
Unlabeled	15	0	17	0	13	45
Total	35	0	17	0	13	65

Table 29 Goodness of fit indices of initial path model (GQS and PQS)

Sample of GQS				
CMIN	CMIN/DF	CFI	TLI	RMSEA
Chi-square = 70.993 Dof = 59 *p*-value = 0.136	1.203	0.993	0.991	0.026
Sample of PQS				
Chi-square = 59.795 Dof = 59 *p*-value = 0.447	1.013	1.000	0.999	0.007

Table 30 Regression estimates of initial path model (GQS and PQS)

			Unstandardized estimate	Standardized estimate	S.E.	C.R.	P	Squared multiple correlation	
Regression estimates of initial path model on sample of GQS									
CR	≪	CL	0.162	0.203	0.054	3.015	0.003	CR	0.041
LO	≪	CL	0.160	0.127	0.080	2.001	0.045	LO	0.196
PR	≪	CL	–.052	−0.069	0.049	−1.063	0.288	PR	0.368
LO	≪	CR	0.628	0.399	0.104	6.061	***		
PR	≪	CR	0.465	0.496	0.076	6.127	***		
PR	≪	LO	0.129	0.216	0.043	2.960	0.003		
Regression estimates of initial path model on sample of PQS									
CR	≪	CL	0.130	0.168	0.051	2.57	0.010	CR	0.028
LO	≪	CL	0.080	0.074	0.068	1.1.8	0.237	LO	0.120
PR	≪	CL	−0.022	−0.033	0.042	−0.514	0.607	PR	0.312
LO	≪	CR	0.455	0.325	0.092	4.96	0.000		
PR	≪	CR	0.353	0.418	0.065	5.405	0.000		
PR	≪	LO	0.159	0.263	0.043	3.697	0.000		

Appendix 8

The alternate proposed Model (final form of the structured Model)

Examination of Alternate Proposed Model on Sample of GQS

See Tables 31, 32, 33, 34, 35 and 36.

Examination of Alternate Proposed Model on Sample of PQS

The model adequacy was examined with the help of various goodness of fit indices. The following table shows the goodness of fit indices for the above structured model.

Table 31 Paths in the alternate model

	Effects on PR	Effects on CR	Effects on LO	Effects on CL
Direct effects	CR to PR LO to PR	CL to CR	CR to LO	NIL
Indirect effects	CL to CR to PR CL to CR to LO to PR CR to LO to PR	NIL	CL to CR to LO	NIL

Table 32 Parameter summary (alternate model)

	Weights	Covariance	Variances	Means	Intercepts	Total
Fixed	20	0	0	0	0	20
Labeled	0	0	0	0	0	0
Unlabeled	13	0	17	0	13	43
Total	33	0	17	0	13	63

Table 33 Goodness of fit indices of alternate model (GQS)

CMIN	CMIN/DF	CFI	TLI	RMSEA
Chi-square = 76.139 Dof = 61 *p*-value = 0.09	1.248	0.992	0.989	0.029

Table 34 Regression estimates of alternate model (GQS)

			Unstandardized estimate	Standardized estimate	S.E.	C.R.	P	Squared multiple correlation	
CR	<	CL	0.164	0.206	0.054	3.068	0.002	CR	0.042
LO	<	CR	0.673	0.428	0.103	6.564	***	LO	0.183
PR	<	LO	0.121	0.204	0.043	2.831	0.005	PR	0.362
PR	<	CR	0.453	0.485	0.075	6.054	***		

Table 35 Goodness of fit indices of alternate model (PQS)

CMIN	CMIN/DF	CFI	TLI	RMSEA
Chi-square = 61.44 Dof = 61 *p*-value = 0.460	1.007	0.999	0.999	0.005

The following table shows that all regression estimates are significant and their *p*-values are less than the threshold of 0.05.

Table 36 Regression estimates of alternate model (PQS)

			Unstandardized estimate	Standardized estimate	S.E.	C.R.	P	Squared multiple correlation	
CR	≪	CL	0.131	0.170	0.050	2.601	0.002	CR	0.042
LO	≪	CR	0.473	0.339	0.091	5.224	***	LO	0.183
PR	≪	LO	0.158	0.260	0.043	3.665	0.005	PR	0.362
PR	≪	CR	0.349	0.413	0.065	5.388	***		

According to the indices shown in the above tables, the model verifies the adequacy of the model for the sample data on PQS.

Appendix 9

Multigroup Analysis (Examination of Conformity on Two Samples Multigroup Analysis in the Measurement Model

See Tables 37, 38, 39 and 40.

Table 37 Goodness of fit indices for multigroup analysis (measurement model)

Model	No. of parameters	CMIN	CMIN/DF	CFI	TLI	RMSEA	SRMS
Unconstrained	90	Chi-square = 130.788 Dof = 118 *p*-value = 0.198	1.108	0.997	0.996	0.013	0.0331
Constrained (Measurement Weights)	77	Chi-square = 140.703 Dof = 131 *p*-value = 0.266	1.074	0.997	0.996	0.013	0.0348

Table 38 Nested model comparisons (assuming model unconstrained to be correct)—measurement model

Model	DF	CMIN (difference)	P
Measurement weights	13	9.915	0.701

Multigroup Analysis in the Structured Model

Table 39 Goodness of fit indices for group analysis (structured model)

Model	No. of parameters	CMIN	CMIN/DF	CFI	TLI	RMSEA	SRMS
Unconstrained model	86	Chi-square = 137.583 Dof = 122 *p*-value = 0.159	1.128	0.996	0.995	0.015	0.0432
Constrained (structured weighs model)	82	Chi-square = 140.973 Dof = 126 *p*-value = 0.171	1.119	0.996	0.995	0.015	0.0485

Table 40 Nested model comparisons (assuming model unconstrained to be correct)—structured model

Model	DF	CMIN (difference)	*p*-value
Structured weights model	4	3.390	0.495

Appendix 10

Mediation in the Proposed Alternate Model

Case-1: CR as the mediator

See Tables 41, 42, 43, 44, 45 and 46.

Table 41 Regression estimates of direct path between CL and PR

			Unstandardized estimate	Standardized estimate	S.E.	C.R.	P	Sample
PR	<	CL	0.056	0.078	0.051	1.092	0.275	GQS
PR	<	CL	0.041	0.066	0.044	0.941	0.347	PQS

Table 42 Regression estimates of all direct and indirect paths between CL and PR

			Unstandardized estimate	Standardized estimate	S.E.	C.R.	P	
PR	<	CL	−0.031	−0.041	0.048	−0.630	0.529	GQS
CR	<	CL	0.161	0.203	0.053	3.008	0.003	
PR	<	CR	0.542	0.582	0.075	7.20	0.00	
PR	<	CL	−0.008	−0.013	0.042	−0.199	0.843	PQS
CR	<	CL	0.130	0.168	0.050	2.584	0.010	
PR	<	CR	0.419	0.503	0.064	6.516	0.00	

Case-2: LO as the mediator

Table 43 Regression estimates of direct path between CR and PR

			Unstandardized estimate	Standardized estimate	S.E.	C.R.	P	Sample
PR	<	CR	0.535	0.574	0.072	7.415	0.000	GQS
PR	<	CR	0.418	0.501	0.064	6.576	0.000	PQS

Table 44 Regression estimates of all direct and indirect paths between CR and PR

			Unstandardized estimate	Standardized estimate	S.E.	C.R.	P	Sample
LO	<	CR	0.670	0.424	0.103	6.510	0.000	GQS
PR	<	CR	0.456	0.486	0.075	6.075	0.000	
PR	<	LO	0.122	0.205	0.043	2.852	0.004	
LO	<	CR	0.472	0.338	0.090	5.230	0.000	PQS
PR	<	CR	0.350	0.413	0.063	5.511	0.000	
PR	<	LO	0.158	0.261	0.042	3.738	0.004	

Direct and Indirect Effects in the Proposed Alternate Model

Table 45 Direct and indirect effects on PR (GQS)

Variables	Direct effects	Indirect effects	Total effects	Rank order
CL	0.000	0.088	0.088	3
CR	0.453	0.082	0.535	1
LO	0.121	0.000	0.121	2

Table 46 Direct and indirect effects on PR (PQS)

Variables	Direct effects	Indirect effects	Total effects	Rank order
CL	0.000	0.056	0.056	3
CR	0.349	0.075	0.423	1
LO	0.158	0.000.	0.158	2

Appendix 11

Testing for Mean Difference in Variables for Two Population

Model variables (manifest/latent)		Mean values			Levene's test for equality of variances				
Var.	Type	GQS	PQS	Diff	F	sig.	t	df	Sig. (2-tailed)
PR	L	34.88	19.72	15.16	0.344	0.558	47.528	598	0.000
pr_sat	M	11.77	6.40	5.37	0.006	0.936	40.471	598	0.000
pr_com	M	11.42	6.79	4.63	0.760	0.384	34.970	598	0.000
pr_mot	M	11.69	6.52	5.17	0.060	0.807	41.428	598	0.000
CL	L	30.15	24.31	5.84	1.686	0.195	12.968	598	0.000
cl_svi	M	9.76	8.20	1.56	1.251	0.264	9.714	598	0.000
cl_scg	M	10.29	8.05	2.24	0.075	0.784	12.704	598	0.000
cl_col	M	10.10	8.06	2.04	2.134	0.145	12.188	598	0.000
CR	L	47.96	25.61	22.35	1.884	0.170	48.425	598	0.000
cr_psj	M	12.12	6.33	5.79	3.483	0.063	43.328	598	0.000

(continued)

Model variables (manifest/latent)		Mean values			Levene's test for equality of variances				
Var.	Type	GQS	PQS	Diff	F	sig.	t	df	Sig. (2-tailed)
cr_mtc	M	12.24	6.21	6.03	2.330	0.127	43.116	598	0.000
cr_ffj	M	12.06	6.31	5.75	1.210	0.272	45.207	598	0.000
cr_asr	M	11.54	6.76	4.78	1.203	0.273	35.057	598	0.000
LO	L	32.51	21.18	11.33	0.006	0.937	26.268	598	0.000
lo_lol	M	11.07	6.88	4.19	0.079	0.779	23.861	598	0.000
lo_rnd	M	10.86	7.06	3.8	0.003	0.958	26.611	598	0.000
lo_kmg	M	10.57	7.24	3.33	0.426	0.514	20.775	598	0.000

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Sidewalk Challenges in Amman, Jordan, and the Urge for Context-Specific Walkability Measurement and Evaluation Tools

Deyala Tarawneh

Abstract

Toward achieving urban sustainability, research argues that society's dependence on automobiles must be reduced. In a city like Amman, Jordan where citizens heavily rely on private motorized vehicles in their everyday commute and to tend to their everyday needs, factors including safety, convenience, comfort in addition to pedestrian accessibility and sidewalk connectivity, among others, have gained less attention in city planning efforts, and as a result, walkability—which is increasingly becoming recognized as a fundamental right to people in their cities and an indicator to improved quality of life—has been compromised. Whether interrupted by poor planting choices or equally by misplaced litter bins, ambiguously transformed into extensions to adjacent businesses or private residents, or, suddenly interrupted, sidewalks in a large segment of the city of Amman are increasingly becoming less walkable. Through looking at a number of assessment and evaluation tools designed for the purpose of examining walkability and sidewalk designs in urban neighborhoods, this paper aims to shed the light on this urban complication in the case of Amman as part of the broader mobility and transportation theme toward achieving urban sustainability goals and suggests the development of new tools—or the appropriation of existing tools—in ways that take into account Middle Eastern context particularities and adhere to its specific walkability problems and key concerns. As a result, and in an attempt to further the understanding of the urban phenomenon and in order to develop the suggested tools, this paper preliminarily evaluates the status quo of sidewalks in Amman and identifies the key challenges to good sidewalk design practice that does not look at sidewalks as mere mediums for walking as a physical activity or for arriving to destinations, instead as catalysts for achieving better built environments and better health through promoting an active lifestyle among numerous other benefits. To conclude, this paper aims to contribute to the growing body of discussions on walkability and urban sustainability from a Middle Eastern perspective; it suggests framework interventions and policy recommendations and recognizes the need to develop context-specific walkability and sidewalk design assessment and evaluation tools that take into account Middle Eastern contextual considerations.

Keywords

Walkability • PLOS • Walk score • GIS • Google street view • Sidewalks • Urban sustainability • Amman

1 Walkability

1.1 Benefits of Walking

The benefits of walking have been extensively researched; Dannenberg et al. (2017), for example, explored not only the health benefits of walking through increasing physical activity and promoting a healthier lifestyle but also its effects on achieving environmental sustainability thought reducing greenhouse gas emissions resulting from transportation by converting short driving trips into walking journeys; they also highlighted the social equity benefits more specifically in lower-income neighborhoods where families are more reliant on walking in their essential journeys. Walkability, urban design, and health were also the foci of Boarnet et al. (2008) research examining the magnitude of health benefits from urban design characteristics that are associated with increased walking using geocoded travel diary data.

On a similar note, Maizlish et al. (2017) studied health and greenhouse mitigation benefits of the ambitious expansion of cycling, walking and transit by quantifying health

D. Tarawneh (✉)
PhD in Urban and Regional Planning, University of Jordan, Amman, Jordan
e-mail: d.altarawneh@ju.edu.jo

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co-benefits and carbon reductions with ambitious levels of active transport in an attempt to examine the efficiency of independent contributions of walking, cycling, and transit at levels consistent with general physical activity recommendations. Using data from travel and health surveys, vital statistics, collision databases, the integrated transport and health impacts model developed for this research estimated the change in the population disease burden, as measured by deaths and Disability-Adjusted Life Years (DALYs). Their study findings suggested that the ambitious maximum alternatives increased population meant travel for walking, cycling, or transit and were associated with a reduction in deaths. The alternative with the most significant health impact was cycling (despite an increase in cyclist injuries). With anticipated population growth, their study found that no alternative achieved decreases in carbon emissions, but bicycling had the highest potential for slowing their growth. Finally, they concluded that alternatives that included transit similarly reduced carbon emissions, but with fewer health benefits, and that aggressive expansion of active transport is efficacious, but an underutilized policy option with significant health co-benefits for mitigating greenhouse gases.

Health impacts, walking, physical activity, and reduced air pollution and road injuries were also the focus of de Sá et al. (2017) work is an attempt to face some of the challenges caused by rapid urbanization. Similar to Maizlish et al.'s work, de Sá et al.'s work found that considerable health gains, where a percentage of premature deaths from ischaemic heart disease and DALYs, were avoided from increased physical activity alone. Conversely, they found that substantial health loses in cases favoring private transport, with an increase in road traffic deaths and injuries among pedestrians and nonmotorized vehicles, and also similar to Maizlish's findings, parameters related to air pollution had the most significant impact on uncertainty. Their research concluded that shifting travel patterns toward more sustainable transport can provide significant health benefits.

Walkability, air pollution, health, and physical activity have been linked together in numerous other studies including Cepeda et al. (2017), Khreis et al. (2017), Doorley et al. (2017), Nieuwenhuijsen et al. (2016), Cohen et al. (2014), Stevenson et al. (2016), and Boniface et al. (2015).

In addition to health and environmental benefits due to increased physical activity, reduced air and noise pollution, and decreased greenhouse gas emissions walking and walkability have been linked to economic benefits. Using the Health Economic Assessment Tool (HEAT) to estimate the health and economic benefits of policies promoting walking and cycling Pérez et al. (2017), for example, measured the economic benefits resulting from implementing these methods. They concluded that changes in transport policies aimed at promoting active transportation that created clear economic benefits, thus supporting the need to better coordinate between urban and transport planning and economic policies.

1.2 Active Transport, Active Aging and Active Living

Active transportation is another benefit associated with walkability, as part of the broader mobility and transit theme; walkability is recognized as fundamental to achieving alternative active transportation, which heavily leans on walking and cycling. Schauder and Foley (2015) investigated the extent to which the amount of cycling and walking for transportation is associated with health outcomes; Barr et al. (2016) explored the association of walking for transport with obesity, metabolic syndrome, and diabetes; Brown et al. (2017) also studied the impact of active transportation on obesity prevention which is given the alarming prevalence of the problem worldwide and in light of the urgent need for interventions that halt the growing epidemic.

Mueller et al. (2015) also assessed the impacts of active transportation including walking and cycling on health, similarly; Shaw et al. (2017) studied the association between active transportation with meeting physical activity guidelines and found that people who walk or cycle are more likely to meet these guidelines than the users of motorized transportation whether private or public but with varying percentages. Tan et al. (2018) evaluated the effects of active transportation on physical activity by looking at students' active morning commutes to schools. Similar to this research, potential confounders of age, socioeconomic status, and built environment characteristics, as well as home–school distance as an effect modifier, were taken into consideration in their research. Active transportation has also been highlighted in work on Lachapelle and Pinto (2016), Yang et al. (2018), and Alvanides (2014) among others.

In addition to active transportation, active aging—understood as the maintenance of positive subjective well-being, reasonable physical, social and mental health as well as continued involvement in one's family, peer group, and community throughout the aging process—is another identified benefit to walkability. Marquet et al. (2017) examined the effects of urban morphology and walkability over active travel patterns.

Of aging older adults where they found that high walkability was associated with more minutes spent walking, and higher odds of meeting physical activity recommendations. Aging in low walkable areas, in contrast, was associated with lower amounts of physical activity derived from transportation.

Active transportation and active aging may be understood as part of the more significant active living—understood as

the concept that encourages individuals to achieve the recommended level of physical activity through the lifestyle that integrates active transportation (Sallis et al. 2006)—which has also been positively linked to walkability. Ingram et al. (2017), for example, argued that the importance of physical activity in maintaining a healthy lifestyle underscores the need to address disparities in access to safe, convenient, and comfortable walking environments in low-income, minority neighborhoods. Moreover, and similar to what this paper aims to highlight, they argued that while improving the walking infrastructure is essential, assumptions regarding perceptions of walkability based on a standardized norm may fail to address the preferences and needs of specific populations.

1.3 From Motorized to Nonmotorized, Making the Shift

Before looking at the notion of walkability in urban cities, the shift from motorized to nonmotorized transportation, this paper argues, must be put forward. Lee et al. (2017), for example, studied the role of the built environment in converting short car trips to active trips. Through examining the effects of land use on travel mode choice and through analyzing the concept of neighbourhood design in the substitution of short car trips by other transportation modes to better understand trip-chaining patterns and mode choice of various urban forms, they concluded that policy-makers should focus on specific context challenges by suggesting strategies that are likely to affect people's decisions concerning travel mode; they also concluded that personal vehicle use could be reduced more efficiently by focusing on trips for leisure time activities and personal business activities near residential locations rather than on work commutes. The topic was also researched in the work of Beckx et al. (2013) who studied the limits to active transport substitution of short car trips by looking at trip-related factors that affect the potential of active transport modes and taking into account trip-related criteria that may hamper substitution of car trips by active forms of transport. So did Scheepers et al. (2014) in their research on shifting from car to active transport. Moreover, by evaluating the four effects: the change in exposure to ambient air pollution for the individuals who change their transportation mode; their health benefit; the health benefit for the general population due to reduced pollution; and the risk of accidents, and by citing costs for other impacts, especially noise and congestion, Rabl and de Nazelle (2012) identified the health and environmental benefits of shift from car to active transport. The research results they argued can be used for a cost-benefit analysis to increase active transport and help individuals make the shift. Numerous other literature discussions also looked at the topic including the above mentioned Dannenberg et al. (2017) and Graham-Rowe et al. (2011) who explored the possibilities to reduce car use found that strategies including targeting drivers who have a healthy driving habit or a robust moral motivation to reduce car use; targeting people who have just moved residence; and, where feasible, relocating employees to reduce commuting time to be the most effective in reducing car use; Morency et al. (2014) who quantified the trips that may be flagged as "walkable" during a typical weekday and the resulting number of steps added to the physical activity per person only to conclude that shifting short motorized trips to walking would allow a significant increase in physical activity which may also help reduce weight gain at a national level; Cole et al. (2015) who examined the prevalence and correlates of walkable short car trips also to suggest that there is a significant potential for some car trips to be converted into walking and that initiatives to replace short car trips with walking may be particularly useful in higher density areas where local destinations are within a walking distance. However, they concluded that barriers that discourage walking will need to be addressed to facilitate walking trips more specifically among middle-to-older adults and in disadvantaged areas.

1.4 Key Challenges to Walkability

Despite the numerous benefits to walkability identified above, safety remains critical. In their research on the impacts of traffic safety regulations on nonmotorists fatality rates, Mader and Zick (2014) investigated the extent to which current traffic safety policies protect nonmotorist travelers. The results of their study indicated that non-motorist traffic safety is positively impacted by law enforcement and expenditures per capita; results also indicated that nonmotorists are affected by driver's behavior, alcoholic consumption, for example. Their research concluded by suggesting the implementation of traffic safety policies that reduce risks for nonmotorists.

In addition to the fatality, walkers and cyclists are subject to other factors that may make their journeys unpleasant. Okokon et al. (2017), for example, studied the particulate and noise exposure during walking, cycling, and other modes of transit as they argued that personal exposure to particulate matter, black carbon, and noise during commuting may be substantial. The results of their study indicated that active and public transport commuters are often at risk of higher air pollution and noise exposure than private car users which they recommend should be taken into account in urban transportation planning. Numerous studies support Okokon's et al.'s argument including de Nazelle et al. (2017) who compared air pollution exposures in active versus passive

travel modes, Yang et al. (2015), who studied the heterogeneity of passenger exposure to air pollutants in public transport microenvironment, Ham et al. (2017) who investigated commuters' exposure to concentrations of delicate particle matter, black carbon, and ultrafine particles also in transport microenvironment, similarly in the work of Morales Betancourt et al. (2017), who investigated the exposure to fine particulate, black carbon, and particle number concentration in transportation microenvironment; Rivas et al. (2017), Hankey and Marshall (2015), MacNaughton et al. (2014), Yu et al. (2012), Qiu et al. (2017), Kumar et al. (2017), Ragettli et al. (2013), Quiros et al. (2013), and Apparicio et al. (2016) among others, also looked at the notion of safety and its associations to walkability.

In addition to the challenges mentioned above that face walkers and cyclists, this study argues that urban planning and design failures more specifically at the neighborhood level in addition to poor sidewalk design and implementation are the key challenges to achieving walkability. The two notions are discussed separately below.

1.5 Walkability and Neighborhoods Urban Design

According to Howell et al. (2017), the walkability of an individual's neighborhood of residence is positively associated with their participation in physical activity. Their research concluded that full activity space walkability showed the most active association with physical transportation activity compared with more restricted definitions and that exposure misclassification may contribute to the variability in the built environment and healthy relationships.

Boulange et al. (2017) examined the association between urban design attributes and transport modes choice for walking, cycling, public transport, and private motor vehicle trips where they argued that walking, cycling, and public trips were positively associated with the housing diversity score and gross dwelling density while private motor vehicle trips was negatively associated with street connectivity, land use mix, local living score, housing diversity score, gross dwelling density, and proximity to supermarkets. Their study concluded that neighborhood environments with specific residential densities, well-connected street network, access to local living destinations, and distances to public transport services encourage walking, cycling, and public transport use while discouraging driving. Moreover, they concluded that comprehensive, integrated urban planning of transport infrastructure, land use development, and service provision is required to create neighborhoods that support active and sustainable living and allow for a flexible mix of land uses and transport options.

This connection between walkability and urban design was further investigated in the work of Badland et al. (2017). Their research identified several planning policies designed to foster walkability and using spatial measures developed for this exercise and linked with geocoded population data, the association between the urban spatial measures and neighborhood transport walking behavior were tested in a sample of urban adults.

The policies identified included street connectivity, common block area, dwelling density, land use mix and diversity, and access to activities. The odds of transport walking they found were significantly higher for those living in "more walkable" (compared with less walkable) neighborhoods; i.e., with more connected street networks, higher residential densities, more destinations available, and shorter block sizes and distances to activity centers. Their findings showed that the identified policies implemented using Geographic Information System (GIS) were independently associated with walking in the residential neighborhood. The associations observed tended to be stronger than those previously shown, especially regarding the dwelling density and daily destination measures. Moreover, their findings supported the call for more research using policy-relevant measures in order to better inform urban planning guidance and suggested that if current spatially derived urban policies were implemented, it might increase transport walking.

Zuniga-Teran et al. (2016), for example, highlight that due to the alarming consequences to increased automobile dependency, architects, urban designers, and land planners have developed new urban design theories, which have been incorporated into the Leadership in Energy and Environmental Design for Neighborhood Development (LEED-ND) certification system. The LEED-ND, they illustrated, includes design elements that improve human well-being by facilitating walking and biking. Their work identified gaps and strengths in the LEED-ND and proposed potential enhancements to this certification system that reflects what is known about enhancing walkability more comprehensively through neighborhood design analysis. They concluded that their work sought to facilitate the translation of research into practice, which can ultimately lead to more active and healthier societies.

Similarly, Singh (2016) identified some of the factors that lead to increased urban walkability in order to improve neighborhood sustainability and public life. Through analyzing the walking behavior of pedestrians in a variety of urban built environment with varying styles and varying usage ratios, and using activity mapping and public surveys to understand the underlying factors that led to certain streets being rendered more walkable than the others, their research results showed that the most critical factors affecting pedestrians' perception of walkability were related to the built envelop on either sides of the streets. Factors relating to

urban morphology like enclosure, block length, and edge conditions were found crucial in creating the perception of a walkable neighborhood.

Lefebvre-Ropars et al. (2017) analyzed the transferability of a composite walkability index, the Pedestrian Index of the Environment (PIE), which combines six urban form variables including (1) comfortable facilities, (2) block size, (3) people per km^2 (population and employment), (4) sidewalk density, (5) transit access, and (6) urban Living Infrastructure (amenities) into a score range. A significant positive correlation was found in their research between the PIE and the choice of walking for short trips, for all purposes as well as for some specific trip purposes. The inclusion of the PIE, they found, also improved the accuracy of the modeling process as well as the prediction of the choice of walking for short trips. As a result, they concluded that the PIE could be used to improve the modeling of travel behavior for short trips.

Peiravian et al. (2014) also investigated the development and application of the PIE to develop a new and easily computable measure of pedestrian friendliness for urban neighborhoods that makes the best use of the available data and also addresses the issues concerning other models in use. According to them, PIE is defined as the product of four components representing land-use diversity (based on the concept of entropy), population density, commercial density, and intersection density. The results of this method, they argued, are region-specific; they are comparable only between the zones within the given study area. The results agreed jointly with the expectation of pedestrian friendliness across different parts of the city. Possible extensions were also listed, including a further study to determine statistical relationships between the PIE and common socioeconomic characteristics. Finally, they concluded that the method could also be further improved should more types of data become available.

Interestingly, Yin (2017) looks at five recently identified street-level urban design qualities including imageability, enclosure, human scale, transparency, and complexity, as opposed to the more traditional D variables—design, density, diversity, destination accessibility, and distance to transit; walkability indices which Yin argued have mostly ignored the microscale streetscape features that affect the pedestrian experience. Using both 2D and 3D GIS, street-level urban design qualities can be objectively measured and their correlation with observed pedestrian counts and Walk Scores can be tested.

The results of Yin's research showed that 3D GIS helped to generate objective measures on view-related features such as long sightline and proportion of sky, and these objective measures, Yin concluded, can help better understand the influence of street-level urban design features on walkability for designing and planning healthy cities. Similarly, Hajna et al. (2013) used both audit and GIS-derived measures of overall neighborhood walkability and assessed the relationship between objective (audit- and GIS-derived) and participant-reported measures of walkability. Their study found that the correlation between audit- and GIS-derived measures of overall walkability was high, and conversely, the correlations between objective (audit and GIS-derived) and participant-reported measures were low for comparable audit and participant-reported items; correlations were higher for items that appeared more objective (e.g., sidewalk presence and versus safety). Their research concluded that GIS derived a measure of walkability correlated well with the in-field audit, suggesting that it is reasonable to use GIS-derived measures in place of more labor-intensive audits. Interestingly, neither audit- nor GIS-derived measures correlated well with participants' perceptions of walkability.

Yin et al. (2015) also emphasized the role of "big data" in pedestrian-oriented research by exploring the use of Google Street View images for pedestrian counts, so did Rundle et al. (2011) in their research using Google Street View to audit neighborhood environments which they argue is more feasible than traditional methods that are costly and time-consuming. Berland and Lange (2017) also used Google Street View as a geospatial technology to conduct a virtual survey of street trees and compared the results to existing field data from the same location. The virtual survey analyst recorded the locations of street trees, identified trees to the species level, and estimated diameter at breast height. Their research results suggested that virtual surveys in Street View may be suitable for generating some types of street tree data or updating existing data sets more efficiently than field surveys.

This notion of using Google Street View to assessing street-level urban greenery, which has long played a critical role in the visual quality of urban landscapes, has also been explored in the work of Li et al. (2015) along with a proposed modified green view index.

Their research found Google Street View to be well-suited for assessing street-level greenery and they suggested further that the modified green view index may be a relatively objective measurement of street-level greenery, and that Google Street View in combination with green view index may be well-suited in guiding urban landscape planning and management.

2 Walkability Assessment Tools

In the contemporary literature, there is a noticeable growing effort in designing and implementing walkability and sidewalk evaluation and assessment tools. In their research toward developing a new assessment model to evaluate the

microscale sidewalk design factors at the neighborhood level, Aghaabbasi et al. (2017), for example, argue that while Walkability Assessment Tools (WAT) and Pedestrian Level of Services (PLOS) are used to examine the same concept, walkability assessment tools seem to be more connected with the work of public health and social sciences while PLOS are more connected with urban and transportation planning. They explained that while WAT aims to assess whether the physical environment features are linked to the levels of different forms of physical activity, walking mainly, PLOS methods are developed to assess the overall quality service, street furnishing, and infrastructure for pedestrian use.

Aghaabbasi identified numerous tools including Path Environment Audit Tool (PEAT), Walking Suitability Assessment Form (WSAF), PIN3 Neighborhood Audit Instrument, Irvine Minnesota Inventory (I-M), Analytic Audit Tool, Neighbourhood Environment Walkability Survey (NEWS), Livable communities, Twin Cities Walking Survey, Pedestrian Environment Data Scan (PEDS), Systematic Pedestrian and Cycling Environmental Scan (SPACES), and Microscale Audit of Pedestrian Streetscapes (MAPS), and used them to develop another assessment method to evaluate the neighborhood sidewalks using microscale factors. The results of using the proposed tool, they argued, indicated that the tool is capable of identifying the drawbacks of neighborhood sidewalks. In addition, this tool allowed the residents to convey their needs to city planners and ask for improving existing sidewalks, which this paper highlights as fundamental to achieving public participation.

Talavera-Garcia and Soria-Lara (2015), for example, argued that while the last decades have seen a growing interest regarding the use of level of service for managing and planning private and public transport infrastructures, shortcomings appear when it is used in the context of pedestrian mobility (i.e., the complexity of pedestrian mobility in terms of behavior and the consideration of urban design factors associated with pedestrianization). Accordingly, based on the quality of urban design for pedestrians and its relationship with walking needs, they developed an alternative walking index under the name of the Quality of Pedestrian Level of Service (Q-PLOS) method.

Similar to the notion of Q-PLOS, Florez et al. (2014) highlight the Pedestrian Quality Of Services (PQLS) by identifying the attributes associated with it in an attempt to contribute to the understanding of pedestrian behavior in a specific urban environment. According to their research, the attributes that best define the pedestrian quality of service are accessibility, comfort, reliability, convenience, security, safety, and sociability. The aspects most emphasized were related to accessibility: rapidity, proximity, and ease. Moreover, they found that the location and the characteristics of the social and built environments are conditions that favor travel on foot and perceived proximity. These factors, they concluded, can be enhanced by good transportation and urban planning policies.

Moreover, building on the previously mentioned Zuniga-Teran et al. (2016), Zuniga-Teran et al. (2017) introduced a walkability framework which organizes the design elements into nine walkability categories including (1) connectivity, (2) land use, (3) density, (4) traffic safety, (5) surveillance, (6) parking, (7) experience, (8) green space, and (9) community, with the purpose to test whether this conceptual framework can be used as a model to measure the interactions between the built environment and physical activity. The results of their research included significant correlations between the walkability categories and physical activity as well as between the walkability categories and the two motivations for walking (recreation and transportation). The walkability framework developed for the study, they argued, allowed the identification of walkability categories most strongly correlated with motivations for walking.

Similarly, Blecic et al. (2015) presented an urban design support tool centered on pedestrian accessibility and walkability of places. Unlike standard decision support systems developed to evaluate given predefined urban projects and designs, their research addressed the inverse problem of having the software system itself generate hypotheses of projects and designs, given some (user-provided) objectives and constraints. By way of example, they briefly presented an application of the system to a real urban area.

Similar to what this paper aims to achieve, Christopoulou and Pitsiava-Latinopoulou (2012) developed a model for the estimation of PLOS in a specific urban environment as they argued available methodologies often refer to different conditions than the ones found in their study context. Their work evaluated 11 methodologies that have been developed at an international level for the estimation of PLOS along the axis of their movement, without crosswalks or intersections including Mozer (1994), Dowling et al. (2009), Landis et al. (2001), Quality/Level of Service Handbook (FDOT 2009), Highway Capacity Manual (HCM) 2000 (TRB), Jaskiewicz (2000), Gallin (2001), Jensen (2007), Muraleetharan et al. (2004), Dandan et al. (2007), and Dixon (1996).

Considering that estimation of PLOS criteria is fundamental as this is the first step of LOS analysis, Sahani and Bhuyan (2013) performed an adaptation of the HCM 2010 methodology more specific to their study contest. An in-depth study was carried out to define PLOS criteria of urban off-street facilities in developing countries having different traffic flow conditions. Defining LOS, they argued, is a classification problem and to solve it, Affinity Propagation (AP), a recently developed cluster algorithm, was used.

Kadali and Vedagiri (2015) also evaluated the pedestrian crosswalk LOS but in perspective of the type of land use. In

their research, they argued that the behavior of pedestrians would change for the different land-use type, and this change in behavior of pedestrian further reflects the change in perceived LOS. Therefore, it was vital for them to evaluate the quality of service of such crossing facilities concerning different land-use types under mixed traffic conditions. As a result, a model was developed taking into account the number of vehicles encountered, road crossing difficulty as well as safety considered as primary factors along with individual pedestrian factors (gender and age), land-use type, and roadway geometry. From the model results, they concluded that perceived safety, crossing difficulty, land-use condition, number of vehicles encountered, median width, and number of lanes have a significant effect on pedestrian-perceived LOS at unprotected (un-signalized) mid-block crosswalks in mixed traffic scenario. The inferences of their results highlighted the importance of land-use planning in designing a new set of pedestrian access facilities for unprotected mid-block crosswalks under mixed traffic conditions. Also, the study results, they argue, would be useful for evaluating pedestrian accessibility taking into account different land-use types and planning required a degree of segregation with vehicular movement at unprotected mid-block crosswalk locations.

Until 2008, Gilderbloom et al. (2015) argue that there had not been a reliable measure of the social, health, and economic impact of walkable neighborhoods until tools that quantified walkability such as Walk Score, which measures available daily living activities by foot, emerged. In their research, Gilderbloom et al. utilized Walk Score to investigate how walkability impacts the quality and sustainability of a neighborhood. Evaluation measures included urban sustainability, neighborhood housing valuation, foreclosures, and crime. The results of their analysis showed a positive impact not only on neighborhood housing valuation but also on neighborhood crime and foreclosure. These results, they concluded, provide policy opportunities for planners and citizen groups to pursue strategies to encourage the development of more walkable and sustainable neighborhoods.

More recently, Hall and Ram (2018) also implemented the Walk Score index in their research. They explained that the index assesses the "walking potential" of a place through a combination of the three elements: the shortest distance to a group of preselected destinations, the block length, and the intersection density around the origin. The index links a gravity-based measure (distance accessibility), with topological accessibility (street connectivity) measured by two complementary indicators that act as penalties in the final score (linearly expanded in the range 0–100). However, they argued, contemporary discussions do not exclusively rely on Walk Score as a single measurement of walkability and add further estimates to capture better multiple dimensions of walkability, and that on no occasion was it used as a dependent variable. Thus, results tend to partly only support the validity of Walk Score. Their research concluded that the index is best understood as a surrogate measure of the density of the built environment of a specific neighborhood that indicates utilitarian walking potential. Implications for, and potential areas of, future research were discussed.

Similarly, Walk Score was also highlighted in the work of Koohsari et al. (2017), Koohsari et al. (2018), Nykiforuk et al. (2016), Chaiyachati et al. (2018), and Cole et al. (2015).

In addition to the previously discussed Yin (2017) and Hajna et al. (2013) in the walkability and neighborhoods' urban design section, GIS in walkability's indices has been very popular. Tsiompras and Photis (2017), for example, define a GIS-based composite walkability index methodology with population density, pathway network connectivity, land-use mix, and proximity to necessary land use, as initial value parameters, in addition to pathway characteristics such as its width, obstacles, and condition.

Their research mainly sought the hierarchical significance of each of the walkability index's parameters and sub-parameters according to the preferences of respondents, which stated they choose walking/cycling to their daily destinations. The results of their research indicated that proximity to essential urban destinations was assigned the highest weight and population density the lowest.

Using innovative methods has also been part of walkability assessment and measurement tools more specifically when measuring non-quantifiable or obscure parameters. Also, in addition to the previously discussed Yin et al. (2015), Rundle et al. (2011), Berland and Lange (2017), and Li et al. (2015) in the walkability and neighborhoods urban design section, Yin and Wang (2016), for example, use data obtained from Google Street View imagery to measure visual enclosure of street walkability. According to them, one significant limitation currently with studying street-level urban design qualities for walkability is the often inconsistent and unreliable measures of streetscape features across different field surveyors even with costly training due to lack of more objective processes, which also make large-scale study difficult. The recent advances in sensor technologies and digitization, they also argued, have produced a wealth of data to help research activities by facilitating improved measurements and conducting large-scale analysis. Accordingly, their research explored the potential of big data and big data analytics in the light of current approaches to measuring streetscape features. By applying machine learning algorithms on Google Street View imagery, they generated measures objectively on the visual enclosure. The results of their studies showed that sky areas, for example, were identified reasonably well for the calculation of the proportion of the sky. The visual enclosure measures were

found to be correlated with pedestrian volume and Walk Score. This method they concluded, allowed large-scale and consistent objective measures of visual enclosure that can be done reproducibly and universally applicable with readily available Google Street View imagery in many countries around the world to help test their association with walking behaviors. Similarly, from the perspective that shade provision by street trees during the hot summer months is a primary factor for the thermal comfort of people in urban areas, Li et al. (2018) presented a method to estimate the shade provision of street trees using a quantification of the Sky View Factor (SVF) from street-level imagery. Also using Google Street View panoramas to represent the street canyon unit and to compute the SVF, using street-level imagery, they argued, allowed them to consider obstructions along street canyons without relying on simplifications or simulations of the environment. In turn, a building height model was used to calculate the SVF, considering only the obstruction of solar radiation by building blocks. Thus, with these two quantifications of the SVF, the difference between the two SVF estimations were treated as an estimate of the shading effect of street trees. They are research results showed that the street trees decrease the SVF, and they concluded that their study could provide an essential reference for future urban greening projects for urban climate moderation.

Numerous other researchers looked at methods for assessing and evaluating walkability of the pedestrian environments, including Kelly et al. (2011), Taleai and Taheri Amiri (2017), among others.

While the tools mentioned above for the measurement of physical features of sidewalks are fundamental to the evaluation of sidewalk design, nonmeasurable factors evaluation, including social and cultural values, remains problematic. In fact, Battista and Manaugh (2018) argued that while walkability remains a guiding framework for practitioners to design vibrant and healthy communities through urban planning interventions and while the associations between travel behavior and physical factors in urban form have been confirmed through numerous studies, focusing on the built environment poorly accounts for the sociodemographic factors bracketing amenity and route choices across space and time. Moreover, they argued that, as transportation planning turns toward strategies associated with maximizing accessibility over minimizing travel time, it is becoming problematic for practitioners tasked with reducing structural inequalities in access to opportunity across society. Using participant testimony from a neighborhood in transition, their research developed a user-oriented walkability framework that incorporates social and personal factors mediating pedestrians' spatial engagement. As a result of their study findings and with the help of the developed framework, they suggested nonengineering interventions necessary to facilitate spatial engagement and, in turn, maximize walkable opportunities available to residents. Their study finding suggested that the perceived quality of service of pedestrian movements was by the results of the application of the proposed model.

3 Walkability, Sidewalks, and Public Participation

The role of the general public in designing sidewalks remains largely overlooked, if fact, Lee et al. (2009) argued that although pedestrians' emotional satisfaction when using urban sidewalk landscapes depends on the sidewalk design elements and components ratios which makes it essential to reflect on pedestrians' emotional perception when designing sidewalks, yet, they are often built based on engineering considerations.

Moura et al. (2017), for example, look at measuring walkability using the participatory assessment method. Their framework takes into account distinct pedestrian groups including adults, children, seniors and impaired mobility pedestrians, and trip purposes including practical and leisure, expressing walkability in terms of seven key dimensions also known as 7Cs layout including connectivity, convenience, comfort, conviviality, consciousness, coexistence, and commitment. From this conceptual framework, a methodology to evaluate walkability through GIS-based and street auditing indicators was presented and the results indicated that there is a clear difference in walkability scores for different pedestrian groups, namely between adults and seniors or impaired pedestrians.

Nieuwenhuijsen et al. (2017) also described the need for novel participatory quantitative methods for the assessment of urban and transport planning in cities. In their research, they identified a lack of participatory and integrated methods, models and tools which they argued should be based on the use of systemic multidisciplinary/multi-sectoral approach and state-of-the-art methods to address critical urban and transport planning policies and measures to improve public health and active transport in cities. Moreover, they argued that active citizen support and new forms of communication between experts and citizens and the involvement of all major stakeholders are crucial to find and successfully implement health and active transport-promoting policy measures. Finally, they concluded with suggesting recommendation for answering questions including how different disciplines can effectively work together, how to incorporate citizen and stakeholder opinion into quantitative modeling for urban and transport planning, how different modeling and measurement methods can be effectively integrated, and whether a public health approach can bring about positive changes in urban and transport planning.

4 Methods

This study leans on two primary sources of information: the first is based on the researcher's observation in addition to the data collected during the imperial work through surveys, questionnaires, and interviews designed for different groups of stakeholders including policy-makers as well as the general public in order to develop a comprehensive understanding of the phenomenon under research. The second source of information is the body of literature concerning walkability and sidewalk assessment and evaluation tools from the international context including GIS-based models, PLOS measures, Google Street View, Walk Score, and PIE, in addition to the other demonstrated tools; however, as the study identifies the need for a more specific tool developed for the study context, and as this study argues, this may be a research on its own; this study will look at the overall objectives, principles and general structure of the assessment tools demonstrated above in the literature review but without particularly identifying or developing one specific tool for the study case context in an attempt to providing a preliminary description for the status quo of sidewalks in Amman which may be taken further in future research.

The study considers the qualitative form of inquiry for its design, data collection, and data analysis. The research design is exploratory, which, by definition, puts an emphasis on "exploring" specific areas of the research and does not necessarily strive to achieve final or conclusive answers to the research question. Moreover, these types of studies are adaptive to change throughout the study or according to the emergence of new evidence.

The research purpose of exploratory design in general: the data it requires is vague, and its sources are ill-defined; the form of exploratory data collection is open-ended; the sample size is relatively small; the data collection is flexible, and its analysis is informal, and the recommendations are more tentative than the final (Sandelowski and Barroso 2007) which is in line with the paper's aims and objectives.

5 Sidewalks in Amman: Key Challenges

If existing in the first place, sidewalks in Amman are becoming less walkable. The images and paragraphs below will shed light on some of the main obstacles observed during a typical walking journey in a "higher-end" part of West Amman performed at the daytime.

- For the nonmotorist traveler, the use of sidewalks in Amman may not be the most convenient alternative. Despite the abundant research on street trees and the numerous existing guidelines for streetscape design, planting choices, this paper argues, is the first prevalent obstacle to good sidewalk design. Characteristics including tree shape, spread or spatial configuration are not considered in the selection of planting choices for sidewalks, which results in trees becoming physical obstacles rather than elements for greening, shading or decreasing air pollution, and adding environmental and ecological benefits. According to participants' statements, plant choices are made according to the recommendations of plant nurseries' owners rather than according to the municipality's guidelines or landscape architects, with pyramidal, round, and oval shapes as the most preferred in order to ensure less human activity in front of the property (including walking or social gathering) and in order to achieve more esthetic arrangements as shown in Fig. 1.
- The second reason why walkers' journeys are rendered unpleasant, this paper argues, is the misplaced litter bins. In addition to the foul odor, the rodents, insects, stray cats, and dogs that seem to take them as habitats, misplaced litter bins are another physical interruption the nonmotorist traveler seems to face always in Amman. According to participants' statements, municipality workers do this on purpose to ease their everyday tasks and do the collection at once rather than four or five times at a block despite the street furniture guidelines. Moreover, this paper argues, this practice may encourage further littering as the distance between two littering locations becomes higher, thus, the more chance for the walker to discard unwanted objects regardless of the existence of a litter bin as shown in Fig. 2.
- In Amman, street/sidewalk ownership remains ambiguous, despite the fact that the area between a privately owned land lot and street is officially a governmental property; its conversion into sidewalks remains the responsibility of the landowner, which this paper argues, created a state of confusion with regards to the right to the sidewalk and resulted in some sidewalks transforming into extensions of private businesses and residents interrupting the walker's journey as shown in Fig. 3.
- The ownership issue, this paper argues, leads to another obstacle to be considered. Suddenly broken sidewalks may occur in cases where land lots are yet to acquire an owner. Thus, the sidewalk construction remains on pause until further notice and the nonmotorist traveler will need to alternate between sidewalk and street until they arrive at their destinations as shown in Fig. 4.
- The general deterioration whether due to the lack of maintenance and follow up or due to construction or infrastructure work not cleaning up post projects or post social events (e.g., tents that require metal rods to be planted into the sidewalk in order to fix the tension cords) is also another problem sidewalks in Amman suffer from. As a result, the state of the sidewalk, this paper argues,

Fig. 1 Poor planting choices examples *Source* Author (2017)

Fig. 2 Misplaced litter bins examples *Source* Author (2017)

Fig. 3 Ambiguously transformed sidewalks examples *Source* Author (2017)

does not allow travelers from different groups including children, elderly, and physically or mobility impaired to use the sidewalks safely, thus, defeats the primary purpose put forward by this urban element (Fig. 5).

- Lack of street furniture including seats, water fountains, smaller litter bins, tree guards, that in addition to poor lighting and the diversity in tiling, patterns, and surfaces throughout the sidewalk are other challenges to walkability this paper also identifies, yet due to their lack, has no images of More obstacles and key challenges identification remain open for future research.

Fig. 4 Suddenly interrupted sidewalk examples *Source* Author (2017)

6 Discussion

This paper identified some of the benefits associated to walkability including health benefits resulting from the added physical activity as well as the promotion of an overall active lifestyle in addition to decreased deaths and Disability-Adjusted Life Years (DALYs), environmental sustainability and reduced air pollution thought reducing greenhouse gas emissions resulting from transportation by converting short driving trips into walking journeys, reduced noise pollution, economic benefits, and social equity benefits more specifically in lower-income neighborhoods where families are more reliant on walking in their essential journeys. Moreover, touched on the associations between walkability and active transportation, which is strongly connected with active aging and as a result, promotes an overall active living.

The paper also highlighted the connections between neighborhood built environment characteristics including street connectivity, common block area, dwelling density, land-use mix and diversity, and access to activities and achieving walkability and urban mobility in an attempt to evaluate pedestrian environments.

The more substantial weight of this paper focused on walkability and sidewalks evaluation and assessment tool and examined a large body of discussions that introduced tools including GIS-based methods, the Pedestrian Level Of Services (PLOS), Quality of Pedestrian Level of Service (Q-PLOS), Pedestrian Quality Of Services (PQLS), Google Street View, Walk Score, Pedestrian Index of the Environment (PIE), among others and demonstrated the ways these tools have been implemented in their study contexts.

The paper then demonstrated literature discussions that investigated transforming from motorized to nonmotorized transportation and showcased examples that focused on converting short car trips into active trips and suggested strategies that may encourage such a transformation. The paper then highlighted some of the key challenges that face walkability and the nonmotorist traveler including safety,

Fig. 5 Deteriorated sidewalk examples *Source* Author (2017)

subjection to particulate, and emissions in addition to subjection to substantial levels of noise. Finally, this paper emphasized the role of the general public in decision-making and showcased examples that describe the need for methods that encourage their evolvement in the discussion on urban mobility in general and walkability and sidewalk design in specific.

The majority, if not the totality, of the discussions, demonstrated in the previous paragraphs were based on international cases that may not necessarily adhere to contexts of the Middle Eastern specifics which brings us to the paper's final notes.

This paper concludes that despite the abundant literature available on the walkability and its association with health, environmental and economic benefits, walkability and neighborhood urban design, walkability evaluation and assessment tools, challenges to achieving walkability, and walkability and public participation, such topics received little academic attention in Middle Eastern contexts and extend an invitation to interested scholars to take these concerns forward.

Therefore, and considering specifically the extensive research dedicated to the development of walkability evaluation and assessment tools, this paper recognizes the need to either develop new tools or appropriate existing tools (as numerous studies have already done) that are tailored for the Jordanian priorities and development objectives that take into consideration its specific context particularities and also extends an invitation to interested scholars to take this opportunity forward.

7 Conclusions

In order to develop the suggested tools, a further understanding of the key challenges to walkability and sidewalk design must be put forward. Therefore, in the study context, it identifies five main obstacles that hinder the practice of

good sidewalk design and thus achieving walkability including (1) poor planting choices, (2) misplaced litter bins, (3) street/sidewalk ownership, (4) the deteriorated condition of sidewalks, and (5) the lack of street furniture including seats, water fountains, smaller litter bins, tree guards, that in addition to poor lighting and the diversity in tiling, patterns, and surfaces throughout the sidewalk. However, despite the efforts made to identify these challenges, this paper concludes that this effort remains the humble work of one scholar. Therefore, more research is required in order to understand further the key challenges surrounding walkability in addition to the identified high gaps in the literature.

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Simulation of Grey Wolf Optimization Algorithm to Distinguish Between Modigliani's and His Contemporaries

Laheeb Mohammed Ibrahim and AbdulSattar Ahmad Al-Alusi

Abstract

The process to identify the real painting of an artist is considered a difficult task and needs expert and time to do this operation. This paper presents an automated system to simulate Grey Wolf Optimization Swarm Intelligence Algorithm to distinguish between Modigliani's paintings and his contemporaries is designed and tested. An automated system to distinguish between Modigliani's painting and his contemporaries consists of three processing steps. In the first step, the digital paintings for Modigliani and his contemporaries are processed automatically, the second step is feature extraction step, and the last step is the recognition step used Grey Wolf algorithm. An automated system that simulates the Grey Wolf Optimization Algorithm to distinguish between Modigliani's paintings and his contemporaries has been developed and tested. The testing results show that the rate of the difference is 91.5%.

Keywords

Simulation • Grey wolf optimization algorithm • Swarm intelligence • Pattern recognition • Feature extraction • Bicubic interpolation method • A histogram of oriented gradients (HOG)

1 Introduction

In the world of art, there is a problem of counterfeiting paintings of famous artists, where some painters reprinted the painting of a famous artist and sold it as the original painting. For example, the artists Vincent Van Gogh, Modigliani, and Da Vinci. In this case, the artist who painted the original painting as well as the person who bought the counterfeiting paintings is exposed to the loss of his rights.

The investigator can discover counterfeiting paintings to find the difference between a real artist's palette and counterfeit artists by studying the same descriptive qualities of the painting as space, texture, shape, color, tone, line, movement, unity, harmony, diversity, balance, contrast, proportion, style, along with brush strokes, theme, and other descriptive concepts. These are used for the remarkable similarities and differences between the original painting and the fake painting.

Determining a painting's authenticity can be extremely challenging. Typically, art experts reach decisions after thorough consideration of many different types of evidence. Correspondence from the artist's lifetime and documents tracing the painting's history of ownership provide clues. Technical analysis of the pigments and other materials and the method of their preparation were used (El-Bayoumy et al. 2013).

Figures 1 and 2 illustrate the work of Modigliani paintings and other contemporaries where similarity is apparent in composition, pose, and subject matter.

Over the past decades, sustainability has increasingly become an important issue because of the concerns over social responsibility and wealth disparity. Famous fine art artists have had faced malpractices problem of reprinting/replicating their paintings by their contemporary's artists. This, in some instances, has led to a loss of the intellectual property right of the original artist, which is socially and ethically unacceptable. Information Technology research on sustainability has been somewhat focused on the

L. M. Ibrahim (✉)
College of Computer Science & Mathematics, Mosul University, Mosul, Iraq
e-mail: Laheeb_alzubaidy@yahoo.com

A. A. Al-Alusi (✉)
American University in the Emirates, Dubai, UAE
e-mail: abdulsattar.alalusi@aue.ae

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(a) Modigliani's painting, Portrait of Woman in Hat, was initially created in 1917

(b) Contemporaries of Modigliani's painting

Fig. 1 Woman in hat, **a** Modigliani's painting, **b** contemporaries of Modigliani's painting

(a) Girl with Braids - Amedeo Modigliani 1918

(b) Girl with Pigtails, circa 1918

Fig. 2 Girl with Braids. **a** Amedeo Modigliani, **b** Circa

realm of green IT. However, this paper uses an innovative Swarm Intelligent algorithm as one of the Smart Information Technology tools to achieve sustainability in fine arts social responsibility. The authors have applied a smart IT tool in exceptional art recognition. The recognition process discovers any malpractices of reprinting famous painter's work through the simulation of Grey Wolf algorithm as a smart swarm intelligent algorithm to achieve sustainable social responsibility in the fine arts field. Similar work has been reported by Ibrahim (2018) as discussed.

In this paper, a simulation system is designed and implemented to use similarity measures to distinguish between Amedeo Modigliani's paintings and his contemporaries based on swarm intelligent methods, Amedeo Modigliani's paintings and his contemporaries is chosen because he is known for portraits and nudes in a modern style characterized by elongation of face, necks, and figures.

The main contributions of this paper include extracting individual brushstrokes automatically, which is a challenging problem partly due to the intermingling nature of brushstrokes in paintings and the low contrast in some painted areas. A Histogram of Oriented Gradients (HOG) is proposed to extracted feature and Grey Wolf *Swarm* authentication method is proposed to distinguish between Modigliani and his contemporaries.

2 Related Work

Unfortunately, the study of the Recognition problem of counterfeiting paintings of famous artists where some painters reprinted those of the famous artist and sold it as the original painting has not been addressed before in a general setting. Few types of research have been published.

Most recently, Ibrahim (2018) has designed an automated system for distinguishing between Van Gogh and his contemporaries by using Swarm Intelligent based on three steps. These are, the processing step in which the digital paintings for Van Gogh and his contemporaries are processed automatically, Extract all the connected components from the image, and Thinning and Resize image), and finally, the recognition step which uses Artificial Fish Swarm Algorithm. The author reported that a recognition rate of 94.51% was achieved between Van Gogh and his contemporaries.

Recently, Babak et al. (2016) have explored the problem of computer-automated suggestion of influences between artists. The authors have presented a two-level comparative study of different classification methodologies for the task of fine art. The first level reviews the performance of discriminative versus generative models, while the second level touches the features aspect of the paintings and compares semantic-level features versus low-level and intermediate-level features presented in the painting. Then the question "*Who influenced this artist?*" was investigated.

As a knowledge discovery, the study investigated the influence on the artist by looking at his masterpieces and comparing them to others. The authors provided a

visualization of artists (Map of Artists) by using several painting-similarity and artist-similarity measures (Ibrahim 2018; Babak et al. 2016).

Further, Li et al. (2012) have used statistical analysis to compare Van Gogh's painting with his contemporaries by analyzing a massive set of automatically extracted brushstrokes. Li et al. developed and implemented a novel extraction method by exploiting an integration of edge detection and clustering-based segmentation. Evidence substantiates that Van Gogh's brushstrokes are strongly rhythmic. That is, regularly shaped brushstrokes are tightly arranged, creating a repetitive and patterned impression. The authors also reported that the traits that distinguish Van Gogh's paintings in different periods of his development are all different from those distinguishing Van Gogh from his peers. The study confirmed that the combined brushwork features identified as unique to Van Gogh are consistently held throughout his French periods of production (1886–1890) (Ibrahim 2018; Li 2012).

Again, Siwei et al. (2014) have described a computational technique for authenticating works of art, accurately, paintings and drawings, from high-resolution digital scans of the original works. Their approach is to build a statistical model of an artist from the scans of a set of authenticated works against which new works are then compared. The developed statistical model consists of first and higher order wavelet statistics. The results from their analysis of 13 drawings that have at various times been attributed to Pieter Bruegel, the Elder confirm the expert authentications. The authors have also applied these techniques to the problem of determining the number of artists that may have contributed to a painting attributed to Perugino (Polatkan et al. 2009).

It is worth noted that the authors had realized some problems in the process of recognition operation when implemented in the field of distinguishing between the painters and their contemporaries' artists. For this reason, researchers have not used intelligent swarm algorithms in the recognition process. However, this paper designed and tested a simulation system of intelligent swarm algorithms to distinguish between Amedeo Modigliani and his contemporary's artists.

3 A Proposed System

This section describes in detail how to design a simulation system to distinguish between Modigliani's paintings and his contemporaries. The designed system is programmed using MATLAB Ver. R2015a and executed in three steps. These steps are the Processing step on Modigliani's digital paintings and his contemporaries, the Feature Extraction step which uses these processed digital paintings, and finally, the Recognition step distinguishes between Modigliani's paintings and his contemporaries' artists.

3.1 Processing Step

The Modigliani's images were taken from the digital internet library and have been treated by eliminating noise and improving them. For this reason, the Processing step in the proposed system has resized the digital images to be suitable for the Feature Extraction step. The Modigliani's digital image is a color image; it is entered to the Resize step. In the Resize step, the pixels in a color image are adjusted or resized using bicubic interpolation and perform antialiasing.

The bicubic interpolation method is somewhat complicated than bilinear interpolation. In bicubic interpolation, 16 nearest neighbors of a pixel have been considered. The intensity value assigned to point (x, y) is obtained using Eq. 1 (Prachi and Vijay 2017)

$$v(x,y) = \sum_{i=0}^{n} \sum_{j=0}^{n} a_{ij} x^i y^j \tag{1}$$

$$v(x,y) = ax + by + cxy + d \tag{2}$$

where the 16 coefficients are determined from the 16 equations in 16 unknowns that can be written using the 16 nearest neighbors of point (x, y), observe that Eq. (1) reduces into form to Eq. (2) if the limits of both summations in the above equation are 0–1. Generally, Bicubic interpolation is performing better in preserving fine details than its bilinear counterpart. Bicubic interpolation is the standard form used in commercial image editing programs (Prachi and Vijay 2017). The digital image after the resize step has (64 × 128) pixels as can be seen in Fig. 3.

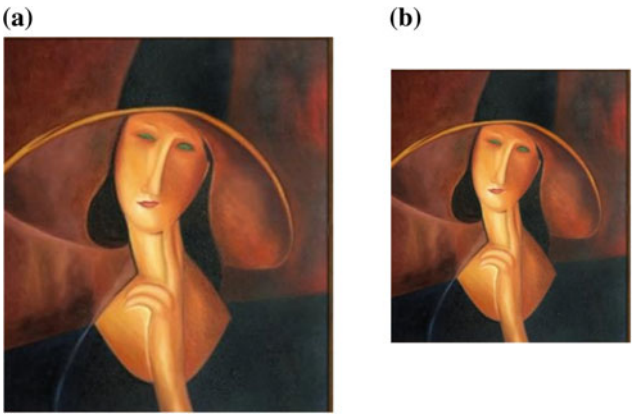


Fig. 3 Processing step for Modigliani's digital images. **a** Original image 245 × 695 pixels, **b** resize image 64 × 128 pixels

3.2 Feature Extraction

The results from the image processing step are used as input to the Histogram of Oriented Gradients (HOG) feature extraction. The technique of HOG counts occurrences of gradient orientation in localized portions of an image (Ibrahim 2018; Siwei et al. 2014).

The implementation of the HOG algorithm is as follows (Intel® Integrated Performance Primitives 2017):

1. Divide the image into small connected regions called cells, and for each cell, compute a histogram of gradient directions or edge orientations for the pixels within the cell.
2. Discretize each cell into angular bins according to the gradient orientation.
3. Each cell's pixel contributes weighted gradient to its corresponding angular bin.
4. Groups of adjacent cells are considered as spatial regions called blocks. The grouping of cells into a block is the basis for grouping and normalization of histograms.
5. Normalized group of histograms represents the block histogram. The set of these block histograms represents the descriptor.

Figure 4 demonstrates the algorithm implementation scheme.

The computation of the HOG descriptor requires the following basic configuration parameters: Masks to compute derivatives and gradients, Geometry of splitting an image into cells and grouping cells into a block, Block overlapping, and the Normalization parameters. The HOG Algorithm's feature extraction step used in this paper is that used by Ibrahim (2018), Siwei et al. (2014), and Satya (2016):

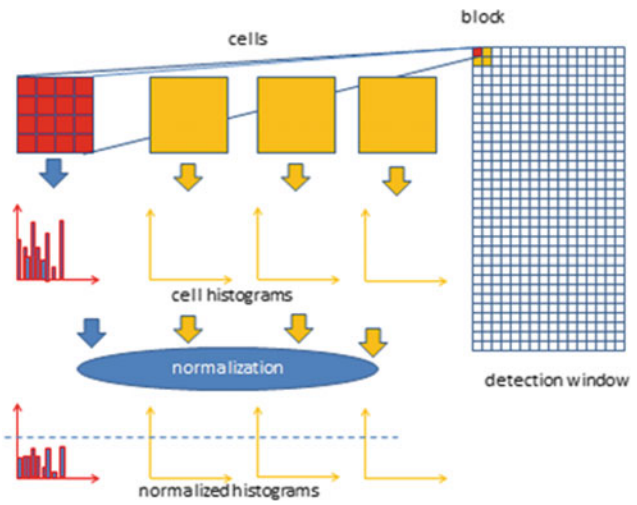


Fig. 4 Histogram of oriented gradients (HOG) algorithm implementation scheme (Intel® Integrated Performance Primitives 2017)

1. **Calculate the gradient images**: The calculation of the Gradient images needs first to calculate the horizontal and vertical gradients; after all, the histogram of gradients is calculated. This is easily achieved by filtering the image with the following kernels.

-1	0	1

-1
0
1

Next, the magnitude and direction of the gradient can be found using the following equation:

$$g = \sqrt{g_x^2 + g_y^2} \qquad \text{Gradient magnitude} \qquad (3)$$

$$\theta = \arctan \frac{g_y}{g_x} \qquad \text{Gradient direction} \qquad (4)$$

2. **Calculate histogram of gradients in 8 × 8 cells**: In this step, as can be seen in Fig. 5, the image is divided into 8 × 8 cells and a histogram of gradients is calculated for each 8 × 8 cells. To learn more about the histograms, it is essential first to understand why the image has been divided into 8 × 8 cells. An 8 × 8 image patch contains 8 × 8 × 1 = 64 pixel values. The gradient of this patch contains two values (magnitude and direction) per pixel which adds up to 8 × 8 × 2 = 128 numbers. By the end of this section, it can be seen how these 128 numbers are represented using a 9-bin histogram which can be stored as an array of 9 numbers. Not only the representation is more compact, calculating a histogram over a patch makes this representation more robust to noise. The histogram is essentially a vector (or an array) of 9 bins (numbers) corresponding to angles 0, 20, 40, 60, …, 160. Let us look at one 8 × 8 patch in the image and see how the gradients look as shown in Fig. 5.
3. **Create a histogram of gradients in these 8 × 8 cells**: The histogram contains 9 bins corresponding to angles 0, 20, 40, …, 160. The operation is conducted on magnitude and direction of the gradient of the same 8 × 8 patch as in Fig. 6. A bin is selected based on the direction and the vote (the value that goes into the b in) is selected based on the magnitude as illustrated in Fig. 6.
As discussed by Ibrahim (2018), Siwei et al. (2014), and Satya (2016), if the angle is more significant than 160° and between 160 and 180, the pixel with angle 165° contribute proportionally to the 0° bin and the 160° bin. The contributions of all the pixels in the 8 × 8 cells are added up to create the 9-bin histogram.
4. **Calculate the HOG feature vector**: A 16 × 16 block has four histograms which can be concatenated to form a 36 × 1 element vector. The window is then moved by 8

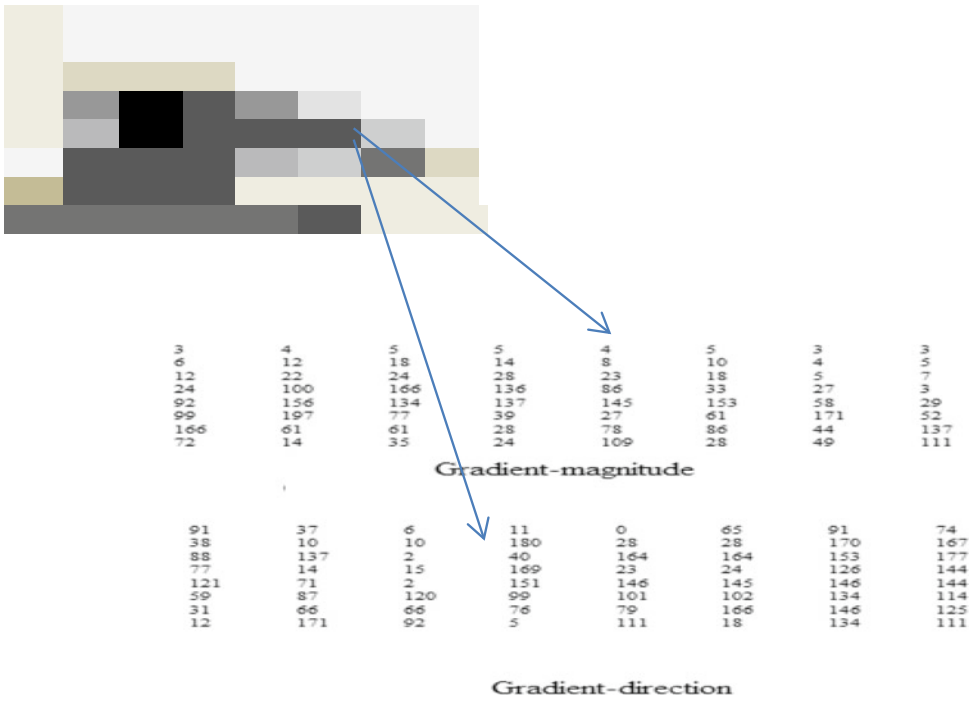


Fig. 5 One 8 × 8 patch in the image and the gradients

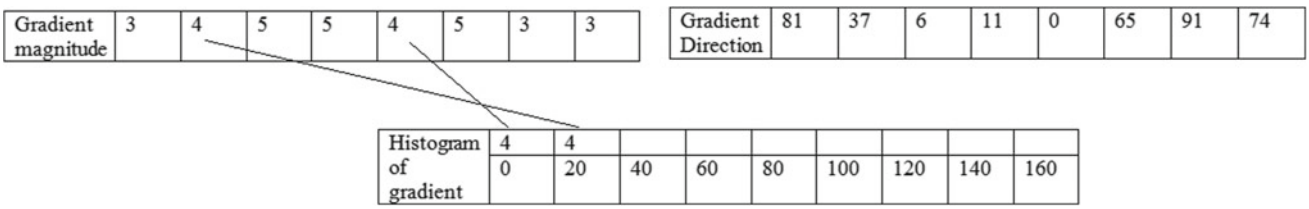


Fig. 6 A bin selected based on the direction, and the vote selected based on the magnitude

pixels, and a normalized 36 × 1 vector is calculated over this window, and the process is repeated, here the 36 × 1 vectors are concatenated into one giant vector to calculate the final feature vector for the Modigliani's paintings and his contemporaries' images. The size of this vector is calculated by seven horizontal and 15 vertical positions for 16 × 16 blocks, this is making a total of 7 × 15 = 105 positions. Each 16 × 16 block is represented by a 36 × 1 vector. Thus, when they are all concatenated into one giant vector, a 36 × 105 = **3780**-dimensional vector will be obtained.

The HOG feature extraction results on Modigliani's paintings and his contemporaries are shown in Figs. 7 and 8.

3.3 Distinguish Between Modigliani's Paintings and His Contemporaries Step

One of the interesting branches of smart computing is Swarm Intelligence (SI). The concept of SI was first proposed in 1993. Swarm Intelligent is "*The emergent collective intelligence of groups of simple agents*". The inspirations of SI techniques originate mostly from natural colonies, flock, herds, and schools. Some of the most famous SI techniques are Ant Colony Optimization (ACO), Particle Swarm Optimization (PSO), Artificial Bee Colony (ABC), artificial Fish, Grey Wolf Optimization (GWO), etc. Some of the advantages of SI algorithms are that SI algorithms preserve information about the search space

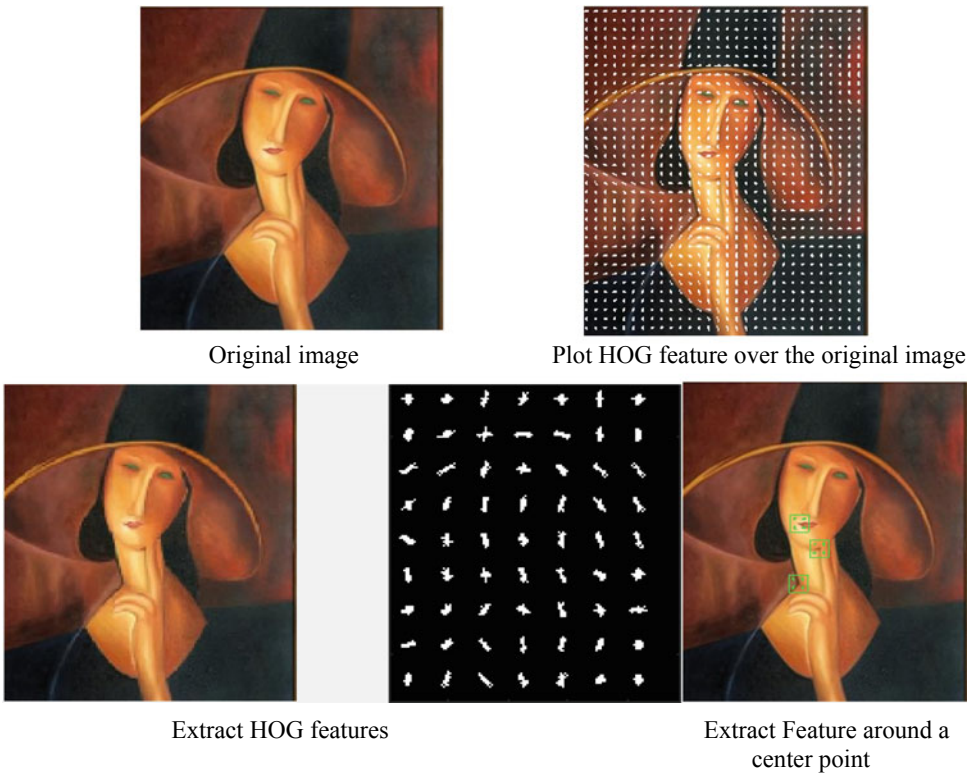


Fig. 7 HOG feature extraction results on Modigliani's paintings

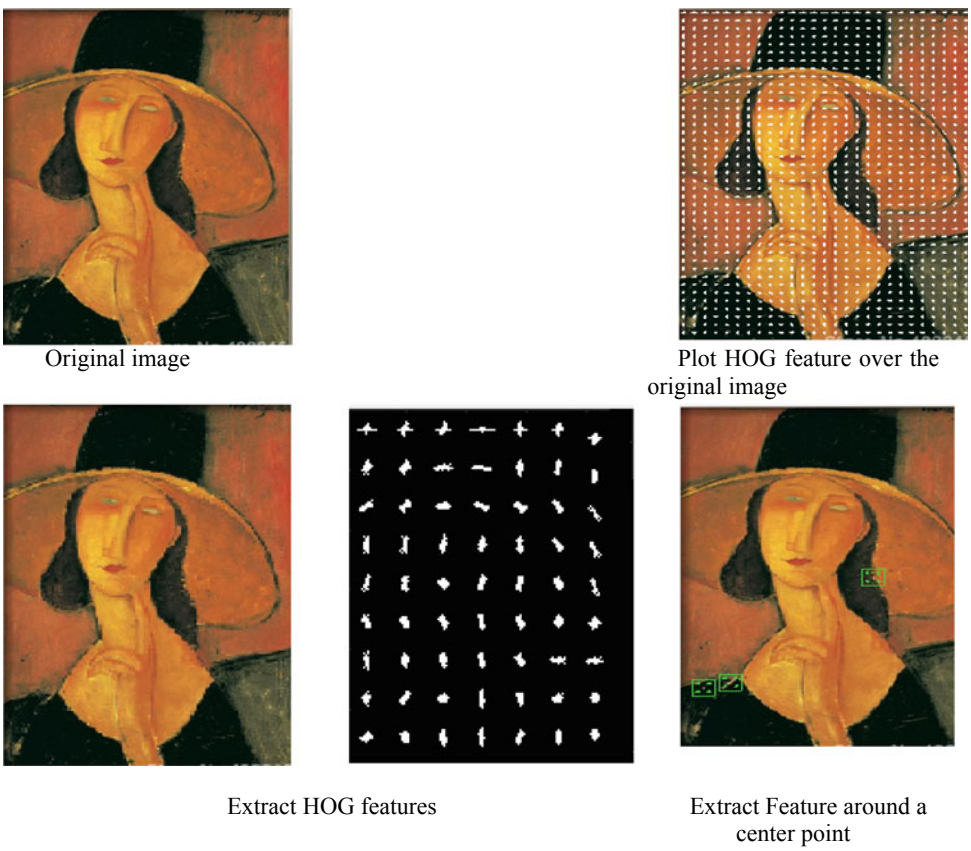


Fig. 8 The HOG feature extraction results on Modigliani's contemporaries

over the course of iteration, whereas Evolutionary Algorithms (EA) discard the information of the previous generations. In addition, the SI algorithms often utilize memory to save the best solution obtained so far, usually have fewer parameters to adjust, and are easy to implement (Mirjalili et al. 2014).

The simulation of Grey wolf optimizer algorithm for image distinguishes is the objective of this paper. Here, image distinguish is considered to be an optimization problem, and it is solved using Grey wolf optimizer algorithm. The Grey Wolf Optimizer (GWO) algorithm is a nature-inspired algorithm. It mimics the leadership hierarchy and hunting mechanism of the Canis lupus (i.e., Grey wolves) (Murali and Jayabarathi 2016).

The Grey Wolf Optimizer (GWO) algorithm is proposed by Mirjalili et al. (2014) and Radu-Emil et al. (2017) based on modeling grey wolf social hierarchy and hunting habits toward finding prey, represented by the solution to the optimization problem. The social hierarchy is simulated by categorizing the population of search agents into four types of individuals, i.e., alpha, beta, delta, and omega, based on their fitness. The search process is modeled to mimic the hunting behavior of grey wolfs, making use of three stages, searching, encircling, and attacking the prey. The first two stages are dedicated to the exploration, and the last one covers the exploitation.

The reduced number of search parameters is an essential advantage of GWO algorithms reflected in various applications, which include blackout risk prevention in smart grids, training multi-layer perceptron, optimization of reactive power dispatch, solutions to benchmarks generally used to test optimization algorithms, hyperspectral band selection, maximum power point tracking, image processing, economic dispatch, harmonic elimination in inverters, software reliability growth modeling, etc. (Murali and Jayabarathi 2016; Radu-Emil et al. 2017).

To see how GWO is theoretically able to solve optimization problems, some points may be noted (Mirjalili et al. 2014):

1. The proposed social hierarchy assists GWO to save the best solutions obtained so far throughout the iteration
2. The proposed encircling mechanism defines a circle-shaped neighborhood around the solutions which can be extended to higher dimensions as a hypersphere
3. The random parameters A and C assist candidate solutions to have hyperspheres with different random radii
4. The proposed hunting method allows candidate solutions to locate the probable position of the prey
5. Exploration and exploitation are guaranteed by the adaptive values of a and A
6. The adaptive values of parameters a and A allow GWO to smoothly transition between exploration and exploitation
7. With decreasing A, half of the iterations are devoted to exploration ($|A| \geq 1$) and the other half are dedicated to exploitation ($|A| < 1$)
8. The GWO has only two main parameters to be adjusted (a and C).

Grey wolves encircle prey during the hunt. The mathematical simulation of the encircling behavior of grey wolves was discussed by Li (2017), Grey wolf optimizer algorithm for image distinguish is given below:

Grey wolf optimizer algorithm, Mirjalili et al. (2014).

Initialize the grey wolf population Xi (i = 1, 2, ..., n)
Initialize a, A, and C
Calculate the fitness of each search agent
Xα=the best search agent
Xβ=the second-best search agent
Xδ=the third best search agent
***while** (t < Max number of iterations)*
***for** each search agent*
Update the position of the current search agent by equation

$$\vec{X}(t+1) = (\vec{X}_1 + \vec{X}_2 + \vec{X}_3)/3$$

end for
Update a, A, and C
Calculate the fitness of all search agents
Update Xα, Xβ, and Xδ
t=t+1
end while
return Xα

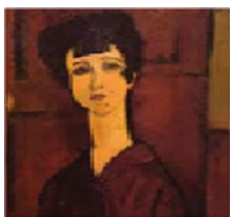
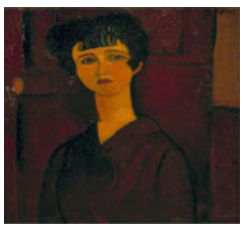
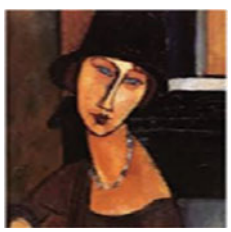
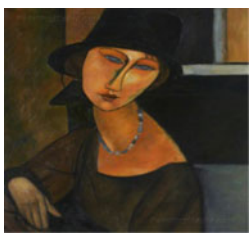
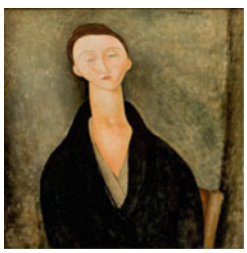
4 Experimental Results

Experimental results were performed on Grey Wolf Optimizer algorithm, in order to evaluate the effectiveness of the proposed method for distinguishing between Modigliani's paintings and his contemporaries problems. 10-Modigliani's paintings and his contemporaries were used to estimate the distinguished results.

The 10 Modigliani's paintings and his contemporaries dataset are taken from Internet digital library, see Table 1, which is composed of HOG feature extraction, each painting image converted to 3780-dimensional vector.

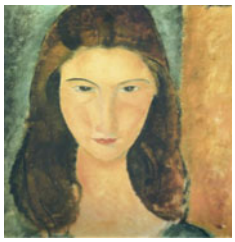
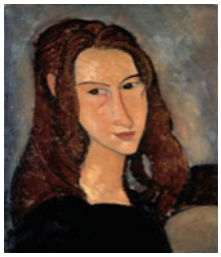
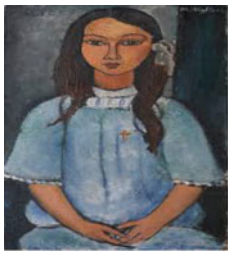
The GWO, implanted for image distinguish were initialized with 12 no. grey wolves, maximum no. of iteration is 200. The values of "a", from "2" to "0" are initialized. After the first iteration, the best solution (fitness function) as given by equation five is taken as "α-wolf", while next two best solutions are taken as "β" and "δ" wolves, respectively.

Table 1 Differences rate between Modigliani's and his contemporaries paintings

No.	Modigliani's paintings	Modigliani's contemporaries paintings	Differences rate (%)
1			89
2			91
3			93
4			94
5			90

(continued)

Table 1 (continued)

No.	Modigliani's paintings	Modigliani's contemporaries paintings	Differences rate (%)
6			88
7			91
8			90
9			95
10			94
Average differences rate		91.5	

$$Euclidean\ distance:\ D = \sqrt{\sum_{i=1}^{n}(q_i - p_i)^2} \qquad (5)$$

After the implementation of an automated system to simulate Grey Wolf Optimization Swarm Intelligence Algorithm to distinguish between Modigliani's paintings and his contemporaries, we note that the Average Differences rate of 10 Modigliani paintings and his contemporary dataset is 91.5%, as shown in Table 1, and this result is a reasonable recognition rate. This Differences rate encourages the researcher to use an automated system to distinguish not only between Amedeo Modigliani's paintings and his contemporaries. Also, this automated system can used to distinguish between other paintings and their contemporaries, such as Matisse, Monet, Vincent Van Gogh, and Da Vinci, Just by changing the dataset of paintings.

5 Conclusions

A new image unique algorithm is proposed based on Grey Wolf Optimization algorithm, the proposed algorithm gives superior results and using Grey Wolf Optimization algorithm made less computational time and utilized memory to save the best solution obtained so far with fewer parameters to adjust, and GWO algorithm is easy to implement. The results for distinguished between Modigliani's paintings and his contemporaries show that the Difference rate is 91.5%. The new proposed algorithm may be applied in solving recognition problems in other different areas of interest.

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Skills Engineering in Sustainable Counter Defense Against Cyber Extremism

Vladimir Tomašević, Tatjana Ilić-Kosanović, and Damir Ilić

Abstract

This article identifies and classifies the core and additional soft skills required not only by engineers that design the security measures against cyber extremism but by other professionals in the field of cybersecurity. Furthermore, it recommends steps in how these competencies may be developed and evolved. IT-based solutions rely on the process of cognition-extrapolation-algorithm-programming from problem identification to the final product delivery. In all approaches to problem-solving, regardless of the nature of the challenge, the end product is only as good as the parameters that define the programming scope. The program capability and scope are defined by the creativity of its creators. Thus, when creating robust security measures that are designed to guard against cyberattacks by extremists, IT measures are only as useful as the creativity of the designer in the cognition-extrapolation phases of product design. Unexpectedly, this implies that the technical-based capabilities of technologically engineered solutions rely on *soft* human skills in order to have a practical application Additionally, as engineered products become more complex, work packages are broken down even further to more significant numbers of programmers and thus are even further devoid of individual creativity which is grounded and substantiated by *soft* skills.

Keywords

Soft skills • Security measures • Cyber extremism • Cybersecurity

V. Tomašević (✉) · T. Ilić-Kosanović · D. Ilić
Belgrade School of Engineering Management, Union "Nikola-Tesla" University, Bulevar Vojvode Mišića 43, 11000 Belgrade, Serbia
e-mail: vladimir.tomasevic@fim.rs

T. Ilić-Kosanović
e-mail: tatjana.ikosanovic@fim.rs

D. Ilić
e-mail: damir.ilic@fim.rs

1 Introduction: Cybersecurity and Cyber Extremism

1.1 Cybersecurity

From the beginning of twenty-first century, cybersecurity, due to the rapid expansion of the number of Internet users, has become one of the most important issues in today's society in security studies, security strategies of public and business sector, governmental and nongovernmental organizations. Rapid integration of the Internet into almost all forms of human activity has increased the vulnerability of modern society from cyberattacks reiterating the old truth that technology can be both useful and threatening. The Internet is a part of the critical global infrastructure (transport, telecommunications, water, electricity, financial transactions, military defense systems, and more) and many other essential services of the modern society (e-commerce, e-banking, etc.) increasingly depend on the Internet and are often the targets of cyberattacks.

One of the main goals of governments and societies has become the sustainable protection of their critical infrastructures from possible cyberattacks both in criminal and extremist nature. Many countries have been developing strategies for ensuring the security of critical infrastructures, businesses, and people, not only in real space but in cyberspace too (Moteff 2015). Potential cyberattacks in many countries are treated like significant threats to state security. In the United Kingdom, the National Security Risk Assessment from 2015 has been placing cyberattacks at the same threat level as terrorism, military conflict, and pandemics (House of Lords House of Commons 2017). There are many kinds of cyberattacks including cybercrime, cyber

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espionage, hacktivism,[1] swarming,[2] cyberbullying, and phishing. United States Department of Homeland Security has stated that "in our daily life, economic vitality, and national security depend on a stable, safe, and resilient cyberspace" (Workforce Intelligence Network for Southeast Michigan 2017).

1.2 Cyber Extremism

Although there are more than 200 existent definitions of *extremism*, there is no universally accepted definition, and it is still difficult to define it. *Extremism* can be described as an action (by individual or group) that has a goal to bring and spread fear and can target people, critical infrastructure, and businesses. United Nations have defined *extremism* as "criminal acts intended or calculated to provoke a state of terror in the general public, a group of persons or particular persons for political purposes are in any circumstance unjustifiable, whatever the considerations of a political, philosophical, ideological, racial, ethnic, religious, or any other nature that may be invoked to justify them" (United Nations 1996). Lutz and Lutz have stated political motives, violence, and the threat of violence as critical factors in defining *extremism* (Lutz and Lutz 2005).

Cyber extremism is even more challenging to define, and the scientists and the professionals have created many similar, but somewhat different definitions. Oxford Dictionary has defined it as "politically motivated use of computers and information technology to cause severe disruption or widespread fear in society" (https://en.oxforddictionaries.com/definition/cyberterrorism). Denning in 2000 has defined *cyber extremism* as "the convergence of terrorism and cyberspace" (Özeren 2008). United States Federal Emergency Management Agency (FEMA) has identified *cyber extremism* as a "distinct [form] from computer crime, economic espionage, and hacktivism" (Özeren 2008). In order for an attack to be qualified as *cyber extremism*, it should "at least cause enough harm to generate fear" (Özeren 2008). Parks and Duggan have described *cyber extremism* as the new approach adopted by extremists to attack cyberspace (Parks and Duggan 2001).

Nevertheless, it is essential to emphasize that not every cyberattack is extremist. The goals and the motivation of perpetrators are the keys to distinguishing between a *cybercrime* and *cyber extremism* (Jerman-Blažic and Klobucar 2016). The thin line between a cyberattack and a cyber extremist attack can be explained through the examples of the incidents in which perpetrators have stolen credit card data in order to get financial gain and the incidents in which perpetrators have stolen credit card data in order to fund extremist activities, such has been a case of a Bali bomber (United Nations Counter-Terrorism Implementation Task Force 2011).

Critical infrastructure (transport, telecommunications, water and electricity production and supply, financial transactions, military defense systems, etc.) in most developed countries relies on computer networks, and there is a growing concern that possible cyberattacks through hacking computer systems, or programming viruses and worms, web pages attacks, and denial of service (DoS and DDoS) attacks by extremists can severely disrupt functioning of the attacked system, and also lead to endangering the lives of people.

It is considered that the first cyberattacks, extremist in nature, happened during Kosovo war in 1999 when, on one side, Serbian, Russian, and Chinese hackers attacked NATO and NATO countries' (mainly US) websites and servers or have sent virus-infected mass E-mails and, on the other side, Albanian, US, and other Western countries' hackers attacked Serbian government websites and servers (Denning 2001; Matusitz 2011). One of the most extensive botnet attacks on the government and private computer networks so far has happened in Estonia in 2007 (United Nations Counter-Terrorism Implementation Task Force 2011).

Different extremist groups during the last two decades have already mastered the use of the Internet in order to recruit supporters and members, to publicize and organize their activities, to spread fear, and wage psychological warfare (United Nations Counter-Terrorism Implementation Task Force 2011; EUROPOL 2015; Rollins and Wilson 2007; Awan 2017). Other uses of the Internet include fundraising, training, and sending encrypted messages through blogs, communications platforms, chat rooms, and gaming platforms. It is known that Osama bin Laden communicated with members of Al-Qaeda through a laptop computer and encrypted messages and that organizers of 9/11 attacks, such as Ramzi Yousef, did the same (United Nations Counter-Terrorism Implementation Task Force 2011). Lately, so-called Islamic State (ISIS) has found new ways to use social networks such as Twitter or Facebook, to promote their goals and beliefs to a broader audience, understanding them as a powerful PR tool (Awan 2017; Brunst 2010).

Cyber extremism brings new ways of extremism since the perpetrators have to possess a specific set of skills and they can stay anonymous and physically safe, hundreds or

[1]The term *hactivism* is coined to define hacking with political motives. See in: Klein, J. J.: Deterring and Dissuading Cyberterrorism. *Journal of Strategic Security* 8, no. 4 (2015): 23–38. DOI: http://dx.doi.org/10.5038/1944-0472.8.4.1460. Available at: http://scholarcommons.usf.edu/jss/vol8/iss4/2.

[2]The term *swarming* is used for simultaneous accessing a website by hundreds or thousands of people. Weimann, G.: Cyberterrorism How Real Is the Threat? Special Report 219. United States Institute of Peace. Washington DC (2004).

thousands of miles away from the location of an attack. Also, cyber extremist attacks do not require broad logistical support and significant financial funds; however, they can cause massive damage to infrastructure or businesses and loss of lives, thus becoming very tempting for many extremist groups. It is important to emphasize that the possibility of an imminent cyber extremist attack creates a new form of warfare exploiting the fear of attacks itself (Brunst 2010; Keith 2005).

All those issues are continually raising questions on how to prevent those attacks and how to defend critical infrastructure, people, and businesses? In order to do so, it is clear that an educated workforce is needed with a set of various skills with the emphasis on *hard* skills such as mastering various aspects of Information Technologies and security studies. Nevertheless, there is another, very important, set of skills needed for understanding and preventing possible cyber extremism attacks; those are a large variety of so-called *soft* skills (like communication, teamwork, etc.) that are not precisely defined yet.

2 Human Resources for Fighting Cyber Extremism

2.1 Major Human Resources Issues for Fighting Extremism

Every organization depends on the quality of human resources. One of the most critical aspects of human resources management in organizations is the selection of candidates. By definition, the selection is a process in which a choice is made between available candidates for a particular job, and a decision is made on their employment or rejection (Dessler 2013). Entire organizations often depend on the results of the candidates' selection process. The significance of candidate selection is most pronounced in those industries and organizations dealing with the security of states and citizens (military, police, security agencies, etc.) and whose work results directly affect the lives of the citizens. The Harvard Business School Philosophy (Harvard Business Review 2003) has suggested an imperative to choose a candidate better than us and that only in this way, an organization will expand. This is of particular importance in the security sector where employees perform narrow-skilled, highly specific, and stressful jobs and which candidate market (*talent pool*) is exceptionally narrow (United States Department of Justice, Federal Bureau of Investigation 2004).

The critical element in sustainable extremism and *cyber extremism* defense is not the technology itself and information–communication systems, but people who design and/or implement such systems, and their expertise and dedication. Many governments and organizations have already developed new programs for human resources management regarding the workforce fighting "traditional" ways of extremism. Key security organizations and agencies in the world, such as the United States Federal Bureau of Investigation (FBI), have stated that the significant first step in sustainable fighting extremism is anticipation and prevention of extremist attacks, which gives completely new tasks to employees in different positions. The need for specific positions that involve specific competencies (analysts, translators, field agents, IT experts in various fields, etc.) is increasing on an almost daily basis (Carter 2006). FBI has also created individual units that deal with recruitment, selection, training, and career development of special categories of employees in the counter-extremism sector (analysts, IT experts, etc.) (United States Department of Justice, Federal Bureau of Investigation 2004).

The events of September 11, 2001, noticeably changed the required candidates' profile and the competencies expected from applicants for the counterterrorism sector. Before these events, the "market" that FBI had attracted the candidates from, included almost exclusively army and navy members or former members of the army and navy employed by the police, legal system, or financial institutions. After September 11, FBI has started to recruit candidates from a much broader "base". The number of newcomers with the so-called critical (or core) competences in areas such as information and communication technologies, foreign languages, or engineering is expanding. The novelty that has been introduced is the design of a system for the selection of future leaders in the agencies for fighting extremism, and essential *soft* competencies were established as leadership, interpersonal relations, organization and planning, analytical and problem-solving skills, flexibility/adaptability, communication, and initiative (Carter 2006).

Also, within the framework of engineering sustainable extremist defense in the United States, for almost a decade, employees in "regular" police services and units have had to develop the *soft* competencies that have been significant for extremist defense: analytical and problem-solving skills, effective communication with the public, control of fear, and community involvement. In this field, it is even more critical that appropriate candidates are selected for the positions that include specific, highly stressful tasks (so-called *right fit*) (College of Policing 2015). In the United Kingdom, under the threat of extremism, for the selection of candidates for units fighting extremism, who can advance faster on a career ladder, *assessment centers* have been increasingly used, evaluating some of the following soft competencies: leadership, professionalism, teamwork, decision-making, performance management, and change management (Chenoweth 1961; Canadian Psychological Association 2013) and in the United States, different situational tests

have been used for policing jobs (Chenoweth 1961), and the jobs that include tasks related to fighting extremism (Deloitte Center for Industry Insights 2018; Tomić et al. 2015) assessing *soft* skills, too.

It is clear that in order to build the workforce able to anticipate and fight extremist attacks, many developed countries have turned to previously unrecognized skills (languages proficiency, information technologies, etc.) and *soft* skills as the crucial factors in developing human resources with the knowledge, skills, and abilities required for new tasks and responsibilities for fighting extremism (Tomić et al. 2015). The crucial question is that what kind of skills are required for fighting cyber extremism?

2.2 Major Human Resources Issues for Fighting Cyber Extremism

As it is previously said, there should be a consensus on, at least, basic knowledge, skills, and abilities required for employees engaged in prevention or fighting *cyber extremism*. This can become a platform for building sustainable educational and training programs for candidates or current employees. As in other professions, there should be two prerequisites met: *hard* component, with the emphasis on the knowledge in certain areas (engineering, information technologies, security studies, etc.) and *soft* component, which includes other skills, intangible skills, which enable all the talents to be involved, inducing teamwork and information sharing.

2.3 Hard Skills for Fighting Cyber Extremism

The concern over intensifying of cybersecurity problems, and possible cyber extremist attacks, has forced governments and organizations to question their capabilities to respond to those problems with existent human resources, especially ones with the hard skills in information technologies. There is a mounting need for cybersecurity professionals (HM Government 2014), though the desired competencies required from those professionals are not yet established. In building *hard* skills for fighting extremism, especially cyber extremism, many governments and companies are encouraging the students to choose education and careers in STEM (Science, Technology, Engineering, and Maths) (HM Government 2014), with the emphasis on information technologies, in order to develop skilled workforce for tackling cyberattacks on critical infrastructure, businesses, and people. Moreover, published research has stated the necessity to develop an interest in STEM from early secondary education and, also, from elementary education, to be able to have educated human resources for future needs (Carlton and Levy 2017).

Most governments and companies have been focused on the employees in everyday operations, so-called *front line cybersecurity employees,* who develop the programs related to security, investigate and address virtual threats, and work directly with security platforms. The occupations involved are network administrators, software developers, and information security analysts (Workforce Intelligence Network for Southeast Michigan 2017). Also, many governments tend to include less traditional ways of recruiting IT experts by targeting and recruiting former hackers (mostly in their early twenties).

Nevertheless, it should be emphasized that professionals in STEM, are not the only ones whose knowledge is needed in sustainable fighting cyber extremism, the professionals with the background in history, law, accounting, languages and linguistics, psychology, communications, philosophy, political science, and sociology are also essential in order to prevent or fight possible cyber extremist attacks.

3 Engineering Soft Skills for Fighting Cyber Extremism

3.1 Scope of the Study

IT-based solutions rely on the process of cognition-extrapolation-algorithm-programming from problem identification to the final product delivery. In all approaches to problem-solving, regardless of the nature of the challenge, the end product is only as good as the parameters that define the programming scope. The program capability and scope are defined by the creativity of its creators. Thus, when creating robust security measures that are designed to guard against cyberattacks by extremists, IT measures are only as useful as the creativity of the designer in the cognition-extrapolation phases of product design. Unexpectedly, this implies that the technical-based capabilities of technologically engineered solutions rely on *soft* human skills in order to have a practical application.

Furthermore, as engineered products become more complex, work packages are broken down even further to more significant numbers of programmers and thus are even further devoid of individual creativity which is grounded and substantiated by *soft* skills. A conducted literature review has shown the awareness of the lack of soft skills in the field of cybersecurity and fights against cyber extremism (Workforce Intelligence Network for Southeast Michigan 2017; Canadian Psychological Association 2013; Tomić et al. 2015; HM Government 2014). Nevertheless, there has not been a comprehensive analysis of the skills that should

be emphasized as the necessary *soft* skills for fighting cyberattacks and *cyber extremist* attacks.

In order to carry out a more extensive study, the interviewing of information technologies experts has been conducted as a basis for further research. In the period of two weeks, from June 4 to June 15 2018, 55 individuals from Belgrade, Serbia area: experts in information technologies, IT start-up owners, web developers, senior programmers, network administrators with the particular interest in cybersecurity, each with more than 50 years of experience, have been interviewed through semi-structured interviews regarding their attitudes on *soft* skills needed for providing cybersecurity with the emphasis on fighting cyber extremism. Two open questions have been stated

1. What *soft* competencies (skills and abilities) professionals in the field of cyberattacks and cyber extremist attacks defense should possess in order to prevent or fight those attacks?
2. Range those competencies in order of importance and relevance.

3.2 Results and Discussion

According to the analysis of the given answers, the model of crucial soft competencies for fighting *cyber extremism* is developed as presented in Table 1.

In the second part of the interview, the interviewees have had the opportunity to give additional remarks on the matter of *soft* skills needed in fighting cyber extremism stating the need for developing programs that can tackle the issues of identifying and developing *soft* skills for sustainable defense against cyber extremism. According to the analysis of additional remarks of IT experts and analyzed literature, it can be concluded that crucial factor in building the workforce able to fight cyber extremism is educational system, especially higher education institutions that can offer undergraduate, master, specialist, PhD, and other programs that include courses and workshops that develop both *hard* and *soft* skills of the STEM students, but also of the social sciences and humanities students who have interest and capacity to be a part of the effort in fighting *cyber extremism*.

There is an evident opportunity for the cooperation of higher education institutions that offer undergraduate and graduate programs in information technologies and security studies. There has to be a willingness to build joint master programs offering knowledge and skills regarding specific issues of cyberattacks and cyber extremism and knowledge and tools to prevent them and fight them including training in *soft* (intangible) skills. As *soft* skills could not be thought ex cathedra, the series of workshops, including case studies, situational and behavioral exercises, role-play exercises, simulations, etc., engineered by professionals in the field of cybersecurity with proven experience should be introduced (see Table 2). Also, higher education institutions and certified agencies should offer programs for additional certification for cybersecurity issues and jobs.

3.3 Limitations and Scope of Further Study

There is a two way significance of the findings of this research, the first is that on the basis of this research in the next phase, more extensive analysis will be carried on, with designing the questionnaire that is going to be delivered to, not only IT experts in cybersecurity, but to wide range of security experts and security studies specialists and other professionals connected to the field of cybersecurity (psychologists, linguists, etc.) in order to engineer a comprehensive list of *hard* and *soft* competencies needed for sustainable counter defense against *cyber extremism*.

The second is in emphasizing the need for listening to the practitioners from the field of cybersecurity regarding the competencies of the future human resources for fighting cyber extremism, with the emphasis not only on the *hard* skills (technical) but on the *soft* skills as well. Higher

Table 1 Soft competencies model for fighting cyber extremism (*Source* Authors' findings)

Core competencies	Additional competencies
Analytical skills	Planning skills
Problem finding skills	Writing skills
Problem-solving skills	Flexibility
Communication	Emotional intelligence
Teamwork	Trust[a]
Willingness to learn	Interpersonal skills
Creativity	Empathy

[a]Trust as a competence has been established by Platts, J., Tomasevic, V. (2006) *Developing productive relationships in civil engineering.* Proceedings of ICE, Civil Engineering 159, August 2006. Paper 14049, pp. 132–137

Table 2 *Soft* skills development workshops (*Source* Authors' findings)

Workshop type	Workshop developers and providers	Additional workshop developing assistance
Simulations	Security experts Cybersecurity experts IT experts	Psychologists
Case studies	Security experts Cybersecurity experts	Historians Political scientists
Situational exercises	Cybersecurity experts	Political scientists Psychologists Linguists
Behavioral exercises	Security experts	Social scientists Psychologists
Role-play	Cybersecurity experts	Psychologists Behavior scientists
Competitions	Cybersecurity experts IT experts	Psychologists Knowledge Managers
Leaderless group discussions	Security experts	Psychologists Social scientists Philosophers

education institutions delivering security studies programs and the programs in information technologies are the key to creating sustainable higher education programs for building, not only technical knowledge of the workforce (*hard* skills), but the *soft* skills (e.g., communication, teamwork, flexibility, etc.), needed for any endeavor, especially in the tasks regarding the field of cybersecurity. There are vast opportunities for developing workshops for *soft* skills training with the inclusion of experts from various fields (security studies, information technologies, psychology, etc.).

4 Conclusion

The Internet as a part of a critical global infrastructure is a potential target for cyber extremist attacks both in criminal and extremist nature, and the governments and societies are set to protect their critical infrastructures because of the concern that possible cyberattacks can disrupt the functioning of the attacked systems and also lead to endangering the lives of people. Many governments and organizations have already developed new sustainable programs for human resources management regarding the workforce fighting "traditional" ways of extremism that include *soft* skills recognition, definition, and development. The critical element in fighting cyber extremism is not the technology itself and information–communication systems, but people who design and/or implement such systems, and their expertise and dedication. The concern over intensifying of cybersecurity problems has forced the governments and organizations to question their capabilities to respond to those problems with existent human resources, especially ones with the *hard* skills in information technologies. Nevertheless, there is a lack of *soft* skills in the field of cybersecurity and fight against *cyber extremism*, but there is no comprehensive analysis of needed *soft* skills and their significance. When creating robust security measures that are designed to guard against cyberattacks by extremists, IT measures are only as useful as the creativity of the designer in the cognition-extrapolation phases of product design.

The analysis of the interviewing of information technologies experts from Belgrade, Serbia, with the questions regarding the definition of the *soft* skills needed for tackling cybersecurity issues, especially the fight with cyber extremism has built the basis for creating the basic model of *soft* competencies for fighting cyber extremism that includes core and additional *soft* skills.

There are vast opportunities for cooperation between higher education institutions that offer undergraduate and graduate programs in information technologies and security studies in building joint master programs offering knowledge and skills regarding specific issues of cyberattacks and cyber extremism. Moreover, those programs have to include training in *soft* skills. *Soft* skills could not be thought ex cathedra; the series of workshops including case studies, situational and behavioral exercises, role-play exercises, simulations, etc., engineered by professionals in the field of cybersecurity with proven experience should be developed.

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Slow Tourism Insights Inspiring Fast Travel Forms via Sustainable Development, the Triple Bottom Line, and Environmental Communication

Konrad Gunesch

Abstract

This research first develops slow tourism as rooted in various social and sustainability movements, concepts and practices of multicultural studies, and lifestyle philosophies. Second, it places slow tourism in the context of worldwide sustainability concerns, substantiated by the business triple bottom line, here placed within the framework of the global travel and tourism industry. Third, it compares two modes of fast tourism, namely, airline and business travel, to two modes of slow tourism, namely, student and religious travel. This comparison prepares the ground for suggestions of how slow travel models and philosophies could inspire and transform fast travel forms regarding their business practices and sustainability implementations in the interests of the global tourism industry. Fourth, those slow tourism inspirations, triple bottom line substantiations and fast tourism transformations are connected to the dynamically evolving field of environmental communication, presented beyond concerns of global warming and environmental protection, and based on media principles such as discursiveness, subsidies, balance and objectivity, frames and agendas, news holes, and environmental reporting. The conceptual contribution of this research lies in connecting slow and fast tourism, sustainability, the triple bottom line and environmental communication. Its practical contribution is the development of action and reflection models as well as transformation motivations for fast tourism forms and expressions. Its overall contribution is a first step toward a new framework of public discourse that now unites global travel and tourism practices and philosophies, worldwide environmental concerns, sustainability substantiations, and their open and fruitful sharing and discussion in global media communication.

K. Gunesch (✉)
American University in the Emirates, Dubai, United Arab Emirates
e-mail: konrad.gunesch@aue.ae

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Slow tourism • Fast tourism • Global tourism • Triple bottom line • Environmental communication • Environmental sustainability

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1 Introduction

This paper connects the ever more discussed and practiced travel form of "slow tourism" to fast travel forms (such as car or plane travel) via the broad concept of "sustainable development", the substantiation of sustainable development in form of the "triple bottom line", and the form of spreading the awareness of all of those concepts in form of "environmental communication". To that end, it will first develop all these terms conceptually, before operationalizing sustainable development via the notion and practice of the triple bottom line.

The contributions of this research are thus on several levels: conceptually, it adds to the understanding of sustainable tourism with the form of slow tourism, deepens the understanding of sustainability via the triple bottom line, and links environmental communication to reporting about sustainability issues and awareness. Operationally, it enables international tourism businesses to assess their day-to-day practices with respect to sustainable development, such as social effects and contributions of their organization, or environmental accounting, or ecological impacts. Practically, it also allows international tourists and global travelers to assess global tourism stakeholders' sustainability practices against concrete guidelines of such effects or practices. Finally, in communication terms, it empowers processes and partners of environmental communication such as

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environmental journalists, standards of reporting, and the public, which in turn has implications for personal and political decision-making.

The fields of "slow tourism" and of "environmental communication" have attracted concentrated scholarship only during the second decade of the twenty-first century. This research undertakes to establish a connection between them. In doing so, it relates slow tourism to broader issues of academic and popular interest, such as various "slow movements", "sustainable tourism" as well as "sustainable development". A focus is on the triple bottom line, presented as a substantiation of the concept of sustainability in the realm of business, but focused on in the context the global travel and tourism industry. Environmental communication is shown to overlap with sub-fields such as "environmental media" or "environmental reporting", while based on a range of key concepts of the social sciences (such as constructionism and discursiveness), of media studies (namely, framing and agenda construction), of environmental journalism (for instance news holes and media subsidies) as well as of environmental reporting (especially objectivity and balance).

To highlight slow tourism's practical relevance, two alternatives of fast travel (namely, airline and business travel) will be compared to alternatives of slow travel and tourism (notably student and religious tourism). This prepares the ground for developing a range of arguments, theoretical and practical solution suggestions, as well as concrete policy recommendations for slow tourism's travel modes and philosophies. The aim is to challenge, inspire, and change fast forms of travel and tourism with respect to their business practices and sustainability implementations, in the shared interests of the worldwide tourism industry, global travelers, as well as ecologically-minded and socially, politically, and culturally sensitive businesses that wish to adhere to the triple bottom line in their day-to-day operations.

This research contributes conceptually by connecting the fields of slow tourism, sustainability, the triple bottom line, and environmental communication, in a form that does not yet exist in the literature. It contributes practically via developing solution models and suggestions based on that conceptual connection, for recommendation and use in the global travel and tourism industry and its related individual businesses, whether on macroeconomic or microeconomic levels.

Therefore, this research can be suitable for companies and practitioners wishing to avail themselves of its insights, but also for leaders and visionaries in the travel and tourism industries wishing to use them as a stepping stone towards even more integration of tourism, media and sustainability.

Argumentatively, the research constructs a thread from slow tourism and its inspiration for fast tourism, over environmental communication toward a potential for transformation of the tourism industry and its stakeholder within a framework of public discourse. This public discourse is in turn based on an investigation of environmental communication and related to various media forms, expressions and concerns, to be developed and connected to tourism concerns in the conclusions.

2 Slow Tourism

2.1 Cultural Forms of Slowness Impacting Travel and Tourism

At the end of the twentieth century, movements that emphasized "slowness" in various forms became a part of social life in many (even in foremost Western) societies. Depending on their orientation, examples of some of their foci are on slow living, slow cities, slow food, slow media, slow money, and even slow parenting, or scholarship (see Fullagar et al. 2012). Subsequently also entering the global tourism industry, these movements became known under the labels of "slow travel" or alternatively "slow tourism" (Dickinson and Lumsdon 2010).

For travel and tourism, the adjective "slow" suggests that its slow forms were originally intended as a contrast to the traditionally fast forms of locomotion, especially airplane travel. However, and importantly, the internal attitude or character of the activity performed during such slow travel and tourism has always been more important than external velocity, so that the resulting slowness was mostly regarded as incidental. This means that slow activities do not necessarily need to be conducted at a pedestrian pace.

Suggested slow activities include for instance stopping at local sights or arts and crafts and truly appreciating them, or one step further, taking part in local customs and traditions of residents, such as by being able to speak their languages or dialects. Some writers even differentiate between "slow travel" as the manner to reach a destination (whether by foot, bicycle, train, or other) and "slow tourism" as including all those activities which one performs after one's arrival at the destination, having settled down, and interacting with its places and people (Tiyce and Wilson 2012).

Here, media can be considered to intersect with both journalistic and academic literature, in that both of those types of writings assisted in substantiating and popularizing slow travel and tourism: in the wake of a rising awareness of environmental issues, they increased social dissemination and acceptance of the concept of sustainability, and more particularly of sustainable development. This in turn led to considering, shaping, and formulating global tourism's sustainability concepts and practices, as shown below.

2.2 Environmental Shape and Scope of Slow Tourism

Some differentiate between "green travel" and "slow travel": green travel focuses on environmental awareness and friendliness, such as carbon dioxide and greenhouse gas emissions or their "environmental footprint," whereas for slow travel proponents, environmental considerations are relevant, but not exclusive for their travel motivations. Resembling the latter stance, some hold that slow tourism does not require any special environmental awareness or actions, besides a sincere relationship with one's inner self and the outer surroundings. For others, finally, the idea and term of slow tourism do necessarily precondition environmental friendliness, which automatically bring with it a "low-to-no" carbon or environmental footprint (see Fullagar 2012 for more details).

Within these differentiations, some favor activities such as "slow mode" travel toward, and experiences at the destinations and within its locations, or, as another variant, traveling more rarely but then more intensively and extensively during any single voyages, as well as in interactive and meaningful ways (Dickinson and Lumsdon 2010). Finally, "hard slow travelers" hold environmental care to be the core of their travel reflections and practices, while "soft slow travelers" consider environmental advantages as a mere bonus and additional motivation (Dickinson and Lumsdon 2010; Fullagar 2012).

As for specific slow travel forms, walking has traditionally been considered as its "classical" form and expression, as it is supposed to bring the traveler into the most frequent and direct contact with sights and sounds, places and people (Tiyce and Wilson 2012). Therefore, this form is especially cherished by "hard slow travelers" (Dickinson and Lumsdon 2010).

By contrast, the travel form of cycling is considered a lifestyle statement charged with individualism while at the same time low in technology, with the perks of increased health, potential group dynamics, and even higher speed, thus distances traveled, and therefore experiences made in a condensed time frame. Among the slow travel forms, cycling arguably has the best summary reputation for combining social ecological and individual health value, as well as altruistic and personal motives (Fullagar 2012).

A third widely practiced form, train travel, is often seen as the perfect combination of interactive and convenient travel; it offers virtually unlimited opportunities for 360° panoramas under full cover and protection, together with engagement with fellow travelers, at high speed and with much distance covered. Train travel thus epitomizes that "slow tourism" can very well be conducted at considerable speeds.

While some might wonder whether high-speed or bullet trains can still be considered "slow", there are however few that would seriously argue with the environmental advantages granted by train travel. Finally, the form of bus or coach travel has the advantage of maximum flexibility as far as destination and route are concerned, which makes this form both more affordable and adventurous. However, downsides are the lack of space and comfort (Dickinson and Lumsdon 2010).

Despite these conferred and perceived advantages and conveniences of slow travel and tourism, in macroeconomic and market analyses, the academic and business literature only hesitantly suggest its various forms and expressions as potential growth markets: such research rather tends to segment customers by mode of travel, by degree of concern for the environment (such as the mentioned "hard slow travelers" or "soft slow travelers"), by distance traveled (mostly short or medium range, with long distances being considered exceptions, for reasons of time and budget constraints, apart, for example, from some of the established scenic train tours such as across Canada or Russia), then by motivation (slowness either as an intrinsic or as an extrinsic motive), and finally differentiating according to the degree of involvement of the tour organizer or operator (such as the facilitation of booking, or the control of undesirable aspects such as weather exposure).

Therefore, slow travel is rather predicted to develop along or between three possible pathways: first, it could continue to be a small market niche together with other forms of alternative travel; second, it could find itself in the mainstream, for instance side by side with other low-to-no carbon travel modes; third, it could develop and expand relying on either already existing or having-to-be-built overland infrastructure. Many voices support slow travel to establish itself among the various forms of "new tourism" (Dickinson and Lumsdon 2010, 2013; Gunesch 2017).

3 Global Tourism, Sustainability, and the Triple Bottom Line

3.1 Global Tourism in Relation to Sustainability

The World Tourism Organization's (WTO) *Tourism 2020 Vision* forecasts 11 key factors of global tourism, including economical, demographical, and socio-environmental ones, besides 12 global tourism "megatrends", such as sustainable tourism due to a globally increased consciousness of environmental issues (World Tourism Organization 2001, 2004). Relatedly, the literature (Dwyer et al. 2008) sees six "key drivers for change" for world tourism, from economic ones (such as globalization effects, labor demographics, or wealth

distribution), over social ones (such as changes in societal values), to environmental ones (such as renewable and nonrenewable energy sources or global climate change), up to others covering basic human needs (such as food provision, or conserving cultural diversity).

The concept of "sustainable development" was first officially defined on a political and international level in the 1987 "Brundtland Report by the World Commission on Environment and Development", namely, in terms of being able to provide for today's generations yet without having to affect the needs of the future ones (see Dwyer and Edwards 2013). Following that report, a series of UN conferences confirmed and detailed that notion, such as the two famous UN Conferences (Earth Summits) on Environment and Development (UNCED) in Rio de Janeiro in 1992 and 2012 (see De Lara 2011).

With respect to tourism, a 2005 guide for policy makers, drawn up by the World Tourism Organization and the United Nations Environmental Program also conceives sustainability as being the long-term balance between economic, environmental, social, and cultural tourism development. This conception focuses on the use of resources in the least incisive way, the respect for social and cultural traditions of host communities, and the provision and respect for fair and future-oriented business operations (United Nations Environment Program and World Tourism Organization 2005).

While critical voices hold the concept of "sustainability" to be too general and vague, besides leveling allegations against it of being infused with a Western-centrism that favors industrialized countries (Meyer 2007), it has however become widely accepted as well as made customary practice in fields as diverse and ambits as large as world politics, business dealings, and tourism research. For all of these, media again can be seen to reflect reality at the crossroads of environmental reporting, sustainable development and global tourism, in that it addresses trends in international relations, as well as conveys and popularizes scientific perceptions and positions of global environmental and sustainability challenges.

The complex interplay between economic, ecological and developmental elements has increasingly shaped public and mainstream awareness, due to the mass media's treatment of related themes. This in turn has made it easier for both tourism literature and research as well as tourism business practice to integrate the concept of "sustainability" into their frameworks and operations. Left to itself, this concept would arguably be too broad and unwieldy and thus unusable for tourism companies. Yet research and practice seem to have found a way to make the notion operational. They have done so by working out the conceptual framework, and then the practical application of the "triple bottom line".

There might be many other ways of operationalizing the broad notions and ideals of sustainability and sustainable development other than the triple bottom line, so this notion is not considered the ultimate or even the optimal model or truth. Rather, as the below section on environmental communication will show, it is itself constructed to a large extent by sociopolitical and environmental discourse. This argument ensures an epistemological connection between the involved areas, a theoretical justification for bringing them together in one research, and a practical applicability that leaves open room for development on both conceptual and practical levels. The reason that the theoretical side of this research focuses on the triple bottom line are its close connection to, and growing practice in the business world, its adaptability by the travel and tourism industry, and its below outlined categories of areas of responsibility, taken actions in day-to-day business life, and resulting believability and accountability. Above all, it is seen as a transparent way to report in the field of environmental communication.

3.2 The Triple Bottom Line as a Substantiation of Sustainability

Based on John Elkington's 1997 book *Cannibals with Forks: The Triple Bottom Line of 21st Century Business* (Elkington 1997), industries worldwide began to factor not just economic but also environmental and social dimensions into their operations. In this regard, tourism companies and tourism business were considered as key operators, given their industry's worldwide interconnectedness and environmental impact (Gunesch 2017). Resulting from these deliberations, the triple bottom line was designed to add a social balance sheet and an environmental balance sheet to the companies' preeminent economic balance sheets, which would have implications for their internal and external procedures and processes, assessments and self-evaluations, as well as their marketing operations and forecasting procedures (Dwyer and Edwards 2013; Tyrrell et al. 2013).

Each of those three balance sheets or bottom lines is then practically and physically represented by key indicators, on what are called "report cards". These cards can contain an unlimited number of factors, but in everyday reality each company and industry sector choose those that suit them best in their specific activities and business dealings (Murphy 2012; Darcy et al. 2011).

For each of the three dimensions and report cards, here are some examples for those key indicators: the business report card might contain information about the company's economic status and progress, which is understood traditionally as the "single bottom line", which hence includes

information on staff turnover, company revenue and profit, taxes paid, spending accrued according to categories such as maintenance and repair, or received visitors and resulting income.

The social report card might comprise data and feedback with a wider scope, such as on visitor satisfaction and their well-being, or host communities' improvement suggestions and their long-term planning. Finally, the environmental report card could outline environmental or ecological impacts caused or made worse by the company directly, or in its vicinity, ranging from natural resource influences such as air and water and its emissions and pollutions, to impacts on the host community or adjacent communities and their residents, including local flora and fauna, ecological habitats such as wildlife or reservoirs, or finally measures to reduce any negative effects, such as resulting from wastage or pollution filters, or measures of prevention, reparation, and payment, for example, installing filters or the conducting of cleanup operations.

The literature (Dwyer and Edwards 2013; Tyrrell et al. 2013) invokes or refers to practical arguments against the triple bottom line, yet without denying its conceptual usefulness, such as causing an unnecessary split of the business into three dimensions, furthermore the challenge of finding suitable key indicators for each dimension, or finally the risk of businesses cherry-picking only the most favorable indicators within each dimension, thus reporting only on the positive sides of their operations. However, most of this criticism implies that the triple bottom line is still the most holistic and comprehensive framework for evaluating key indicators in the three most relevant dimensions for tourism companies worldwide, related to their three principal areas of responsibilities and concerns in the highly integrated and globalized travel and tourism industry.

4 Sustainability Considerations of Fast and Slow Travel Forms

4.1 Environmental and Sustainability Aspirations of Airline Travel

Over the last two decades, the airline industry has increasingly attempted to reconcile outside environmental requirements and public pressures with its inside target of consistently transporting the highest number of passengers per flight and airplane. As a result of the 1997 *Kyoto Protocol*, global climate change treaties and their national implementations and regulations have resulted in either "cap-and-trade" options (which has those companies that pollute in excess of regulated limits paying for that privilege, while non-polluters, or polluters below those limits receive financial benefits), or "emission trade" permits (allowing the businesses within an industry to exchange emission permits among each other). Given the worldwide trend of lowering individual and communal carbon footprints, "carbon offsetting" is yet another option, with the final target of "carbon neutrality" (Daley and Callum 2011). Hence also airports have begun to restructure their inner working organization and outer marketing operations.

Against this background, the concerned stakeholders continue to contest technical details, for instance who exactly does produce, therefore own, and thus is in the end be responsible for those emissions: it could be either the countries that own the airlines, or the airlines that do business in the nations, or the airports from which the airlines operate, or the communities in which both the airlines and airports are situated (Gunesch 2017). This web of interests highlights the urgency of global travel and tourism stakeholders to collaborate in order to find solutions on levels of legal regulation, technical implementation, and competency for implementation ranging, for instance, from the installations of pollution-preventing filters over the charge of emission taxes up to the marketing of customer airline preferences; the latter could be expressed in booked and sold travel seats, or in competitively obtained stock market options (Graham 2011).

Faced with these trends, the global airline industry attempts to preempt corresponding problems with upgraded travel technology and improved operations. One example is the launch of the biggest commercial passenger airliner in the world to date, namely, the "Airbus 380", which had been widely advertised for its environmental friendliness due to consisting mostly of composite and renewable materials and parts (Lück 2012).

4.2 Environmental and Sustainability Aspirations of Business Travel

The technological progress brought about by application software that is designed to assist people in achieving a common task software (thus also called collaborative software or groupware) has improved the quality, speed and sophistication of connections and related media and their interfaces, as well as of video conference or virtual business meetings. This process has increasingly replaced traditional, face-to-face office meetings with virtual ones, which in turn has considerably changed how resources are evaluated and invested in scenarios of human workplace collaboration, as well as across geographical, political, cultural and linguistic boundaries and differences.

Consequently, traditional face-to-face business meetings have increasingly been reserved for high-stakes deals or major players, or specialized tasks such as sales operations based on personal impressions and contact. In general, the

rise of virtual reality has helped business travel to increase its returns on investment (Stangel 2014). This even more in the case of multinational travel and tourism companies, which have come to reserve any direct meetings among their representatives mostly for items and issues that require a worldwide coordination and an indeed physical communication (Sharma 2004).

Finally, businesses and companies on all levels find themselves under increased scrutiny by their public or private stakeholders to pay attention and to be transparent about their environmental footprint and ecological impacts. Consequently, the more a company's operations are ecologically or environmentally incisive, the more that company tends to gravitate toward considering and implementing appropriate measures (Gunesch 2017). This novel baseline of business outlook can now also be practically and publicly substantiated with the triple bottom line via its three overarching dimensions and multiple specific subcategories.

4.3 Stakeholders of Global Tourism: Student and Youth Travelers

In business terms, stakeholders are all those groups and individuals that are affected by a company's actions and activities; in global tourism, this can be public as well as private people or groups such as tourists, travel organizations, or tourism corporations (Gunesch 2017; Hall and Brown 2010), as well as host communities, and even entire nations in that they must balance their need and demand for tourism with the conditions and constraints of their ecology and heritage (Goeldner and Ritchie 2014; Moutinho et al. 2011).

Student travelers consist a special subgroup of stakeholders in global travel and tourism, due to their unique financial situation and philosophical positions, which influence companies' triple bottom line considerations. Compared to other tourist segments, students travel more frequently but for shorter time spans, possess a more exploratory mindset, invest more money in relation to their available income, buy more travel products online, are more adventurous and daring in the face of natural or man-made disasters (that is, regarding dangers ranging from earthquakes to terrorism) than other demographic tourist segments, tend to engage more interactively with encountered local populations, be more innovative in social or technological aspects of travel, and altogether typify a travel form that is environmentally and ecologically highly sensitive and considerate (Gunesch 2017).

For students and young people, traveling is often a lifestyle statement and as such an integral part of their individual and group identities, which in turn they consider as a part of their lifelong learning experiences that include a familiarization with different countries and cultures, a concurrent private and professional development, as well as an idealistic construction of their spiritual values (Richards 2008). Altogether, student and youth travel are considered among the socially and environmentally most valuable forms of global tourism, in realms ranging from education and culture over politics and economy up to environment and ecology (Richards 2008).

Therefore, tourism companies which focus on this market segment will arguably focus on targeting and marketing the second and third bottom lines (social and environmental factors) in exemplary style, and thus might be well advised to mediatize their efforts accordingly, which would include effective media and public relations departments and campaigns that make full use of the bandwidth of available options for the media's discursive construction of their corporate reality and image, and carefully consider the framing effects and agendas that different forms of media have for different types of companies and selected business purposes in the tourism industry.

4.4 Stakeholders of Global Tourism: Religious Travelers

Religious pilgrimage sites and tourism locations were often planned and built based on spiritual motivations. This has made even remote mountains preferred religious locations and pilgrimage destinations, as an embodiment of humanity's extended earthly efforts and spiritually higher aspirations. Yet this scenario already carries in it the seeds of potential conflicts of interests, such as when economic pursuits and ecological interests collide in the face of corroding the spiritual values for which those religious sites were built in the first place (Gunesch 2017).

China, for once, has many such locations, for instance due to Taoists' and Buddhists' reverence for the Four Sacred Mountains Emei, Jihua, Putuo and Wutai as enlightened places or *bodhimandas*, destined for the residence of enlightened beings or *bodhisattvas*. As a concrete example of incurred and increasing damage to such sites, the murals in northwest China's *Caves of the Thousand Buddhas*, dating back to the fifth to fourteenth centuries, and spreading across 577 caves, continue to suffer from the mere physical presence of tourists, which raises their internal temperature and humidity levels with negative and erosive effects (Mu et al. 2007).

In reaction, many Chinese destinations of religious tourism and pilgrimage have now come to prohibit hitherto typical yet by now harmful activities, such as littering, engraving trees or walls, or open-air camping. As an example of international community reaction, some Middle Eastern monasteries such as Saint Catherine's at Egypt's

Mount Sinai now enjoy internationally and collaboratively funded measures to raise awareness of their environmental and educational predicaments (Mu et al. 2007; Olsen and Timothy 2006).

Finally, some movements even support tourism for world peace and development, and have their own catalog of requirements for destinations and travelers, which range from overall education, preservation, and protection measures for cultural heritage sites, over resident engagement and support and developmental assistance, to strict demands for refraining from any harmful activities, up to endorsements of only such tourism businesses and companies that adhere to the same or a similar code of ethics (Haessly 2010).

5 Environmental Communication

5.1 Multidisciplinary Nature of Environmental Communication

In a scholarly development that is similar although unrelated to slow tourism, the field of "environmental communication" has also attracted concentrated scholarship only during the second decade of the twenty-first century. "Environmental communication" is defined by recent literature as "the pragmatic and constitutive vehicle for…understanding…the environment as well as…the natural world" and in that function, as "the symbolic medium…in constructing environmental problems and in negotiating…responses" (Cox and Pezzullo 2018). The field of environmental communication began in the 1970s and started to consolidate itself only in the 1990s as a subfield of media and communications research. It did so by developing its own conceptual frameworks and analytical approaches for types of media and processes of communication (Hansen and Cox 2015). The field of environmental communication developed independent and specialized research institutions and procedures as of 2007 and 2011; for instance with its first journal called *Environmental Communication* issued in 2007, and its first scholarly and practical association of that name established by 2011 (Cox and Depoe 2015).

Today, it is acknowledged that environmental communication has a double purpose and function: on a constitutive level, it represents nature and environmental problems as subjects for popular understanding, for example when environmental advocacy groups evoke images of nature as unspoiled and worthy of our protection. On a pragmatic level, it serves to tackle and solve environmental problems, such as when those advocacy groups disseminate information about, or publicly take sides on ecological debates and issues (Cox and Pezzullo 2018).

Much of the diversity and dynamics of environmental communication go back to the multidisciplinary nature of its approaches as well as the academic backgrounds of its researchers and the professional preparations of its investigators. The respective disciplines, areas and fields include geography, history, politics, psychology, or sociology, besides cultural, literary, linguistic, and especially media studies (Cantrill 2015; Hansen and Cox 2015). The widely admitted complexity of environmental problems stipulates that solution models are developed in conceptual collaboration and methodological coordination across social, economic, political, and natural sciences (Peeples 2015). Some of the methodological approaches proposed in the literature are, for instance, comparative analysis, contextualizing and disciplinarily overarching approaches (Bucchi 2014), or specific critical approaches such as discourse analysis or rhetorical criticism (Peeples 2015).

5.2 Discursive Construction of Environmental Communication

It is often considered to be environmental communication's principal achievement as well as its main challenge for the future, that it develops and highlights, and then successfully communicates in public first, the depth and complexity of environmental issues, and second the detail of their social construction together with the involved scientific resources and sociopolitical power relationships (Dunwoody 2015; Hansen and Cox 2015). Correspondingly, and referring to the "constructionist perspective" of the social sciences, the literature stresses that environmental issues and problems are often socially and discursively constructed (Cox and Depoe 2015; Hansen 2015; Nisbet and Newman 2015).

This constructionist approach or framework, which is mainly borrowed from research in sociology, media as well as mass communication, suggests that social issues such as environmental challenges are not themselves found in a preordained "objective" scientific form, but rather expressed, constructed, and investigated by means of a process of discursive and public claims-making (Hansen 2015). For example, different forms of media as the main sources of information on climate change do not only steer public opinion, but also "construct" much of the concept of "climate change" (Whitmarsh 2015). Likewise, many theoretical options or suggestions for application and solutions are defined and dictated by public claims-makers before they proceed through stages that are themselves discursively shaped (Hansen 2015). Some typical stages are: (a) diagnosis of the problem; (b) determination of its causes; (c) search for remedies; (d) formulation of solution suggestions; (e) considering (if at all) that those suggestions often rely

rather on established policy packages than on recent and solidly reached scientific conclusions (Dunwoody 2015).

5.3 Media Subsidies and News Holes as Part of Environmental Journalism

According to most recent definitions, environmental journalism is the "researching, verifying, writing, producing and broadcasting of news about the environment to the public… by trained professionals" (Cox and Pezzullo 2018). Environmental journalism began as a subarea of general reporting already back in the 1960s, before it found a more specialized niche as a subfield of environmental communication, thereby retaining a more practical orientation (Friedman 2015). Just as environmental communication, environmental journalism straddles the scientific disciplines and practical fields of politics and business, nature and technology, society and culture, besides the dimensions of personal and social life, as well as local, regional, and global geographical levels (Bødker and Neverla 2013). After the global increase of news coverage of environmental accidents and disasters during the 1970s, their coverage then declined along the 1980s. Among the main reasons, environmental effects became less visible or frontpage news, and instead revealed themselves to be no less incisive, but less transparent issues such as biodiversity loss on a long-time scale, or potentially serious but hidden biochemical hazards such as underground or radiation contamination (Friedman 2015). As far as the 1990s are concerned, the literature is divided: while some consider that period at the end of the twentieth century as "the golden age of environmental journalism" (Sachsman and Valenti 2015), others maintain that "space or airtime given to environmental topics continued to shrink throughout the…1990s and…2000s", and invoke as reasons that media coverage suffered from an industry-wide downsizing all across, for instance, the United States (Friedman 2015).

When environmental journalists, as they regularly do, keep a foot in traditional media forms and outlets, they are often confronted with the dilemma of having to fit an ever-increasing need of the public for stories that are detailed and deep into a however ever-shrinking "news hole", which is the available space in a newspaper or television newscast to tell that story in relation to other stories which are competing for exactly the same slot (Cox and Pezzullo 2018). It then often falls to editors and their newsroom staff to struggle with these competing demands at including environmental content: for once, the challenging subject matter makes it difficult for either field reporters or newsroom editors to acquire and stay on top of the required specialized backgrounds and training; and even then, logistical challenges remain to cast environmental issues, which are often characterized by covert, inobtrusive and long-term effects, into a standard news format (Cox and Pezzullo 2018).

As a reaction to these multiple challenges, reporters and editors have increasingly come to rely on online or outsourced news services for their background information. Some of these "media subsidies" (that provide information to the news media) are for instance channels of social or digitized media, but they can also be traditional information sources such as PR (public relations) firms, environmental (often nongovernmental) organizations, government officials, or independent think tanks (Aykut et al. 2013; Bødker and Neverla 2013; Hansen and Cox 2015). Surprisingly, the audience which individual science reporters regularly consider as their most important, adhered to and engaged with, is less the domestic or global public (which is after all the end consumer of mass media), but rather the reporters' sources (which then fulfill roles of personal informants as well as professional sounding boards), including other media organizations and their editors and newsrooms. These audiences therefore have a "gatekeeping role" in that they decide from the outset which stories to cover, or not to cover (Dunwoody 2014).

5.4 Demands of Objectivity and Balance in Environmental Reporting

Traditionally considered as one of the pillars of good journalism, objectivity is understood as the commitment to provide accurate information without unjustifiable bias, and to be balanced in case of uncertainty or controversy. Balance requires collecting positions and statements from all concerned parties and on all relevant facets of the reported issue (Cox and Pezzullo 2018).

However, in journalistic practice, especially in environmental reporting, the principle of objectivity and its element of balance are challenging to fulfill. Objectivity broadly begins with the selection and the presentation of the contested environmental issue, but is often ideologically influenced, for example on topics of climate change. As a practical solution for this dilemma (caused by inner principles clashing with outside influences), environmental reporters often resort to quoting credible sources, also called "authorized knowers", who can for instance be experts in the investigated area, leaders of government and industry (Cox and Pezzullo 2018), or specialized local or national stage departments such as of health, environmental quality or natural resources, or finally even local environmental groups, citizens active in environmental movements or local manufacturers (Sachsman and Valenti 2015).

As for the element of balance, the inclusion of all conflicting viewpoints might exceed a story's allocated space, let alone the resources of any single reporter or news agency.

As a practical solution, environmental reporters have come to resort to citing different viewpoints; this was, for instance, often practiced during the first two decades of global climate change discussions, namely, between 1990 and 2010 (Cox and Pezzullo 2018; Sachsman and Valenti 2015).

However, the principle of balance has itself come under critique in recent literature, namely, as a way of avoiding journalistic responsibility on issues where the evidence is mounting so strongly in favor of one side that covering all or just several sides would by itself create a "false balance" and thus a biased reporting style (Cox and Pezzullo 2018). In simple terms, it seems that keeping objectivity sometimes means having to let go of balance. As a practical solution to this dilemma, then, some authors suggest openly resorting to advocacy journalism (Bødker and Neverla 2013).

Some therefore maintain that, while objectivity is still a laudable goal in environmental reporting, even the best reporting can at most hope to produce an equitable public attention to complex environmental equations (Priest 2015). This would be yet another form of (the earlier mentioned) "social construction of reality", which in turn is strongly related to, and especially relevant to consider in the context of media's "framing effect", discussed below.

5.5 Media Frames and Agendas in Environmental Reporting and Journalism

In journalism, a "media frame" refers to a core topic or overarching theme that ties the various pieces of a news story together (such as quotes or headlines) and into a unified whole, helping the audience make sense of the latest information against the background of their previous knowledge (Cox and Pezzullo 2018). Hence the resulting media "framing effect" (Hansen 2015) can occur without even offering new facts or interpretations, and instead by just shifting the interpretive frameworks for those evaluations (Cox and Pezzullo 2018). The framing effect is also discussed more specifically in environmental reporting (Cox and Depoe 2015; Nisbet and Newman 2015), such as on the topic of climate change (Whitmarsh 2015). For instance, the conflicting parties in environmental controversies often use a different frame each, to influence public opinion in their favor (Cox and Pezzullo 2018).

In a similar context, communications research and political practice differentiate between the media's "agenda setting" and its "agenda building" activities and outcomes (Hansen 2015; Priest 2015; Cox and Depoe 2015). Accordingly, agenda building occurs in reciprocal relationships between the mass media and the people or societal institutions, shaping social awareness and positions about current issues, starting with the public's awareness of the existence of a problem all the way to how one is supposed to address it (Hansen 2015). Going farther than the media's agenda building, agenda setting is the ability to affect public perception of an issue, or of its importance (Cox and Pezzullo 2018). In an often-cited concise definition, merely by filtering and selecting issues for public attention, the media has the power to tell people not only *what* to think but also what to think *about* (Cox and Pezzullo 2018, referring to Cohen).

Some differentiate between the upside of this media power as the creation of public awareness, and the downside of increasing dependency on the media's quality and goodwill in selecting, transmitting, and criticizing information. They conclude that "the media are…the central form through which we, as audiences and publics, make sense of our environment, society and politics…Most of what we as individuals know, we know not from direct experience…but from the symbolic reality constructed for us through…media of various kinds…Much of the symbolic construction of reality by a host of social institutions is now itself principally encountered through their representation in and through the media" (Hansen 2015).

6 Tourism and Sustainability, Environment and Communication

6.1 Uniting Sustainability, the Triple Bottom Line, and Slow Tourism

Our investigation of tourism, sustainability and the triple bottom line has shown that the triple bottom line can improve and inspire a tourism company's business in several ways, from its theoretical foundations (such as a clear understanding of what sustainability is supposed to mean to its stakeholders), to concrete measures and strategic assistance within the industry sector. Such positions and measures also raise the company value overall, starting with improving its internal quality levels, to setting benchmarks for the industry, enhancing its internal relationships with employees and staff, and gaining outside market standing and respectability, until finally and hopefully culminating in advantages for the residents and local community as a tourist destination.

Combining these concrete triple bottom line benefits with the more philosophically and spiritually oriented insights that have come out of slow travel and tourism movements and from its adherents, an interesting picture emerges, which is relevant even for fast travel forms and their business practices and outlooks:

First, as we observed, fast travel forms and representatives have recently performed a course change in the way they do business, namely, they find it more and more recommendable and rentable to "slow things down". Since hitherto they were considered as conceptual and practical opposites to slow travel forms and representatives, this

course change can be taken as a serious statement of intent and observable action. Changing their strategies inside and outside, and then putting their money where their mouth is, indicates both a deeper belief in the righteousness of their actions as well as a practical conviction in the resulting bottom line advantages.

Second, this could be seen as a testament to the power of the media and of its framing effect, namely, that the growing sensitivity to environmental and social issues by the stakeholders of both business and airline travel can be traced back to the earlier mentioned discursive construction of reality as well as the media's potential of agenda building and agenda setting: even some of the most affluent and influential segments of society (such as fast travel and tourism business sectors) feel compelled to develop and adopt socially desirable traits and practices, in reaction to the extensive and in-depth media coverage over the last few decades and the resulting general awareness in turn causing public pressure that in the end lead to societal change and progress.

Third, the specific stakeholder group that is comfortable with practicing both forms of travel, namely, student and youth travelers, might well try to attain professionally and practice privately some of the more environmentally and socially taxing forms of fast travel such as airline and business travel in the medium run in their lives, due to their current age bracket, energy levels, and later career aspirations. This would somehow offset their current practices and philosophies, and thus be to the detriment of considerations of the second and third bottom lines. However, for the time being they still embody socially and environmentally rather conscious ways of travel, such as low-to-no carbon emissions and minimized ecological footprints. It can only be hoped that when their financial and occupational restrictions are released, they continue to be driven towards their self-defined goals in terms of, and as symbolized by the first (profit) bottom line, but still inspired by the deeper altruistic insights and inspirations that link them to the second (societal) and third (environmental) ones.

6.2 Recommendations for the Media Strategies of Global Tourism

A combination of slow travel forms and philosophies with the triple bottom line promises to provide interesting insights and advantages for the worldwide travel and tourism industry and its stakeholders on several levels:

For once, the two concepts of slow travel and of the triple bottom line might form a powerful double package of sustainability that can bring even more fast travel representatives and businesses to enjoy its advantages. In that case, the media would receive a key role and responsibility in this process, such as by bringing scientific insights, data, statistics, and opinions about the merits of slow travel to a wide part of the population.

Second, the concept of the triple bottom line, the travel form of slow tourism, and the enablers and benefactors of travel companies could all benefit in a triangle of exchange of theoretical insights and practical experiences about having committed themselves to applying the triple bottom line. In parallel, environmental media and environmental reporting could incorporate science journalism to improve popular understanding and willingness to cooperate with the global tourism industry beyond a mere provider-client relationship, namely, based on shared visions for the future of global travel and the well-being of the planet and its people.

Third, the advantages of implementing the triple bottom line, aided by reflections and philosophies of slow travel, could benefit industries related to travel and tourism, provided (or hopefully given) that they also share the desire to implement the idea of sustainability with solid and clear criteria. It is already observable within the hospitality industry that tourist resorts are introducing ever more slow activities in their programs and on their premises, and thus benefit from positive economic, social, and ecological impacts on their in-house guests and surrounding host communities.

In a similar vein, several branches of the entertainment industry, including sports, film, or gambling such as casino establishments, also increasingly offer slow and sustainable items in their portfolio. Recent examples are such large and diversified entertainment complexes as on Macao's *Cotai Strip*, which are ambitious enough to openly declare their intent to surpass their Las Vegas predecessor and namesake. It seems that the outlined character of environmental media with its multidisciplinary, discursive, and constructionist elements and influences is especially suited to provide links between these various industry forms, interests and stakeholders.

In the end, it might even be that considerations of sustainability, practicalities of the triple bottom line, and philosophies of slow tourism philosophies can form a triple pack of concepts for tourism, and in this manner produce results for businesses that turn out to be advantageous for all sides involved. Then, instead of seeing the second and third bottom lines (regarding social and environmental development), or the related concept of corporate social responsibility as an impediment toward maximizing the first bottom line (regarding the company's economic profits), their evaluation might rather be reversed, in that the second and third bottom lines assist the first one, and that their combination constitutes a beneficial (because altruistic) business deal, that improves a company's internal and external market profile, social position as well as economic profits.

Based on the insight that socially and ecologically virtuous deeds would also mean doing well economically, tourism companies could then launch marketing and media campaigns that offer their packages equally to their

employees, their customers, as well as the global travel community. Being now able to back up their mission and vision statements about not only economic but also social and environmental engagement with verifiable and transparent data via the indicators and balance sheets of the triple bottom line, could give their marketing campaigns some rewarding and deserved lift.

In our evermore interdependent, increasingly interconnected and globalized world, this would require from their marketing and public relations departments to work closely together with both traditional as well as new media representatives and outlets.

This might mean to consider the cooperation between the global tourism and global media industries not as merely codependent stakeholders of information distribution, but as real partners in the enterprise of sustainable business practices and global development. This could bring on board other stakeholders and players in the worldwide travel and the media industries, such as national tourism ministries, non-governmental development organizations, environmental watchdog agencies, aid associations, or philanthropically inclined individuals that could personalize and give a face to those idealistic efforts of caring for profit, people, and planet. The global media role and responsibility would then be to leverage its local positions and networked power to provide those individual entrepreneurial efforts with coordinated eyes, ears and faces, and a global stage to unify their concerns.

In such circumstances, the combinations of companies' convincing internal media strategies and a winning outside news representation could shine refreshingly caring spotlights on the tourism company that reveals its slow or fast travel offerings as beneficial for all, in a jointly constructed and discursively defined media image, and within a media frame that embraces sustainability as a global mission and a local task, as well as a collective calling and an individual effort, and thereby substantiating cultural sensitivity and environmental awareness, reorienting modes of travel, and finally no less than transforming ways of life.

6.3 Impulses from and for Environmental Communication

Some of the characteristics of the field of environmental communication themselves epitomize some of the contributions of this research, such as its multidisciplinary nature, and the discursiveness of its constituent elements. It seems telling that one of the analyzed key advantages and arguments in favor of the triple bottom line was its transparency that enabled a higher level of internal and external accountability of businesses in the global tourism industry.

This insight and principle could be applied also to contents and styles of environmental reporting, and even improve or modify some of its current tenets. For instance, the acknowledged media frame that limits the picture and perspective of any environmental report can now consider the three dimensions of the triple bottom line, and accordingly balance its written, spoken, or pictorial information.

Similarly, any agendas could now be expressed and pursued more transparently by referring to the triple bottom line criteria, thereby garnering public support and acceptance for the respective media's content, style, and overall quality.

Likewise, objectivity and balance can now both be achieved more convincingly and with less worry about distorting important scientific findings and social processes: objectivity is more reliably linked to the concept and practice of the triple bottom line, and balance can refer to the weight and focus given to each of its three dimensions, for the sake of the individual business interests and the concerns of the wider community.

This process would also satisfy the journalistic need of enabling an equitable public attention to complex environmental equations, and set the stage for an argumentatively wider and reflectively deeper discussion of, for instance, social and sustainability issues, and simultaneously a publicly and politically more acceptable social construction of reality.

Furthermore, the concept and limitations of the news hole can be recast, since with the diversification of information according to the three dimensions of the triple bottom line, more specific knowledge can be imparted to the public, and more conveniently compartmentalized according to, for instance, an industry's economic, social, or environmental accomplishments or improvement needs. So instead of filling, say, an entire newscast or documentary about a part of the global tourism industry with all elements of that industry's impacts, it could be broken down into news or documentary segments each focusing on one triple bottom line dimension.

Finally, media subsidies might gain in number and importance, as the sheer volume and diversity of the knowledge required to report reliably on those triple bottom line dimensions and company performances would need to be distributed among more sources and providers. However, this seems a justifiable and manageable concession to our age of specialization, and itself open up possibilities, such as for work niches that fulfill the demands of such knowledge production and its quality assurance.

Fulfilling multiple roles, environmental communication could thus be the foundation, the vehicle and the inspiration for an ever closer integration of global sustainability, international tourism, and worldwide acceptable business practices that have implications for and beyond their stakeholders, and for planetary safety and conviviality. To paraphrase a widely popular saying from the media and entertainment world in the form of a recent series and remakes of "Spiderman" movies, with the considerable social power of environmental media and reporting, especially in

our globalized, internationally interconnected and increasingly digitalized age, comes a corresponding amount of responsibility. In the latter, we all share, whether as fast or slow tourism participants, digital communication producers or consumers, stakeholders of our planet's ecological survival, or the next generations' trust and well-being.

6.4 Overall Summary and Recommendations for Future Research

This research has connected slow tourism to fast travel forms in a way that makes the care for sustainable development a desirable goal even for those forms of fast tourism which until now would have considered such considerations comparably low on their list of business priorities. It has been able do so due to a substantiation of sustainable development via the triple bottom line, which enriches the theoretical framework and notion of sustainability. It could finally spread the resulting awareness of environmental and social issues (that constitute the added second and third bottom lines of businesses) via deeper insights into the processes and challenges of environmental communication.

The involved concepts are under recent academic scrutiny. This means firstly that their theoretical ramifications undergo constant development, and secondly that their practical implications will depend on both their evolving frameworks as well as parallel developing business practices in the global travel and tourism industry. One example is the evolution of the business models of tourism resorts with ever more attractions on their premises and under one roof, but equally with ever more family friendly and environmentally conscious attractions and amenities.

Consequently, future research should consider both the theoretical and practical implications and developments of the areas united in this research. This will require the use of methodological frameworks that will arguably go beyond mere multidisciplinarity (as simply juxtaposing parts of several conventional disciplines to get a broader understanding of a theme or problem) or even cross-disciplinarity (as real interactions across disciplines yet where their extent of communication, combination, integration, or conceptual synthesis varies considerably) and benefit from genuine transdisciplinarity (as articulated conceptual frameworks that seek to transcend the worldviews of the respective specialized disciplines). This corresponds to our increasingly interconnected world across not only academic and disciplinary, but also political, cultural and geographical boundaries, and does justice to issues of sustainable development which in our day and age are admitted as being solvable only ever more in global cooperation.

Thus, future research might even develop new models of transnational collegiality, political goodwill, and economic compromise. In this sense, the full extent of the relationships and the degree of repercussions of the discussed concepts as well as their practical challenges are not even fully predictable. That, then, should be all the more reason for transcending existing boundaries of thinking and acting on the way to shaping suggestions for their solutions.

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Smart Visa System with Improved Security Features

Adel Khelifi, Saleha Hashmi, Feras Darwich, Sarah Ali, and Ali Al Tenaiji

Abstract

With the growing number of fake and fraudulent companies that issue visas to UAE, people abroad seek a reliable system application to apply for UAE visa. Wasting money on non-creditable resources pushed people to complain about the non-trusted companies that deliver visas.This paper aims to mitigate the risk of being subject of fraudulent or suspicious ways of getting the visa. This research is about building a visa application system, which allows its users to apply for a UAE visa through a mobile application insecure manner. The Mobile App provides a list of trusted companies in UAE, which through them users can apply for UAE visa. It aids its users to apply for a new visa without compromising their confidentiality. The App is built with high-security features and to be able to integrate with other platforms through many API layers.

Keywords

Smart • Visa • Applications • Security • Mobile

A. Khelifi (✉) · S. Hashmi · F. Darwich · S. Ali · A. A. Tenaiji
College of Computer Information Technology, American University in the Emirates, Dubai International Academic City, Dubai, 503000, UAE
e-mail: adel.khelifi@aue.ae

S. Hashmi
e-mail: saleha.hashmi@aue.ae

F. Darwich
e-mail: 131110005@aue.ae

S. Ali
e-mail: 131110020@aue.ae

A. A. Tenaiji
e-mail: 131120015@aue.ae

1 Introduction

1.1 Background

In a world where information technology security is quickly becoming a prioritized concern at the forefront of every small, medium, and extensive enterprise as well as in any government institution. Which is a given based on how everything has moved towards a digitalized landscape in the past decade.

Nowadays, technology is evolving rapidly, and daily life activities heavily are based on technology (Williams 2015). Automating UAE visa process based on new technology needs to include many aspects such as security, availability, integrity, and confidentiality, etc. UAE is a unique destination for many people around the globe. Given the stable and transparent conditions of getting a UAE visa, several brokers, fraudulent companies, and untrusted agencies started to provide the fake visa to generate illegal income. Therefore, this research comes up with the idea of building a secure system for visa application.

1.2 Overview

The main contribution of this paper is to combine the visa process into one secure system that encompasses a mobile app and a backend system with the ability to manage from the web dashboard. Smart visa application is an app based on the Android OS, which provides information about the trusted companies and organizations in the UAE. The app would allow the public to choose one of the listed companies to request a visa to visit the UAE. This application contains companies which are credible and reliable by the UAE's government. The aim here is to provide a smart mobile application to automate the UAE's visa process and protect people from fake companies and fraudulent brokers. It is designed and developed to be easy to use with a friendly

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user interface and increased scalability and security features. User's data is often a significant target for breach. Since the data transferred from client to server are crucial; therefore, the focus would be on securing the connection between the client and server as well as protect the user's data. Here are a few reasons why android has been selected as the development environment for the mobile app. According to Noyes (2010), "Android has several compelling advantages that make its apps inherently safer than those for the iPhone. On the Linux-based Android platform, each application runs in a separate silo, unable by default to read or write data or code to other applications. Whereas Android puts the user in control of evaluating an application's requirements before it installs, Apple keeps that control for itself. Although the Android platform is not as open as many would like it to be, there is no denying that it is far more open than Apple's iPhone platform is".

1.3 Problem Statement

There is a risk for UAE visa applicants to get fake visas, and there is a need to have a visa application system secure and within one platform. These two requirements are making the automation of visa process challenging. For instance, how to connect to General Directorate of Residency and Foreigners (GDRFA) securely to avoid the access of malicious organizations to sensitive data. To mitigate this risk, the team receives a periodical update from GDRFA of the trusted list of companies and agencies that approved to issue UAE visa. The mobile app called e-Visa allows its users to browse the list of these approved institutions.

1.4 Scope

The scope of this research provides an android app to meet the user's requirements with a high percentage of performance and provide nonfunctional requirements to meet the security level. Thus, the emphasis is on providing enough security features while displaying the list of trusted companies and navigating through the app. In addition, it handles many users and allows them to request the UAE visa. In the future, the app will have more functions and the ability to renew and check visa status. The future plane also is to provide QR feature to increase the application security and to facilitate the progress of getting a visa.

2 Literature Review

2.1 Ministry of the Interior in the KSA Web-Based System

According to the available online information, in the gulf area, the ministry of the interior kingdom of Saudi Arabia has e-Visa services. The ministry has one platform which could access all the services, and one of these services is visa application. Using this web-based platform, the user can renew the visa in a relatively short time. Besides, the user can request for a new visa, and only the government is responsible for providing this service. There is no outsourcing companies could handle this service and provide a visa. This web-based application can be utilized through mobiles. However, it is not developed in a native programming language. It deployed within IBM WebSphere platform as Content Management System. The user should have an account. It has a payment feature, as well. The main point is there is only the government can provide visa services and there is no contract with outsourcing companies, which could make the process much easier and reliable. The ministry seeks to unite all the services in one platform (m. o. i. s. 2013). In addition, it is not a mobile application that equips its users with the advantages of the device itself.

2.2 GDRFA Dubai App

UAE has a mobile application that gives access to the most frequently required services of Dubai Immigration. "As a Dubai citizen or resident sponsor, you can apply for a visit visa for your relatives. Use the smart gates on the airport with the app if you are registered already for the gates. Apply for a residence entry permit for your family members. Apply for a new residence for your family members. Renew residence permits for your family members. Transfer your residence to your new passport. Check e-Form application, residence application, residence, and entry permit status (Fig. 1).

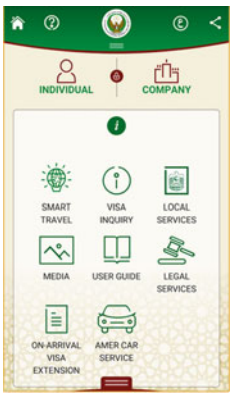

Fig. 1 GDRFA Dubai app (interface) (Sathish 2014)

Apply for fee refund for refused applications and warranty refund for entry permits. Apply for canceling resident for any sponsored under your sponsorship. You can generate the travel status report and the list of people you sponsor" (Dubai 2014).

The figure below illustrates the Visa workflow in UAE (Fig. 2).

Thus, as a Dubai citizen, you additionally can

- Get an Entry Visa for domestic helpers (maids, nannies…)
- Request a new or renew it UAE passport

  As a tourist arriving in Dubai, you can
  - Extend you're on arrival visa

  As a company registered in Dubai, you can
  - Extend, renew or cancel an entry permit for anyone your organization sponsors before they enter the UAE
  - Request Establishment Card or PRO card renewal
  - Request Establishment Card or PRO card in replacement of a Lost/damaged one
  - View the list of individuals your organization sponsors and Generate sponsor and sponsored report.

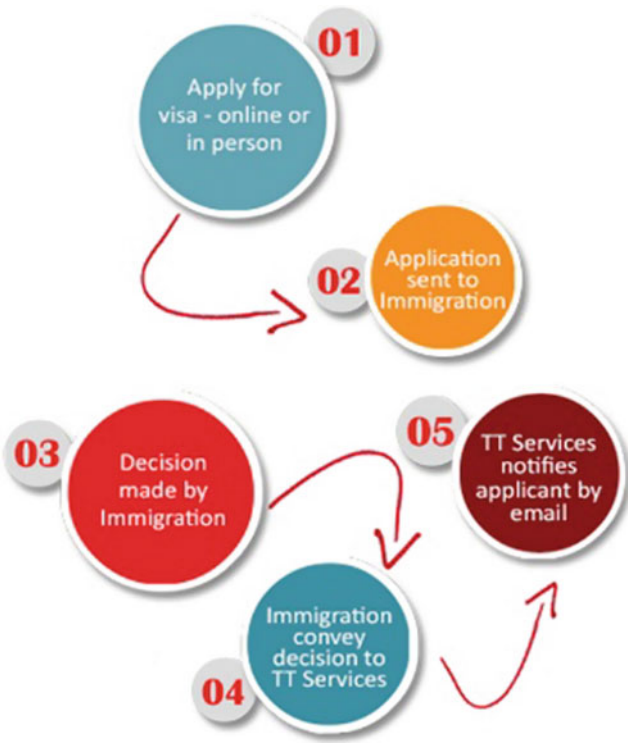

Fig. 2 Visa workflow in UAE

2.3 Dubai Visa Status Using eDNRD Web Applications

The General Directorate of Residency in Dubai (previously called Department of Naturalization and Residency Dubai—DNRD) has the facility to check the Dubai visa status and information about DNRD applications through a website. The GDRFA site provides a Query DNRD App page to check the visa status and other immigration applications. The status of following immigration forms applied in DNRD can be checked through the Dubai immigration portal by entering the necessary application information like smart form number or application number. Residence Application Status will show the status of a passport that has been submitted to DNRD for visa stamping as whether it is processed or not.

Dubai immigration also started a smart mobile application from their website for checking the status and validity of visit visas and other immigration transactions. The new mobile service from General Department of Residency and Foreign Affairs in Dubai will enable the public to check about the status of Dubai visas and other immigration transactions.

DNRD services is a fully integrated online system designed for minimizing the time required for managing your application and other transactions with DNRD. Residents do not need to register to use the online visa status inquiry services." (Katha et al. 2013) (Figs. 3 and 4).

3 Methodology

In order to choose the appropriate methodology for developing this research, a brief idea about the Software Development Life Cycle (SDLC) is recommended. The SDLC is also referred to as the Systems Development Life Cycle or the Application Development Life Cycle. It is a conceptual model that illustrates the phase to develop a software, system, or application. There are many popular models for SDLC. Below are a few of them that most appropriate to the context of this research:

Waterfall Model: The waterfall model underlines that a reasonable progression of phases executed during the software development life cycle (SDLC), is similar to the cascading stages down an incremental waterfall.

Iterative Model: It is a specific implementation of an SDLC that emphases on an early and basic implementation that gradually gains further complexity and a more significant function set until the ultimate software is complete.

Spiral Model: It tackles mainly risk awareness and management. The spiral model's risk-driven method guarantees high flexibility and high awareness of the challenges

Fig. 3 eDNRD web platform (interface). (Blog 2016)

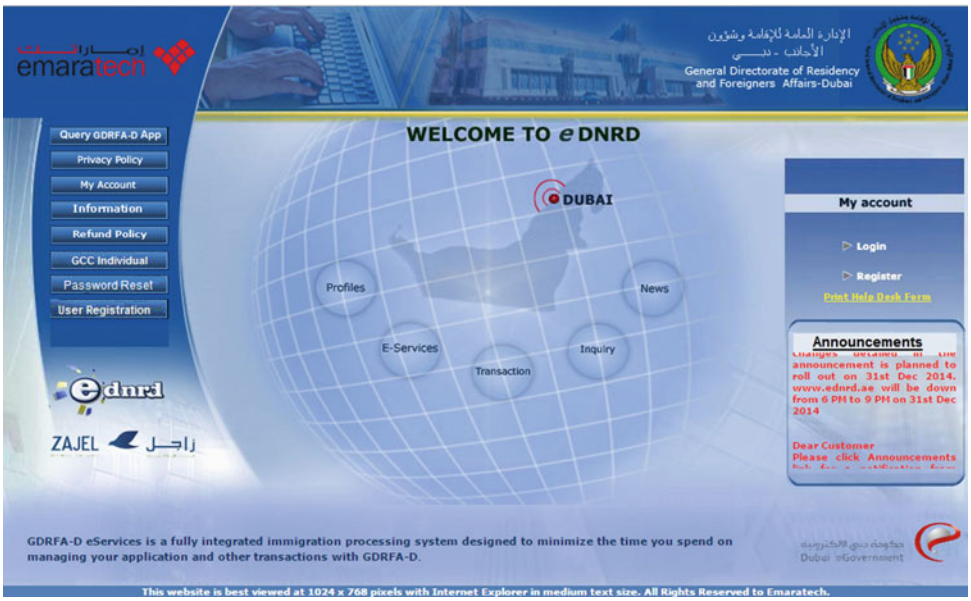

Fig. 4 eDNRD official web site (https://www.ednrd.ae/)

that can happen down the road during the development of the software. The spiral model is recommended when risks are uppermost, and the main delays are not on the table.

V-Model: It is a unique, lined SDLC development methodology. The V-Model emphases on an equally distinctive waterfall kind of method, which follows solid, step-by-step phases. Although primary phases are extensive design phases, development continues down through further coarse phases, leading to programming, and lastly back overall testing steps before the project completion.

Incremental Model: All the software requirements are divided into several modules. Every iteration goes over the stages of design, coding, and testing. Every software release adds features to the one before until all requested functions have been implemented. When the first increment is released, the software is deployed for production. The first increment is usually an essential part of the software where the main requirements are implemented, and more functions are added in the following increments.

For the context of this research, the incremental model is the most appropriate because it is more flexible for adding new features and functions. The users' feedback will be easy and more suitable to be added using an incremental model, which will improve the e-Visa project and enhance the ability to meet all the requirements. The main tasks which were followed through the incremental model:

- Understand the objectives of the e-Visa application.
- Gathering the requirements from multiple resources.
- Meet the customer and identify the key issues.
- Planning and set the functions and nonfunctions which are required.
- Designing using tools.
- Implementation.
- Testing.

4 Smart App Requirements Analysis

4.1 Survey Analysis

The survey is a data collecting method used to gather information. The survey of this research has fifteen questions. It was essential to gather system requirements. This is especially useful when dealing with critical data, wherein users need security and high performance. Below are the survey questions with their answers. The graphs to illustrate the answer were not included to keep the paper concise:

1. How often you use a specific mobile application? The survey found that more than 86% of users are using mobile apps as part of their daily life.
2. What takes your most attention in a mobile application? (You can select more than one) Most of the people see the design is the most things that can get your attention, on the other hand, it should be very simple and very elegant, days are passing no one still think that having very complex bright color design will be good, it will reduce.
3. What do you think about tracking Visa Application through Mobile Apps? Tracking the visa through the application would make your life easier, some people did not get used to the mobile application and try it and see how it will reduce their time standing in the line waiting for their turn and the rest of the day will suddenly disappear.
4. Do you know about any mobile applications for Visa Application tracking? Not all the people need thee visa application, some of them never go out of his country, from the other side the people who keep traveling specially if their businessmen need to get their visa application right now, that why they should be interested.
5. How helpful/useful do you think the application is for you? As I mentioned before the people who need it urgent, have their own business, or they do not want their family to be in a considerable queue they need it, and for sure it will make their life easier.
6. Could you list four main functions for such application:
7. If a mobile application was made for Visa Application tracks, will you use it? About 60% of the surveyed people found it very useful.
8. Do you think mobile applications for Visa Application tracking save time and cost for you? This fact no one could disagree about because standing in a queue is the hardest thing for the client and for the employee, and maybe after all of this time standing the working hours would be finish.
9. If the app will offer extra information, what would be? (Please specify) As per the survey, extra information that would customer need.
10. The app might have an automatic feature, which is the most ideal? Its same idea about having reminder but you could see it on your phone screen with your phone lock, or you could receive a message. Some of them want it to be daily; others prefer the massage when t time to do something.
11. What frustrate you in such applications? Most of the surveyed people showed frustrations when the text is too long.
12. How do you like to be notified about your Visa Application? The best thing is to get notified for your visa, because most of us just forget everything, and the visa confirmation might come out very fast and you will not know, so you could of miss it, some countries if you did not use their visa for the first time they will not give it to you in the future.
13. Do you recommend any specific features for this application? People recommended the ease of use and reminder as specific features of the Smart Visa App.

4.2 Function Requirements

The functional requirements describe all the functions that users requested within the application. The table below elicits the system's functional requirements (Table 1).

4.3 Nonfunctional Requirements

Nonfunction requirements describe all the properties that the application should have. These nonfunctions related to the business field. The goal is to maintain users' information secure, confidential, and safe. Thus, following nonfunction requirements are addressed during the system development:

1. Security: "Android has security features built into an operating system that fundamentally lessen the recurrence and effect of utilization security issues. The Secure Sockets Layer (SSL)—now technically known as

Table 1 The app functional requirements

Functional requirements	Actors involved	Function description
Select the language	Clients, administrator	The actors involved can select the language which is preferred
View the trusted companies list	Users	The actor can see all the trusted companies names
View the location of the company on map	User	Users can check the location of the company using google map which integrated with this app and we use Google API for android
View company details	Users	Users can click on company details and read more about the company
Login/logout	Users	Users can logon to their accounts
Register	Users	Users can register for a new account using email, full name, and birthday details
Login/logout	Admin	Admin can logo to SQL server and check the user's details
View city list	Users	Users able to check which city want to apply for a visa

Transport Layer Security (TLS)—is a common building block for encrypted communications between clients and servers." (http://developer.android.com/training/articles/security-ssl.html).

2. Multilingual Support: The application supports tow language that is English and Arabic, which users can select among them.
3. Usability: This is the leading known function requirements which the app forced on. The usability means all users can navigate, understand, and use the app user interface quickly and successfully.
4. Reliability: This term describes the degree of a mobile app that can operate without frailer in its function and non-function requirements. The App should work properly according to the customer's needs and expectations.

4.4 The Smart Visa System Diagrams

Sequence Diagram.

"The sequence diagram is used primarily to show the interactions between objects in the sequential order that those interactions occur. Much like the class diagram, developers typically think sequence diagrams were meant exclusively for them." (Bell 2004).

The diagram below shows the sequence of the "Search for a trusted company based on cities" functions (Fig. 5).

Use Case Diagram.

It is a tool uses to describe the behavior of the system or application, which consists of actors and their interactions with the system. It shows a diagram, Visual Paradigm, which

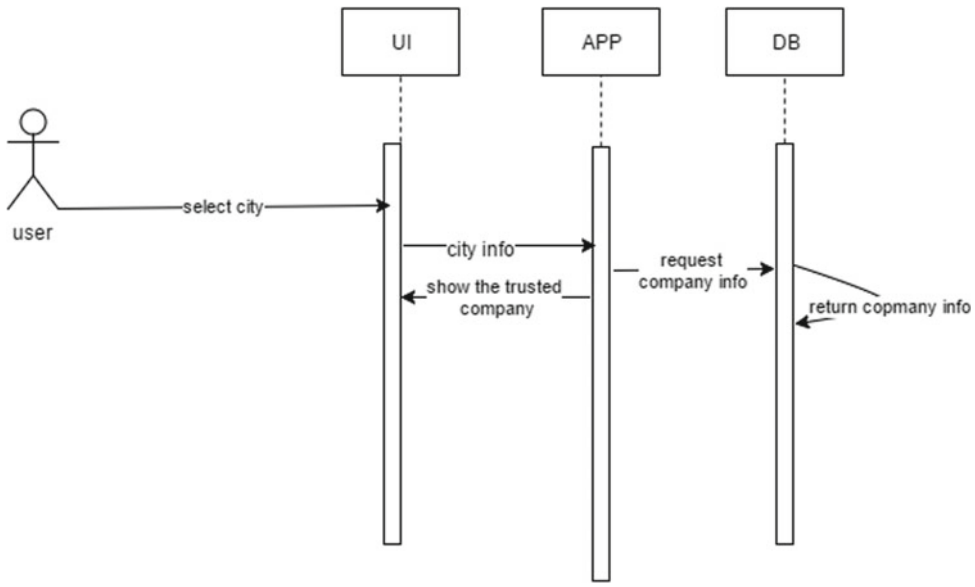

Fig. 5 Sequence diagram searching trusted company

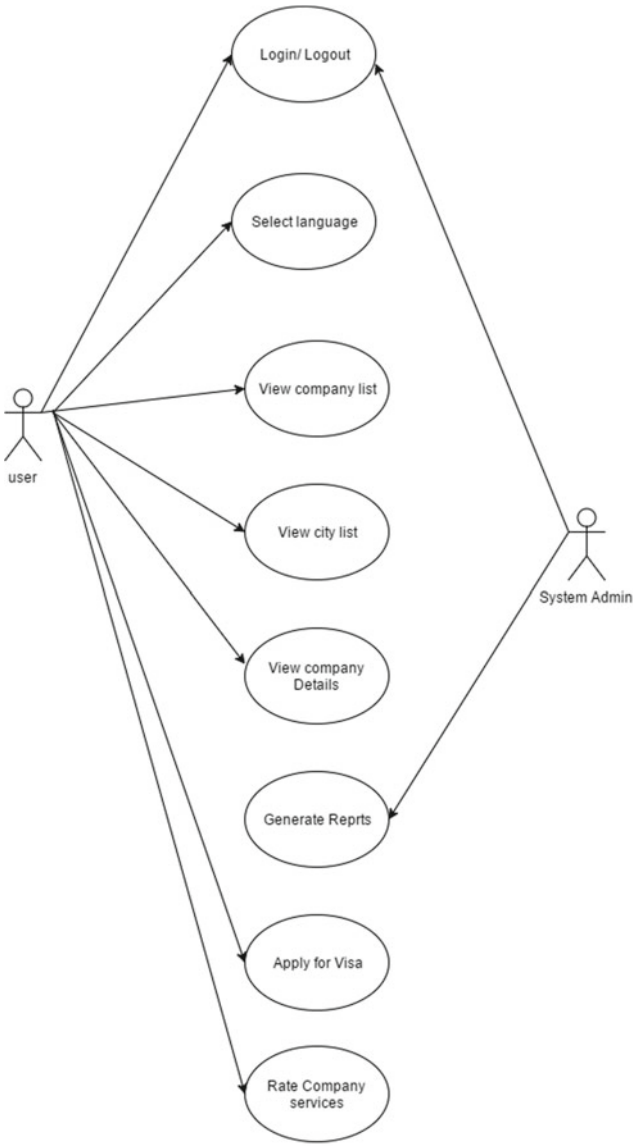

Fig. 6 The app use case diagram

allows to details each action with the system and gives the transparent picture for the stockholders how the system will react. The developers denote the use case diagram and consider it as an essential reference for documentation process. The Figure below shows the use case diagram for the e-Visa app (Fig. 6).

5 The Smart Visa App Implementation

Development or implementation phase is the most time-consuming phase in the SDLC; during this phase, the app will be built according to the requirements analysis and design, which was done in previous phases. In a standard software release life cycle, Alpha, Beta, and Release

Fig. 7 e-Visa app front-end and back-end architecture

Candidate stages are recommended. As a proof of concept, for e-Visa app, the prototype model is developed to validate the expected App functions, which could help to give an understanding and meet the project's scope. The Smart Visa App (e-Visa) has a front end, which is developed using the Android software development kit (SDK). It is written using Java, and it uses the entire Android stack. The code, which runs on the server, is the back end. It receives clients' queries and has the logic to provide the client with the correct data. It also contains the database that will permanently record all the application data the application. The picture below illustrates the e-Visa app front-end and back-end architecture (Fig. 7).

5.1 User Interface

This term refers to what users can see including all the functions which are presented in graphical view, in short, UI is everything designed into an information device with which a human could interact with the app including the display screen, keyboard, icons, and menus.

Splash screen.
It illustrates the first displayed screen when the user launches the app; e-Visa splash screen includes a picture of the government of Dubai (Figs. 8 and 9).

The business value of splash screen is:

- Show to the user that the e-Visa app is reliable by the UAE government.
- Enhance the confidence between the e-Visa app and its users.

Choose the language screen.
This screen allows users to choose which language prefer to interact with the app. e-visa app has two languages, which are Arabic and English. So, it supports the multi-languages function.

Login/register screen.
Login and register function increase the value of e-Visa app as well as build up a bridge of authentication, integrity, and confidentiality. For inexperienced users, should fill in all the details requirements then, the app will communicate with Node.JS server to register a new user in the e-Visa app to use the e-Visa app functions.

Fig. 8 Splash screen

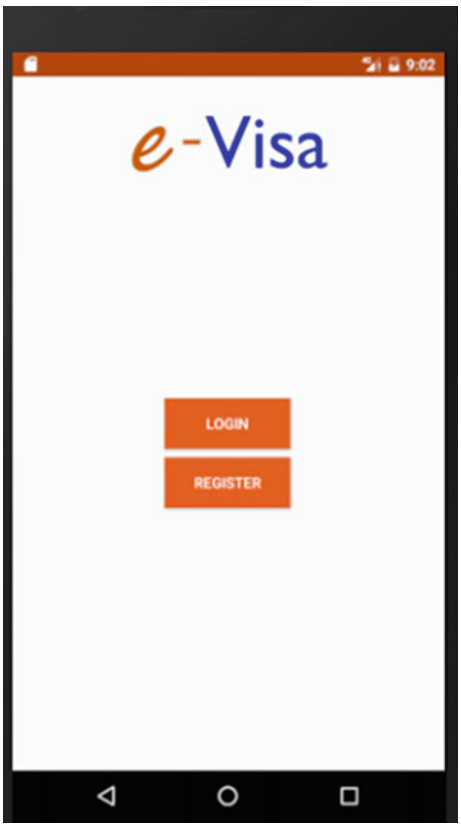

Fig. 9 Login/register screen

Login screen.
Once the registration is done, this screen asks users for their credentials by writing their username and password in two boxes. e-Visa app will check with Node.JS server the validation of data then if it is true users login to the system; otherwise, a pup up screen appears with an error message.

Main home screen.
Main home page shows for users the main functions which provide by the e-Visa app.

- Check trusted company: this function allows users to check the trusted company in UAE seven emirates that issue a visa. In addition, users can get more information about a selected company and apply for a visa.
- Apply for visa: allows users to apply for a visa online by providing information to GDRFA through the specific company.
- Trace visa status: e-Visa app allows users to trace their visa by providing the reference number and passport number.
- Help: this is to show more information about the app and what kind of services which is implemented in the e-Visa app (Figs. 10, 11 and 12).

5.2 Node.JS Server

It is a server using Javascript programming language. It is mainly used as a toolkit to connect the software with the server. "Node.js is a novel event-based network application platform which forces developers to use asynchronous programming interfaces for I/O operations." It is also considering as server-side solution for JavaScript, and in particular, for receiving and responding to HTTP requests (get, post).

Node.JS server served to build the backend of e-Visa app. Node.js Server saves all the data which users post in e-Visa app. The server will save data in Mongo database. "MongoDB is an open-source document database, and leading NoSQL database. MongoDB is written in C++" (http://www.tutorialspoint.com/mongodb/mongodb_advantages.htm).

In e-Visa data binding is used to communicate with Node.js server to post and get data from Mongo database. "Data binding connects two objects, called the source and the target. The source object provides the data. The target object, which must be a bindable property, will consume (and often display) data from the source object" (Britch 2016). The figure below illustrates the process of data binding (Fig. 13).

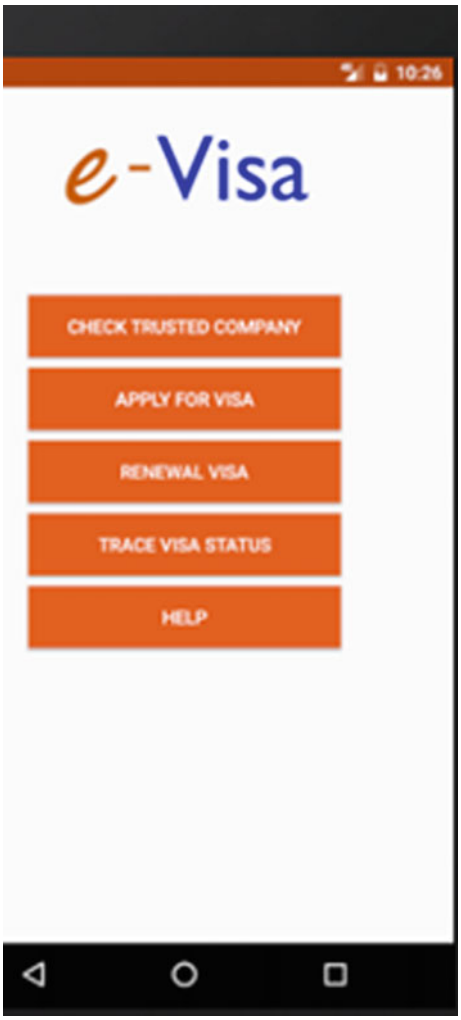

Fig. 10 Main home scree

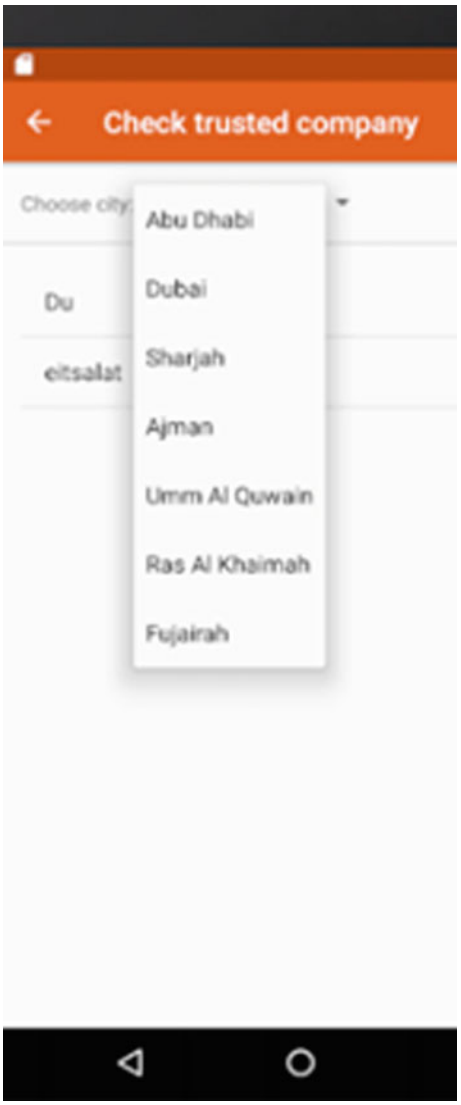

Fig. 11 Check trusted company

5.3 The Application Security

Visa data are considered critical data; therefore, the implementation of the security feature in the e-Visa app got high priority. E-Visa app provides data validation for login and register function, therefore, users cannot log in unless the e-Visa app sends a request to the database to check if users provide valid data for login or not. All the user's data are saved in Node.JS server as well as Node.js server provides Brute Force protection. In addition, e-Visa is using Node.JS to mitigate Cross-Site Request Forgery (CSRF) this kind of attack. "Cross-Site Request Forgery is an attack that forces a user to execute unwanted actions on a web application in which they're currently logged in. These attacks specifically target state-changing requests, not theft of data, since the attacker has no way to see the response to the forged request" (https://blog.risingstack.com/node-js-security-checklist/). Furthermore, e-Visa application is built to be as a platform and has the flexibility to connect with other servers through API's. E-Visa is connecting with the server through API's which increase the security level.

5.4 Testing

Software Testing is "a process of verifying and validating that a software application or program meets the business and technical requirements that guided its design and development, and works as expected" (Rohrman et al. 2015). The testing phase is the last stage in the SDLC. To test an application, there are mainly two recommended types of testing: White-box and black-box testing. White-box testing checks with the code, its structure, and the algorithm. Black-box testing tests the system's functionality through its graphic user interface. It takes inputs and compares the

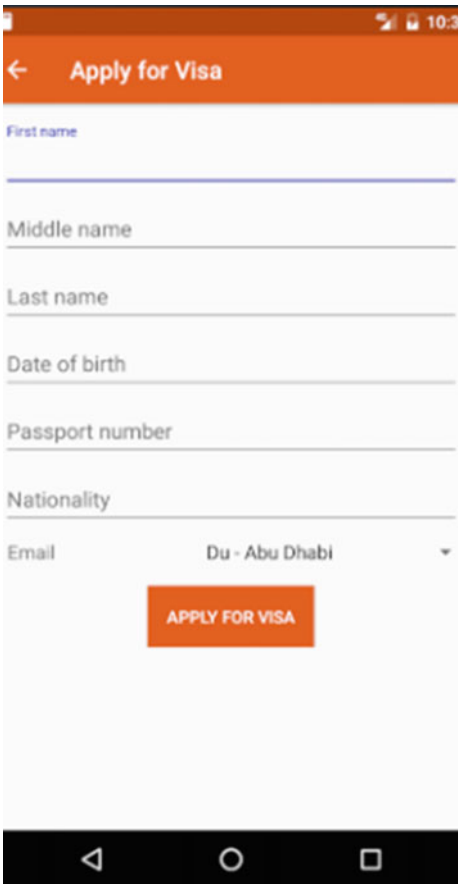

Fig. 12 Apply for visa screen

actual outputs with the expected outputs. Below are examples of black-box testing (Tables 2 and 3).

5.5 Risk Assessment

Nowadays, Smartphones are required to carry many daily tasks thanks to their pervasiveness, small size, advanced processing, advanced capability, and their ability to host multipurpose third-party applications. Smartphones host heterogeneous data such as multimedia, sensors, communication logs, data created or consumed by applications, etc. This triggered the central chapter of a long story in the security and risks which most people are not aware of it. However, many organizations know the disastrous impact of breaching the security of their systems. So, the risk assessment for applications such e-Visa is compulsory. E-Visa must be accurate and reliable, especially as users may enter critical information through the app. So, it is imperative to know and measure the diverse types of risk associated with e-Visa usage. According to ISO (2017), usually, there are two dimensions that define risk: the likelihood of an incident occurring that might lead to damage, and the damage severity that is probable to follow that incident. To identify the different types of risk in the context of e-Visa, the Lewis and al. (2014) table is adopted (Table 4).

There is no standard pertinent risk assessment guidelines for mobile apps, so it is challenging to accurately assess the

Fig. 13 Process of data binding

Table 2 Test case 1

Test case details	Information				
Test case ID	001				
Test priority (low/medium/high)	Med				
Module name	Login-in screen				
Test title	Verify the username and password				
Test description	e-Visa should accept username and password and show the main home screen				
Pre-conditions	User login to e-Visa app				
Step	Test steps	Test data	Expected result	Actual result	Status (pass/fail)
1	Enter username	Registered user			
2	Enter password	The password of the user	User should be able to enter the application	User can enter the application	Pass

Post-conditions: user can enter the application successfully

Table 3 Test case 2

Test case details		Information			
Test case ID		002			
Test priority (low/medium/high)		High			
Module name		Apply for Visa			
Test title		Apply for Visa			
Test description		Test if the user can apply for the visa online			
Pre-conditions		User can apply for the visa online			
Step	Test steps	Test data	Expected result	Actual result	Status (Pass/Fail)
1	Navigate to visa application screen	Press the button to navigate to the required screen	User can navigate to apply visa screen	User accessed to apply visa screen	Pass
2	Fill the apply visa screen	Press the Submission button	User fill required information and get a successful message	User filled the apply visa screen successfully	Pass

Post-conditions: the user can apply for a visa online

Table 4 Different types of risk that e-Visa may face

Type of risk in increasing order of severity	The main stakeholder affected	Sample scenario where this risk could arise	What can be done to manage this risk
Loss of reputation	User/agencies/GDRFA	The app displays sensitive performance data about professional or service	Good security
Loss of privacy (user confidentiality)	User	Poor security of user data	Encryption
		Lose phone holding user data	Avoid holding user data on a mobile device
Poor quality data	User/agencies/GDRFA	The app allows bad data to be entered into user record or retrieved from it at handover	Data validation on entry and retrieval from authenticated source
Poor recommendation	User/agencies	Bad list of companies' data used in the application for a visa	Check correct data retrieved
		Bad knowledge or search tool	Check algorithm properly coded
		Poor risk communication	Guarantee periodic trusted companies list update

risks associated with a specific app. To conduct a proper risk assessment task and to differentiate between the several types of risk listed in Table 1, key variables that may impact risk in apps are defined. These variables are categorized into two types: risk factors that are intrinsic to the app and risk factors that are related to the external context of the app usage. The first type can be diminished through the right rule, whereas dealing with the second type involves raising awareness amid the users. In our opinion, the table below that is adapted from Lewis et al. work (2014) presents the two categories of the risk factors that inherent to mobile apps (Table 5).

In this research, each of the factors and types of risk above was considered during system development. Nevertheless, safety threats posed by the software, hardware, and sensors that made up the entire e-Visa system will be tackled in the next version of the solution. This will include risks associated with the user interface, network, information display, and subsequent information loss.

Table 5 Two categories of risk factors inherited from mobile apps

Type of risk factor	Specific risk factor	Explanation
Intrinsic to the app	Developed feature	When the feature provides the list of trusted companies that issue UAE Visa, this will augment the risk
	Imprecise or obsolete information	Apps with imprecise or obsolete information have an increased chance for providing fake visa
	The app supports the complex task	Apps with complex tasks are more subject for errors and fraudulent attacks
	Absence of comment or reliable approach	Apps with no option to report concerns to its developers are relatively unsafe
Related to the app usage external context	Users	Unexpected users might be a source for misuse
	Improper usage of the app	Inappropriate usage of the app, e.g., outside their context, are integrally perilous
	A user without enough knowledge	In case the user has not enough knowledge of the app purpose, he or she can compromise its confidentiality
	Possibility of mistakes being noticed	In case there is low error detection, this can be likely to be riskier for the application information entered.

6 Conclusion

With the advent of technology and modernization, the number of fraud has increased too. As mentioned earlier that there is a growing number of fake things going on to get a visa to the UAE. Thus, people are facing severe problems regarding this. In such a situation, the project has taken initiatives to assist foreign people in having a visa in UAE. The applications have to be updated and monitored correctly as there are also some adverse side effects of such applications and technology.

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Students' Assessment of Electronic Waste Environmental Management and Sustainability at an Emirati Federal Institution

Lama Mahmoud, Maisa El Gamal, and Wafa Zoghbor

Abstract

With the ever-shortening lifespan of electronic devices due to advancements in electronics and attractive consumer designs, a dramatic rise in the electronic waste magnitude has been reported as a severe challenge worldwide. These devices do contain not only valuable recyclable materials but also toxic chemicals which can impose human effects and environmental pollution. This paper investigates the awareness among UAE educated people about the electronic waste magnitude. Regionally, UAE generates 17.2 kg of e-waste per capita every year. It ranks among the highest producers of e-waste in the middle-east. As such, in efforts to develop guide strategies and extend awareness among UAE population, a diagnostic survey was conducted and spread among 562 government undergraduate students (202 males and 360 females). One significant finding revealed that despite only one-quarter of the students are not genuinely aware of e-waste definition and its environmental effects; those who are aware are not effectively practicing appropriate e-waste disposal potentially due to the lack of motivation and willingness. Finally, recommendations for engaging students in environmental sustainability through in-campus standards and operations are followed.

Keywords

Electronic waste • E-Waste management • Toxic • Sustainability • Environmental pollution • Social awareness

L. Mahmoud · M. E. Gamal (✉) · W. Zoghbor
Zayed University, Abu Dhabi, UAE
e-mail: maisa.elgamal@zu.ac.ae

L. Mahmoud
e-mail: lama.mahmoud@zu.ac.ae

W. Zoghbor
e-mail: wafa.zoghbor@zu.ac.ae

1 Introduction

Electronic waste (e-waste) or a waste of electrical and electronic equipment (WEEE) has become a significant concern in the modern world. Previous studies reported that every year, 73 million tons of e-waste is accumulated around the world in 2017 (Ni et al. 2010). The rapid annual increase of e-waste is due to the fast-technological growths, rapid changes in information and communication skills, and economic growth. Consequently, e-waste is becoming a significant constituent of the day-to-day life, increasing the versatility of most electronic devices, and the descending trend in charges (Umair et al. 2015; Ylä-Mella et al. 2015; Yoshida et al. 2016). E-waste is the fastest growing waste on the planet, with an annual growth rate of 3–4%. It is estimated to reach 52.2 million tons per annum by 2021. At present, only 15% of e-waste is recycled. One of the most significant constituents of e-waste is plastics, accounting for almost 20% of it. Despite several technological developments, e-waste recycling is hindered mainly due to the presence of flammable retardants (Kumar et al. 2018). Special attention must be paid when dealing with e-waste because of the toxic materials it contains. If treated improperly, the disposal of e-waste can impose severe environmental and human health challenges. Environmental regulatory agencies (e.g., electronic equipment manufacturers, retailers, and recyclers), environmental nongovernmental organizations, and several related entities are interested in up-to-date statistics about how much e-waste is generated, stored, recycled, and disposed of. In developed countries, the extended producer responsibility (EPR) policy is introduced to reduce the number of electronic products and promote resource recovery from e-waste (Cao et al. 2016).

The management of e-waste has become a significant issue of concern for stable waste communities due to the high volumes of waste being generated and the potential environmental impacts associated with the toxic chemicals found in most electronic devices. As managing e-waste

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becomes a priority, countries are being forced to develop worldwide, new, environmentally friendly methods of e-waste collection and disposal. There are over 41.8 million tons of e-waste generated all over the world (Baldé et al. 2014). The tremendous amount of waste that was produced and the demands of managing it are the unforeseen dimensions in the ecosystem of continuous production and consumption of current society. The high toxicity of the component materials in WEEE, especially when burned or recycled in an uncontrolled manner, may lead to several socioeconomic problems. Lack of proper waste management leads to a risk for both human health and the environment (Gallardo et al. 2016). To contribute to an efficient waste management system, the design and implementation of new tools are needed to allow users to reduce the amount of e-waste generated and improve e-waste management practices considering that e-waste became obsolete within a short period, creating a large surplus of unwanted electronic gadgets. Concerns arise not just from the large volume of e-waste imported worldwide but also with the full range of toxic chemicals associated with this e-waste. Grant (insert year) and others summarized tabulated data for typical e-waste components, sources, and routes of exposure (Grant et al. 2013). For example, the average 14-inch monitor uses a tube that contains an estimated 2.5–4 kg of lead. The lead can seep into the groundwater from landfills, thereby contaminating it. If the tube is crushed and burned, it emits toxic fumes into the air. The hazardous content of these materials poses serious environmental and health threats. The second concern is that the lifespan of many electronic goods has been substantially shortened due to advancements in electronics, attractive consumer designs, and marketing and compatibility issues. For example, the average lifespan of a new computer has decreased from 4.5 years in 1992 to an estimated 2 years in 2005 and is further decreasing (Widmer et al. 2005).

Nowadays, universities can be considered as small cities, as they have several campuses and buildings where technological innovation is used to facilitate knowledge transmission among its students. Tools such as computers, iPad, mobile phones, and batteries have an influence on the daily activity of most, if not all, of its students, faculty, and staff. Furthermore, when they are terminated, they generate several direct and indirect impacts on the in-campus environment and sustainable development. For this reason, universities should commit to their sustainable institutional responsibility (Zanzi et al. 2001). In any case, these impacts could be minimized by spreading awareness among students as well as by promoting appropriate technical and organizational measures (Zhang et al. 2011).

For this reason, many universities have conducted studies to implement measures to reduce the impact generated in their facilities. One of these measures is environmentally friendly waste management. The design of university e-waste management systems (UEWMS) in the industrialized countries was started 20 years ago, and there are both voluntary as well as institutional programs (De Vega et al. 2008). Some of the initiatives implemented to recycle and reduce e-waste have been very successful. In the USA, recycling programs are one of the most popular measures, where 80% of schools and universities have institutional programs (Feng et al. 1999). Currently, many U.S. universities have extensive recycling and waste reduction programs, some of them with over a decade old (Gallardo et al. 2016). Besides, the implementation of waste reduction and recycling strategies in colleges and universities is mandatory in the USA (Lounsbury 2001).

2 Significance of the Study

This paper reports on the findings of a survey conducted on students in a federal higher education institution in the UAE, which may help in designing customized awareness programmers for addressing e-waste more effectively. The study aims to explore students' willingness and involvement in environmental sustainability programs with a particular focus on their e-waste management awareness and respective practice.

3 Methodology

This paper is part of a large-scale study on exploring the involvement of members of federal higher education institutions in the UAE in environmental sustainability, focusing on their electronic waste management awareness and respective practice. For this purpose, a questionnaire was developed through the Select Survey and sent electronically to 562 potential undergraduate students. Three hundred eight responses were received from the targeted undergraduate students. Participants' profile is provided in Tables 1, 2 and 3 according to gender, age and major.

Before data collection and tool distribution, the questionnaire was piloted with five participants to ensure clarity of questions and allow modification to increase accuracy and meet the study focus and purpose. The final questionnaire incorporated three main parts; the first focused on the factual data of the participants (e.g., age, gender, and major); the second identified participants' e-waste disposal methods; the

Table 1 Participants' profile—gender

Gender	No. of participants	Percentage of participants (%)
Male	111	36
Female	197	64
Total	308	100

Table 2 Participants' profile—age

Age	No. of participants	Percentage of participants (%)
17–19	65	21
20–29	243	79
Total	308	100

Table 3 Participants' profile—major

Major	No. of participants	Percentage of participants (%)
Natural and health sciences (including nutrition and nursing)	46	15
Education	12	4
Human resources	7	2
Information technology	36	11
Engineering	102	33
Business administration (including management and accounting)	46	15
Humanities and social sciences	25	8
Arts and creative enterprise	3	1
Other	34	12
Total	308	100

third explored their awareness of, and perception toward; applying e-management techniques.

4 Results

4.1 Annual Electronic Gadget Expenditures

This section asked questions about the amount of money typical undergraduate students spend annually. As shown in Fig. 1, almost half of the students (43%) annually spend between AED 1000 and AED 5000, and less than one-third (29%) of the students responded that their annual average expenditures of electronic devices range between AED 500 and less than AED 1000. Only 15% spend less than AED 500. What is striking in Fig. 1 is that approximately 13% of the surveyed students spend at least AED 5000 a year for electronic purchases and particularly around 3% of the 13% even spend AED 10000 and more. In addition, students

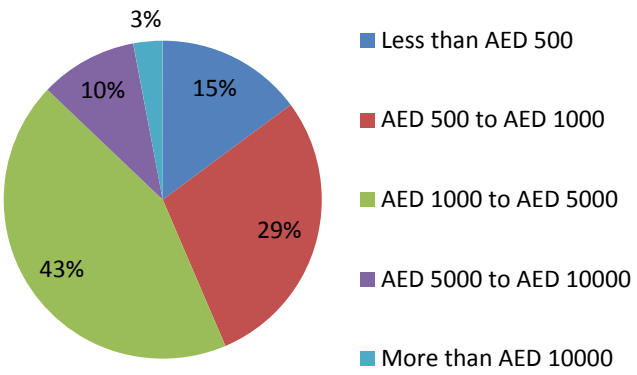


Fig. 1 Annual electronic devices expenditure by the students

commented that earphones, batteries, and mobile phones are the most purchased gadgets.

The options in the figure should be: Less than AED 500; AED 500 to less than 1000; AED 1000 to less than 5000, AED 5000 to less than 10,000, 10,000 or more.

4.2 Students' Awareness About Sustainable Development

Investigating students' preliminary awareness on e-waste management may give some perspective into the extent to which a university and its students are involved in sustainable practices. Therefore, students' knowledge about e-waste definition and its effects on the environment was explored. Consequently, results can be grouped into three main categories; zero or minimum knowledge (26%), moderate knowledge (57%), and advanced knowledge (15%) of e-waste management and its environmental effects. First, approximately 12% of the surveyed students indicated that they know nothing and a slightly higher percentage (14%) indicated that they do not know much (see Fig. 2). Second, one-third (31%) of the students believed they know some, and almost the same percentage (28%) expressed more than common knowledge. This means that together, nearly 57% of the respondents do have some knowledge of e-waste. In other words, approximately four out of every seven students are knowledgeable of e-waste and its effects on the environment. Finally, 14% and 1% indicated that they have a great deal of knowledge or they are even experts, respectively. Moreover, students acknowledged the resources from where they became familiar with e-waste management and its environmental effects, included their first-year general education courses; Introduction to Information Technology and English Composition I course.

Figures 3 and 4 depict surveyed students' decisions toward their unwanted electronic gadgets. Students were asked to choose whether they would repair, donate to a secondhand user, sell to a secondhand user, sell to a scrap dealer, or put with other household electronic devices, i.e., mobile phones, laptops, tablets, earphones/headphones, MP3/MP4 players/iPods, speakers, printers/scanners, or batteries. All the practices are considered as sustainable except for the fifth one.

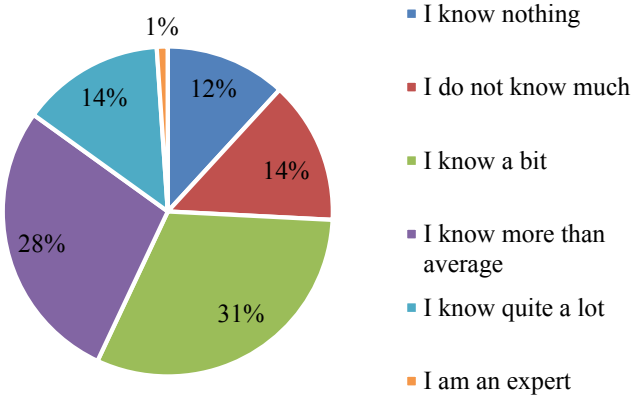


Fig. 2 Students' awareness about e-waste definition and its environmental impact

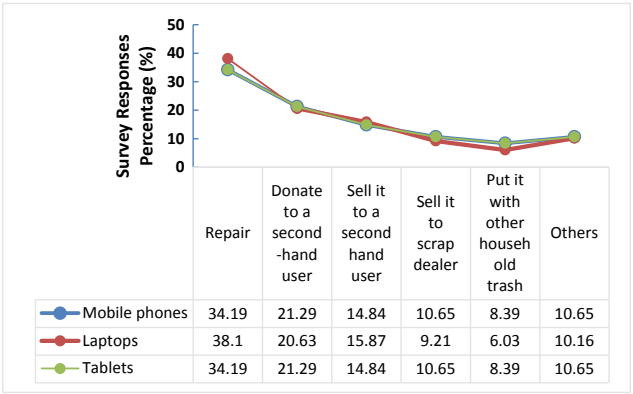


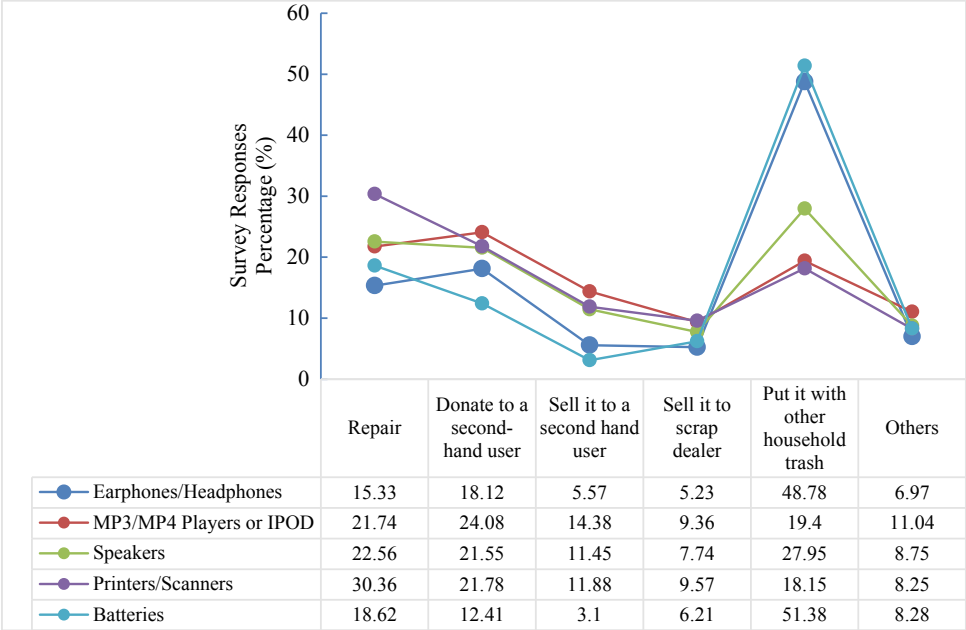
Fig. 3 Students' practices against unwanted mobile phones, laptops, and tablets

As shown in Figs. 3 and 4, most of the surveyed students proved to be relatively sustainable when it comes to disposing of mobile phones, laptops, and tablets. As Fig. 3 shows 34–38% of the students repair their aforementioned electronic gadgets, between 20 and 21.5% donate them to a secondhand user, 14–16% sell them to a secondhand user, and 9–11% sell them to scrap dealers. Results in this portion of the survey are promising, and they show a real, sustainable practice toward disposing of unwanted mobile phones, laptops, and tablets. However, between 6 and 9% of the students put their unwanted mobile phones, laptops, and tablets with other household trash (Fig. 5).

Figure 4 shows surveyed students' practices concerning unwanted earphones/headphones, MP3/MP4 players/iPods, speakers, printers/scanners, and batteries. A common trend is observed for these five electronic gadgets when students chose between the same five practices above of disposal in Fig. 3. A significant finding in this portion of the survey is that.

The relatively high percentage of the students deal with these devices unsustainably. Specifically, they leave such unwanted electronic gadgets with other household devices; earphones and batteries recorded 50% of the students followed by speakers (28%) and finally by MP3/MP4 players/iPods and speakers (19.5% and 18%, respectively). Other practices showed various percentages; 15% to 30% of the surveyed students repair such unwanted gadgets, 12% to 24% donate them to a secondhand user, 6% to 12% sell them to a secondhand user, and 5% to 10% sell them to scrap dealers.

In order to understand the rationale affecting students' decisions to repair unwanted devices, students had to choose between seven factors as follows; price of repair compared to the price of replacement; privacy reasons; warranty of the product; availability of spare parts; knowledge of needed



	Repair	Donate to a second-hand user	Sell it to a second hand user	Sell it to scrap dealer	Put it with other household trash	Others
Earphones/Headphones	15.33	18.12	5.57	5.23	48.78	6.97
MP3/MP4 Players or IPOD	21.74	24.08	14.38	9.36	19.4	11.04
Speakers	22.56	21.55	11.45	7.74	27.95	8.75
Printers/Scanners	30.36	21.78	11.88	9.57	18.15	8.25
Batteries	18.62	12.41	3.1	6.21	51.38	8.28

Fig. 4 Students' practices upon unwanted or old earphones/headphones, MP3/MP4 Players or iPods, speakers, printers/scanners, and batteries

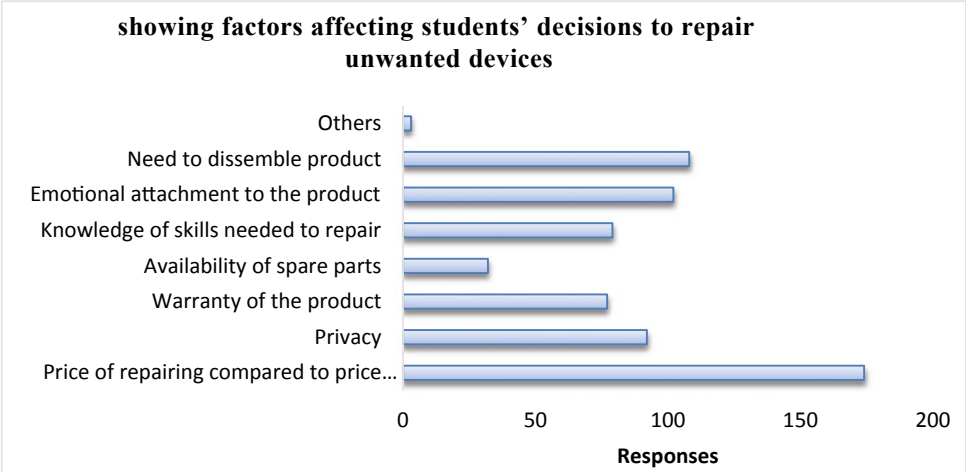


Fig. 5 Factors affecting students' decisions to repair unwanted devices Discussion

skills to repair; emotional attachment to the product; or needing to disassemble the products. Recorded results from highest to lowest frequency of responses are as follows: 64% of the students voted for the price of repairing compared to the price of replacing; 40% voted for privacy reasons; 38% voted for warranty of the product; 29% equally voted for emotional attachment to the product and knowledge of skills need to repair while only 12% voted for lack of skills needed to disassemble the product.

5 Discussion

The surveyed undergraduate students were randomly invited to participate in this case study as evident from their age groups as well as studying majors. Figure 1 indicates that government undergraduate students assign a relatively significant amount of annual budget only for purchasing new electronic gadgets. This may be attributed to the various

continually evolving advancements in electronics and attractive consumer designs, which shorten the lifespan of old electronic devices. Since every upgrade of an electronic device is a downgrade of an old one, a bulk surplus of unwanted electronic devices, or "e-waste", is continuously created which imposes severe environmental crisis and raises an urgent need for individuals' awareness toward its harmful effects.

The highest category in Fig. 2, which displayed students' awareness about e-waste definition and its environmental impact, is the second one, where over half of the students (57%) indicated they have a moderate knowledge of e-waste and its impact on the environment. These results are in-line with another study by a Saudi research group (Abubakar et al. 2016). This means that a large proportion of students are aware of the negative e-waste impact on the environment and, therefore, are expected to reveal some knowledge and curiosity about environmentally friendly methods of e-waste management and disposal. Nevertheless, it should be noted that students' theoretical knowledge should also be supported with frequent e-waste management practices, for example, experiencing the availability of visible in-campus electronic, plastic, paper, and other substantial waste disposal container. This highlights the vital role of the university's e-waste management system to support resolving the current unsustainable practice by embedding green environmental tools into their campuses. Moreover, the emerged statistics suggest a pressing need to adopt the current curricula of the bachelor degrees offered by federal and non-federal higher education institutions to focus more on sustainability and e-waste disposal methods. This can, possibly, be achieved by allowing students to take elective classes on sustainability, inviting guest lecturers to deliver sessions on sustainability and e-waste related topics, fostering the link between the natural and the social sciences, and providing planned and systematic sustainability education to educators (Utama et al. 2018).

Depending on the technology of fabrication and the choice of the provider, mobile phones contain between 500 and 1000 components; many of which are toxic and hazardous if inappropriately disposed of (Nnorom et al. 2009). Mostly, a typical mobile phone is composed of a keyboard, a battery, a screen (a liquid crystal display LCD), and a printed wiring board (PWB). The two dominant types of batteries in use today in mobile phones are nickel–metal hydride batteries (NIMH) and lithium-ion batteries (Li-ion); both of which contain flammable, toxic chemicals. Similar compositions of mobile phones are tablets and laptops. Survey results revealed that personal electronic devices, such as mobile phones, laptops, and tablets, are more likely to be repaired (36%) than be put with other household devices (7.5%). Since photos, social media accounts, bank accounts, and other private data may be saved on such devices, and users might be reluctant not only to sell or denote them to secondhand users but also to put them with other household devices. This is attributed to the confidentiality which these devices hold especially that many customers doubt that such data can be permanently deleted from their devices (Karlson et al. 2009).

On the other hand, other gadgets, such as the ones in Fig. 4; earphones/headphones, MP3/MP4 Players or iPods, speakers, printers/scanners, and batteries; are less personal and are more classified into electronic accessories. Results show that such devices are often disposed of in an unsustainable manner. About 50% of the unwanted batteries, earphones, and headphones are disposed of with other household trash. This high percentage, which is 50% of the total respondents, is quite elevated if it is generalized to the public. According to a recycling center in Singapore, such devices include harmful substances such as mercury, cadmium, and lead that can leach from landfills and contaminate groundwater (Terazono et al. 2006).

The majority of respondents articulated that they would exchange their old devices for newer ones every time they wanted to upgrade. This was especially true in the case of mobile phones. The components of mobile phones and computers are so costly that customers prefer to buy new products; for example, the cost of a battery for mobile phones and laptops, and the cost of print cartridges in case of printers. After that, customers do not consider buying a component, but to replace it with a new product.

6 Conclusions and Suggestions

This study aimed to assess students' perceptions and involvement in e-waste management and sustainability system in a federal institution in the United Arab Emirates (UAE). The noteworthy finding is that while there are great concerns and substantial knowledge about environmental sustainability among the respondents, survey results showed lack of motivation and willingness to effectively and responsibly engage in initiatives toward achieving sustainability. Suggested recommendations for further in-campus sustainable hands-on practices could be the following: first, Emarati universities may ensure the visibility of in-campus suitable facilities to students such as electronic, plastic, paper, and other reliable waste disposal centers. Second, institutions may arrange for in-campus donation for unwanted electronic devices to charities, which can involve the students and demonstrate to them sustainable methods of e-waste disposal. Third, UAE universities' curriculum should be restructured implementing innovation of sustainable cities throughout end-of-courses' projects and field trips to well established sustainable sites such as Abu Dhabi Clean Energy Company (MASDAR). Finally, at the

Ministry of Education level, set unified standards and policies should be established, applied, and followed by all UAE universities. In conclusion, while this study showcases only preliminary e-waste management and reveals the level of awareness of students in one federal university in the UAE, it can still be considered as a first stepping-stone along a path for further sustainable environmental development. Further research is needed on related topics such as investing innovative teaching on improving students' sustainable practices and empowering the role of faculty and staff in delivering active advising strategies in extending sustainability companions among Emarati students.

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Sustainability Across Generations: What Can We Learn from the Elderly Generation About Sustainability in UAE?

Casiana Pascariu and Leslie Vandeputte

Abstract

In order to understand sustainability implies, among other factors, to grasp cultural perceptions of the environment and our impact on it. Both sustainability and anthropology are, therefore, intrinsically intertwined and growing numbers of studies have been conducted to examine this relationship (Al Musharrekh 2015). Sustainability and anthropology where they stand include cultural competencies. This research is comparing and contrasting the word *sustainability* to intergenerational and transgenerational perspectives, aiming to define the term from a United Arab Emirates (UAE) perspective. Fieldwork methods used for this research were anthropological such as Participant Observation (P-O), informal interviews, focus groups, and surveys. The data was collected through surveys distributed to eligible students at the American University in the Emirates (AUE), focus groups with the sociology and anthropology students, and eight visits to the Thukher Social Club for Elderly (males and females). In this research, the focus was sustainability from a cultural perspective: how did the cultural competencies (socially and religiously) influence the lifestyle of elderly UAE generation and the new UAE young population (AUE students). The research results aim to teach the UAE millennial generation how to be *sustainable* from the elderly about the new modern times. In the end, we intend to reconsider/reimagine our contemporary practices and our relationship to the environment by drawing inspiration from the knowledge of the elders. Based on the data analysis, we offer three recommendations: open a *Baraka* club in schools, integrate the elderly in higher education and create cross-generational workshops, and lastly, learn from the past when it comes to architecture, reusable materials, and energy.

Keywords

Intergenerational education • Sustainability • Anthropology • Conservation • History • Transmission • Development • Religion • Middle East • MENA region • UAE • Emirates • Arab Peninsula

1 Introduction

Sustainability has become an inescapable concern for all countries across the globe. Even though this multidimensional concept has gained popularity, defining it remains complex. One of the main aspects it covers has to do with transmission and transgenerational legacy. Indeed, as Dr. Rashid Allem pointed out during his lecture at the second international research conference (AUERIC 02) hosted by the American University in the Emirates: "Sustainable development is a fair share between generations." While cultural anthropology concerns itself with understanding human being throughout the past and present, it is, therefore interlinked with environmental issues (Kenneth 2017). This research project aims at giving a comprehensive understanding of sustainable cultural practices and values embraced by the elderly.

What have they transmitted and passed on to the millennial generation?

In order to answer this question, we used ethnographic methods to gather data. In this research, the focus was sustainability from a cultural perspective: how did the cultural competencies (socially and religiously) influence the lifestyle of elderly UAE generation and the new UAE young population (AUE students). The research results aim to teach the UAE millennials generation how to be *sustainable* from the elderly about the new modern times. This article presents the first results coming from our fieldwork and discusses

C. Pascariu · L. Vandeputte (✉)
American University in the Emirates, Dubai, UAE
e-mail: leslie.vandeputte@aue.ae

C. Pascariu
e-mail: casiana.pascariu@aue.ae

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across the generational transmission. First, this article tends to define sustainability from the UAE perspective, in relation before and after oil production. Then, it presents the research questions and methods used. Finally, analyses and results are discussed, and recommendations are made. Across this study, we also tend to contribute to defining the word sustainability.

1.1 Sustainability as a Concept and Its History

There is no single and unanimous definition of sustainability due to a variety of fields which use the concept. None of the definitions given by scholars or organizations provides a perfect understanding of it. Difficulty in defining sustainability shows the complexity of this concept as well as its multidimensional issue (Ciegis et al. 2009).

Sustainability has been studied and defined through different disciplinary approaches such as economics, sociology, and ecology. Definitions vary according to which perspective is chosen. Scholars, as well as international organizations such as United Nations Environment Program (UNEP), World Wide Fund (WWF), International Union for Conservation of Nature and Natural Resources (IUCN), have tried to define it (Gabriella et al. 2008).

Researches show that sustainability allows us to understand the complicated relationship between the environment, society, and the economy. More broadly, sustainability incorporates different aspects, for instance, efficiency, equity, as well as *intergenerational equity on economic, social, and environmental fields.* Incorporating all these aspects, the National strategy of Sustainable development (2003) defines sustainable development as follows:

> sustainable development is the society's development that creates the possibility for achieving overall wellbeing for the past and future generations through combining environmental, economic, and social aims of the society without exceeding the allowable limits of the effects on the environment. (Armitage 2006).

From the 1970s and the 1990s, sustainability has been related mainly to environmental issues. During the 1990s, it had a lot to do with economic development. Today, scholars and organizations tend to question the social impact of sustainability as well as the intergenerational aspects of it. The anthropology of sustainability concerns with studying cultural processes from "multiple perspectives, based on their interests and needs of particular societies, rather than the universalist interests of any single ideological, historical and methodological interests." (Brightman 2017). Indeed, sustainability also encompasses a significant ethical component: a universal right of every human citizen to the fair share of the planet's resources. More broadly, sustainability is associated with the equity of distribution. As mentioned in the introduction, it may also be defined as a better quality of life for both present and future generations.

Social equity, social justice, and equality of conditions are also essential to consider while defining sustainability, as well as intergenerational equity. Sustainability also has to do with needs, the satisfaction of needs, and the limitations. Therefore, sustainability is a very anthropocentric concept. Before analyzing this concept through the lens of transgenerational transmission, the background of the UAE's history before and after oil production is needed.

2 Before Oil Production

The inhabitants of this region were historically nomads. Even though the first discovery of oil was in the 1950s, because of the colonization by the British Empire, the locals got to have access to their resources and use it for production only in the 1960s, when the region regained their independence and the nations were formed (Definition Ramdan 2018). Their ethnic identity is Bedouin Arabs, and the focus will be the Bedouin tribe from the United Arab Emirates (UAE) (Shukla 2011; Groucutt and Petraglia 2011). Some were **migrant** Bedouins, such as Awamer and Al Manasee tribes, moving all year long, and they used to graze animals. The most common Bedouins were **semi-migrant** who settled near oases/water resources for part of the year in villages during the dry seasons and had villages where they would dwell for the other half of the year when they had resources. The Persian Gulf/Arab Gulf has been an essential place for merchants, travelers, and explorers to meet. The Gulf was a significant pass between three different continents: Europe, Asia, Africa. Before the oil production, the region was known for transnational merchant families, where they used to trade with countries such as India, Iran, Egypt, Oman, Yemen, and Great Britain. Some of the most essential goods they traded were rice, flour, spices, rifles/guns, very few cars and gold/jewelry (Alsharekh 2007).

2.1 Islam in Relation to Sustainability

The Arabian Peninsula has been influenced heavily by Islam for the past 1400 years. Because of this, it was essential to look at Islam from a sustainability perspective. Islam

preaches against destructive behavior. One Hadith,[1] discussing wudu[2] states: "Do not waste water, even if you perform your wudu on the banks of an abundantly-flowing river" (Al Musharrekh 2015). Dr. Wasim Ahmad professor of Islamic Studies at the American University in the Emirates (AUE) also stated in an informal interview in regards to water consumption in Islam "you should only use how much you need, not more than that, as water has always been a main issue in the region."

Another Hadith is addressing the food about Prophet Muhammad "The son of Adam does not fill any vessel worse than his stomach. It is sufficient for the son of Adam to eat a few mouthfuls, to keep him going. If he must do that (fill his stomach), then let him fill one third with food, one third with drink and one third with air." Narrated by al-Tirmidhi (1381), Ibn Maajah (3349); classed as Saheeh by al-Albaani in al-Silsilah al-Saheehah (2265) (2011, Islamia). Islam is a set of guiding rules and allows the individuals to make decisions on their own, rarely do they specify an exact amount and specific rules. Even about food, it recommends that we do not fill our stomach only with food, believing that air is essential, and overeating can be harmful to health. This was a way to prevent diseases and sickness.

Allah has a relationship with the animals even though not through human language. Muslims are allowed to eat only individual animals such as beef and chicken, and pork is considered haram.[3] The only way the food will be accepted from an Islamic perspective is by being halal.[4] Halal meaning that the animal(s) would need to be slaughtered in a specific way minimizing suffering and could not be used for the pleasure of people. In Islam, animals, just like humans have a nonmaterial soul. Animals are allowed to be utilized as long as they are under the divinization prohibition guideline (Nazari Saeid 2015). Some Sufis[5] do practice vegetarianism, but there is no agreement amongst Muslim scholars that this is a requirement or a solution throughout the Muslim scholars that this is a required or a solution.

2.2 After the Oil Production

A third industry developed rapidly with the oil boom. Now with the oil production, a fast globalized development influenced the culture and heritage of the region. The trading expended to the entire world, beyond East Africa, Southeast Asia and a few countries in Europe. The oil production and the favorable location of UAE created more natural ways to import and export. The products imported changed as well, such as avocados, potatoes, more cars, material for construction (as modern western villas with Arabic influence are the norm for personal residence) from parts of the world as far as Chile and China.

The connection with animals also changed after oil production. There are still some farmers throughout UAE that are grazing animals, but for the most part, most locals do not own animals anymore, and if they do have camels or horses (most common animals to own), they are held by stablers or private farms outside of their primary residence.

Like other Gulf countries, the United Arab Emirates is a new country created during the 1970s (1971). Therefore, Gulf leaders have used religious identities and tribal relationships to consolidate their legitimacy. Arab nationalism is deeply rooted in merchants' positions and roles (Tohail As'eed 2016).

Consequently, and even though the region does not have a long history of national self-determination, nationalism is nowadays a powerful way to link people together. It plays an important role to define Emirati people. Indeed, national identity is transmitted along with other religious values and has become increasingly significant, especially among the Millennial generation (Partrick 2009).

3 Research Questions

The focus of this research was about the following three research questions:

1. Does UAE as a society, one way, or another, use sustainability methods from a cultural competency perspective, or it is a new western term?
2. Does the ideology of Nationalism exist much stronger with the new generations (born after 1971) than with the elderly generation (born before the Union)?
3. Did the oil production and the fast, economic development, access to resources, technologies, and the impact of globalization, create a significant cultural gap between generations?

4 Methods

For this fieldwork, a mixed range of research methods has been used, both anthropological and sociological. Because of the diversity of the methods, quantitative and qualitative methods were used to collect and then analyze the data. Using QuestionPro, we created an online survey with 32

[1]Record of the words, actions, and the silent approval, of the Islamic prophet.
[2]Washing before the prayer.
[3]Sinful, not allowed, forbidden.
[4]Halal meaning lawful, allowed for use in the Qur'an in contrast with Haram (not allowed).
[5]A more meditative branch of Islam.

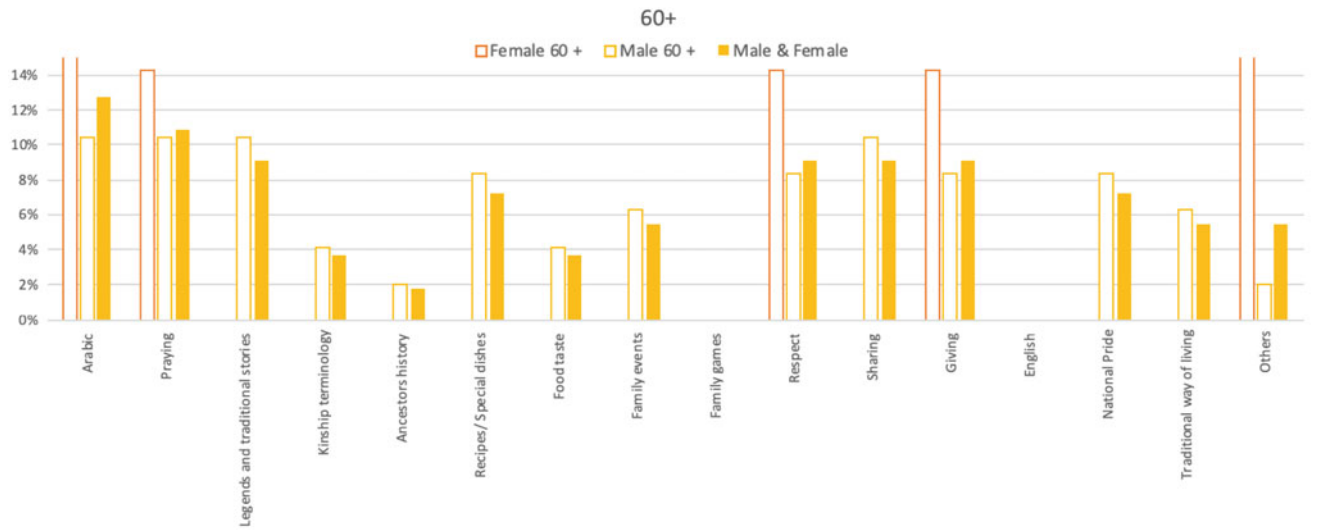

Fig. 1 What mamas and babas have been received

questions: two questions for eligibility (born in UAE and Arabic their first language) and four demographic questions (age, gender, education level, marital status). This survey was distributed to all students, staff, and faculty at the American University in the Emirates (AUE). The collaboration with the Community Development Authority (CDA), from the Government of Dubai, was crucial for the success of this research. Through CDA, there were eight visits to the Thuker Social Club for elderly,[6] where we were able to fully emerge through anthropological method Participant Observation (P-O) into the lives of UAE elderly about their activities and far away from their homes. Additional to the visits at the Social club for elderly, we visited three homes of locals where we had 2–3 interviews conducted with eligible family members. At the AUE, we conducted three focus groups with our courses that were eligible (in Anthropology and Sociology courses), where we discussed the key terms (*wasta*, *Baraka*, *estidama*, and sustainability). The students had to take the survey as part of their in-class assignments and give constructive feedback and use critical thinking about the material learned in class (Chapter on research methods).

4.1 Analyze Data

The data analyzed was categorized in three types of intergenerational transmissions:

1. Transmission from the elderly received from their parents.
2. Transmission from the elderly to the new generation.
3. Transmission from the new generation received by the elderly.

5 Transmission from the Elderly Received from Parents

Out of sixteen categories (see Fig. 1), six had over 8% response, and they are worth discussing. Language is a significant component for any culture, so Arabic as a language transmission had a high percentage (12%). Though some of our informants made the distinction between Arabic and their Emirate dialect. As the Emirate dialect is rooted in Arabic, and some of our informants were not Emirates, we considered Arabic as a broad category appropriate for our research topic. There is no culture in the world, that anthropologists studied, who did not have a belief system (religion). Religion is another category that helps individuals associate themselves with a culture or ethnic group. As a category about religion, prayer was added, who had approximately the same percentage as a language (11%). Even though we did not limit to Islam, all of our informants were self-identified as Muslims. Through our data collection and literature review, we noticed an impactful connection

[6]UAE government defines an elder person anyone 60 and above.

between Islam and Sustainability. Hence, we added a subcategory in the literature review regarding this topic.

Three categories "respect", "sharing", "giving" had 9%. Though in the interviews the informants discussed the neighborly feelings, being more connected with the family and the community which was linked to the former three categories. One of the *babas*[7] said to us during the interview "in the past we had only one TV and we all had to be in one room, now we have seven TVs, and each of them is in their room; we are not together anymore; my grandchildren as young as two years old have cell phones, they are busy with their cellphones all the time", "before I knew all my neighbors, now I do not know the name of my neighbor, I have never been to him, maybe he doesn't want to receive me." "I never see him, and they are all busy," another informant stated "before if someone had a little pain in the leg, you would go to his visit him stay with him, now we don't; I have a brother, but where is my brother? He is always working, I never see him, before was better." and a *mama*[8] informant stated, "before we slaughter a lamb, we shared everything, give each a piece, now nobody wants a piece, is not the same sharing, everyone has food." The interconnectedness between family members and neighbors was one of the things that were better in the past, even though the lifestyle of today is more comfortable.

Despite the category "recipes and traditional dishes" had no predominant percentage, based on the interviews and P-O, there seemed to be a high correlation between transgenerational transmission and how it is perceived by the new generation. Something that seems to be lost. All of our elderly informants discussed the food "we used to eat only one date with milk and I was strong, now we eat all these foods, too much is not good for us, not organic and we are all sick." This is also linked to the view of Islam correlated to sustainability. Eating less and fasting during Ramadan[9] are all sustainable ways of taking care of the body. The mamas and babas also discussed the food intake about the advice from Prophet Mohammed; the stomach should be filled "one third with air" Narrated by al-Tirmidhi (1381), Ibn Maajah (3349).

The environment was central to the old generation in their daily lives. The palm trees were used for things including food, making baskets for carrying goods, fashioning carpets as furniture and making tents for shelter. The sea was essential, where humans fished, harvested pearls and used it for drinking water, for the tribes which lived near the sea. One of the mamas states in her interview, "It was better before than now. No buildings before, concrete buildings make the place hot. Life was harder, but all families before used to gather together. Before people were most generous, now people do not share."

Baraka is translated as lasting, continuity, or increasing it in size. It is associated with Islam, and in the past, it was used as a common word. The elderly knew what Baraka means and said it was something they learned in the past from their parents. One baba described Baraka as "you give me one dirham, and I make them two dirhams." A mama said about Baraka, "it is gratitude. It comes from God. Allah is the source of Baraka," meaning that whatever you have, you should be grateful for, and make it last. Baraka could almost be translated as sustainability. Also, the elderly confesses that "[there is] no Baraka in our days." In the focus group with four Emirati women, the word *Baraka* created heated conversations. The mamas said that in the past, as there was "little money" and no globalization, the options were limited. Now when you go to the market [referring to the mall] everybody tries to buy so much, so no Baraka as we spend more than we have before we have it [referring to credit cards].

6 Transmission from the Elderly to the New Generation

Some changes in the transmission based on our survey existed. The first subcategory for the data is interconnected with the second one, as no answer was given without the relationship to the new generation. Language and religion have the highest percentage in transmission as in the transmission from the elderly from their parents (see Fig. 2).

The category of "traditional food/receipts" had the lowest percentage, which shows the direct impact on the economic boom (oil production) about the intergenerational transmission. The normality of the region is to have a maid in the home, and mostly the women are not cooking anymore, which means the traditional dishes from families are being lost. When it comes to food, sustainability about Islam "have a third of your stomach filled with air" as per the recommendation of Prophet Mohammed, is something that never came up in the conversations with the new generation compared with the old generation. There is still a request for halal food, though no other dietary restriction recommended by the hadiths are mentioned.

7 Transmission from the New Generation Received from the Elderly

Comparing the previous two transmissions: (1) *Transmission from the elderly received from their parents* and (2) *Transmission from the elderly to the new generation*, with the last

[7]Males elderly over 60 years old.
[8]Female elderly over 60 years old.
[9]The ninth month of the Islamic year observed as sacred with fasting practiced daily from dawn to sunset.

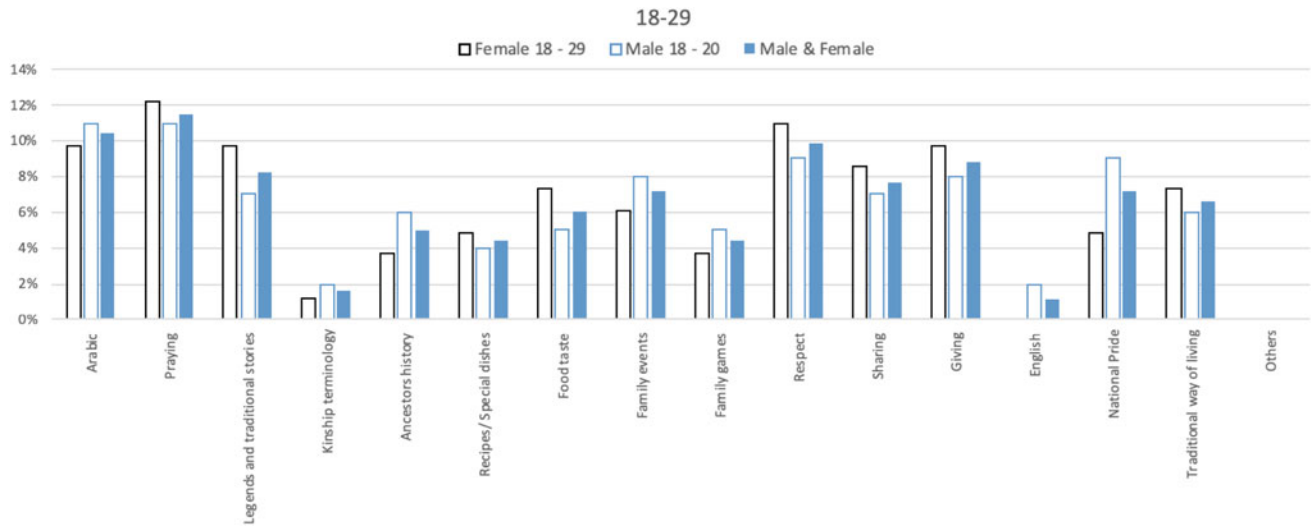

Fig. 2 What the new generation has been received

transmission (3) *Transmission from the new generation received from the elderly*, we still see the highest percentage in Arabic and Prayer, categorized in language and religion. The language has changed, as the Arab dialect is not emirate anymore and has many influences. The new generation, including the Emirati locals, can truly understand the old generation while they speak the Emirati dialect. Again the technology and globalization play a role. Through observations, we noticed that during informal peer conversations, students used a significant number of English words, as well as having full conversations in English, though their native language and language spoken at home in Arabic. The student's translators who assisted us with this research, though some were Emirati and some were born and raised in the UAE, had difficulties communicating with the elderly we interviewed because of the language barrier. One of the students stated, "When I speak with an old Emirati person, they know what I say to them, but I had a difficult time understanding them…you might say we had a language barrier, [though] I was born and raised here." Like every language, the Emirati dialect is dynamic and is continuously evolving. Using different varieties of language emphasizes the generation gap between elderly and young people. Borrowing from English is becoming more and more common. Indeed, as an international, widespread, and influential language, English benefits from a very positive perception of the "linguistic market" (Bourdieu 1982). It is the language of mainstream music, fashion, high technology, higher education, and more broadly, globalization. Thus, as the millennial generation increases their use of the English language, the divide between the elderly generation and new generation widens.

The new generation, even more than their parents, do not know how to cook even though they are aware of local dishes and dishes passed down by their grandparents. An informant stated, "I do not cook [laughing], but I teach my maids the recipes of my mother." Part of the culture of food preparation "…cooking in big family pots together" also been lost as the kitchen is used mainly by the maids and is disconnected with the rest of the family/house.

The term *Baraka* (mentioned in the **transmission 1**), is widely embraced and understood within the older generation, is contrastingly inexistent among the new generation. The young generation had a vague definition of *Baraka* and is a world not used regularly as it used to be in the past. The globalization and capitalism took over, with new values such as materialism and money focus. As explained above on an individual level, *Baraka* can be understood in slightly different ways. Lasting, charity, generosity, right actions taken that will reflect on one's, etc. Slowly the young generation seems to lose the sense of *Baraka*. Their lifestyles (good incomes, comfortable living conditions, etc.) do not require to apply this life principle in their beliefs and behaviors.

Human connection is probably the most significant difference between the generations. Though because of the rise of social media, we see these disconnect throughout the world, and in UAE we had a more significant impact because of the lack of resources during the elderly generation (our informants) compared with their grandchildren (our students) who were born into significant wealth compared to their grandparents. One of the criticisms that we received during the AUERIC 02 conference, was that "take those quotes and apply them to any elderly population in the world, either Poland, Romania and France, and you will have the same results." We disagreed with this, because even though we recognized the impact of globalization throughout the world, in other established countries, the grandparents are still more likely to live on the land of their parents,

maybe even the same house or an upgraded house from a past generation, and similar work fields as their parents or grandparents. The horizontal mobility is not as significant as in the Emirati culture, where we were told by all of our informants that "in the past we had one room [for the entire family], maybe two, no electricity, no air conditioning, and now we have seven rooms in the house, each room with television and maybe five to six cars parked outside." Currently, outside of the Gulf Cooperation Council (GCC) countries, we will not find these significant changes in other countries.

8 Conclusions

In the conclusions, we categorized our findings into the three main themes of advice from elderly in UAE:

1. Sustainable Values: generosity, hospitality, respect. Though these values are shown as transmitted to the new generation, based on our surveys, the elderly did argue that the new generation has lost some of them. They explained that the new generation understands these values but do not apply them in their everyday life.
2. Sustainable Connections: neighbors, family, etc. Probably the leitmotif of our research, throughout all the research methods used, was the loss of the human connections: neighbors and family alike.
3. *Baraka*: to learn how to make something last much longer. A lost term, we would dare to argue that this is the word equivalent to *sustainability* from a United Arab Emirates perspective, and not *estidama.*

9 Recommendations

Based on our three main conclusions, we offer three recommendations. These recommendations are also based on the feedback we received on the two occasions where we presented our research: AUERIC 02 conference and "*Bringing past into the future: learning from UAE elderly generation.*"

Professor Muthanna G. Abdul Razzaq, president of AUE, let us consider creating a *Baraka* club that would bring the old generations (UAE nationals over 60 years old) and AUE students into a familiar place. This would allow the elderly to offer advice and ideas on how to practice *Baraka.* The students could use this information and adapt it to new technology and their modern lifestyles. The activities and programming of this club could also be integrated into the curriculum for many courses, including: Media, Sociology, Anthropology, and Innovation and Entrepreneurship. This model would be adaptable to any higher education institution.

The sociology students during their sociological research also offered actions to ameliorate the gap between generation in UAE. They considered having universities collaborate with the Government of Dubai (Thukar Social Club and Waleef program along with any other appropriate or incoming programs) that would connect students to the elderly potentially creating a generational exchange experience. These collaborations could also encourage the elderly to become an influential part of the society, with no age discrimination. This recommendation could be linked to the *Baraka* club.

Another recommendation is to use more reusable material, from the surrounding environment, as the older generations did in the past. Link to the other two recommendations, the architecture sustainable can be part of a curriculum in universities, and throughout the transgenerational meetings, more complete information can be gathered.

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Sustainability Behavior at the University of Sharjah: A Gender Comparison

Anwar Hamdan, Nada Murad, Marah Abdelrazeq, Sadeque Hamdan, Imad Alsyouf, and Maamar Bettayeb

Abstract

Universities around the world have an important role in sustainability which encourage them to conduct campus sustainability studies to measure their sustainability performance. This study aims to assess sustainability performance and compare the level of behavior between males and females at the University of Sharjah. We developed and distributed a questionnaire to all the university populations to measure sustainability behavior. We used a Likert scale and hypothesis testing to analyze the questionnaire. By the end of the questionnaire duration, we received 646 responses, where 238 were males, and 408 were females. To analyze the questionnaire, the sign test was applied to determine the level of sustainable behavior of the males' and females' respondents. The results of this test showed that both males' and females' behavior levels are high. This is a good sign that both males and females are practicing their daily activities in a sustainable manner. Furthermore, the Wilcoxon–Mann–Whitney test was applied to compare the males' and females' behavior levels. As a result, it was found that males have better sustainability behavior. It is recommended that the University of Sharjah organizes more events and activities to boost the behavior level of female respondents. Also, the university may define some rules and regulations to monitor the sustainability behavior at the campus by providing rewards, incentives, and penalties in case of violation.

Keywords

Sustainability • Higher education • Behavior • Gender

1 Introduction

In the 21st century, humans continue their advanced research in technology and further innovations to reveal the secrets behind sustainability. According to Hacker et al. (2015), sustainable development can be defined as the development that satisfies the needs of the current generations without affecting the needs of future generations. Sustainability has three main pillars, which are economic, environmental, and social (Hansmann et al. 2012). These pillars are considered to be the drivers for sustainability excellence. Universities can play an essential role toward sustainable development through the three sustainability pillars, where according to Isa (2016), operations and activities performed at universities can have negative or positive effects on the sustainability performance.

Many universities in the past were showing interest in sustainability in one way or another. Higher Education institutions have a significant and critical role in achieving excellent sustainability performance results. Therefore, it is imperative to include sustainability in the curricula to help in achieving the expected sustainability performance outcomes. By doing this, academic programs will help in influencing people's behavior positively to achieve the goals and missions of sustainability. Many universities' studies focused on

A. Hamdan (✉) · S. Hamdan
Sustainable Engineering Asset Management (SEAM) Research Group, University of Sharjah, Sharjah, 27272, UAE
e-mail: anwar.hamdan@sharjah.ac.ae

S. Hamdan
e-mail: shamdan@sharjah.ac.ae

N. Murad · M. Abdelrazeq · I. Alsyouf
Industrial Engineering and Engineering Management Department, University of Sharjah, Sharjah, 27272, UAE
e-mail: U14123320@sharjah.ac.ae

M. Abdelrazeq
e-mail: U14123185@sharjah.ac.ae

I. Alsyouf
e-mail: ialsyouf@sharjah.ac.ae

M. Bettayeb
Electrical and Computer Engineering Department, University of Sharjah, Sharjah, 27272, UAE
e-mail: maamar@sharjah.ac.ae

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and applied advanced techniques in the field of water and energy conservation to achieve economic and environmental excellence. Hacker et al. (2015) stated that a successful sustainability program depends on involving students. As a result, it is critical to understand the factors, which motivate people to perform sustainable activities. Therefore, this research paper discusses sustainability from a different perspective, which is the behavior of students, staff, and faculty members toward sustainability. According to Ribeiro et al. (2016), monitoring sustainability-related issues is essential.

Sustainability assessment can be defined according to Pope et al. (2004) as the process of evaluating the implications of an initiative on sustainability. According to Singh et al. (2012), the goal of the assessment is to provide decision makers with an evaluation related to the environment and society in order to improve sustainability outcomes. Sustainability behavior can be defined as how people respond and act regarding sustainability (Manning 2009). It is important to spot the light on people's behavior because it is considered to be the direct indicator that affects all the sustainable elements.

As the University of Sharjah consists of two campuses (male campus and female campus), it is assumed that males and females have equal sustainability behavior levels. Therefore, the main aim of this study is to assess the sustainability performance and compare the level of behavior between male and female respondents at the University of Sharjah. This study will help in answering the following questions. (1) Is the sustainability behavior level of males and females high? (2) Is there a significant difference between the males' and females' sustainability behavior levels? (3) Which category (males or females) has a higher sustainability behavior level?

To the best of the authors' knowledge, and based on the literature review (see Sect. 2), the research related to this topic is minimal and most of the published works considered the assessment on either students or faculty. However, no work attempted to present the overall university sustainability behavior that is affected by all the individuals in the university.

This study will help us to identify the weaknesses of each campus and improve them in order to enhance sustainability in the university. Based on the results of this study, decision makers and top management at the university can develop the needed action plan to improve the sustainability level.

2 Literature Review

Recently, research works have been developed to measure the sustainability level in higher education institutions. For instance, Abubakar et al. (2016) assessed the students' awareness in different sustainability components including curriculum and research, operations, and engagement by surveying 152 students from the Architecture and Planning college in the University of Dammam at Saudi Arabia. They found that students have a high level of awareness regarding the environment, and courses were found to have a small focus on sustainability. However, this study was only limited to students from one college instead of considering other colleges and the other university populations. Marans and Callewaert (2017) applied sustainability cultural indicators program to evaluate the effectiveness of sustainability initiatives regarding the expansion of compositing in the university.

Moreover, Mir and Khan (2018) surveyed 437 students at three Indian universities to measure the sustainability knowledge, attitude, and behavior of students. The study revealed that the students have low levels of knowledge and behavior toward sustainability but a high sustainability attitude level. However, this focused only on students, and it did not consider other university populations such as the administrative staff and faculty members.

In addition, Katiliūtė et al. (2017) studied the role of administrative staff in designing sustainable university campus to identify the problem and provide solutions for the development of a sustainable campus. Dagiliūtė et al. (2018) compared between students sustainability attitude from two different universities were one of them is a green university, and the other is a non-green. Based on the survey results, it was found that there are no significant differences between the sustainability attitudes in the two universities.

In most of the studies that used questionnaire and hypothesis testing, a Likert scale was utilized to quantify the results and construct the required data for hypothesis testing. For instance, in quality management, Alsyouf et al. (2018) assessed the impact of ISO 55000 implementation by using a Likert scale and a non-parametric hypothesis testing to analyze questionnaire results. In project management, Ruqaishi and Bashir (2015) developed a questionnaire to investigate the causes of delay in construction projects in the oil and gas industry and utilized a Likert scale in order to apply Kruskal–Wallis to test their hypothesis. In addition to that, Hamdan et al. (2019) investigated the delay factors for electrical installation projects by developing a questionnaire and analyzing the results using a Likert scale and Fuzzy TOPSIS. In Psychology, Koh (1996) developed a Likert scale questionnaire to investigate if the entrepreneurial inclination is significantly associated with the six psychological characteristics. Two statistical analyses are used to analyze the results of the survey, which are the t-test and the logit analysis.

Based on the above literature review, minimal studies aimed to measure sustainability in higher education

institutions. The above studies aimed to measure sustainability only for one campus population, mainly students and no study considered the sustainability behavior of the different campus population (students, staff, and faculty) together, which will be addressed in this study. Furthermore, in this study, gender comparison will be conducted on sustainability behavior.

3 Methodological Framework and Results

The methodology used in this study consists of two stages. First, the design of the survey and second, the analysis of the data, which are described in the sections below.

3.1 Design of the Questionnaire

In order to identify the gap between the current and required sustainability behavior at the University of Sharjah, we surveyed students, staff, and faculty members. We designed an electronic questionnaire using Google Forms (https://www.google.com/forms/about/) that includes 23 questions about sustainability behavior, which are shown in Table 1. The questionnaire has been checked for reliability and validity by distributing it to a test group to collect feedback about the questionnaire design. Furthermore, the questionnaire content has been validated by experts.

The purpose of the questionnaire was to understand the baseline sustainability behavior at the University of Sharjah and to create a data collection plan that will serve as a tool to reveal the actual indicators of the behavior. The questionnaire covered questions about the three pillars of sustainability to measure the behavior of sustainability at the university. In the first section of the survey, we collect general information about the participants, such as their gender, class, college, and place of living (on or off-campus).

In the next section, the behavior of the participants was measured in 23 questions about their daily activities and aimed to capture how people respond and act daily regarding sustainability. The questionnaire was distributed several times by email through the Information Technology Department and Office of the Chancellor in cooperation with the Sustainability Office to remind people to participate. The questionnaire duration was around three weeks, starting from March 12, 2018 till April 5, 2018. At the end of the questionnaire period, the number of participants was 646, where 36.84% of the participants were males.

4 Analysis of Results

In this section, we analyze part of the obtained data. The result of a comprehensive data analysis will be published in another extended paper.

Data Analysis. We performed a hypothesis testing to determine the level of behavior (high or low) for males and females, separately. Then, we aim to know the sustainability behavior difference between the two genders at the University of Sharjah. To perform the analysis, we apply a Likert scale, which takes the level of agreement of the participants on given statements on a scale from strongly disagree to agree (Joshi et al. 2015) strongly. We assigned a score for each question using a scale from 1 to 5, where one is for Never, and five is for Always. The total score was 115 points (23×5). The collected data were not normally distributed. As a result, we applied the sign test on the median of the data as a hypothesis testing tool.

Measuring the Level of Behavior. To measure the level of behavior, we selected half of the total score (which is 57.5) to be the baseline, and we tested the hypothesis, S_1, of having the median of the data achieving more than this level (57.5), which means that the level of behavior is high using a level of significance of 5%.

$$S_1 = \begin{cases} H_0 : \breve{\mu} = 57.5 \\ H_1 : \breve{\mu} > 57.5 \end{cases} \quad (1)$$

where H_0 indicates that the median ($\breve{\mu}$) behavior level is less than or equal to half of the total score, i.e., low behavior and H_1 Indicates a high behavior. Both males' and females' behavior levels are high, as shown in Table 2. In short, it is a good sign that both males and females are practicing their daily activities in a sustainable manner.

Comparing the Behavior Level Based on Gender. We conducted a hypothesis testing, S_2, using Wilcoxon–Mann–Whitney to identify if the difference in behavior between males and females is significant or not. It is used to compare two independent samples using either the mean or median (Fagerland and Sandvik 2009), even with unequal sample size (Montgomery and Runger 2007).

$$S_2 = \begin{cases} H_0 : \breve{\mu}_M = \breve{\mu}_F \\ H_1 : \breve{\mu}_M > \breve{\mu}_F \end{cases} \quad (2)$$

Table 1 Questionnaire questions

Sn	Question
Please indicate how often you engage in each of the following behaviors, whenever possible. (Never, rarely, sometimes, often, all the time)	
1	Recycle
2	Encourage others to recycle
3	Turn off the water while brushing teeth
4	Use a reusable cup or mug
5	Print double-sided
6	Walk to class from the university dorms (Faculty and students)
7	Take showers less than 5 min (in campus dorms)
8	Turn off lights when leaving a room
9	Use energy efficient appliances to conserve energy
10	Unplug electronics when not in use to conserve energy
11	Eat locally grown or organic foods
12	Take classes that have a focus on sustainability
13	Participate in activities on campus that promote sustainability
14	Use the stairs rather than the elevator
15	Wash laundry only when you have a full load
16	Switch off the computer before leaving the room
17	Purchasing more recycled office materials
18	select materials such as paper, ink, and binding materials which are environmentally friendly as possible
19	Use green cleaning products
20	Share your car with your colleagues
21	bring your food with you in a lunch ware or the water using eco-friendly water bottles
22	If you have your car would you use the University bus instead
23	In conditioned areas, do you keep doors and windows closed

Table 2 Level of behavior based on gender

Gender	p-Value	Decision	Behavior level
Females	7.64×10^{-26}	$7.64 \times 10^{-26} < 0.05 \rightarrow$ reject H_0	High
Males	2.27×10^{-22}	$2.27 \times 10^{-22} < 0.05 \rightarrow$ reject H_0	High

where H_0 indicates that the behavior level of males is less than or equal to the one of the females while H_1 Indicates that males showed better behavior than females. The hypothesis testing provided a p-value of 0.0477, which means that males' behavior is higher than females' at a significance level of 5%.

5 Discussion

By analyzing the results of the questionnaire, we found that both males' and females' levels of sustainability behavior are high. This might be because most respondents are from the college of engineering, sciences, and medical studies, where sustainability concepts are integrated into their courses.

When comparing the males' and females' respondents, we found that males have a higher sustainability behavior level than females. Based on the results of this study, the university needs to set guidelines and to spread awareness by organizing more events and policies to promote sustainability, with a focus on the females' campus to improve their sustainability behavior level.

Additionally, even though sustainability behavior levels are high for both females and males, the university needs to set some behavior monitoring policies, as in some cases,

respondents tend to answer questionnaires in a positive way that may not reflect the exact personal behavior in an attempt of showing good personal behavior even with an anonymous questionnaire.

6 Conclusions and Recommendations

In summary, universities are considered to be leaders in education and research. The University of Sharjah is a large comprehensive pioneer academic institution in the UAE and the Gulf Cooperation Council region (GCC). Universities have the potential to lead the way toward approaching sustainability. Starting from involving students as partners, the University of Sharjah will observe the change and will attain a sustainable campus. Human behavior is an essential and critical factor that affects sustainability performance. Although changing behavior is not easy, it is very beneficial to achieve sustainability. This study aimed to assess the sustainability behavior level based on gender at the University of Sharjah using statistical testing, to help improve the current situation and drive it toward sustainability. The study revealed that although both males' and females' sustainability behavior levels are high; males' sustainability behavior is higher than the females' at the University of Sharjah. As an action plan, the University of Sharjah needs to organize more events and activities to boost the behavior level of female respondents. In addition to that, the university needs to define some rules and regulations to monitor the sustainability behavior at the campus by providing rewards, incentives, and penalties in case of violation.

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Sustainable Energy Development and Nuclear Energy Legislation in the UAE

Evan K. Paleologos, Abdel-Mohsen O. Mohamed, and Eric Canal-Forgues

Abstract

The MENA region has been experiencing the highest population growth rate in the world since the last century. Concomitantly, energy needs in the region are projected to exceed 50% of the current demand in the upcoming two decades. The United Arab Emirates (UAE) has become the newest addition to the countries that utilize nuclear energy for electricity production. For MENA countries, UAE constitutes the model in operational and regulatory actions in their pursuit of nuclear power. UAE's principles of transparency, nonproliferation, safety, and security, as well as its willingness to provide full operational access to international organizations, have been the key factors for this development. This study analyzes UAE's regulatory framework with the emphasis on the organizational structure of FANR, the country's nuclear regulatory body. Comparisons are made with USA and France, which have mature institutional structures and suggestions are provided for improving FANR's organizational chart. Our article also discusses issues of independence and accountability of regulatory bodies, pertinent to MENA countries' agencies.

Keywords

The United Arab Emirates • Nuclear energy regulations • Nuclear regulatory agency

1 Introduction

The United Arab Emirates (UAE) has a population of approximately 9.5 million, about 11.5% of which are Emiratis and the remaining expatriates. The annual growth rate of the population has been over 7% since 2005 (SCAD 2016). Despite its abundant oil and gas reserves, UAE has aimed to diversify its economy so that it does not depend solely on the oil and gas sectors. In 2017, construction accounted for about 9.6% of Abu Dhabi's (the Emirate that controls 94% of the UAE's oil) total GDP; the financial sector combined with insurance for approximately 7%; manufacturing, with the chemical and plastics industries being the most prominent, for 5.7%; real estate for about 5.1%; wholesale and retail for 4%; transportation and storage (buoyed by new and expanded ports) for 3.2%; and IT and telecommunications for approximately 2.2% of the Emirate's total GDP, respectively (Oxford Business Group 2017).

Population expansion, vast scale housing projects, and new economic activities require significant energy inputs from the national grid. Besides, resorts and attractions have made travel and tourism a 5.2% contributor to the UAE's 2017 GDP, with luxurious spaces entirely dependent on air-conditioning to ameliorate the harsh desert conditions of the country. Thus, for example, cooling accounts for 50% of Dubai's electricity demand, and exceeds 60% at peak times. Finally, water needs cannot be met by the scant water resources of the country and are supplemented by desalination, an energy-intensive technology, which accounted in 2015 for about 42% of the total water supply (1,750 Mm^3 out of a total of 4,200 Mm^3 of water). Annual desalinated water production increased by about 5.5% the last 10 years in order to meet domestic water consumption, expanded agricultural activities, and to preserve the forests and parks that have been planted, primarily, in the Emirate of Abu Dhabi (United Arab Emirates Ministry of Environment & Water 2015; United Arab Emirates Ministry of Energy 2017).

E. K. Paleologos (✉)
Abu Dhabi University, Abu Dhabi, UAE
e-mail: evan.paleologos@adu.ac.ae

A.-M. O. Mohamed
Zayed University, Abu Dhabi, UAE
e-mail: mohsen.onsy@zu.ac.ae

E. Canal-Forgues
Paris-Sorbonne University Abu Dhabi, Abu Dhabi, UAE
e-mail: eric.canalforgues@psuad.ac.ae

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Global and regional energy needs for the upcoming decades are staggering. BP's Energy Outlook projects a 60% increase in energy demand by 2035, in the Gulf region, higher than the average global energy consumption, projected to have a 48% increase by the US Energy Information Administration. In order to meet the country's energy needs the "UAE Energy Strategy 2050" envisions an energy mix where renewable energy will participate with 44%, gas with 38%, clean fossil with 12%, and nuclear energy with 6% of the installed capacity, respectively. At the same time, UAE is implementing long-term energy efficiency and savings measures (some of which have already reduced residential communities' energy demand by 19%), cutting edge technological innovations (such as those implemented in Masdar City and Dubai Sustainable City), and green initiatives (such as those by the Dubai Green Mobility Initiative to promote the use of hybrid and electric cars; by the Dubai Traffic and Roads Agency (RTA) to convert all street lighting into LED, and to automatically switch off residential internal roads' lighting during the night, etc.) (United Arab Emirates Ministry of Energy 2017).

Large-scale solar parks, such as the Mohammed bin Rashid Al Maktoum Solar Park that will reach an installed capacity of 5,000 MW eventually are projected to generate 75% of Dubai's total power output in a few decades. However, solar energy is not expected to contribute significantly to the national energy budget before the year 2030, and hence, could not meet the short-term electricity demand that had been increasing by approximately 9% since 2007 (United Arab Emirates Ministry of Energy 2017; Fichtner 2011). Thus, the immediate energy needs and the country's goal to reduce carbon dioxide emissions necessitated the move to nuclear power. This will be provided by four nuclear plants supplying 25% of the UAE's energy by 2020, each plant producing 1,400 MW of electricity. Completion of the first unit was achieved in 2017, and construction of the second unit was at 93% in June 2018. By that time unit, two had also undergone preoperational hot functional testing (HFT), and overall construction progress for all four units at the Barakah nuclear power plant (Fig. 1) had reached 89% (Emirates Nuclear Energy Corporation 2018).

This study focuses on the regulatory framework of the UAE and specifically on the country's nuclear industry institutional structure. Thus, the role of the different units in FANR, the UAE's nuclear regulatory authority, are analyzed and compared to those in the US NRC (Nuclear Regulatory Commission) and the French Authority of Nuclear Security ASN (Autorité De Sûreté Nucléaire) since these represent some of the most advanced and long-standing nuclear regulatory agencies in the world. Finally, given the short history and the recent development of the institutions of the country, issues of independence and accountability of regulatory agencies are expounded.

2 Methodology and Significance of the Study

This study relies on the qualitative analysis of the laws, regulations, and guidelines of the UAE and its regulatory agency, the Federal Authority for Nuclear Regulation (FANR). In addition, key documents from USA and France, countries with mature nuclear regulatory legislation and extensive experience in this field were utilized in order to compare with the developing UAE regulatory, organizational structure in order to identify potential deficiencies and to provide suggestions.

As the latest newcomer in the nuclear industry, UAE's actions and regulatory framework have the potential to become a blueprint for other countries in the region interested in developing peaceful uses of nuclear energy. Complete operational transparency, commitment to the highest standards of nonproliferation, safety, security, and sustainability (UAE Government 2008), and the direct and long-standing relations with the International Atomic Energy Agency's (IAEA) together with the Bilateral Agreement with USA (U.S. Department of State 1954) "For Peaceful Nuclear Cooperation Pursuant to Section 123 of the U.S. Atomic Energy Act of 1954, as Amended," which was entered on 17 December 2009 and into force until 2039 provided the warranties to the international community for the UAE's program.

Other countries in the MENA region that the USA has bilateral nuclear agreements are Egypt (entered on December 29, 1981, and into force until December 29, 2021) and Morocco (entered on May 16, 1981, and into force until 2021 with rolling 5-year extensions) (U.S. Department of State 2017). The USA signed MOUs "Concerning Cooperation in Peaceful Uses of Nuclear Energy" with Bahrain, Jordan, and Saudi Arabia on May 2008. As some of the MENA countries, given the region's future energy needs, start developing their peaceful nuclear programs, UAE has the potential to become the paradigm of a familiar, neighboring country to guide their actions.

3 Nuclear Energy Legislation in the UAE

The UAE's nuclear program was officially announced by the government's 2008 white paper (UAE Government 2008), where the options for the projected 40,000 MW energy needs of 2020 were evaluated. Natural gas was assessed to be capable of providing a maximum of 25,000 MW,

Fig. 1 Barakah nuclear power plant, UAE

whereas other options, such as crude oil, diesel, and coal were rejected for their economic and/or environmental cost, and solar and wind energy were estimated to be capable of covering only a 6–7% share of the energy needs by 2020. Nuclear energy was thus promoted as an environmentally and financially promising option that would provide diversification and security in the country's energy sources.

3.1 Role and Organizational Structure of FANR

UAE Federal Law by Decree No. 6 of 2009 Concerning the Peaceful Uses of Nuclear Energy (UAE Government 2009) established the Federal Authority for Nuclear Regulation (FANR) as UAE's regulatory body for nuclear energy. FANR was defined in Article 4 of this Law as "A public organization… [with] …independent balance sheet…an independent legal personality, full legal competence, and financial and administrative independence in all its matters." The mission of FANR is to protect the public and the environment, to ensure that the use of nuclear energy is done according to international standards, and to develop national capacity in the nuclear field (FANR Federal Auhority for Nuclear Regulation 2017).

The organizational chart of FANR has undergone several modifications since its inception (FANR Federal Auhority for Nuclear Regulation 2017) with the most recent one (October 2018) shown in Fig. 2 (FANR Federal Auhority for Nuclear Regulation 2017, 2018a).

The highest body, the Board of Management, is appointed by the UAE Cabinet for 3 years renewable, and it now consists of seven members. Reporting to the Board are the Audit and Risk and the Radiation Protection Committees, and the International Advisory Group (IAG) for Nuclear Safety Regulation. The IAG is composed exclusively of international experts, and its role is to advise the Board on technical and policy matters and to make sure that FANR conforms to the International Atomic Energy Agency's (IAEA) safety standards and practices.

The Board also appoints the Director General of FANR. Reporting to the Director General are four Divisions: Corporate Development, Legal Affairs, Administration, and Operation Division. The last two are each composed of five units. The first consists of Finance and Control, Information Communication Technology, Government Communications, Human Resources, and Supply Chain and General Services. The Operation Division includes Nuclear Safety, Nuclear Security, Radiation Safety, Safeguards, and Education and Training.

Other local organizations involved in the UAE's nuclear program are the Emirates Nuclear Energy Corporation (ENEC) and the Environment Agency-Abu Dhabi (EAD).

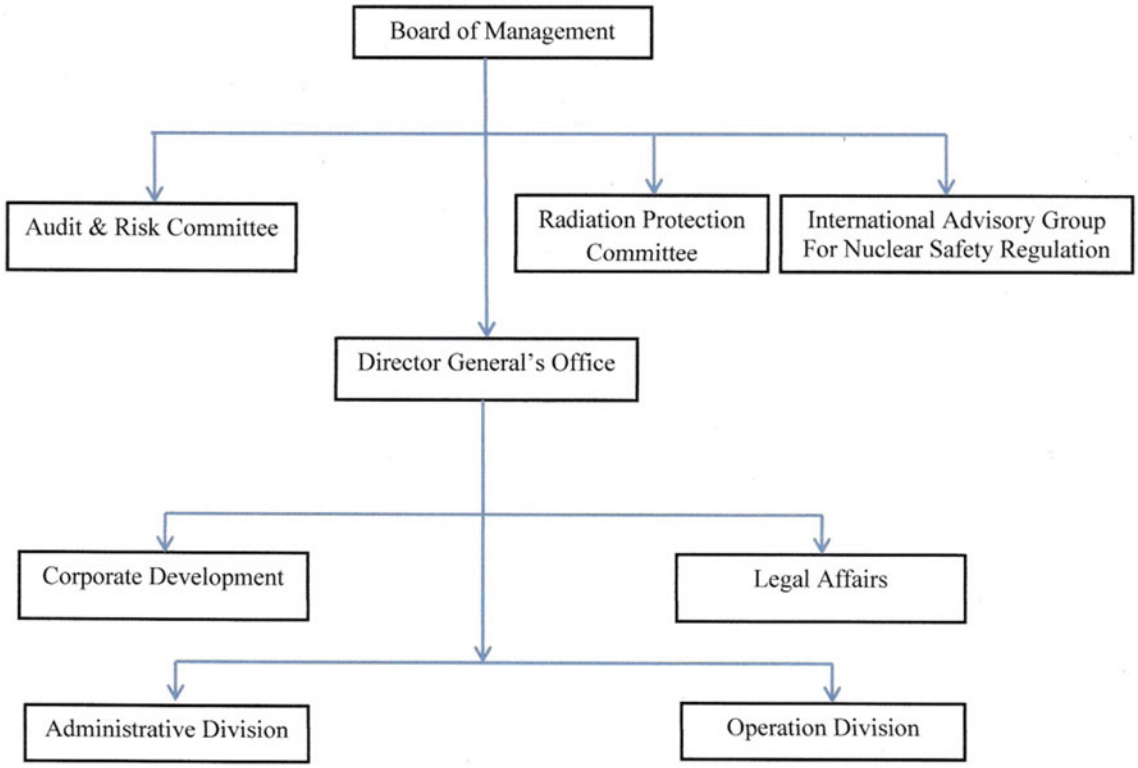

Fig. 2 FANR organizational chart (FANR Federal Auhority for Nuclear Regulation 2018a)

ENEC is a corporation of the Abu Dhabi government, which owns the nuclear energy plants in the UAE, but is also tasked to make investments in the sector, internationally. It oversees Korea Electric Power Corporation's (KEPCO) design and construction of the Barakah nuclear power plant and owns (holding an 82% majority) the subsidiary companies together with KEPCO, which will operate, maintain, and manage the funds of Barakah (Emirates Nuclear Energy Corporation (ENEC) 2017). The four reactors of Barakah will be jointly operated by UAE and South Korean personnel for the expected life of the reactors of about 60 years. ENEC was established through Abu Dhabi Law No. 21 of 2009 Regarding the Peaceful Uses of Nuclear Energy. Similarly to FANR, ENEC had set up its own International Advisory Board to guide it through design and construction of the nuclear power plant, which delivered its final report and disbanded in 2017 (ENEC International Advisory Board (IAB) 2017).

The Environment Agency-Abu Dhabi (EAD) is involved through the Federal Environmental Law's requirement of an Environmental Impact Assessment (EIA) report to be submitted prior construction and operation of energy projects and the issuance of an environmental permit by EAD for the Barakah nuclear power plant.

EAD participates in FANR's Board of Management with its Secretary-General and is involved in nuclear policy and oversight through its mandate to protect and conserve the environment, which includes monitoring and regulating air, soil, groundwater, and marine environment from potential pollution from activities of the nuclear industry, and later on from the storage, transport, and disposal of spent fuel (Environment Agency-Abu Dhabi (EAD) 2017).

3.2 UAE Nuclear Energy Legislation

The laws that apply to the nuclear industry in the UAE are:

1. Federal Law by Decree No. 6 of 2009 Concerning the Peaceful Uses of Nuclear Energy (establishing FANR).
2. Abu Dhabi Law No. 21 of 2009 Regarding the Peaceful Uses of Nuclear Energy (establishing ENEC).
3. Law No. 14 of 2007 Concerning the Establishment of the Critical National Infrastructure Authority.
4. Federal Law No. 1 of 2002 Regarding the Regulation and Control of the Use of Radiation Sources and Protection Against their Hazards.
5. Federal Law No. 24 of 1999 for the Protection and Development of the Environment (establishing EAD).

The following regulations have been issued by FANR as of October 2018:

- FANR-REG-01, Regulation for Management Systems for Nuclear Facilities
- FANR-REG-02, Regulation for the Siting of Nuclear Facilities
- FANR-REG-03, Regulation for the Design of Nuclear Power Plants
- FANR-REG-04, Regulation for the Radiation Dose Limits and Optimisation of Radiation Protection for Nuclear Facilities
- FANR-REG-05, Regulation for the Application of Probabilistic Risk Assessment (PRA) at Nuclear Facilities
- FANR-REG-06, Regulation for an Application for a License to Construct a Nuclear Facility
- FANR-REG-08, Regulation for Physical Protection for Nuclear Materials and Nuclear Facilities (not publicly available)
- FANR-REG-09, Regulation on the Export and Import Control of Nuclear Material, Nuclear Related Items and Nuclear Related Dual-Use Items
- FANR-REG-10, Regulation for the System of Accounting for and Control of Nuclear Material and Application of Additional Protocol
- FANR-REG-11, Regulation for Radiation Protection and Predisposal Radioactive Waste Management in Nuclear Facilities
- FANR-REG-12, Regulation for Emergency Preparedness for Nuclear Facilities
- FANR-REG-13, Regulation for the Safe Transport of Radioactive Materials
- FANR-REG-14, Regulation for an Application for a License to Operate a Nuclear Facility
- FANR-REG-15, Regulation for Requirements for Off-Site Emergency Plans for Nuclear Facilities
- FANR-REG-16, Regulation for Operational Safety Including Commissioning
- FANR-REG-17, Regulation for the Certification of Operating Personnel at Nuclear Facilities
- FANR-REG-19, Regulation for Existing Exposure Situations
- FANR-REG-21, Regulation for Decommissioning of Facilities
- FANR-REG-23, Regulation for the Security of Radioactive Sources (not publicly available)
- FANR-REG-24, Regulation for Basic Safety Standards for Facilities and Activities Involving Ionising Radiation Other Than in Nuclear Facilities
- FANR-REG-26, Regulation for Predisposal Management of Radioactive Waste

FANR has issued guidelines for the construction and operating license applications of nuclear facilities (FANR-RG-001); for the probabilistic risk assessment and probabilistic safety targets (FANR-RG-003 and FANR-RG-004); for the transportation and radiation safety (FANR-RG-006 and FANR-RG-007); for the obligations of the additional protocol to the UAE safeguards agreement (FANR-RG-015); for the predisposal of radioactive waste (FANR-RG-018); for the safety in industrial radiography (FANR-RG-019); and for modifications during construction (FANR-RG-023).

4 Nuclear Legislation in the USA and France and Comparison of the Regulatory Structure with that of the UAE

4.1 Nuclear Legislation in USA and Comparison of Regulatory Structure with that of the UAE

The United States Nuclear Regulatory Commission (NRC) (U.S. NRC 2018a) licenses and regulates civilian use of radioactive materials, specifically: (i) commercial nuclear power plants; (ii) research, test, and training reactors; (iii) nuclear fuel cycle facilities; (iv) radioactive material use for medical, academic, and industrial purposes; (v) transport, storage, and disposal of radioactive materials and waste, and (vi) the import and export of radioactive materials.

The US NRC aims to protect public health and safety, promote the United States' defense and security, and protect the environment.

The key US laws related to the nuclear industry and waste are classified according to NRC in U.S. NRC (2018b):

Fundamental Laws Governing Civilian Uses of Nuclear Materials and Facilities:

Atomic Energy Act of 1954, as Amended
Energy Reorganization Act of 1974
Reorganization Plans

Laws on Nuclear Waste:

Nuclear Waste Policy Act of 1982
Low-level Radioactive Waste Policy Amendments Act of 1985
Uranium Mill Tailings Radiation Control Act of 1978

Nonproliferation:

Nuclear Nonproliferation Act of 1978

Fundamentals Laws Governing the Processes of Regulatory Agencies:

Administrative Procedure Act (5 U.S.C. Chaps. 5 through 8)
National Environmental Policy Act

The nuclear regulatory legislation and other relevant NRC publications, abbreviated as NUREG, are too numerous to list here and can be found at the NRC site under the title: NUREG-Series Publications (U.S. NRC 2018c).

The organizational structure of NRC is as follows. The NRC is led by a five-member Commission, one of whom is the Chairman, NRC's top executive officer also having emergency powers, who is designated by the US President. All five Commissioners serve 5-year terms and are appointed by the US President and confirmed by the Senate. Below this level and assisting the Commission are three bodies.

The first body contains the Advisory Committee on Reactor Safeguards that advises the Commission on reactor safety issues and standards, including hazards from US Department of Energy's (DOE) facilities and activities; the Atomic Safety and Licensing Board Panel, which contains legal and technical judges of "persons of recognized caliber and stature in the nuclear field," tasked to conduct licensing and hearings; and the Office of Commission Appellate Adjudication that assists the Commission in its quasi-judicial functions, such as appeals, petitions for review of initial licensing, etc.

The second body consists of the Office of the General Counsel, which is the principal legal advisor of the Commission on mitigating risks of proposed actions and supervisor of NRC's representation in litigation cases; the Office of International Programs, which provides recommendations and coordination of NRC's international activities and maintains relationships with other countries and international nuclear organizations; and the Office of the Secretary that provides executive management services to the Commission.

The third body contains the Office of Congressional Affairs and the Office of Public Affairs that assist the Chairman directly, the former as the official point-of-contact with the US Congress and its relevant committees, and the latter in the Chairman's role as the official spokesperson for the NRC. It also includes the Office of the Chief Financial Officer, responsible for NRC's planning, budgeting, and financial management policy, and the Office of the Inspector General that conducts audits and financial investigations. Finally, the last Office is that of the Executive Director of Operations, which conducts the operational and administrative functions for NRC's day-to-day operations. This Office is supported by one Assistant for Operations, two Deputy Executive Directors, nine Directors, four Regional Administrators, and two Chief Officers, and their respective staff.

Significant differences exist between the NRC and FANR organizational structure. The five-member NRC Commission is composed of persons with a lifelong technical or regulatory experience in the nuclear industry. Instead, the FANR Board of Management has limited or no prior experience in nuclear energy matters. FANR's Board makes up for this deficiency by including in one of its three committees an International Advisory Group (IAG) of international nuclear experts to advise it on technical and policy matters.

The placement of the IAG in the organizational chart at the same level as the Audit and Risk and the Radiation Protection Committees does not seem appropriate (Fig. 2). Since IAG's role is advisory, and this body does not have the authority to oversee and report on activities, it should be placed in Fig. 2 above the level of the two Committees with IAG's connection directly and next to the Board. Although IAG advises the Board and its Chairman on technical and policy matters, it does not compensate for the lack of similar to the NRC Offices of Public Affairs and Congressional Affairs, which would assist the Chairman directly in his dealings with the UAE government, the public, and the international community.

The inclusion of international experts at high levels in FANR's organization and the complete lack of such a body in NRC, reflects the fact that US had led early on in the use of nuclear energy, whereas UAE, one of the youngest nations in the world, entered this arena without any prior scientific or regulatory experience in the field. In addition, the international composition of FANR's IAG and of the Director General was meant to demonstrate UAE's commitment to transparency and conformity to IAEA's standards and to serve as an incubator for the new generation of Emirati scientists and regulators to be trained under international standards. This follows the pattern of many UAE organizations and agencies (for example, EAD, Abu Dhabi Educational Council (ADEC), etc.) where international experts are found at high levels within the organization. Thus, the current Director General of FANR is a non-Emirati with training and a long career in international nuclear regulatory agencies.

The international collaboration and transparency component of the UAE's nuclear program is evidenced by the 2015 5-year agreement between FANR and NRC for exchange of technical information, cooperation in nuclear safety research, and training. Similar agreements have been signed by FANR with the Korea Atomic Energy Research Institute (KAERI), France, Canada, the UK, and recently in May 2018 with China's National Nuclear Safety Administration (NNSA) (World Nuclear Association 2018).

Another distinction between NRC and FANR is the extent of legal representation in NRC's organizational chart, in several committees that report directly to the Commission, and the single committee on legal affairs in FANR, which reports at a lower level, to the Director General, rather than

to the Board of Management. Again here, the structure of FANR, as shown in Fig. 2, needs amendment. The Legal Affairs committee in its placement under FANR's Director General Office and on the operational side appears to be dealing primarily with internal legal affairs that are anticipated to arise during day-to-day operations. The Legal Affairs committee needs to be expanded drastically to include international legal aspects and be brought up in the organizational chart of FANR, reporting directly to the Board.

The number of committees in NRC concerned with legal matters reflects the complexity of the US legal system, the private ownership in USA of nuclear plants that gives rise to licensing issues (reviews, hearings, petitions, appeals, etc.), and to litigation cases where NRC may be involved. Thus, whereas FANR's Legal Affairs office mentions only that its role is to ensure that "FANR's activities are consistent with applicable laws and regulations," NRC's Office of the General Counsel (one of the many NRC Offices dealing with legal or quasi-legal issues) has a very detailed description of its role: "Directs matters of law and legal policy, providing opinions, advice, and assistance to the agency with respect to all of its activities; reviews draft Commission opinions on public petitions seeking direct Commission action and rulemaking proceedings; monitors adjudicatory proceedings, and reviews draft Commission adjudicatory decisions; provides interpretation of laws, regulations, and other sources of authority, and the legal form and content of proposed official actions; represents and advises staff offices in all programmatic activities and administrative litigation in connection with licensing and enforcement; prepares or concurs in all contractual documents, interagency agreements, delegations of authority, regulations, orders, licenses, and other legal documents, and prepares legal interpretations thereof; represents NRC in administrative proceedings related to such matters as personnel, procurement, and equal employment opportunity; reviews and directs intellectual property work; represents and protects the interest of the NRC in legal matters, in court proceedings, and in relation to other government agencies, administrative bodies, committees of Congress, foreign governments, and members of the public; provides legal advice to the Commission (including staff), and represents the Commission in courts of appeals proceedings to review Commission orders and rules; and, in cooperation with the Department of Justice, represents the Commission in court proceedings affecting the agency's programs in the Federal district courts and the Supreme Court" (U.S. NRC 2018a).

Further differences include the role of units under the Director General, in the case of FANR, and under the Executive Director for Operations in NRC. The five units under the Administrative Division that report to the FANR Director General appear to be by and large generic, like those that can be found in any large organization. One of these units is entitled "Information Communication Technology" and its limited description at the FANR website does not give any indication of its role in the cybersecurity of the nuclear facilities. Protection from attacks on the computer systems of nuclear power plants has been an issue of intense discussion recently, with for example, the UN and 29 countries signed the "Cyber Security of Industrial Control and Plant Systems at Nuclear Facilities" during the 2016 Nuclear Security Summit (NSS), the IAEA publishing a reference manual "Computer Security at Nuclear Facilities" (IAEA 2011), etc. The topic of cybersecurity of nuclear facilities exceeds the scope of this paper and will be dealt with in future publications.

The Nuclear Safety, Nuclear Security, and Safeguards units under the FANR Operation Division find the partial correspondence to NRC's Office of Nuclear Materials Safety and Safeguards and the Office of Nuclear Safety and Incident Response. It is worth noting that none of these units appear, at least from the descriptions in FANR's website, to have responsibilities on emergency preparedness response, or duties of coordination with other relevant government departments, in case of a security threat or accident (FANR Federal Auhority for Nuclear Regulation 2018a). In contrast the mandate of the NRC's Office of Nuclear Safety and Incident Response clearly includes providing "…technical expertise regarding emergency preparedness issues and interpretations, conducts and directs the NRC program for response to incidents, and is the agency emergency preparedness and incident response interface with the DHS [Department of Homeland Security], Federal Emergency Management Agency (FEMA) and other Federal agencies" (U.S. NRC 2018a).

4.2 Nuclear Legislation in France and Comparison of Regulatory Structure with that of the UAE

France possesses all facilities to convert, enrich, fabricate, process, and recycle nuclear material. Five sites in France are involved in uranium extraction, fuel fabrication, reprocessing and recycling of spent fuel, and final disposal. The French Authority of Nuclear Security ASN (Autorité De Sûreté Nucléaire) (Autorité De Sûreté Nucléaire (ASN) 2018a) monitors and regulates the nuclear safety and radiation protection of employees, patients, and the public in general and the environment from the risks of nuclear activities in the county.

Delivering the UAE's spent fuel to France for storage or reprocessing is one of the options that are considered to deal with the nuclear waste that will be generated by the Barakah nuclear power plant, together with the possibility of a

permanent geologic repository investigated by Sweden's SKB (World Nuclear Association 2018). France was the first country to sign a bilateral nuclear cooperation agreement with the UAE in 2008. FANR has signed agreements with the French Institute for Radiological Protection (IRSN) and the French National Institute for Nuclear Science and Technology in 2013 and 2016, and recently, in September 2018, three MOUs with the IRSN, the Nuclear Safety, and the Alternative Energies & Atomic Energy Commission of France (FANR Federal Auhority for Nuclear Regulation 2018b).

The ASN and FANR organizational charts resemble each other in the central role given to the Director General's office to the operation of the organization. The ASN Director General's office supervises eight Departments and 11 Regional Divisions (Autorité De Sûreté Nucléaire (ASN) 2018b). The Departments monitor the many uses of radioactivity in France, which include: (i) electricity production, by 19 nuclear power plants that produce 78.4% of the country's electricity with a total of 58 reactors; (ii) industrial applications (for example, industrial irradiation of medical devices and food, radioactive tracers, leak and wear detection, etc.); (iii) research activities in a large number of research facilities in France where experimental reactors are used to investigate nuclear reactor and waste performance and to develop future systems; (iv) medical uses in about 50,000 medical diagnostic radiology facilities and 300 nuclear medicine departments; (v) transport of about 900,000 packages of radioactive material each year, and (vi) the cycle of processing, storing, and disposing of low- and high-level nuclear waste. The eight Departments of ASN are the Nuclear Power Plant Department (DCN); Nuclear Pressure Department (DEP); Waste, Research Facilities and Fuel Cycle Facilities Department (DRC); Transport and Sources Department (DTS); Ionizing Radiation and Health Department (DIS); Environment and Emergency Department (DEU); International Relation Department (DRI), and Information, Communication and Digital Uses Department (DIN).

4.3 Nuclear Regulatory Agency's Independence and Accountability

Regulatory governance that had concentrated in the past in the food, medical, banking, and securities sectors has recently expanded to address the privatization of other sectors of many countries' economies, such as the transportation, water, and energy sectors. The challenge to resist its regulated industry's influence is a critical test for any regulatory agency and becomes even more so when issues of public safety and health, as in the case of the nuclear industry, are involved. At the same time, since regulatory decisions are not solely technocratic, but they affect government policy and the public domain the line between an agency's independence and its role in serving broader public goals is excellent (OECD 2017; Maggetti et al. 2015).

The power exercised by regulatory agencies comes together with the responsibility for accountability of their decisions to all interested parties. This includes different levels of the government, the courts, citizens and special interest groups, and to the industry they regulate. This 360° perspective of the accountability of regulatory agencies was detailed in a special report of the UK House of Lords (Maggetti et al. 2015) and is depicted in Fig. 3. On the other hand, government interventions have been seen to limit the independence of regulatory agencies, and this more so in countries with a short history of institutional controls on executive power (The House of Lords UK 2003). Thus,

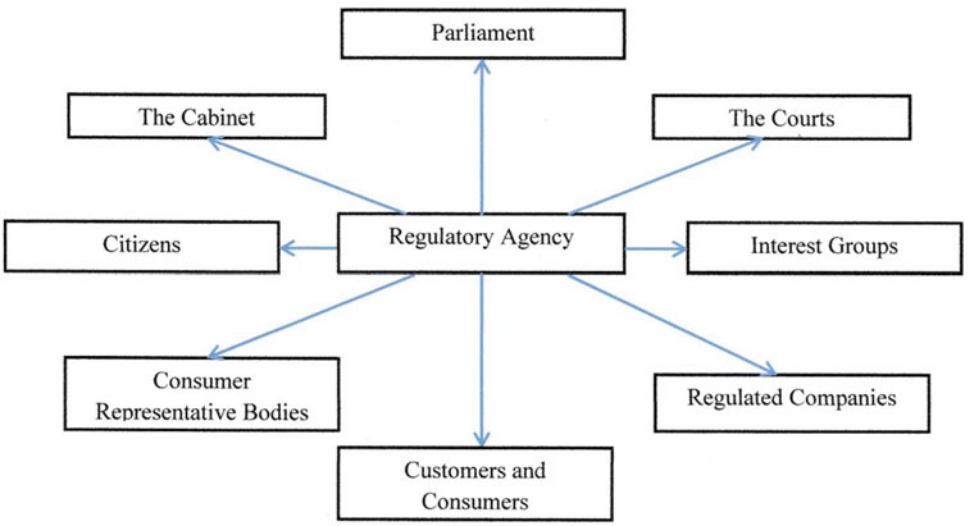

Fig. 3 Regulatory agency's 360° accountability

FANR's future challenges include striking a balance between all of these elements as it matures along with the UAE's use of nuclear energy.

5 Conclusions

This article presents a critical review of the regulatory and legislative steps of UAE, the newest country to develop nuclear plants for electricity production. Given the warranties needed to obtain international approval UAE's steps towards establishing such a program have the potential to become the paradigm for other countries. This is especially true for countries in the MENA region where population expansion, economic diversification, and scarce water resources, which require desalination to meet water demands, make it critical to increase the energy output.

UAE's transparency in dealing with all concerned international organizations, the signing of bilateral agreements with key countries, as well as of agreements between FANR, UAE's regulatory agency, and regulatory agencies of countries with existing nuclear capabilities have been some of the key factors in this process. The fact that UAE's nuclear power plant will be jointly operated by UAE and South Korea, and the existence of international boards at the highest level in FANR and ENEC have also been clear indications of UAE's peaceful intentions in developing its own nuclear program. Such actions have the potential to accelerate the transition of a country's energy grid to include nuclear power by tapping into international expertise, while at the same time providing the warranties needed of transparency, nonproliferation, safety, and security.

Along with the UAE's process of maturity in the use of nuclear energy, the role of its regulatory agency will continue to be refined. FANR's administrative work is presented here and its organizational structure is compared to that of the US NRC and the French ASN. The article presents suggestions related to the proper placement of the International Advisory Board and the Legal Affairs Office in FANR's organizational chart and also proposes the creation of a Public and Government Affairs Office directly linked and assisting the Board. The role of sub-divisions related to cybersecurity and emergency response are recommended to be clarified and expanded. Finally, FANR's future challenges include striking a balance between independence from the industry it seeks to regulate and accountability for its decisions.

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The Character Traits of Polyglots What Can Be Learned from and About Polyglots for Sustainable Foreign Language Learning and Education?

Alexander Arguelles

Abstract

Despite the fact that no scholarly research has been conducted until now on polyglots, or extreme language learners, or on polyglottery, namely the process of enthusiastic language learning that leads to becoming and being a polyglot, investigative journalists commonly report that polyglots display a pattern of specific character traits. A pioneering survey was designed that asked detailed questions about both general character traits and language learning habits. This was distributed to attendees of an International Polyglot Conference. Using cluster analysis based on two questions (number of languages known and number of languages studied), the 640 respondents were divided into three groups (low, middle, and high). These were then compared both which each other and with the random probability among the general population of displaying various character traits in order to test two counter hypotheses. Hypothesis A was that an extreme language learner has a more-than-random chance of being a gay, left-handed male on the autism spectrum, with an autoimmune disorder, such as asthma or allergies (i.e., their success is due to immutable traits). Hypothesis B was that the successful and sustainable language learning achievements of polyglots are due to mutable factors such as time spent studying, discipline, and systematic study habits. Although hypothesis A was proven wrong in many of its specific claims about immutable character traits, other immutable character traits were discovered that polyglots do display more commonly than these are prevalent among the general population. Hypothesis B was substantiated, suggesting that normal learners can learn successful and sustainable habits by emulating those of polyglots.

Keywords

Polyglots • Polyglottery character traits • Successful foreign language learning

1 Introduction

Almost no academic research has been done on polyglots or the phenomenon of polyglotism or polyglottery. This may in part be due to the fact that polyglots are relatively rare and locating a group of them to study would have been difficult in the past. However, over the past 15 years or so, the internet has allowed individual polyglots to connect through online forums and the posting of YouTube videos, to the degree that a veritable community has formed. Members of this community have been holding international gatherings and conferences over the past 5 or so years, and the number of attendees at these conferences has risen into the hundreds. Thus, there is now ample opportunity to engage in the study of polyglots and of polyglottery.

First, let us define our terms. A "polyglot," by definition someone who knows "many languages," is not synonymous with a multilingual person. People become multilingual through language acquisition, that is, through exposure to multiple languages in their childhood environment. Bilingualism is a common phenomenon, trilingualism is not rare, and there are societies where most people acquire up to four, five, or even six languages to some degree, however imperfect. In contrast, polyglots are people who know their "many languages" mostly through language learning, i.e., through the conscious study of foreign languages. Furthermore, while multilingualism has a limit of about half a dozen languages, some polyglots know dozens or even scores of languages to some degree. These last are sometimes referred to as "hyperpolyglots," or, more elegantly, as "extreme language learners."

A. Arguelles (✉)
American University in the Emirates, Dubai, UAE
e-mail: aarguell@cord.edu

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Now, how many languages count as "many languages?" There is no consensus upon this. Many polyglots are uncomfortable answering the question as to how many languages they know, saying they cannot answer this simply, but need to know what is meant by a "language," and what is meant by "know a language." Nonetheless, for purely statistical purpose at this stage of this study, a polyglot is defined as someone who knows at least 7 languages, or, alternatively, as someone who has studied at least 10 languages.

"Polyglottery" is defined as pursuing the path of the polyglot. In other words, it is a condition of being actively, indeed passionately, fascinated by, attracted to, and engaged in the study of foreign language such that one is likely to become a polyglot. While almost all members of the polyglot community are individuals who evince a passionate interest in and love of studying foreign languages, only about a quarter of them are polyglots proper by the above definition of self-reported knowledge of at least 7 languages and/or study of at least 10, though most of them aspire to become one. Fewer still are hyperpolyglots/extreme language learners, though again, this is the ideal aspiration for many.

While the phenomenon of hyperpolyglots has attracted some limited attention because of its spectacular nature, the emergence of the polyglot community has attracted none at all. As this research shows, the traits that set hyperpolyglots apart from the general public are in the main shared by the polyglot community at large, so even if one only wishes to understand hyperpolyglots, it seems wrong to ignore the community from which they come. That community cannot only furnish important information about them as it is far more numerous than they are, but it is certainly worthy of study in its own right.

2 Research Questions

Although there is no real data on polyglots, it is often stated that a partial profile has emerged along the following lines: "An extreme language learner has a more-than-random chance of being a gay, left-handed male on the autism spectrum, with an autoimmune disorder, such as asthma or allergies." (Thurman 2018).

Is this really the case? Without data to support it, how can such claims have become so widely accepted? Surely the author does not mean this literally, i.e., to say that a hyperpolyglot is likely to display all five traits? Surely she means to say that a hyperpolyglot has a greater than average chance of displaying any one of those five traits? One purpose of this research is to test the above hypothesis, Hypothesis A, in two regards.

Firstly, is it true in its five particular assertions (gay, left-handed, male, autistic, autoimmunity)?

Secondly, is it true in its general assumption that the most salient character traits of polyglots are fixed and immutable ones over which an individual has no control? If so, this would imply a worldview that is along the lines of predetermination or predestination if put into philosophical or theological terms.

Over and against this, a counter hypothesis, Hypothesis B, is offered and tested, one that is along the lines of free will and free choice in that it assumes that the character traits of extreme language learners are of a mutable nature, such that they can be developed.

Specifically, it is posited that extreme language learners simply put more time into their study, study in a more systematic fashion, are better students overall, and have different sets of goals and attitudes towards language learning than do less extreme language learners.

A third question drove this project but is being bracketed for the time being while answers to the first two are sought, namely: are there general character traits (e.g., musical, mathematical, or artistic ability or lack of ability, phobias, sleep habits, relations to companion animals, etc.) that might also correlate with polyglottery in unexpected ways?

3 Rationale and Justification

As already noted, the phenomenon of polyglottery is a virgin field in academic research so it is impossible to provide a literature review to justify this project with reference to existing knowledge about the topic as no relevant research has been done upon it. Considering this fact, it appears that polyglottery has for some reason been deliberately ignored or considered unworthy of notice until now. This is baffling, as it would seem that normal language students could achieve better results if they would emulate the study habits of polyglots, for although many people are multilingual because they grow up in an environment where more than one language is spoken, there are relatively few people who learn multiple foreign languages to degrees of permanent proficiency through conscious study, but polyglots do precisely this. Most average individuals consider foreign language study to be a difficult and burdensome task, but polyglots enjoy it to the degree that they excel at it—or perhaps they excel at it because they enjoy it. If normal language learners could improve their experience and performance by emulating the traits of polyglots, this would contribute to successful, i.e., sustainable, foreign language learning, as polyglots, by definition, are people who have sustained their own language learning habits such as to develop them to a highly efficient degree.

Applied linguists such as Rebecca Oxford have long studied the traits of "good language learners" to the end of identifying what makes them successful. A most recent article along these lines concludes that "for effective second language learning, it appears that the learner needs to (1) possess a positive attitude toward learning and practising; (2) deal positively with the demands of learning a second language; (3) understand the language as a system; (4) monitor his or her own language development; and (5) use the language communicatively whenever possible." (Sykes 2015). As polyglots excel in all of these regards, it would seem that applied linguists would wish to study them, but thus far this has not been the case.

Likewise, another long-established field of applied linguistics relates to learning styles suitable for those of different personality types, and recent research along these lines has begun to reach conclusions such as that "to a great extent, foreign language learning and teaching involves not only developing linguistic proficiency but also fostering in learners cultural awareness, which also includes shaping students' attitudes to other cultures." (Piatkowska 2012). Here, too, it would seem that applied linguists could find much material for investigation among devotees of polyglottery, but thus far this has not been the case.

A very active area of research regarding bilingualism is in the area of brain research, i.e., neuroscience, neuroanatomy, and neuroimaging. With findings such as "our results provide structural evidence to suggestions that L2 acquisition continuously occurs in an immersive environment, and is expressed as dynamic reshaping of the core of the brain," (Pliatsikas et al. 2017), it would seem there should be interest in studying the brains of polyglots, but thus far this has not been the case.

Very recent research done not just on bilingual but on multilingual brains of people who speak 3 or more languages concludes with results that "suggest that multilingual expertise might exercise a continuous impact on brain structure, and that as additional languages beyond a second are acquired, the additional demands for linguistic and cognitive control result in modifications to brain structures associated with language management processes." (Hervais-Adelman et al. 2018) Perhaps these researchers will soon be interested in studying the brains of those who speak 5, 7, 10 or more languages, but thus far this has not been the case.

As can be seen, the phenomenon of polyglottery, and indeed the very existence of polyglots, has been almost completely ignored by scholarly researchers. However, that of hyperpolyglots stimulates occasional curiosity among investigative journalists, such as the article that provides the quote for the first hypothesis being tested here (Thurman 2018) Indeed, there has been exactly one book in English written on case studies of hyperpolyglots, whom the author refers to as a "neural tribe" as main perspective on the phenomenon is that it is a matter of "neuroplasticity." (Erard 2012). Polyglottery has received more attention in Russia, at least from one research who has written two books on the linguistic and psychological strategies of both historical polyglots such as Humboldt, Vambery, and Schliemann. Hopefully these books are an indication that polyglots and polyglottery will now finally begin to receive the attention they merit as an existing linguistic phenomenon that has hitherto been neglected.

4 Methodology

To test the above two hypotheses, an extensive and detailed two-part survey was developed using QuestionPro. The first part of the survey asked both demographic questions and general questions about a wide range of traits and aptitudes such as musical, mathematical, and artistic abilities, inclinations with regard to social activities and companion animals, free time activities, and the like. The second part of the survey asked questions specifically related to language learning, study, knowledge, and use.

The survey was made public on the 29th of September 2018 in that all expected to attend the 6th annual Polyglot Conference (in Ljubljana, Slovenia, from 26 to 28 October 2018) were asked to take the survey. Likewise, it was publicized throughout the above-mentioned wider polyglot community via social media and YouTube.

To date, close to 700 people have completed the survey, taking an average of 36 min to do so. One quarter of the respondents come from the U.S. and another quarter from the larger European countries (Great Britain, France, Germany, etc.), but there was a global response to the announcement, with respondents from the rest of Europe, Australia, and New Zealand, most of South America, and many countries in Africa and Asia. Over half of the respondents were under 30 years old, but there were respondents from all age groups up to 80 years old.

As responses continue to come in, the survey is still running as of this writing, in the hopes that an even larger number of respondents will eventually allow for even more comprehensive results to be drawn from the data, especially for enough respondents from hyperpolyglots to allow a separate category for them. When it is complete, coded responses from the general section regarding habits and preferences will be run through SPSS to look for statistically significant correspondences with the number of languages known or studied.

So that this paper could be prepared for this conference, however, the existing data was downloaded for the first 640 respondents, who thus comprise the sample for this study, which is limited to seeking answers to the two hypotheses

above, i.e., to the general question as to whether extreme language learning is a product of immutable or mutable traits, of predestination or of free will.

To that end, a cluster analysis was done based on two of the major questions on the survey: Question 51: "Including your native language(s), how many languages would you say that you know in total (i.e., can use and understand to any degree)?" And Question 53: "How many foreign languages have you ever studied overall?"

The responses were then divided into three roughly equal groups that might be called low, medium, and high, or more properly beginning, intermediate, and advanced in terms of stages of progression in the condition of polyglottery, as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 229 respondents
Middle/Intermediate: 4–6 languages = 230 respondents
High/Advanced: 7 or more languages = 174 respondents
Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 218 respondents
Middle/Intermediate: 5–9 languages = 233 respondents
High/Advanced: 10 or more languages = 182 respondents

The high or advanced group contains both polyglots and hyperpolyglots or extreme language learners. To date, however, only 48 individuals have reported knowing 12 or more languages, and only 58 individuals have reported studying more than 20, so there are not enough samples upon which to base generalizations. As noted, the survey continues to run, and when and if more than 100 individuals report knowing this many languages, a further category will be made and considered.

These three groups were then analyzed with regard to those questions directly relevant to the two opposing hypotheses as well as to a few other traits where remarkable differences between the groups were immediately apparent. They were compared not only with each other but also, whenever possible, with statistics about the incidence of specific traits among the general public.

5 Findings

5.1 Relevant to Testing the Specific Propositions of Hypothesis A

All of the variables here are ones that can be compared with the percentages in the general population, and the findings are as follows:

Male Gender. The percentage of males among the general population in North America and Europe, whence most of the respondents come, is approximately 49%.

However, the percentage of males (439) among all 640 respondents to the survey was much higher at 69.35%. The percentage among the various groupings was as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 141/229 respondents or 63.29%
Middle/Intermediate: 4–6 languages = 164/230 respondents or 71.30%
High/Advanced: 7 or more languages = 131/174 respondents or 76.71%
Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 135/218 respondents or 62.50%
Middle/Intermediate: 5–9 languages = 166/233 respondents or 70.94%
High/Advanced: 10 or more languages = 135/182 respondents or 76.27%

Remark: Polyglottery does appear to be a predominantly male character trait, and this becomes more pronounced as polyglottery becomes more advanced.

Left-handedness. The percentage of left-handers in the general population is generally estimated to be about 10%, though some estimates are slightly higher, in the 12–15% range.

The percentage of left-handers (72) among all 640 respondents to the survey was 11.38% or well within this range. The percentage among the various groupings was as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 22/229 respondents or 9.69%
Middle/Intermediate: 4–6 languages = 33/230 respondents or 14.34%
High/Advanced: 7 or more languages = 16/174 respondents or 9.20%
Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 20/218 respondents or 9.21%
Middle/Intermediate: 5–9 languages = 32/233 respondents or 13.67%
High/Advanced: 10 or more languages = 19/182 respondents or 10.55%

Remark: There is no apparent connection between polyglottery and left-handedness, and if there is one, it is not with extreme language learning, but rather with intermediate level polyglottery.

Homosexuality. The percentage of homosexuals among the general population is extremely controversial, but it is emphatically rising among millennials, who comprise the majority of respondents to this survey. The most common estimate seems to be 1.7%.

However, the percentage of homosexuals (72) among the 640 respondents to this survey was 10× higher at 11.36%. The percentage among the various groupings was as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 15/229 respondents or 6.64%
Middle/Intermediate: 4–6 languages = 31/230 respondents or 13.54%
High/Advanced: 7 or more languages = 26/174 respondents or 15.03%
Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 14/218 respondents or 6.45%
Middle/Intermediate: 5–9 languages = 22/233 respondents or 9.48%
High/Advanced: 10 or more languages = 36/182 respondents or 20.11%

Remark: There does indeed appear to be a strong correlation between homosexuality and polyglottery, and this grows dramatically more pronounced as polyglottery advances.

Asperger's Syndrome. Although the percentage of people with Asperger's Syndrome, as with all Autism Spectrum Disorders, is on the rapid rise in Western Society, whence the majority of respondents come, it is still only 0.5% among the general population.

However, the percentage of those with Asperger's (39) among all 640 survey respondents was 12× higher at 6.09%. The percentage among the various groupings was as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 14/229 respondents or 6.11%
Middle/Intermediate: 4–6 languages = 9/230 respondents or 3.91%
High/Advanced: 7 or more languages = 16/174 respondents or 9.19%
Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 9/218 respondents or 4.12%
Middle/Intermediate: 5–9 languages = 14/233 respondents or 6.00%
High/Advanced: 10 or more languages = 16/182 respondents or 8.79%

Remark: Asperger's Syndrome does correspond strongly with polyglottery in general and with extreme language learning in particular.

High-Functioning Autism. Although the percentage of people with High-Functioning Autism, as with all Autism Spectrum Disorders, is on the rapid rise in Western Society, whence the majority of respondents come, it is still only 0.25% among the general population.

However, the percentage of those with High-Functioning Autism (16) among all 640 survey respondents was 10× higher at 2.50%. The percentage among the various groupings was as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 9/229 respondents or 3.93%
Middle/Intermediate: 4–6 languages = 4/230 respondents or 1.73%
High/Advanced: 7 or more languages = 3/174 respondents or 1.72%
Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 9/218 respondents or 4.12%
Middle/Intermediate: 5–9 languages = 4/233 respondents or 1.71%
High/Advanced: 10 or more languages = 3/182 respondents or 1.64%

Remark: High-Functioning Autism does appear to correspond with polyglottery, though it does so twice as much at the beginning stage than at the intermediate or advanced stages.

Allergies. The percentage of percentage of people with allergies in Western Society, whence the majority of respondents come, is on the rapid rise and currently stands at approximately 35%.

However, the percentage of people with allergies (184) among all 640 respondents was lower than this at 28.75%. The percentage among the various groups was as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 60/229 respondents or 26.20%
Middle/Intermediate: 4–6 languages = 76/230 respondents or 33.04%
High/Advanced: 7 or more languages = 48/174 respondents or 27.58%
Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 51/218 respondents or 23.39%
Middle/Intermediate: 5–9 languages = 85/233 respondents or 36.48%
High/Advanced: 10 or more languages = 48/182 respondents or 26.37%

Remark: Allergies do not appear to correlate with polyglottery. In fact, those at both the beginning and the advanced levels of polyglottery have a less-than-random chance of having allergies.

Asthma. The percentage of people with asthma in Western Society, whence the majority of respondents come, is on the rapid rise and currently stands at approximately 8.3%.

However, the percentage of people with allergies (67) among all 640 respondents was slightly higher than this at 10.47%. The percentage among the various groups was as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 28/229 respondents or 12.22%
Middle/Intermediate: 4–6 languages = 22/230 respondents or 9.56%
High/Advanced: 7 or more languages = 16/174 respondents or 9.19%
Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 20/218 respondents or 9.17%
Middle/Intermediate: 5–9 languages = 28/233 respondents or 12.01%
High/Advanced: 10 or more languages = 18/182 respondents or 9.89%

Remark: Asthma does not appear to correlate significantly with polyglottery. To the degree that it does, it is more at the beginning and intermediate levels than at the advanced one.

5.2 General Conclusions Regarding the Specifics of Hypothesis A

The hypothesis, "An extreme language learner has a more-than-random chance of being a gay, left-handed male on the autism spectrum, with an autoimmune disorder, such as asthma or allergies," is only partially correct. As the trends found are not just among extreme language learners but among those at all levels of polyglottery, one should first of all replace "extreme language learner" with "enthusiastic language learner."

The hypothesis would be better rephrased as "An enthusiastic language learner has a more-than-random chance of being a gay male with Asperger's Syndrome, and these traits are more pronounced as his polyglottery advances."

However, this still presupposed that all three traits (gay, male, Asperger's) will be found in the same individual, and a simple filtering of the data for all 640 respondents yielded only 1 such respondent.

Therefore, the hypothesis would be best rephrased as: "The more his polyglottery advances, the more an enthusiastic language learner has a more-than-random chance of displaying each of the following three traits: male gender, homosexuality, Asperger's Syndrome."

5.3 Relevant to Testing the Worldview of Hypothesis A

Hypothesis A is examined here, not in terms of its specifics, but in terms of the idea that the character traits of polyglots are likely to be fixed and immutable, that is, those that come with predetermination or predestination. This is because, although about half of the specifics seem to have no correlation to polyglottery after all, other immutable traits that do correlate were discovered.

The first batch of these traits relates to laterality. The proposition that polyglots are likely to be left-handed is not so much incorrect as imprecise. Although polyglots are no more likely to be left-handed than the general public, they are much more likely to display abnormal laterality, as follows:

Ambidexterity. The percentage of ambidextrous people among the general population is estimated at only 1%.

However, the percentage of ambidextrous (30) among the 640 respondents to the survey was much higher at 4.74%. The percentage among the various groupings was as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 8/229 respondents or 3.52%
Middle/Intermediate: 4–6 languages = 10/230 respondents or 4.34%
High/Advanced: 7 or more languages = 11/174 respondents or 6.32%

Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 6/218 respondents or 2.76%
Middle/Intermediate: 5–9 languages = 12/233 respondents or 5.13%
High/Advanced: 10 or more languages = 11/182 respondents or 6.11%

Remark: Ambidexterity seems to correspond strongly with polyglottery, the more so the more advanced it becomes.

No Eye Dominance. Among the general population, only 1% shows no eye dominance.

However, among respondents to this survey, the number reporting no eye dominance (166) was dramatically higher at 26.48%. The percentage among the various groupings was as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 62/229 respondents or 27.56%
Middle/Intermediate: 4–6 languages = 62/230 respondents or 27.43%
High/Advanced: 7 or more languages = 39/174 respondents or 22.81%
Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 52/218 respondents or 24.41%
Middle/Intermediate: 5–9 languages = 68/233 respondents or 29.31%
High/Advanced: 10 or more languages = 43/182 respondents or 24.29%

Remark: Having no eye dominance seems to correspond with polyglottery to a such a remarkable degree that this is either an anomaly in the reporting, a misunderstanding of the measurement on the part of the participants, or an extremely significant finding. Combined with the following, it seems to indicate the latter.

No Foot Dominance. Among the general population, only 1% shows no foot dominance.

However, among respondents to this survey, the number reporting no foot dominance (80) was considerably higher at 12.62%. The percentage among the various groupings was as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 28/229 respondents or 12.33%
Middle/Intermediate: 4–6 languages = 25/230 respondents or 10.96%
High/Advanced: 7 or more languages = 26/174 respondents or 15.03%
Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 21/218 respondents or 9.72%
Middle/Intermediate: 5–9 languages = 29/233 respondents or 12.45%
High/Advanced: 10 or more languages = 29/182 respondents or 16.20%

Remark: Having no foot dominance seems to correspond with polyglottery to a such a remarkable degree that this is either an anomaly in the reporting, a misunderstanding of the measurement on the part of the participants, or an extremely significant finding. Combined with the preceding, it seems to indicate the latter.

Other Gender. The percentage of those identifying as "other" (transsexual, etc.) among the general public is only 0.3%.

However, there percentage of those with "other" (9) among the 640 respondents to the survey was higher at 1.42%. The percentage among the various groups was as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 4/229 respondents or 1.77%
Middle/Intermediate: 4–6 languages = 3/230 respondents or 1.30%
High/Advanced: 7 or more languages = 2/174 respondents or 1.17
Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 4/218 respondents or 1.85%
Middle/Intermediate: 5–9 languages = 2/233 respondents or 0.85%
High/Advanced: 10 or more languages = 3/182 respondents or 1.69%

Remark: Being other gendered seems to correlate slightly with all levels of polyglottery, though the numbers reporting are so few as to be unstable.

Bisexuality. The next set of variables relates to sexual orientation as it seems that the proposition that homosexuality correlates with polyglottery is incomplete. It is not just homosexuality, but other sexual orientations. The percentage of bisexuals among the general population is extremely controversial, but it is emphatically rising among millennials, who comprise the majority of respondents to this survey. The most common estimate seems to be 1.8%.

However, the percentage of bisexuals (67) among the 640 respondents to this survey was 10× higher at 10.57%. The percentage among the various groupings was as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 27/229 respondents or 11.95%
Middle/Intermediate: 4–6 languages = 17/230 respondents or 7.42%
High/Advanced: 7 or more languages = 23/174 respondents or 13.29%
Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 23/218 respondents or 10.60%
Middle/Intermediate: 5–9 languages = 24/233 respondents or 10.34%
High/Advanced: 10 or more languages = 20/182 respondents or 11.17%

Conclusion: There is a strong correlation between bisexuality and polyglottery, which is approximately the same at all levels of language enthusiasm.

Other sexuality (asexuality, pansexuality, etc.). The percentage of other sexual orientations among the general population is extremely controversial, but it is rising dramatically among millennials, who comprise the majority of respondents to this survey. The most common estimate seems to be only 0.1%.

However, the percentage of other sexual orientations (32) among the 640 respondents to this survey was 50× higher at 5.05%. The percentage among the various groupings was as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 16/229 respondents or 7.08%
Middle/Intermediate: 4–6 languages = 10/230 respondents or 4.37%
High/Advanced: 7 or more languages = 6/174 respondents or 3.47%
Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 13/218 respondents or 5.99%
Middle/Intermediate: 5–9 languages = 12/233 respondents or 5.17%
High/Advanced: 10 or more languages = 7/182 respondents or 3.91%

Conclusion: There is indeed a strong correlation between other sexual orientations and polyglottery, but it grows less pronounced as language enthusiasm progresses.

Birth Order: Oldest Child. A variable that was not mentioned at all in the original hypothesis of immutable character traits, but which immediately springs forth upon glancing at the raw data, is birth order. There are no general statistics for this, but given that, in Western Society whence most of the respondents come, one-child families are on the rise, while multi-child families are on the decline, and two-child families are the norm, the probability of being either an oldest or youngest child, which must be the same, cannot logically exceed 20%.

However, among the 640 respondents to this survey, one birth order, namely oldest child (265), stands out as dramatically higher at 41.73%. The percentage among the various groupings was as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 84/229 respondents or 37.00%
Middle/Intermediate: 4–6 languages = 100/230 respondents or 43.67%
High/Advanced: 7 or more languages = 79/174 respondents or 45.66%
Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 73/218 respondents or 33.80%
Middle/Intermediate: 5–9 languages = 108/233 respondents or 46.35%
High/Advanced: 10 or more languages = 82/182 respondents or 45.56%

Conclusion: Being an oldest child correlates very strongly with polyglottery at all stages, though less at the beginning than in the intermediate and advanced stages.

Monolingual Background. A variable that was not mentioned at all in the original hypothesis of immutable character traits, but which immediately springs forth upon glancing at the raw data, is lack of multilingual background. It is generally estimated that most of humanity (43–56%) is bilingual or multilingual.

However, among the 640 respondents to this survey, most 481 or 75.51% were from monolingual backgrounds. The percentage among the various groupings was as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 188/229 respondents or 88.82%
Middle/Intermediate: 4–6 languages = 173/230 respondents or 75.22%
High/Advanced: 7 or more languages = 118/174 respondents or 67.82%

Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 168/218 respondents or 77.42%
Middle/Intermediate: 5–9 languages = 179/233 respondents or 76.50%
High/Advanced: 10 or more languages = 132/182 respondents or 72.33%

Remark: Compared to the general population, those affected by polyglottery are considerably less likely to come from a bilingual or a multilingual background, though those at the advanced stages are more likely to do so than those at the earlier ones. While it might seem that a multilingual background would provide a head start for polyglots to learn more languages, this is not the case. Instead, it appears that one needs to come from a monolingual background in order to become obsessively fascinated with learning languages. Perhaps when one gets several languages for free by growing up multilingual, foreign languages are just not as appealing.

Polyglot Genes/Patterning. Another variable that was not mentioned at all in the original hypothesis of immutable character traits, but which immediately springs forth upon glancing at the raw data, is having polyglot family members.

Among the 640 respondents to this survey, 215 or 33.59% reported having at least one ancestor, grandparent, parent, aunt or uncle, cousin, or child who also demonstrated traits of polyglottery. The percentage among the various groupings was as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 57/229 respondents or 24.89%
Middle/Intermediate: 4–6 languages = 79/230 respondents or 34.34%
High/Advanced: 7 or more languages = 78/174 respondents or 44.82%
Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 81/218 respondents or 37.15%
Middle/Intermediate: 5–9 languages = 77/233 respondents or 33.04%
High/Advanced: 10 or more languages = 67/182 respondents or 36.81%

Remark: Having a polyglot family member seems to correlate with number of languages known, but not number of languages studied.

Sense of Direction. A final immutable variable that surfaced glaringly in this study was having an excellent sense of direction.

Among the 640 respondents, 93 or 14.65% reported this, with the percentage among the various groupings as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 27/229 respondents or 11.95%
Middle/Intermediate: 4–6 languages = 30/230 respondents or 13.10%
High/Advanced: 7 or more languages = 35/174 respondents or 20.11%
Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 24/218 respondents or 11.00%
Middle/Intermediate: 5–9 languages = 28/233 respondents or 12.01%
High/Advanced: 10 or more languages = 40/182 respondents or 21.97%

Remark: Having an excellent sense of direction correlates strongly with extreme language learning.

5.4 General Conclusions Regarding the Worldview of Hypothesis A

Although incorrect in a number of its original specific details, other specific factors emerge when it is examined, such that the proposition that many of the character traits of polyglots are of a fixed and immutable nature cannot be denied.

5.5 Relevant to Testing the Specific Propositions of Hypothesis B

The counter hypothesis, Hypothesis B, posited that the salient character traits of polyglots would reflect free will and free choice as they are of mutable, trainable, learnable nature, such as amount of time spent studying, degree of systematic study, attitude toward language learning, etc.

Only several variables here are of the type that has statistical averages among the general population, while most can only be compared between the various levels of polyglottery. Many more traits may surface once the SPSS analysis is run, but those that leap dramatically forward upon an overview of the three groupings by number of languages known or studied are as follows:

Obsessive Compulsive Disorder. OCD can range from a truly debilitating condition to one that can be controlled to simple inclinations that can be productively channeled. Among the general population, 2.3% of people are said to display traits of OCD at some point in their lives.

However, among the 640 respondents to the survey, twice as many people (29 or 4.53%) reported this tendency. The percentage among the various groupings was as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 10/229 respondents or 4.36%
Middle/Intermediate: 4–6 languages = 11/230 respondents or 4.78%
High/Advanced: 7 or more languages = 8/174 respondents or 4.59%
Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 7/218 respondents or 3.21%
Middle/Intermediate: 5–9 languages = 10/233 respondents or 4.29%
High/Advanced: 10 or more languages = 12/182 respondents or 6.59%

Remark: Those interested in polyglottery show twice the rate of OCD as the general public, and extreme language learners show thrice the rate.

Length of Formal Education (Doctoral Degree). The percentage of holders of doctoral degrees differs from country to country, in the range of 2.0–3.8% in the countries from which most of the respondents come.

Among the 640 respondents to this survey, 63 or 9.84% reported earning doctoral degrees. The percentage among the various groupings was as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 11/229 respondents or 4.80%
Middle/Intermediate: 4–6 languages = 30/230 respondents or 13.04%
High/Advanced: 7 or more languages = 22/174 respondents or 12.64%
Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 18/218 respondents or 8.25%
Middle/Intermediate: 5–9 languages = 20/233 respondents or 8.58%
High/Advanced: 10 or more languages = 21/182 respondents or 11.53%

Remark: Length of formal schooling appears to correlate with polyglottery.

Study Habits. Among the 640 respondents to this survey, 215 or 33.59% reported having been outstanding or excellent students while in school. The percentage among the various groupings was as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 66/229 respondents or 28.82%
Middle/Intermediate: 4–6 languages = 68/230 respondents or 29.56%
High/Advanced: 7 or more languages = 82/174 respondents or 47.12%
Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 68/218 respondents or 31.19%
Middle/Intermediate: 5–9 languages = 74/233 respondents or 31.75%
High/Advanced: 10 or more languages = 74/182 respondents or 40.65%

Remark: Those who excel at polyglottery appear more likely to have excelled in their studies.

Language Study Experience. Among the 640 respondents to this survey, 189 or 29.53% reported having had to overcome negative experiences with language study in school in order to find their passion for polyglottery. The percentage among the various groupings was as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 79/229 respondents or 34.49%
Middle/Intermediate: 4–6 languages = 72/230 respondents or 31.30%
High/Advanced: 7 or more languages = 38/174 respondents or 21.83%
Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 73/218 respondents or 33.48%
Middle/Intermediate: 5–9 languages = 74/233 respondents or 31.75%
High/Advanced: 10 or more languages = 42/182 respondents or 23.07%

Remark: Those in advanced stages of polyglottery appear less likely than those in the beginning or intermediate ones to have ever had negative experiences studying foreign languages.

Language Learning Aspirations. Among the 640 respondents to this survey, 311 or 48.59% said they would like to learn as many languages as they possibly could. The percentage among the various groupings was as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 95/229 respondents or 41.48%
Middle/Intermediate: 4–6 languages = 108/230 respondents or 46.95%
High/Advanced: 7 or more languages = 109/174 respondents or 62.64%
Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 78/218 respondents or 33.48%
Middle/Intermediate: 5–9 languages = 111/233 respondents or 47.63%
High/Advanced: 10 or more languages = 123/182 respondents or 67.58%

Remark: More extreme language learners appear to have a stronger desire to learn many languages.

Stable Language Persona. Among the 640 respondents to this survey, 150 or 23.43% reported that their personality did not change with their foreign languages. The percentage among the various groupings was as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 49/229 respondents or 21.39%
Middle/Intermediate: 4–6 languages = 47/230 respondents or 20.43%
High/Advanced: 7 or more languages = 54/174 respondents or 31.03%
Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 45/218 respondents or 20.64%
Middle/Intermediate: 5–9 languages = 55/233 respondents or 23.60%
High/Advanced: 10 or more languages = 50/182 respondents or 27.47%

Remark: Extreme language learners seem more likely to maintain the same persona in their various languages than those at other levels of polyglottery.

Study Time. Among the 640 respondents to this survey, 183 or 28.59% reported studying languages for more than 2 h a day. The percentage among the various groupings was as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 53/229 respondents or 23.14%
Middle/Intermediate: 4–6 languages = 59/230 respondents or 25.65%
High/Advanced: 7 or more languages = 72/174 respondents or 41.37%
Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 53/218 respondents or 24.31%
Middle/Intermediate: 5–9 languages = 48/233 respondents or 20.60%
High/Advanced: 10 or more languages = 83/182 respondents or 45.60%

Remark: Extreme language learners devote more time to learning languages than less extreme learners.

Systematic Study Schedule. Among the 640 respondents to this survey, 111 or 17.34% reported studying languages according to a systematic language study schedule that they set and kept. The percentage among the various groupings was as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 37/229 respondents or 16.15%
Middle/Intermediate: 4–6 languages = 32/230 respondents or 13.91%
High/Advanced: 7 or more languages = 43/174 respondents or 24.71%
Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 36/218 respondents or 16.51%
Middle/Intermediate: 5–9 languages = 31/233 respondents or 13.30%
High/Advanced: 10 or more languages = 45/182 respondents or 24.72%

Remark: There appears to be a strong correlation between systematic study habits and advanced polyglottery.

Systematic Maintenance Cycle. Among the 640 respondents to this survey, 39 or 6.09% reported maintaining their languages according to a systematic cycle of study and use. The percentage among the various groupings was as follows:

Question 51 (Variable = Number of languages known)
Low/Beginning: 3 languages or less = 8/229 respondents or 3.49%
Middle/Intermediate: 4–6 languages = 12/230 respondents or 5.21%
High/Advanced: 7 or more languages = 19/174 respondents or 10.91%
Question 53 (Variable = Number of languages studied)
Low/Beginning: 4 languages or less = 10/218 respondents or 4.58%

Middle/Intermediate: 5–9 languages = 9/233 respondents or 3.86%
High/Advanced: 10 or more languages = 20/182 respondents or 10.98%

Remark: Systematic language maintenance habits are more common among extreme language learners than among less extreme learners.

5.6 General Conclusions About Hypothesis B

Hypothesis B, the Free Will/Free Choice Hypothesis, is also borne out. Polyglots/extreme language learners do display many attributes related to language study that are matters of their personal effort and decisions, and they display these attributes to greater degrees than do those at the beginning and intermediate stages of polyglottery.

6 Conclusions

Most of the character traits revealed in this study can be found among those at all levels of polyglottery, not just among extreme language learners. Some traits are more or less pronounced at different levels of polyglottery, while others are evenly distributed among them. In any case, there are far more traits that set practitioners of polyglottery off from the general public than there are traits that set polyglots off from those who have not yet learned that many languages.

In testing for combinations of traits, the formulation should **not** be that an enthusiastic or extreme language learner has a higher than average probability of displaying **all** of the given traits, but rather higher than random odds of having any given one of them. The traits are as follows:

Compared to the average probability among the general public, a polyglot is:

1.5 times more likely to be male
3–4 times more likely to be "other" gendered
6 times more likely to be bisexual
7–10 times more likely to be homosexual
35–40 times more likely to be "other" sexual orientation
18 times more likely to have Asperger's Syndrome
7 times more likely to have high-functioning autism
6 times more likely to be ambidextrous
23 times more likely to have no eye dominance
15 times more likely to have no foot dominance
2.5 times more likely to be an oldest child
1.4 times more likely to have a monolingual background
2–3 times more likely to have "OCD"
3–4 times more likely to hold a doctorate

Compared to those at earlier stages of polyglottery, polyglots are:

1.8 times less likely to have had a negative language learning experience
2 times more likely to have a polyglot family member
2 times more likely to have an excellent sense of direction
1.6 times more likely to have an excellent academic record
1.5 times more likely not to experience personality shift with languages
2 times more likely to aspire to learn as many languages as they can
2 times more likely to study for more than 2 h a day
1.5 times more likely to have a systematic study schedule
2–3 times more likely to have a systematic maintenance cycle

7 Implications for Further Study

The preliminary results of this survey have opened up a virgin field in linguistics for further study. For the first time ever there is hard data on polyglots and polyglottery, but while the existence of many correlations between polyglottery and other character traits has been established, the cause and effect for all of these remains yet to be explored.

Nonetheless, the results of this study can also have immediate implications for more successful and sustainable foreign language learning by normal learners. It has been shown that in addition to higher than average probabilities of displaying some inherent character traits, the successful and sustainable achievements of polyglots in the field of language learning are also due to their own hard work and systematic study. This means that their attainments are not the result of some mysterious ability, but of their application to their studies—application that normal learners can easily and profitably emulate.

As mentioned in the introduction, this paper presents the findings of only a fraction of the data gathered from the present survey. Further papers will present the findings of the existence or absence of correlations between enthusiastic and extreme language learning and a host of character traits relating to artistic, mathematical, musical, and other abilities, diet and exercise habits, social and personal interaction, etc.

Furthermore, another survey is being planned. This second survey will be targeted specifically at extreme language learners and will ask more detailed questions about their language knowledge and use. While the responses to this current survey were anonymous, the new survey will require an invitation with an e-mail address so that follow up questions can be asked in interviews of those who provide particularly unusual or interesting responses.

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Sustainable Modes of Mobility in New Urban Neighborhoods in UAE: Assessing Walkability and Bikability

Khaled Galal Ahmed

Abstract

Sustainable modes of mobility within local communities are not only enhancing the physical and mental health of the residents, but they have significant social benefits. As residents are encouraged to abandon using their cars to access locally provided amenities, they develop more cohesive social relationships within their local communities. UAE has recently adopted a sustainable development agenda that endorses eco-community development where the conventional car-dependent sprawl urban forms are being transformed into more compact ones. This new trend has been reflected in recent new designs of urban communities in which it is claimed that sustainable urbanism principles, including sustainable modes of mobility, have been considered. However, there is a lack of reliable evidence that can assess the prospective performance of these new urban forms in terms of walkability and bikability. This study compares 'walkability' and 'bikability' scores, that range from 0 to 100, in both a conventionally developed urban sprawl neighborhood, and a recently designed more compact urban neighborhood. For investigating the two modes of mobility, the UMI urban modeling simulation tool has been utilized in this study to test walkability and bikability proximity to the points of interest for the provided local amenities in each of the two case studies. Walkability and bikability scores were obtained through constructing a pedestrian/cyclist travel network and performing a series of shortest path calculations using Dijkstra's algorithm. It has been surprisingly found out that the new neighborhood achieved lower walkability and bikability scores despite being more compact where walkability scored 61 versus 66 for the conventional sprawl case study. The same result has been found out for bikability, where the score was 85 for the former and 96 for the later. These unexpected results indicate that the new 'compact' design has not reached to a sufficient and appropriate degree of compactness that takes into consideration not only the Floor Area Ratio, but also other important walkability/bikability factors including catchment distances, variety and sufficiency of provided amenities, global and destination weights of amenities, street intersection densities and average block length.

Keywords

Walkability • Bikability • Mobility • Neighborhoods • Sustainability • UMI • UAE

1 Introduction

Accessibility, proximity, and mixed-use have been argued as the significant factors that affect any city's urban form and the interrelationship of people, transport and amenities is thus the basis for such a form. Catchment areas for services and facilities significantly define the hierarchical urban from of the city, starting from neighborhood to district to town to city. On the urban neighborhood scale, as the smallest 'building block' or 'unit' of which the city is made up, a mixed population with sufficient density is essential to support local services and facilities which cater for the daily needs of the residents.

As one of its definitions, the neighborhood is described as a territorial locality in which a group of independent people shares accesses to specific amenities located in walking distance from their home, whether they use these amenities or those provided elsewhere. Neighborhood services and amenities would best be located at the center of the neighborhood and around the transport node, to best contribute to the creation of a mixed-use center. Neighborhood service centers would usually encompass a public transport stop, a market place, housing over shops and service outlets, a community park with a community hall, a number of shops

K. Galal Ahmed (✉)
United Arab Emirates University, Al Ain, UAE
e-mail: kgahmed@uaeu.ac.ae

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for daily needs and a small supermarket, a post office counter, a public house, a newsagent, a local bank, a library, local (medical and dental) surgeries, commercial units and other workplaces. The neighborhood should also accommodate several kindergartens, a primary school and youth facilities play and sports areas for children and youngsters, and allotments (Frey 1999).

On the other hand, it is commonly agreed that the distance between any house front door and the local amenities or a transport stop should be within a maximum 10 min walk. The distance between the edge of a neighborhood and its central service area (and a transport node) should be about 600–800 m. Catchment areas for schools and other facilities are not limited to the neighborhood in which they are located but overlap with other neighborhoods. Furthermore, there should be a variety of house types, from flats in high-density low-rise housing to terraces and other forms of family homes. Mixed dwellings and tenure types will encourage a mixture of social and income levels in the neighborhood, which in turn, help secure the viability of community services and local amenities (Barton 2000).

The utilization of high density, mixed land use and short proximity between amenities are effective strategies that decrease automobile dependency and contribute to the utilization of human-powered transportation (HPT) as more sustainable modes of transportation (Sustainable Design Lab 2018). Sustainable modes of mobility within local communities are not only enhancing the physical and mental health of the residents, but they have significant social benefits through encouraging residents to abandon using their cars to access locally provided amenities, and thus, develop more socially cohesive communities. A wide spectrum of research has proved that walkable communities usually have better social capital that intensifies developed social networks, bonds, ties, and connections among local community members. The statistical analysis of the results of a study about the effects of urban qualities, including walkability, on the level of social capital in a local community in Isfahan City, Iran, showed that there is a direct relationship between changes in the qualities including walkability and the social capital indicators (Masoud 2011). In another research, the case study method was implemented to comprehensively examine the correlation between social capital and walkability. A positive correlation between the two aspects has been evidence suggesting that measuring a social aspect of sustainability may be feasible, especially in the context of community development (Rogers et al. 2013).

Paranagamage et al. (2014) conducted a case study to explore the impact of walkability on social capital in Braunstone, Leicester through a massive regeneration program funded by the New Deal for Communities. Braunstone, a typical disadvantaged area in the UK, is distinguished with its persistent socioeconomic problems and a poor physical setting. The study revealed that local facilities and neighborhood walkability provide incentives for longer term residency, and facilitates people interaction, which positively reflected on the community social capital. Paranagamage et al. (2014) added that accessing services by walking boosts people engagement in various local social activities, while poor accessibility to local services and public transport nodes negatively affects participation in social and leisure activities. Also, improving connections beyond the neighborhood is a critical measure in encouraging longer term residency, which, in turn, helps develop social capital. In very recent research, Mazumdar et al. (2018) found that there is a significant relationship between social capital on the one hand, and accessibility to local service destinations through walkability, on the other hand.

2 Research Problem, Question, and Method

UAE has recently witnessed a transformation toward sustainable urbanism associated with changing the conventional significantly sprawl urban forms in housing developments to more compact and efficient ones. It has been claimed that the urban form designs of new residential schemes are considering sustainable urbanism principles, including walkability and bikability. However, there is a lack of reliable evidence that can assess the prospective performance of these new urban forms in terms of walkability and bikability efficiency. With the recent introduction of new quantitative tools such as Urban Modeling Interface (UMI) (Sustainable Design Lab 2018) and Urban Network Analysis (UNA) (City Form Lab 2018), examining the expected degree of walkability and bikability in different urban forms has become much more straightforward and with more reliable results. Therefore, the research poses this question; *to what extent have the urban forms of the newly designed neighborhoods enhanced walkability and bikability compared to the conventional more sprawl ones?*

In order to answer this question, the research adopted the case study method in which walkability and bikability scores, that range between 0 for the worst to 100 for the best, are going to be investigated in two urban neighborhoods; first, is Al Dhaher, that represents a conventionally developed urban sprawl neighborhood, and second, is Al Ghareba, a recently designed more compact urban community in which walkability and bikability should have been taken into consideration as two essential components of its claimed sustainable urban form design.

For investigating these two modes of mobility in the two neighborhoods, the UMI urban modeling simulation tool was utilized in this study. UMI is a Rhino-based design environment for architects and urban planners interested in

modeling the environmental performance of neighborhoods and cities with respect to operational and embodied energy use, daylighting potential, and walkability/bikability. Since 2012, UMI has been developed by the Sustainable Design Lab at the Massachusetts Institute of Technology with support from a National Science Foundation EFRI_SEED project, the MIT Energy Initiative, the Kuwait-MIT Center, the Center for Complex Engineering Systems (CCES) at KACST and MIT, Trans-solar Climate Engineering and United Technologies Corporation. The latest UMI Version 2.1 has been used in this study.

3 Measuring Urban Compactness and Mobility Scores in UMI

3.1 Floor Area Ratio (FAR) as a Measure for Urban Compactness

Floor Area Ratio (FAR) is a measure for the degree of physical urban compactness. FAR is calculated in UMI as the ratio of the total gross floor area of each building to the total area of the site it occupies. In order to perform a FAR calculation, two measures must be set. First, is the floor-to-floor height for every building on the Buildings Layer, through the assigned customized template for each building. This indicates the number of floors in each building. Second, is developing a 'Ground' layer on which all ground surfaces must exist. Ground surfaces must be flat and closed surfaces. The FAR calculation is executed from within the UMI Bundle panel's Simulate tab through executing the 'UmiCalculateFAR' Rhino command (Sustainable Design Lab 2018). FAR were calculated for both selected case studies to specify their degree of urban compactness that is going to be linked with their calculated walkability and bikability scores.

3.2 Walkability Score

Walkability score measures the degree to which the neighborhood is *walking friendly*. UMI software is evaluating *walking friendliness* in urban contexts by implementing the widely used benchmark of ¼ to 1½ mile (400–2400 m) walking distances from housing units to essential amenities. The resulting 'Walk Score' expresses the ease of residing in a particular area without depending on private cars. UMI adopted this web-based tool to test proximity of the points of interest representing nine neighborhood urban amenities well-recognized in North America such as schools, restaurants, etc., where each amenity receives a 'weight' based on its estimated importance. Calculating walk scoring requires first constructing a pedestrian travel network, then performing a series of shortest path calculations using Dijkstra's algorithm. Egress points for addresses are then rewarded based on distances to amenities, and a polynomial distance decay function is used to calculate scores. Within a distance of quarter a mile (400 m), a full score is received, and at one mile (1600 m), amenities receive about 12% of the score as a penalty. After one mile, scores slowly decrease with greater distance, until it reaches zero at 1.5 miles (2400 m). There are other reward scores received by examined points based on street intersection densities and average block length (Sustainable Design Lab 2018). In UMI, the default parameters of walking distances, points of interest (amenities) and weights can be customized to suit other urban contexts. Customized parameters for this research are explained in Sect. 5. The walk score of 70 or above defines neighborhoods with walkable access (Koschinsky et al. 2017). Scores between 70 and 100 are usually segmented into five categories indicating the walkability differences where scores from 90 to 100 are reflecting a 'walkers' paradise' because with such score residents can almost walk to all neighborhood services, facilities, and public transportation nodes. Therefore they do not need to own a car. The scores between 70 and 89 suggest a very walkable neighborhood which residents can walk to most of the provided amenities, and thus, they probably do not need private cars. Scores between 50 and 69 indicate that the neighborhood is partially walkable but probably necessitate public transportation, a bike, or a car for accessing the neighborhood amenities. A walkability score below 50 reveals a car-dependent neighborhood, and finally, a score below 25 means residents need to drive everywhere (Trimarchi et al. 2018).

4 Selected Case Studies

4.1 The Conventional Urban Sprawl Case Study: Al Dhaher

Al Dhaher neighborhood is an Emirati citizens neighborhood located to the southeast of Al Ain city urban agglomeration (Fig. 1). It occupies a rectangular shaped lot of about 1230 m × 2280 m with a gross area of about 285 hectares. Developed in 2002, the neighborhood has 460 single-family housing plots. The plot area is either a 45 m × 60 m or 45 m × 45 m. The neighborhood has some planned services and amenities, including eight mosques, two schools, a clinic, and various retail shops. The urban form of the neighborhood was conceptualized as clusters of 10, 12, 14, and 16 housing plots grouped around shared open spaces. The primary services and amenities are located on both the linear center of the neighborhood and on its outer edges. As for the pedestrian network, the urban form of the

Fig. 1 Land use of Al Dhaher neighborhood showing the distribution of amenities

street/sidewalks grids is orthogonal and almost symmetrical around central horizontal and vertical axes (Fig. 1).

Despite the fact that the neighborhood was conventionally developed as a 'self-contained' community with the envisaged needed services and amenities locally provided for residents, apparently not all of the planned amenities have been actually provided most likely due to the low population density that would make the provision of many of the planned amenities not economically feasible. The calculated FAR of Al Dhaher neighborhood was 0.11, which is a low ratio reflecting the low density that results from the adopted sprawl urban form of the neighborhood.

4.2 The New 'Sustainable' Case Study: Al Ghareba

Al Ghareba is an Emirati citizen neighborhood consisting of 1,022 single-family housing plots on a 155 ha site located approximately 10 km west-south of Al Ain city center (Fig. 2). The critical transit corridor with a future high-speed rail connecting to Abu Dhabi is located 4 km to the north of the site, separated by the Al Maqam Palace. The site is zoned as 'Low-Density Villa Residential' under the future Plan Al Ain 2030. (Department of Urban Planning and Municipalities 2018). Sustainability has been a key consideration throughout the master planning process for Al Ghareba. The master plan and the villas were designed to achieve a minimum rating of 2 Pearls of the *Estidama* sustainability rating system.

In response to the desire for achieving a more compact urban form, the housing plot area has significantly decreased from 45 m × 45 m and 45 m × 60 m in Al Dhaher conventionally designed neighborhood to only 30 m × 36 m with a ground floor area of 430 m^2. Besides the residential use, the master plan land uses include 2 mosques, various local and district retail shops, KG + Cycle 1 school, 2 large community parks, various pocket parks in a form of small gardens considered to be *Baraha* (traditional small open space), linear park, *Sikka* (traditional name for a 2–6 m wide linear pedestrian access) (Fig. 2). The neighborhood infrastructure was developed under the surface leaving the ground level as a habitat reserve. There is also a buffer zone in a form of undevelopable land setback for the protection of the community. A waste area was allocated for waste recycling with municipality pick up, as per *Estidama* requirements (http://www.keoic.com/Projects/Details/1231).

The street/pedestrian sidewalk grid is almost orthogonal with various block sizes, but the bottom left section of the grid is taking a curvilinear form affected by the site

Fig. 2 Land use of Al Ghareba neighborhood showing the distribution of amenities

geometrical shape. The adopted a more compact urban form of Al Ghareba has resulted in a higher calculated FAR of 0.24, which is slightly above the double FAR of Al Dhaher.

5 Preparation for the Simulation Process

5.1 Defining Local Amenities and Catchment Distances for UAE Neighborhoods

In UMI, neighborhood amenities are categorized in a JSON array of amenity categories to which people will try to walk. Because this study is contextual, using a reliable and relevant assessment benchmark is essential. Therefore, a customized list of amenities has been prepared based on the types of amenities indicated by the land use plans of the two studied neighborhoods. This list has been added to the standard amenities of the UMI (Table 1).

In UMI, the two parameters of Minimum Distance and Maximum Distance control how walking trip distances affect walk scores. Minimum Distance is the distance at which penalties begin to be applied. The default value of 400 means that walking trips of 400 m or less receive perfect scores. On the other hand, Maximum Distance specifies the maximum distance people are willing to walk at all. Accordingly, trips more extended than this distance will be ignored. Trips with lengths close to this value will still receive very low scores. For customizing the catchment distances to these defined amenities, some references and standards developed by local municipal and planning authorities in UAE were consulted. These local resources included; Abu Dhabi Community Facility Planning Standards Report, issued by Abu Dhabi Urban Planning Council

Table 1 Localized amenities and catchment distances in UAE neighborhoods

	Amenity type	Maximum catchment distance (m)
1	Mosque	800
2	Neighborhood Park	800
3	Grocery	600
4	School	800
5	Kindergarten	350
6	Cafeteria and Café	800
7	Retails	800
8	Pharmacy	800
9	Clinic	800

(ADUPC) (2014a), Second, Abu Dhabi Public Realm Design Manual, issued by ADUPC (2014b), third, Abu Dhabi National Housing Guidelines For Integrated Communities, Planning Guidelines issued by Abu Dhabi Housing Authority (ADHA) (2016), and finally, Community Facilities Standards issued by the Planning Department, Dubai Government (2018). Based on these local resources, the catchment distances are ranged between 350 and 800 m, i.e., from about 5 to 10 min walk, which are close to the internationally recognized catchment distances (Barton 2000). Table 1 is summarizing these catchment distances. Each type of customized amenities was then assigned a separate layer carrying exactly the name of the amenity type. To ensure that, destination layers were created using the 'Create Amenity Layers' command in the UMI Mobility simulation panel. This automatically created any missing amenity layers, using the names specified in the profile as a reference.

5.2 Customizing the Amenities Weighting for the UAE Neighborhoods

Each amenity in the list of amenities in UMI has these parameters: Name, Global Weight, and Destination Weight. For UMI walkability and bikability simulation and after defining the types of amenities and their distances to the houses for UAE neighborhoods, the Global Weight and the Destination Weight of each amenity type were defined. The Global Weight controls how important an amenity category is compared to other categories, and it is defined based on its importance to the community's everyday life and should be defined on a tripled scale from 1 to 3 while 3 represents the highest importance. The Global Weight parameter has nothing to do with calculating the score within each amenity's category, and rather, it is used to relatively scale each category score before they are summed for the final score. Meanwhile, calculating the score within each amenity's category is controlled by the Destination Weight parameter as described below.

Destination Weight is a JSON array that controls both how many destinations are required for a perfect category score and how the distances to those destinations contribute to the category score. One destination is required for each value in the array, and the values are the relative weights of each destination. For example, the Destination Weight of the kindergarten category is '5, 3'. This means that for a perfect score, two kindergarten destinations are required, and the score for the trip to the nearer of the two is 5/3 as important as the score for the trip to the farther. Several of the categories in the default profile have a value of 1 for their Destination Weight. This means that only a single destination is required. All the default profile categories have decreasing Destination Weight, meaning that the distance to closer destinations is more important. As with global weights, the critical information is the value ratios so changing kindergarten's Destination Weight to '10, 6' in the default profile, for example, would leave scores unchanged.

For customizing these Global and Destination Weights, it was decided whether one or more of an amenity type is needed within the neighborhood. This has been decided based on the defined land use of both studied neighborhoods. So, for example, there are 3 grocery stores in the neighborhood, among which the closest grocery is most likely to be chosen by residents to walk to, and therefore it is weighted as (5), while the second closest one is weighted as (3) that means it is 3/5 as likely as the closest grocery to be chosen. The farthest one is weighted as (1), so it is 1/3 as likely as the second closest grocery to be chosen as a

Table 2 Weighted amenities in the UAE neighborhoods

	Amenity type	Global weight	Number of needed amenities	Destination weight
1	Mosque	3	1	1
2	Neighborhood Park	2	1	1
3	Grocery	3	3	5, 3, 1
4	School	2	1	1
5	Kindergarten	3	2	5, 3
6	Cafeteria and Café	3	5	10, 8, 6, 4, 2
7	Retails	2	5	10, 9, 8, 7, 6
8	Pharmacy	3	1	1
9	Clinic	1	1	1
10	All others	1	1	1

destination. Table 2 summarizes the weighted amenities in the two neighborhoods.

5.3 Developing Neighborhoods 2D and 3D Models for Simulation

The first step before undertaking the UMI simulation analysis of the two neighborhoods was developing digital models for the service buildings and spaces, housing clusters, groupings of housing clusters and the overall neighborhood, showing the plots boundaries and the open space/street grid of each case study. The two neighborhoods were firstly modeled in a 2D format on AutoCAD 2018. In this phase, each building type was assigned a separate layer to ease the UMI analysis later on. Separate layers have been assigned to the street network, neighborhood parks, and neighborhood boundaries. Also, the footprint of every existing building in each neighborhood, that is going to appear later as a solid mass in the Rhinoceros 5 software environment and the UMI Bundle was represented by a single boundary object (or enclosed polyline) in the AutoCAD environment. In this 2D modeling phase, the shape of the whole neighborhood land and the neighborhood parks regions were converted into a combination of enclosed triangular/quadrilateral polylines in order to easily facilitate converting the parks and the neighborhood land into meshes (surfaces) when developing the 3D model in Rhinoceros 5 software. More complex neighborhood and parkland shapes were created through the combination of multiple meshes where all together constituted the desired shape.

Afterward, the completed 2D model of each neighborhood was exported, with its overall appropriately drawn and layered elements including building outlines, street networks, and parks/neighborhood land boundary, to Rhinoceros 5 software, the tool for developing the 3D format of the two neighborhoods. After completing the 3D modeling of all buildings, with their appropriate assigned layer, converting neighborhood parks and the whole neighborhood boundary into surfaces (or meshes), and defining the street networks, the Rhinoceros 5 generated 3D model was converted into a UMI bundle. Within this bundle, a customized building template and amenities list with their customized weights were assigned to each single service building/house in each of the two analyzed neighborhoods, as relevant.

Before conducting the walkability and bikability simulation, the locations of the neighborhood amenities were defined in the UMI environment. To do so, a 'point' was placed at the entrance 'line' of every amenity building. In the case where a single building includes different amenities, more than one 'point' were set (under different amenities layers) at the entrance of this building. Subsequently, the customized amenities types and there amended weights were uploaded, where the existing default amenities profile was exported, using the project settings tab, then, it was edited using a text editor, by adding, removing, or modifying amenity categories as decided and mentioned above. Finally, this customized amenity profile was reimported to the project using the project settings tab.

6 Simulation Results

After undertaking all the pre-simulation steps, the walkability and bikability simulations were conducted. The walkability score for Al Dhaher reached 66 which is a slightly above average walk score, but still less than the claimed walk score of 70 or above for neighborhoods with 'walkable access' (Koschinsky et al. 2017). Figure 3a shows a color-coded result of the simulation in which several houses, especially in the bottom section, are apparently out of the appropriate catchment areas for the neighborhood amenities.

As for bikability, the score reached 96, which reveals that most of the neighborhood's amenities are within 'bikable' distances from houses (Fig. 3b). The simulation analysis of the second case study Al Ghareba resulted in a walk score of 61. Figure 4a depicts the score in color code where it is clear that several houses, especially those located in the bottom left sections of the neighborhood, are considerably out of the walkability catchment area for the neighborhood amenities. On the other hand, the bikability score was 85, which is generally appropriate (Fig. 4b).

Table 3 concludes the comparative results of the two case studies. It is surprisingly revealing that the walkability score in the urban sprawl case study of Al Dhaher is slightly better, on average than that of the more compact urban form case of Al Ghareba. As expected, the same was observed for the bikability score.

One would expect the results to be the opposite with the more compact urban form leads to more walkable neighborhoods, i.e., with a higher walk score. These results though shed light to the fact that the mere compaction of the urban form is not enough to enhance walkability and bikability in neighborhoods but rather, other essential measures should be appropriately addressed in the neighborhood design including; distribution of amenities, consideration of customized weights for the different types of amenities, and the effect of permeability of pedestrian movement grid, which is mostly just sidewalks adjacent to vehicles streets lanes.

In this research, the walkability and bikability scores were calculated based on the catchment areas and weights of

Fig. 3 **a** Walkability score for Al Dhaher neighborhood. **b** Bikability score for Al Dhaher neighborhood

amenities, nonetheless, there are other practical factors that have not been taking into consideration in these simulations. For instance, the existence/absence of dedicated cycling lanes and pedestrian walkways, how safe and pleasant are the cycling lanes and the pedestrian walkways, etc. All these items, apart from the pure simulation, are significant and should be taken into consideration side-by-side with other issues discussed in this research.

7 Conclusions

UAE is witnessing a remarkable change toward sustainable urban development. The recently designed and developed neighborhoods have more compact urban forms that are envisaged to encourage human-powered transportation (HPT). Such more sustainable modes of residents

Fig. 4 **a** Walkability score for Al Ghareba neighborhood. **b** Bikability score for Al Ghareba neighborhood

Table 3 Comparing Walkability and Bikability scores in the two neighborhoods

Neighborhood	FAR	Walkability score	Bikability score
Al Dhaher Conventional sprawl urban form	0.11	66	96
Al Ghareba More compact urban form	0.24	61	85

commuting especially walkability are not only leading to a better living environment with reduced pollutions and GHG emissions but also help attain cohesive and interconnected communities with precious social capital. The research investigated how walkable is the newly claimed to be sustainable neighborhoods with their more compact urban forms if compared with conventional neighborhoods in UAE. Al Dhaher and Al Ghareba neighborhoods in Al Ain

were selected to represent the conventional urban sprawl of FAR of 0.11 and the more compact recently designed neighborhood of FAR of 0.24, respectively. The conducted UMI simulations, with customized parameters for walkability distances and amenities, on both neighborhoods have surprisingly revealed that the new neighborhood had less walkability score than that of the conventional neighborhood and was also much behind the 'walker's paradise' score of 90 and above. The calculated scores of the two neighborhoods were in the range of 50–70 score category, which revealed that the neighborhood is 'partially walkable' and thus, it necessitates public transportation, a bike or a car for accessing the neighborhood amenities. These results mean that walkability has not reached its desired target that, if realized, would help achieve eco-friendly urbanism for new neighborhoods through encouraging residents to abandon using their cars to access locally provided amenities and thus reduce energy consumption and pollution. This can be referred to the fact that these new designs are still noticeably fragmented. Once truly a compact urban form is realized, walkability and bikability would significantly enhance in a way that contributes positively to the cause of sustainable residential urbanism.

Finally, to enrich the research about the walkability and bikability potentials for newly developed neighborhoods in the UAE, other design and influential urban measures, beyond the catchment distances and weights of amenities, should be investigated in further research. These include, for example, reducing the number of car parking plots, provision of affordable and reliable public transportation systems, increasing petrol tax to limit the reliance on private cars, introducing car parking charges, and considering the provision of multipurpose trips in neighborhood land use design.

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Sustainable Tourism Development in Historical Cities Case Study: Karak, Jordan

Jawdat Goussous and Oraib Al-Jaafreh

Abstract

Cultural tourism is essential in conserving and realizing the value of our heritage. Furthermore, in Jordan, the tourism industry was set as a priority, and the urban heritage of Jordanian cities has been identified as one of the country's valuable assets. The Jordanian government is working to working to develop, or attract investment in the tourism sector; to improve productivity and living standards; and create and sustain a vibrant economy. This study discusses the Jordanian experience in sustainable tourism development of historical cities, such as the historic city of Karak, as in this case study. This study aims to preview the emergence of the sustainable cultural tourism industry in Jordan; analyze sustainable tourism development strategies in Karak; study the obstacles to the application of sustainable solutions; and determine ways of activating sustainable tourism strategies. This study concludes with the importance of increasing efforts toward the application of sustainable tourism strategies in Jordan and encouraging the participation of the local and private sectors to ensure the satisfaction of all stakeholders.

Keywords

Tourism industry • Sustainable tourism • Historic cities • Cultural heritage

1 Introduction

Jordan, as a developing country, has relatively few natural resources. It is characterized by its arid desert climate, limited agricultural land, and freshwater supplies. In addition to problems of unemployment, poverty, and lack of opportunities, the government of Jordan has been working hard to improve the productivity and living standards of the local inhabitants by developing economic reforms and long-term programs to create and sustain a vibrant economy, and thus reach a relatively competitive position as a safe and welcoming country with a strong and positive national profile (MOTA, Third Tourism Development Project, 2005).

The main economic sectors of the country are the diversified services sector, together with limited agriculture and specialized industries. Within the services sector, cultural tourism has essential importance because of its importance in conserving and realizing the value of our heritage. It is almost the largest productive sector, and it started to see very rapid growth since the 1990s (Alrawadieh 2009). Jordan has set the promotion of its tourism sector as a priority, and the urban heritage of Jordanian cities has been identified as one of the valuable assets on which the sector can promote itself. The government has studied several tourism projects in the kingdom since the 1990s, such as the World Bank-funded First Priority Tourism Projects in Jerash and Karak, and the Second Priority Tourism Projects in Karak, Jerash, and Mabada.

In this study, we will preview the sustainable cultural tourism development strategies for the Old City of Karak; ways of dealing with heritage architectural sites; and challenges and opportunities for implementation in the cultural, social and economic aspects of life.

1.1 Importance of the Research

The importance of this study lies in the development of the tourism industry for historic cities, which has become one of the essential pillars of the national economy. Tourism is almost the largest productive sector; it improves the economic conditions of the inhabitants of these cities. In addition, there is a need to study ways of maintaining sustainability in tourism development plans.

J. Goussous (✉) · O. Al-Jaafreh
The University of Jordan, Queen Rania St., Amman, Jordan
e-mail: j_goussous@ju.edu.jo

O. Al-Jaafreh
e-mail: o_aljaafreh@ju.edu.jo

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1.2 Research Objectives

This research aims to identify the tourism development plans for the city of Al-Karak; the different orientations in dealing with urban heritage sites for the purposes of sustainable tourism development; and to determine the current state of tourism services; and highlight the most important factors that help attract tourists to the region to provide solutions for the short duration of tourist stays in the city.

1.3 Research Problem

The inhabitants in Al-Karak city suffer from low levels of income, as well as in the rest of the governorates of the south, where the study area recorded the lowest percentage in income levels. The residents considered tourism as a secondary sector for income, despite the significant increase in the population growth from 1 year to another.

Karak acts as a gateway for tourists; the short duration of stay in the city leads to a lack of benefits for the inhabitants.

Therefore, this study will try to discuss the sustainable tourism development strategy as a way to increase the socioeconomic benefits for local inhabitants.

1.4 Methodology

This research will use the description method by reviewing the provided data and information on sustainable tourism development strategies from institutions and various government departments, such as the Ministry of Tourism and Antiquities, and also a number of sources and references, research reports and newsletters in magazines, as well as using analytical methods to analyze the effects of developments on the economic and social aspects of inhabitants through designing a questionnaire for tourists and conducting interviews with local inhabitants.

2 Important Definitions

In order to understand the main aims of this research, we should consider the following definitions.

2.1 Cultural Tourism

The European Association of Historic Towns and Regions (EATHR) defines "Cultural Tourism" as "the principal purpose of which is to share and enjoy the physical and intangible heritage and culture, including landscapes, buildings, collections, the arts, identity, tradition and language" (EAHTR 1999).

2.2 Historic Towns and Cities

Also, it defines historical places and areas as "places that include villages, small towns, cities, and parts of larger urban areas with significant cultural and heritage assets" (EAHTR 1999).

2.3 Sustainability

The concept of sustainable development has been a significant concern in tourism literature since the 1980s. One of the best-known definitions of sustainable development emerged from the Brundtland Commission Report of 1987, in which it was defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987).

2.4 Sustainable Tourism

The UNWTO defines sustainable tourism as "Tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment, and host communities" (Making Tourism More Sustainable—A Guide for Policy Makers, UNEP and UNWTO, 2005, pp. 11–12).

The World Tourism Organization (WTO) describes sustainable tourism development as meeting "the need of present tourists and host regions while protecting and enhancing the opportunity for the future. It is envisaged as leading to management of all resources in such a way the economic, social, and esthetic needs can be fulfilled while maintaining cultural integrity, essential ecological processes, biological diversity, and life support systems" (World Tourism Organization, 1997).

3 The Emergence and Importance of Sustainable Tourism Industry

Tourism is not new to historical places, and much of their history was built around it, and it continues to support these places by generating economic value; supporting investment in heritage assets; supporting local facilities and services; and sustaining local traditions, events, and products.

Today, tourism is considered to be one of the most rapidly growing sectors of the economy in Jordan, and one which exerts a strong influence on the development of both industrialized and Third World countries. Tourism is a dynamic and competitive industry that requires the ability to adapt to the customers' changing needs, desires, satisfaction, as the customers' safety and enjoyment is mainly the focus of tourism businesses (www.go2hr.ca, 2014).

There have been many significant changes in tourism and travel throughout recent history, where it was known as a way to travel to another place to have adventures and learn about other cultures and communities; then it changed to achieve religious and commercial goals during the ancient and medieval periods. More recently, travel has served the purpose of satisfying various motivations and needs which vary over time due to changes in lifestyle, the progress of the human quality of life, and the improvement of economic conditions in many communities (Alrawadieh 2009).

When in the late 1980s and early 1990s Africans came up with the idea that tourism can be an escape from poverty and improvement of economic conditions, they began to build massive hotels on the coast of Kenya and South Africa, which attracted tourists to these sites who were in search of unusual tourism by enjoying the search for what was new, such as animal observations, exotic meals, and hunting.

Today, tourism has changed in a way that tourists try to discover more authentic experiences correlated to local inhabitants in an attempt to understand their traditions, culture, and their unique lifestyle. So, the definition and objectives of tourism have changed these ways which have led governments to think seriously about tourism development plans for historic sites and take into consideration all factors that attract tourists.

However, tourism can cause problems for historic cities such as threats to the preservation of cultural and environmental resources, in addition to the damage to both the sense of place and the local cultural identity. This created a need to take into consideration the development of sustainable cultural tourism (EAHTR 1999) after the concept emerged from the concept of sustainable development, which developed from the World Commission on Environment and Development (The Brundtland Commission) (Endresen 1999, p. 8).

3.1 Elements of Sustainable Cultural Tourism

The tourism sector can be made to be sustainable in order to contribute to economic development, employment, and poverty reduction without destroying culture and damaging the environment. However, it requires a strategy that takes into account economic, environmental, social, and cultural factors. According to the UNWTO, sustainable cultural tourism should consider the following components (United Nations Conference on Trade and Development, Tourism's contribution to sustainable development, 2013, p. 15):

1. Environment: Make optimal use of environmental resources that constitute a key element in tourism development, maintaining essential ecological processes, and helping to conserve natural heritage and biodiversity.

Fig. 1 The interests of visitors, industry, the community and the environment overlap (*Source* EAHTR 1999)

2. Economy: Provide sufficient resources for support and funding to ensure product quality and establish proactive destination management. Provide stable employment and income-earning opportunities, and social services to host communities to reduce the effects of poverty.
3. Society/culture: Respect the sociocultural authenticity and identity, conserve their built and living cultural heritage and traditional values and bring a positive experience to local inhabitants and tourists.

The interaction between place and cultural tourism is always dynamic, and it requires constant monitoring of impacts, introducing the necessary preventive and/or corrective measures whenever necessary (Fig. 1) (EAHTR 1999).

In 2005, the United Nations World Tourism Organization (UNWTO) and the United Nations Environment Program (UNEP) identified a set of 12 aims which should be included within the scope of sustainable tourism development (Fig. 2).

4 Sustainable Cultural Tourism in Jordan

The development of the tourism sector is still one of the most critical priorities of the government of Jordan and recently showed remarkable growth in terms of revenues, rising by 9% in the first quarter of 2010. In the recent Travel and Tourism Competitiveness Report, Jordan ranked in 53rd position out of 130 countries on the Travel and Tourism Competitive Index (Jordan Inbound Tour Operators Association, 2014).

The tourism sector generated $3.5 billion (around JD2.5 billion) in 2012 as income, a 15.3 percent increase from $3 billion in 2011 (The Jordan Times, 2013). About 46,667

Fig. 2 Relationship between 12aims of sustainable tourism and the three pillars of sustainability (*Source* UNEP/UNWTO 2005)

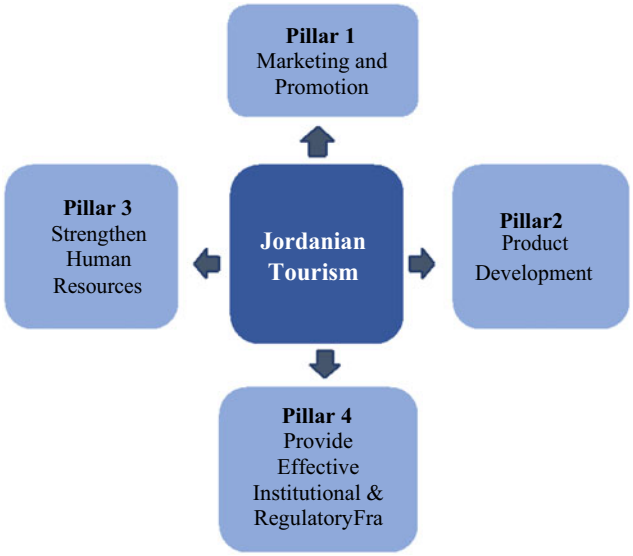

Fig. 3 Main Tourism pillars in Jordan (*Source* Researchers)

jobs were offered as direct employment by the tourism sector in 2013, which is more than the 43,942 jobs offered in 2010; all these numbers show the importance of tourism to the economy of Jordan (MOTA 2013).

Tourism in Jordan can be divided into the following categories:

1. Natural resources: These include areas of significant land/seascapes, these include: Aqaba, Wadi Rum and natural reserves, spreading throughout many regions.
2. Cultural resources: Include mainly archeological/historical sites, shopping and galleries, events, and handicrafts.
3. Therapeutic resources: These comprise the Dead Sea and some locations where waterfalls and hot springs are found (Shdeifat 2006).

Tourism in Jordan acts as a driver of sustainable economic development. The Ministry of Tourism and Antiquities (MOTA) adopted the National Tourism Strategy of Jordan and Second Priority Tourism Projects of the country, which aim to fight against poverty and unemployment through a partnership approach of the government, the private sector and civil society.

The strategy was based on four main pillars and helped guide the development and growth of the sector in each of these areas (Fig. 3).

In 2007, a partnership between the World Heritage Alliance for Sustainable Tourism (WHA) and the Jordanian Ministry of Tourism and Antiquities was announced to support world heritage conservation and sustainable tourism in Jordan, through transformation of business practices to be more sustainable; educate their customers about world heritage; and support local communities through conservation and sustainable development initiatives around the sites (United Nations Foundation, 2007).

Also, the Ministry of Tourism and Antiquates emphasized the development of regional tourism centers in Karak, as one of the 12 governorates in Jordan similar to other centers such as Ajloun, Jerash, and Petra (MOTA 2003).

5 Heritage in the Old City of Karak

5.1 Karak City: Geography and Population

The governorate of Karak is located in the south of Jordan, extending from Wadi Mujib the north to Wadi Al-Hasa in the south, and from the Eastern Badia in the east to the international border of Jordan in the west. It is about 130 km from the capital Amman. The governorate covers an area of 3,496 km^2 (Jordan Investment Board).

The population of the governorate of Karak was estimated at 228,260 inhabitants at the end of 2008, comprising 3.9% of the population of the kingdom. It has the highest percentage of the four southern governorates with a percentage of 41% (Table 1) (Fig. 4).

Table 1 Population in Karak city

Urban	79.600	
Rural	148.600	
Population	2008	2011
Karak Governorate	228,200	238,4
% of kingdom population	3.9%	3.9%

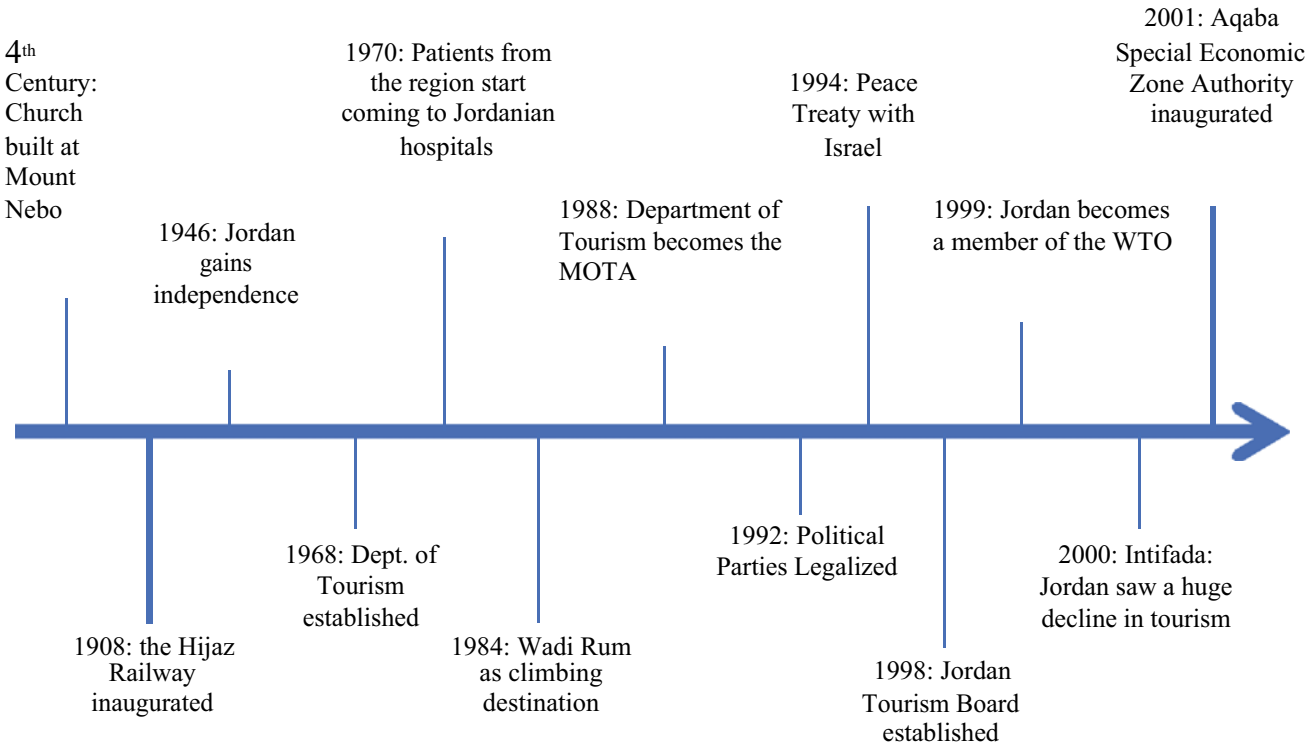

Fig. 4 Timeline for the Jordan tourism industry

5.2 Karak History

Karak is mentioned in the Old Testament as Qir Heres, Qir Moab, and Hareseth. It has been inhabited since at least the Iron Age. Karak has been occupied by several civilizations such as Moabites, Crusaders, Mamlukes, Romans, and Ottomans. It lies on the ancient caravan routes that used to connect Egypt to Syria.

The city was the ancient capital of Moab and was also used by the Greeks and Romans. During Roman times, it was known as Characmoba (Fig. 5) (http://www.kinghussein.gov.jo/tourism6b.html, 2013).

5.3 Urban Fabric and Pattern

Karak's Old City is considered a historical urban settlement, with a landmark historical castle, characterized by its long-form related to its defensive function and topographical location. Karak is located on top of a hill surrounded by a

Fig. 5 Arial view of the historic core of Karak (*Source* MOTA, Third Tourism Development Project, 2005) (Investment Board, 2012)

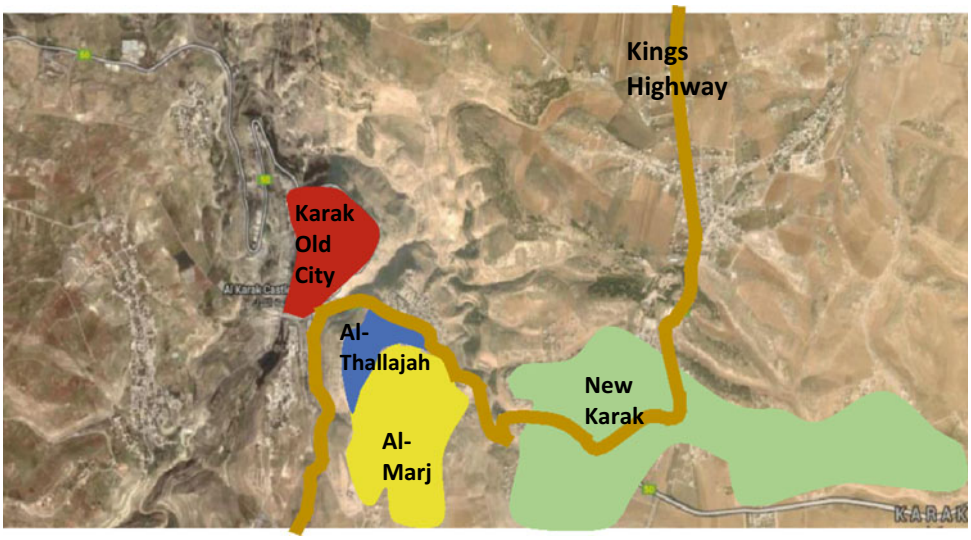

Fig. 6 The main districts of the Old City of Karak (*Source* Researchers)

network of wadis, which contribute to its character and urban form (MOTA, Third Tourism Development Project, 2005).

The Old City of Karak consists of four central districts (Fig. 6):

1. The Old City Center: Located on top of a mountain rising of 960 m above sea level, surrounded by valleys on three sides, much like a horseshoe with an area of approximately 0.5 km^2 which is equivalent to 7% of the area of the city.
2. Al-Thallajah: It is a part of the Old City covering an area of 3% of the whole city.
3. Al-Marj: This is the mountainous region in the southeast, an area expanded from Old Karak and has an area of 25% of the area of the city.
4. New Karak: This steppe region located to the east of the ancient Karak constitutes the main entry point to the city from the Desert Highway, with an area of 65% of the total area of the city.

The natural characteristics of the site give to every part of the city its pattern and exceptional composition. The urban fabric appeared like terraces in some areas, especially along the edges of the city. Other parts appeared like a semi-flat hill. This configuration is compatible with the topography of the site and contributed to the city as a whole to give some unity in the formation of the urban fabric (Fig. 8).

This unique and limited geographical status which is suitable for expansion and urban growth distinguished the old historic core of Karak, where the city is located on the top of a high hill to form a terrace with a limited area of 0.5 km^2, which explains the lack of buildings in Old Karak dating back to the times of Almoabih.

5.4 Social Fabric and Culture

Karak is the home of the most influential Muslim and Christian tribes of Jordan who significantly affected the sociopolitical and economic situation of Jordan, and still does.

The general framework of the social structure in the city of Karak is formed by:

1. The tribes are not scattered around the kingdom but live in one region.
2. Semipermanent alliances: Small tribes are associated with the largest tribes.
3. Groups from outside the region: The tribes reside with local inhabitants, in addition to the nomadic tribes which live in the desert and have a structure similar to that of the tribes of Karak, but are usually larger.
4. Villages: The groups with its territory, but it is not extended. The village has branches of two tribes or three, usually associated with one of the forms of alliances.
5. Minorities: The tribes are different from other groups of the population, and because of their unique qualities they do not integrate into the political structure, such as the Ghawarneh and the Armenians (Fig. 7).

5.5 Architecture

Karak characterized by its distinctive architecture and traditional houses. In 1897, during Ottoman control, Karak School, which is now considered an iconic building, was built using stones collected from the walls of the city (Fig. 8). In addition, it is in the building style of the

Fig. 7 Topography contributed to the terraced urban form (*Source* Researchers)

Fig. 8 Ottoman Karak School (*Source* http://www.factjo.com/pages/print.aspx?id=34819)

traditional housing with its unique structure system of vaulted arches built from stone and wooden rafters.

Awareness and knowledge of the significance of architectural heritage have an important role in maintaining it.

6 A Sustainable Cultural Tourism Development Strategy for Karak

The main challenge that the historic core of Karak is facing is to recover its urban centrality and be revived with a new "social and economic mission" within its regional context. The project aims to achieve these objectives through a structured city revitalization program that includes regulatory, physical, and capacity building actions.

6.1 Key Issues for Sustainable Tourism Development

Karak has to face several key issues affecting its social and economic development, as has been defined by the Ministry of Tourism and Antiquities. These key issues include (MOTA, Main Report, 2005):

1. Substitution of population and poverty of locals
2. Change of commercial functions
3. Conflict with proximity functions
4. Physical decay of the urban environment
5. Threatening cultural heritage
6. Lack of interactive social spaces
7. Decay and lack of public spaces
8. Economic stagnation.

6.2 Development Strategic Objectives

In order to achieve sustainable cultural tourism development in the historic core of Karak, the Ministry of Tourism and Antiquities has developed the main objectives for strategic development that considers the requirements of sustainable development. These objectives include:

1. Improve local economy and social cohesion in Karak
2. Creating sustainable revitalization of the historic core and tourism development
3. Rehabilitate the historic core
4. Improve the quality and livability of the historic core
5. Manage and improve the cultural assets
6. Involvement of the private sector and the community in the city revitalization process.

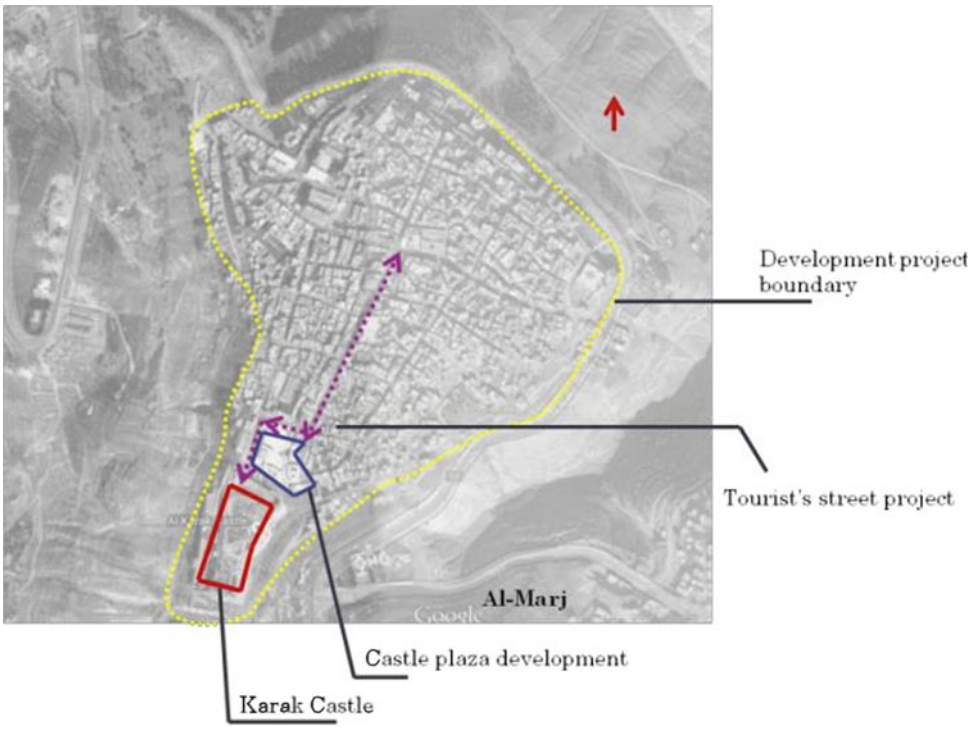

Fig. 9 The development of the target area (*Source* MOTA, Third Tourism Development Project, Annex 1, 2005)

6.3 Development of Target Area

The target area of the city revitalization program is the historic core of Karak which has been determined by the physical borders of the city marked by the cliff, within an area of 0.5 km^2. The most comprehensive actions of the program are concentrated on two main urban structures (Fig. 9).

The first action is focused on the enhancement of the urban axis defined by the central commercial spine of Al-Malik Al-Husayn Street; the group of heritage buildings located at the southwestern end of Al-Mujamma Street; and the new Castle Piazza and the Castle.

The second development axis concerns the creation of a new pedestrian path, or "heritage trail," along with the remains of the fortification located on the southeastern edge of the historic core of the city (Fig. 10) (MOTA, Third Tourism Development Project, Annex 1, 2005).

6.4 Sustainable Development Principles

Historic city centers in Jordan are a resource that can significantly contribute to the improvement of the living conditions of the local communities. Thus, strategic development aims to achieve the main principles of sustainability to ensure that these actions will respect the environmental, cultural and economic assets of the historic city. The principles divided into three categories as following:

1. Regulatory actions
2. Physical actions
3. Capacity building.

6.5 Regulatory Actions

6.5.1 Karak Historic Core Regulations

The regulations create a set of policies which aim to maintain and protect the traditional functions by consolidating the existing multi-functionality in all cases where buildings have a clear commercial purpose, such as those on Al-Malik Al-Husayn Street.

It is also designed to regulate building activities and ensure that these regulations are compatible and respect the historic character of the Karak historic core; provide for the protection of monuments and traditional buildings; and rehabilitate activities which aim to improve the living conditions of the inhabitants (MOTA, Main Report, 2005).

6.5.2 Parking and Traffic Management

The development strategy includes the management of parking through developing a strategy of parking meters and the creation of 51 new parking stalls along Al-Malik Al-Husayn Street (Fig. 11), in addition to upgrading the street network and developing a comprehensive traffic program in the historic core, and improving the streetscape of the Karak commercial core (MOTA, Main Report, 2005).

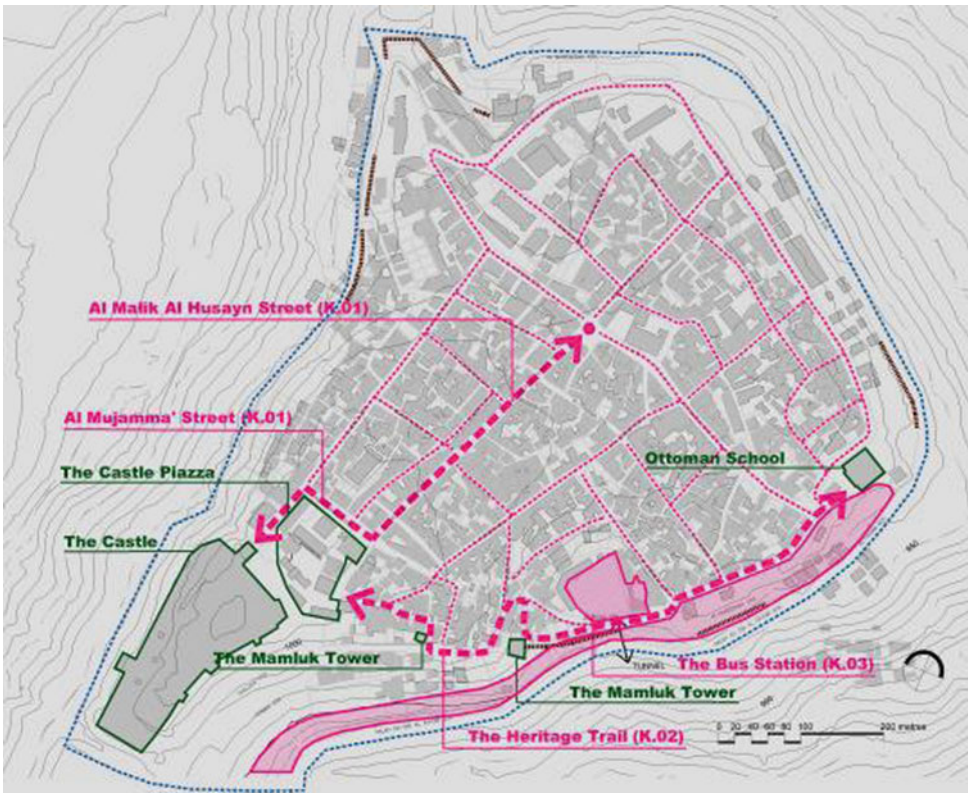

Fig. 10 The main action of the development (*Source* MOTA, Third Tourism Development Project, Annex 1, 2005)

Fig. 11 Traffic management on-Malik Al-Husayn Street (*Source* Researchers)

Parking meters will be located within the parking stalls to manage a payment system; parking meters will be applied with a ratio of one parking meter for every two stalls. The municipality will be the only authority in charge of parking stall management, and will, therefore, be responsible for enforcing the payment of fees and collecting money from the machines.

The comprehensive traffic program will be developed and enforced to organize, administer, govern and control vehicular traffic within the historic core (Fig. 12) (MOTA, Third Tourism Development Project, Annex 1, 2005).

6.6 Physical Actions

6.6.1 Upgrading of the Street Network and the Public Space

The project's objective is that of creating a new circulation pattern within the historical city core that will rationalize the allocation of spaces dedicated to vehicular and pedestrian traffic (Fig. 13). This action focuses on the rationalization and beautification of the street sections of Al-Malik Al-Husayn Street and Al-Mujamma' Street, the landscape enhancement of the street section of Salah Ad-Din Al-Ayyubi, and the rationalization and beautification Salah Ad-Din Al Ayyubi/Al-Madeenah street (Fig. 14) Al-Handasah (2003, 2005).

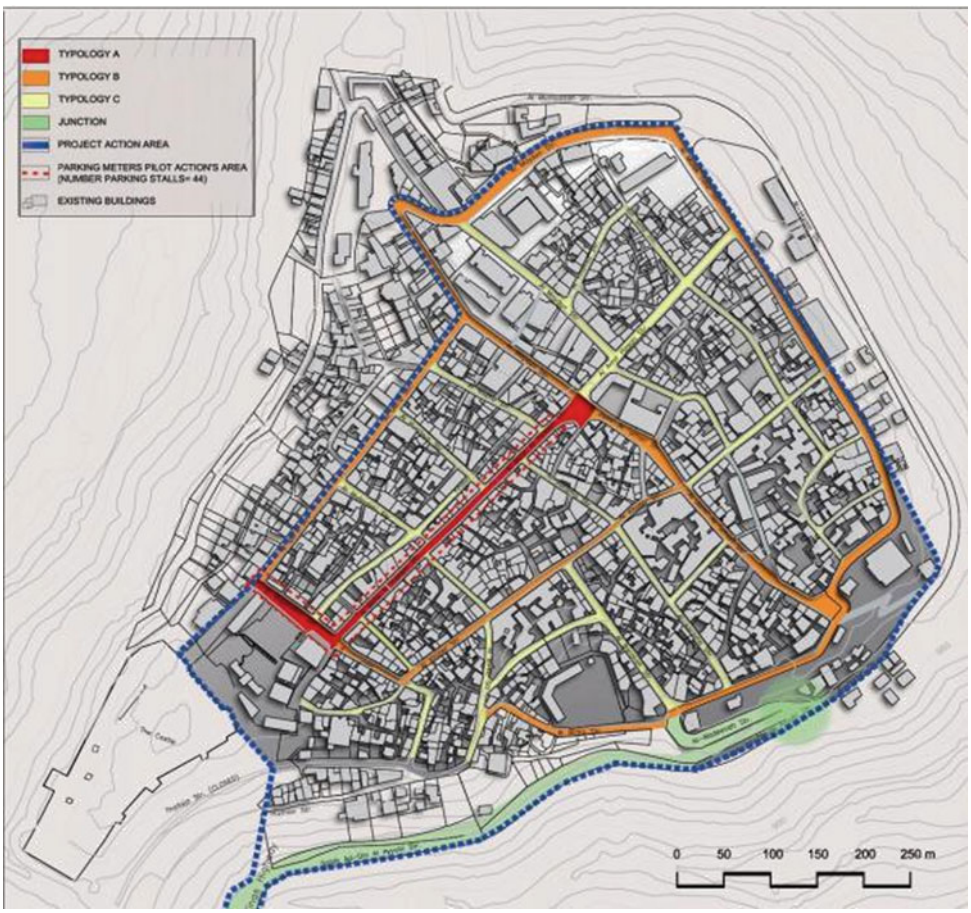

Fig. 12 Traffic management in-Malik Al-Husayn Street (*Source* MOTA, Third Tourism Development Project, Annex 1, 2005)

Fig. 13 View of Al-Madinah Street (*Source* Researchers)

6.6.2 The New "Heritage Trail" Along the Eastern Side of Karak

This project aims to create a new pedestrian path along the southeastern portion of the Old City wall linking the heritage Ottoman School to the renovated central bus station. The new Heritage Trail will then proceed, flanking the two existing Mameluke towers in the direction of the Crusader Castle (Figs. 14, 15, and 16) (MOTA, Third Tourism Development Project, Annex 1, 2005).

6.6.3 The Redevelopment of the Bus Station

The central bus station is located in the southeast part of the Old City, adjacent to Al-Birka Street and close to Salah Al-Din Al-Ayyoubi Street.

Fig. 14 View of Al-Birka Street towards the Mamaluk tower (*Source* MOTA, Third Tourism Development Project, Annex 1, 2005)

Fig. 15 Virtual view of the New Heritage Trail (*Source* MOTA, Third Tourism Development The project, Annex 1, 2005)

The increased economic and population growth in Karak municipality has resulted in higher movements of public transport into and through the Old City causing extensive citywide congestion and the need to provide enhanced facilities for the central bus station.

The new peripheral bus station aims to enhance the role of the central bus station as a gateway to the historic city core while emphasizing the need for a fundamental redesign of the entire compound to create a new quality space on the eastern boundary of the city (Fig. 17). In order to properly enhance the significance of the central bus station as the living, economic and social hub of the city, the project proposes the design and construction of a new hotel and shopping facilities within the station compound (Fig. 18).

6.6.4 Proposed Capacity Building Actions

The general objective of this action aims to improve the organizational and institutional capacity of the municipality in order to:

1. Play its role within the context of the City Revitalization Program
2. Manage and preserve the historical center in a sustainable way
3. Improve its performance in service delivery
4. Play an increased role in the reinforcement of social cohesion, urban integration, and social and economic development of the city.

7 Quality of Tourism Services in Karak

Analysis of tourism services in Karak and their quality might be an approach to shed light on product performance and its ability to penetrate outside tourism markets, mainly because services represent the second pillar in any tourism product together with the available resources, be they cultural, historical, archeological, natural, or otherwise.

An administrator working in the tourism sector commented on tourism services:

"The tourism sector still needs more development; For instance, if a tourist wants to come to Karak individually without being involved in an all-inclusive package, they will face infinite difficulties in moving and transferring from one place to another since Karak lacks a regular means of transport that connects all tourist sites."

Indeed, many of the people who were interviewed agreed that there is insufficiency tourist services and low quality of services.

One inhabitant said:

"Tourist facilities still need huge efforts to enhance them."

However, this point of view might not be shared by tourists who expressed their satisfaction regarding some services, particularly in the accommodation sector (Table 2).

Q: How have you found the quality of the accommodations offered in Karak?

Fig. 16 The New Heritage Trail (*Source* MOTA, Third Tourism Development Project, Annex 1, 2005)

Fig. 17 The new peripheral bus station (*Source* MOTA, Third Tourism Development Project, Annex 1, 2005)

Fig. 18 The existing bus station (*Source* Researchers)

Table 2 Tourist satisfaction in Karak

Expectations	Percentage (%)
Much more than what I expected	15.5
More than what I expected	19.0
As I expected	53.4
Worse than what I expected	12.1
Much worse than what I expected	00
Total	100

Tourists did express some annoyance at the lack of some basic services such as toilets, information points, and road signs. Moreover, tourists complained about the quality of public transportation, the service in restaurants and high prices.

8 Problems and Obstacles Facing Sustainable Tourism Development

There are some main problems and threats regarding tourism development in Karak and these can be summarized as the following:

1. Unawareness by a large segment in society about the importance of tourism and its activities.
2. Lack of facilities in the historic sites and destinations, and if existed, they are inadequately distributed.
3. Weak organizational structure for many frameworks involved in tourism development with lack of funding.

Table 3 Problems and threats regarding tourism development in Karak

Product components	Percentage (%)
Transport quality	16.8
Accommodation quality	8
Restaurant quality	10.6
Price level	32.7
Lack of recreational activities and events	7.1
Lack of some essential services at the archaeological sites	24.8

4. Some public authorities have not taken serious steps to share responsibility with the private sector (Shdeifat 2006).
5. Lack of promotional campaigns and marketing representatives abroad.
6. Lack of expertise in the field of planning and heritage conservation.
7. Neglect of the needs and requirements of the local inhabitants and their lifestyle (Table 3).

9 How Can We Activate Sustainable Tourism Development Strategies?

In order to solve the previous obstacles and problems and enhance the quality of tourism services, the following principles should be ensured:

1. Develop a good relationship between the private and public sector.
2. Apply a comprehensive system of quality control of the Jordanian tourism product.
3. Develop the role of all stakeholders in tourism industry (Government, public inhabitants, private sector) (Fig. 19).
4. The use of efficient instruments and strategies to manage and control the development actions.
5. Enhance both tourist transport services and public transport.
6. Develop promotional efforts and keeping revision for tourism product and using new technologies (Fig. 20).

10 Conclusions and Recommendations

Nowadays, all efforts go toward achieving sustainability in all aspects of life. The tourism industry is considered one of the main pillars of the Jordanian national economy. This research discussed the definition of sustainable tourism and the development of this concept in Jordan.

Karak historic core was one of the main historic cities where the government studied the development of cultural tourism strategies to achieve sustainability and order to increase the socioeconomic benefits for local inhabitants and solve the situation of short-duration stays in the city in a way that respects the local cultural identity and enhances the participation of local inhabitants and the private sector.

Fig. 19 The stakeholders in the Tourism Industry (*Source* Researchers)

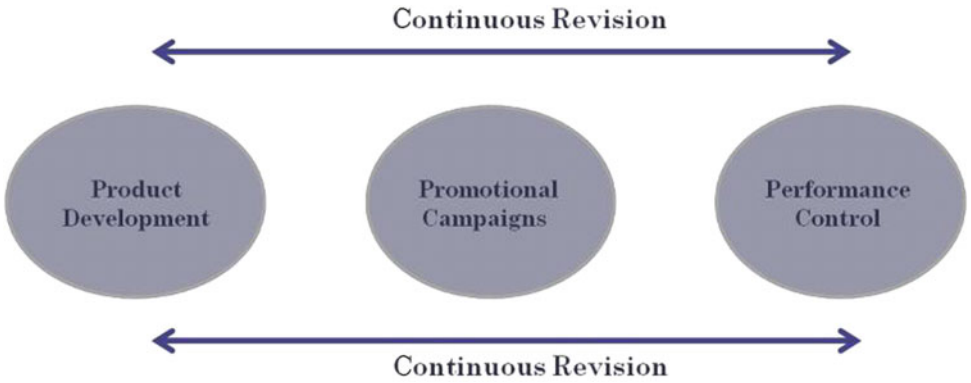

Fig. 20 The continuous revision in tourism development (*Source* Researchers)

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The Criminal Offense of Tax Evasion in the Law of the Republic of Serbia and International Standards

Aladin Šemović, Šaban Gračanin, and Dženan Koca

Abstract

This paper addresses the challenges of Tax evasion and the degree to which the Republic of Serbia's laws have been harmonized with international standards in this area. Tax evasion is a problem faced by every country in the world to a greater or lesser degree. Crimes of tax evasion are often followed by money laundering and other methods of financial fraud, which creates an even more significant problem. These financial crimes, which jeopardize the financial systems within countries, have led to the establishment of international instruments in which countries cooperate to combat these crimes. The Republic of Serbia is also faced with this problem, leading to its formal criminalization under the Criminal Code. However, the use of this criminalization in practice causes numerous problems related to differing interpretations of tax codes on account of the complexity of the financial laws and regulations.

Keywords

Tax evasion • Tax codes • International standards

A. Šemović (✉)
Law Department, International University of Novi Pazar, Novi Pazar, Serbia
e-mail: aladinsemovic@gmail.com

Š. Gračanin
Faculty of Economics, University of Kragujevac, Kragujevac, Serbia
e-mail: saban.gracanin@hotmail.com

D. Koca
Economics Department, International University of Novi Pazar, Novi Pazar, Serbia
e-mail: dzenan.koca@gmail.com

1 Introduction

The criminal offense of tax evasion has been the subject of numerous papers, most of which have been concerned with a theoretical analysis rather than with the problems that practitioners come across daily. However, it is possible to observe that taxation and related criminal offenses are one of the most abstract areas for prosecutors and judges to understand. In addition to the many tax laws that must be understood to deal cases related to this matter adequately, it is also necessary to comprehend the basics of bookkeeping and accounting, which are not a particularly strong skill of lawyers.

If we take into account the very dynamic area of public finances as well as the recent changes in the criminal legislation, we can often conclude that the views of the Instance Courts have already been taken into account, especially given that particular views conflict concerning the same facts. In doing so, we come to a problem concerning not only how to act in an individual case but how this will affect the uniformity of court practice throughout the territory of Serbia. In attempting to find a solution to the legal doctrine, we have come across inconsistencies and contradictory notions that, when applied in practice, bring about even more confusion.

In this paper, we will concern ourselves with an analysis of some court decisions in Serbia related to the current issues at hand and thereby seek to point out the irrationalities and subsequent need to reexamine certain positions.

2 Tax Evasion and Legally Obtained Income

From the preceding description of the criminal offense of tax evasion from Article 229 of the Criminal Code (CC),[1] it follows that the only legally obtained incomes are those that

[1]Criminal Code, "Official Gazette of RS," no. 85/2005, 88/2005-ispr., 107/2005-ispr., 72/2009, 11/2009 and 121/2012.

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can be subject to taxation and about which it is possible to avoid the payment of taxes, contributions, or other prescribed fees. It has long been noted in case law that "the criminal offense of tax evasion can only be carried out concerning income or material legally obtained."[2] However, what has remained unexplained in practice is *what is meant by legally obtained income?* In an attempt to answer this question, we have analyzed the varying legal views presented in several court decisions.

For example, "the sale of goods on 'the black market' means the sale of goods in an unauthorized and unlawful manner,"[3] and in such a situation this would not be legally obtained income, i.e. "an instance of the criminal offense of tax evasion."[4] The view that this is unlawfully obtained income in this case, which cannot be said for any other criminal offense, can also be found in earlier views expressed in the judgments of the former Supreme Court of Serbia.[5]

Since it is not explicitly stated in any law or regulation what is considered to be legally obtained income, then the logical interpretation of accounting, tax, and other regulations through the *argumentum a contrario* method can provide one answer. This "will be evaluated in each specific case, in which it is not necessarily stated in the factual description of the criminal act, in the enacting clause of the indictment, that this is legally obtained income, but it is necessary that the factual description does concern this income."[6] However, "such a finding/ruling was in practice … faced with major problems."[7] This was the reason why the Law on Amendments and Supplements to the Criminal Code (CC),[8] as an essential element of the criminal offense of tax evasion referred to in Article 225 of the CC, delete the term "legally" so that the only question in the definition of this criminal offense concerns the phrase "obtained income." Such an amendment is expected to significantly facilitate the verification of these crimes. Nevertheless, we will analyze the current court practice that is chiefly related to cases before the changes to the Criminal Code, where are still current because of past cases.

If we compare some of the verdicts, we can observe certain irrationalities by how the courts have assessed the lawfulness of the earned income in different ways in similar situations. Thus, for example, in one judgment about the sale of goods on the so-called "black market," it was determined that the defendant "legally obtained the goods. However, that he then sold the goods received without registering the transaction in official books, so that information about which persons, physical or legal, when, in what place, under what prices, and is unknown and thus the proceeds of such goods cannot be described as legally obtained"[9] Contrary to this verdict, the court found in another situation that the defendant "did not report the legally obtained income, in such a way after the sale of goods in four retail facilities…that the money from the sold goods from the market was not paid into the company's account and which, according to expert statements, represents taking money from the company, subject to taxation at the rate of 20%"[10] It is evident that in this second case, the defendant sold goods without registering the transactions in official records and thus did not know with which individuals and at which prices the transactions took place, signifying that these were not legal transactions but the income from the goods thus sold was still considered to be legally obtained. Income can thus be considered to be legally obtained when the court so judges and in cases where it is found that "transactions are not recorded in the official accounting records, and the individual did not enter the payments into the account of the company but used for his purposes those payments, which are considered as income that he was obligated to record and pay income taxes on"[11]

It is interesting to note that "if the inventory displays a lack of goods, this fact is equivalent to the sale of the goods for which VAT is paid, but it cannot be considered by itself as the sale of goods on the black market or in cash without the issuance of fiscal accounts and without paying market prices to the current account, as there is no evidence for this, but the legal assumption is that it entails taking goods that are part of the taxpayer's property for the taxpayer's consumption, that is, the personal needs of the founder and other individuals"[12] This interpretation is based on provisions of

[2]Source: Bora Čejović, *Criminal law in judicial practice: special part*, Lion Mark, Kragujevac, 2008, p. 572.
[3]Judgment of the Appellate Court in Kragujevac Kž1 no.2666/10 from 07.09.2010 (downloaded from: *Propisi.com*).
[4]Judgment of the Appellate Court in Kragujevac Kž no.187/14 from 27.02.2014 (downloaded from: *Propisi.com*).
[5]Judgment of the Supreme Court of Serbia Kzp 283/07 (downloaded from: *Propisi.com*).
[6]*Answers from the Criminal Division of the Appellate Court in Kragujevac, adopted at the session held on 03.12.2014, on the controversial issues raised by the Criminal Offices of the Basic Court in Jagodina and Čačak.*
[7]J anko Lazarević, Milan Škulić, "Basic planned changes to the Criminal Code of Serbia," *Bulletin of the Supreme Court*, no. 2/2015, p. 56.
[8]"Official Gazette of RS" no. 94/16.
[9]Judgment of the Appellate Court in Kragujevac Kž1-362/13 from 06.02.2014 (unpublished decision).
[10]Judgment of the Appellate Court in Kragujevac Kž1-4088/13 from 18.02.2014 (unpublished decision).
[11]Judgment of the Appellate Court of Kragujevac Kž1- 249/15 from 16.04.2015 (unpublished decision).
[12]Judgment of the Appellate Court of Kragujevac Kž1-1608/14 from 29.01.2015 (unpublished decision).

Article 4 Paragraph 4 Point 1 of the Valued Added Tax Act[13, 14] and Article 2 Paragraph 2 of the Code on determining what is considered as taking and using goods, other sales of goods, and the provision of services free of charge in determining the generally quantities of business supplies, advertising material, and other gifts of lesser value.[15, 16] However, it is unclear how an unlawfully obtained income can be determined by contravening the legal personality of a company,[17] which, contrary to the law,[18] was not recorded and documented, has still not been "validated", and has been given a presumption of legality, and it is even less clear that the alimentary goods in the amount of 18,235,693.32 dinars (approximately 150,000 euros) were established in the case as goods for consumption by the two accused individuals over a period of 9 months, which is, of course, a matter for a legislator.[19]

Given that there are entirely different views between the appellate courts regarding specific issues related to this matter, we can conclude the following. Namely, according to one opinion,[20] if the defendant's false accounts, or so-called phantom companies, are used as a deductible item in the form of previous VAT, then it is not possible to discuss the legality of the obtained income as one of the essential elements of this criminal offense because there was no transaction. Contrary to this position, it has also been found[21] that it is irrelevant whether the goods were sold or not because the defendants, recording the falsified invoice accounts, effectively assumed the right to deduct the tax based on the previous VAT, harming the budget of the Republic of Serbia. In the first case, there was an acquittal, and in the second case, a conviction. Thus, given substantially the same factual and legal conditions, we are presented with two distinctly different rulings by two appellate courts, in this case, the Appellate Court in Novi Sad and the Appellate Court in Kragujevac.

A particular problem in this area is the confiscation of property benefits in the case of these criminal offenses. Namely, as previously discussed, if during the criminal procedure it is determined that the income was not legally obtained, then tax evasion cannot be dealt with (this refers to the situation before the change in the Criminal Code) but instead another criminal offense, in which case this income cannot be taxed but must be confiscated.[22] Here it must be noted that the position of court practice that "the tax liability and the amount that would be calculated and paid on the basis of tax liability are not included in the abuse (misuse of the official position referred to in Article 359 of the CC or the abuse of the position of the responsible individual referred to in Article 234 of the CC), in light of the consequences of the subject matter."[23] On the basis of the aforementioned, this would mean that the case is relevant when, if an individual is convicted of the criminal offense of abuse of the position of the responsible individual referred to in Article 234 of the CC (now Article 227 of the CC) they are deprived of the material gains in the amount of the value of goods illegally obtained from the company selling it on "the black market" and not to the amount of the tax evasion. This further leads us to the question, are these actions of the defendant to the detriment of the company? If so, then under Article 93 Paragraph 1 of the CC, if the property claim of the company is accepted in the amount of the value of the goods in question, the court will not be able to impose a confiscation of the property gained. Such a situation could lead to the case where nothing is confiscated from the defendant since their company was awarded a property claim, which would be absurd. We can add to this finding that in this case, the company cannot be considered criminally responsible under Article 6 of the Law on the Liability of Legal Persons for Criminal Offenses[24] because in the same way it is not a realized benefit but for a physical person who appears as the owner or director.

3 Application of an Extended Criminal Charge for Tax Evasion

In judicial practice, we often come across various notions as to whether the institute of an extended criminal offense can be applied in the case of tax evasion. If it is accepted that the obligation to avoid payment is prescribed in more severe forms, there is a "qualifying circumstance (which must be determined by the intent of the perpetrator), regardless of the

[13]"Official Gazette of RS," no. 84/2004, 86/2004, 61/2005, 61/2007, 93/2012, 108/2013, 68/2014, 142/2014, 83/2015.
[14]The circulation of goods for compensation is equated with the acquisition of goods that are part of the taxpayer's business property for the personal needs of the founders, owners, employees, or other individuals.
[15]"Official Gazette RS," no. 118/12.
[16]Personal consumption is also considered to be a shortage of goods, in addition to a defect that can be justified by force majeure or in another prescribed manner (natural disaster, theft, traffic accident, etc.) determined on the basis of the act of the competent authority or organization.
[17]Art. 18. Para. 2. Point 2. Law on Commercial Enterprises, "Official Gazette of RS," no. 36/2011, 99/2011, 83/2014, 5/2015.
[18]Art. 10. Law on Accounting, "Official Gazette of RS" no. 62/2013.
[19]Please note that these are the most recent regulations at the time of writing.
[20]Judgment of the Appellate Court in Novi Sad Kž 1 – 3055/12 from 14.05.2013 (downloaded from: *Propisi.com*).
[21]Judgment of the Appellate Court in Kragujevac Kž.1-844/15 from 17.11.2015 (unpublished decision).
[22]Decision of the Appellate Court in Niš Kžl no. 431/10(downloaded from: *Bulletin of the Appellate Court in Niš*, no. 1/2010).
[23]Judgment of the Appellate Court in Kragujevac Kž1 362/13 from 06.02.2014 (unpublished decision).
[24]"Official Gazette of RS," no. 97/2008.

fact that it is formulated in the same way as in the basic form[25] in that case, there is no obstruction to compliance with the provisions of Article 61 Paragraph 5 applied in this case if the legal requirements are met for it."[26, 27] Thus "the appellate court finds that since the defendant committed more of the same crimes over the same time period and that they represent a single act because of the exemption that the payment of the tax on deductions over two fiscal years on which the individual avoided tax obligations exceeded the amount of one million five hundred thousand dinars, the defendant committed an extended criminal offense of tax evasion from Article 229 Paragraph 2 in relation to Paragraph 1 of the CC, in which the basic form is referred to in Article 229 Paragraph 1 of the CC."[28, 29] However, in some rulings, the view is that the amount of tax evasion across different years is not to be accumulated.[30] It follows from the above that the application of Article 61 of the CC is partial, i.e., that the courts apply the extended criminal offense to tax evasion but do not apply Paragraph 5 of that article, which explains that sums from different calendar years cannot be collected and that an extended criminal offense may take place in a more severe form.

In regards to the primary form of this criminal offense, bearing in mind that the prescribed amount of the obligation avoiding payment constitutes an objective condition of incrimination, "the amount of tax evasion in a calendar year, which is a fiscal business year, must be significant, which arises from provisions in Article 41 Paragraph 3 of the Law on Tax Procedure and Tax Administration and it is unacceptable to collect amounts of tax liabilities for which payment has been avoided in two calendar years."[31] This position is also taken by the Supreme Court of Cassation in its findings on a request for the protection of the legality of the Republic's Public Prosecutor.[32]

It is also interesting to note the starting point "that the act of committing the criminal offense of tax evasion is… determined by the verb 'gives'… which means that the act of committing the criminal act implies the undertaking of only one activity, while the undertaking of more activities in this area constitutes a unique act of execution … and in this case there was no basis for the application of Article 61 of the CC because the actions of the defendants constitute a single actions and not individual criminal offenses that would constitute a part of the extended criminal offense."[33]

4 A Review of Court Practice Related to the Criminal Offense of Nonpayment of Tax on Deductions Referred to in Article 226 of the CC (Formerly Article 229 of the CC)

Through the changes to the Criminal Code in 2009. And then since 2012, this criminal offense officially registered before taking on its current interpretation.[34] One of the controversial issues that have appeared in court practice is how to prove the intention not to pay taxes on the deduction, which contributes to other prescribed fees. There is a view that "the very fact of failing to pay taxes, as a rule, indicates the existence of this intention except cases of omission and the like, where there would be no such intention."[35] This interpretation stems from the legal formulation itself, which implies that the perpetrator has already calculated the amount of tax on the deduction, the contributions for compulsory social security after deductions, and other prescribed fees, but did not pay these fees to the prescribed payment account for public revenues. However, on the other hand, there is a view that this intention has not been proven "until first taking into account the indisputable fact that the defendant displayed such tax obligations in their official records, which indirectly suggest that they were not hidden with the intention of never paying them which may possibly constitute a certain tax misdemeanor."[36] In this way, we have two entirely different approaches to determining the existence of this intent as a subjective element of the criminal act, which in the future will unquestionably lead to

[25]In the basic form, the obligation of payment avoided represents an objective requirement of incrimination.
[26]Zoran Stojanović, *Commentary of the Criminal Code*, Official Gazette, Belgrade, 2012, pp. 678–679.
[27]Order Art. 61. Para. 5. of the CC states: "If an extended criminal offense includes criminal offenses whose significance is a certain amount of money, it will be considered that the extended criminal offense has resulted in the sum of the amounts accumulated by the individual acts if this is covered by the unique intent of the perpetrator."
[28]Judgment of the Appellate Court in Kragujevac Kž 1-4670/10 from 24.09.2010 (downloaded from: *Propisi.com*).
[29]The same view was taken into account in the judgment of the Appellate Court of Kragujevac Kž1-4088/13 from 18.02.2014 (unpublished decision).
[30]Judgment of the Appellate Court in Kragujevac Kž 1-249/15 from 16.04.2015 (unpublished).
[31]Decision of the Appellate Court in Novi Sad Kž1-2739/11 from 15.04.2013 (downloaded from: *Propisi.com*).
[32]Judgment of the Supreme Court of Cassation Kzz 56/11 from 31.08.2011 (downloaded from: *Propisi.com*).
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[34]In theory, it is correct that there was no room for the inclusion of this incrimination into the basic criminal legislation and that the aforementioned actions should have been prescribed as an misdemeanor. See: Nataša Delić, *New solutions in a special part of the CC of Serbia*, Faculty of Law, University of Belgrade, Belgrade, 2014, p. 79.
[35]Zoran Stojanović, ibid., p. 681.
[36]Decision of the Appellate Court in Belgrade Kž2 137/15 from 03.02.2015 (from: http://www.bg.ap.sud.rs/cr/articles/sudska-praksa/izabrane-sentence/krivicno-odeljenje/, accessed 05.04.2016).

serious controversy. Otherwise, the problem of determining the intent for this and the previous criminal offense are to be determined by doctrine and case law. Certainly this can be determined based on the actual conduct of the perpetrator,[37] that is, as with any other subjective element; its verification is to be based on previously established objective facts.

In the case of this criminal offense, the issue of the nonexistence of the objective condition of incrimination in its basic form can also be raised as a serious problem, such that the amount calculated on behalf of the tax on deduction and not paid is irrelevant, in contrast to the criminal offense of tax evasion (Article 229)."[38] However, what should be done if the amount calculated, but not the unpaid tax or contribution, is small or insignificant? Some consider that, in this case, while "other conditions may have been met, the existence of a criminal offense can be ruled out by applying an issue of minor importance."[39] In our view, this decision, bearing in mind the nature of this criminal offense, is debatable because we consider that one of the mandatory conditions of the prescribed Article 18 Paragraph 2 of the CC is missing and that the degree of guilt of the perpetrator is no higher. It would be difficult to avoid paying a tax on the deduction, contributions, and other prescribed fees, and it could lead to a lesser degree of guilt. In this respect, the CC would be more suitable if it provided for the primary form of an objective condition of incrimination.

5 Compliance of the Laws of the Republic of Serbia with International Standards Concerning the Fight Against Tax Evasion

At the international level, several regulations were adopted that directly or indirectly deal with this issue. We will mention some of the most important in this area and point to the degree of harmonization with them by the laws of the Republic of Serbia.

As far as the United Nations is concerned, it is necessary to mention the 2003 Convention against Corruption, which Serbia ratified in 2005. In addition to the fact that the Convention requires its state parties to establish an effective system of control and increase the transparency of public finances, it also requires the introduction into legislation of a longer period for the limitations for criminal offenses related to corruption. Bearing this in mind, the Criminal Code of Serbia prescribes a long limit for the prosecution of corruption offenses as well as for fiscal crimes. Additionally, regulations of the Ministry of Finance were established that creating a system of internal financial controls in the public sector. The 1997 Declaration on Anti-Corruption adopted the International Code of Conduct for Civil Servants, which requires civil servants to protect the integrity of the institution in which they work and to ensure transparency in the use of public funds that they have at their disposal. Given this, Serbia has established a system of internal and external mechanisms for the control of spending of public funds and has prescribed criminal offenses for the inappropriate use of such funds. The 2001 Vienna Declaration on Crime and Criminal Justice state that economic crimes, as an integral part of economic crimes, should be the backbone of the fight against organized crime. It also foresees the adoption of a national crime prevention strategy, which Serbia has achieved by adopting the National Anti-Corruption Strategy in 2013.

On the other hand, Serbia strives to join the European Union. Therefore, it must harmonize its legal system with EU standards. In this respect, the Criminal Law Convention on Corruption in 1991 and the Convention on the Protection of Financial Interests of the European Union in 1995, which require state parties to pass national legislation outlining criminal offenses to protect the financial system of the European Union, are of importance. In order to cooperate in the fight against financial crimes, the 2011 Directive on Administrative Cooperation in the field of taxation is also of significance, as well as the Regulation on Administrative Cooperation in the area of value-added taxes in 2003.

6 Concluding Remarks

In light of the preceding discussion, it follows that court practice in Serbia is conspicuously inconsistent regarding the application of the criminal offense of tax evasion, thereby causing uncertainty in the conduct of the judicial authorities and legal uncertainty among citizens. The problem is even more significant for other so-called tax offenses that can be found in secondary criminal legislation, and more specifically in specific tax laws, and the judicial practice is uneven and often inconsistent, which further reinforces the problems above.[40] All this leads to widely varying outcomes for individuals tried for the same action, depending on the area in which the case is tried. Therefore, the contradictory interpretations regarding this issue must first be seriously analyzed and then possible solutions must be indicated, if not through judicial findings then by proposals to the

[37]Mirko Kulić, Goran Milošević, "Ratio of criminal offense of tax evasion and non-payment of tax on deduction in Serbian criminal law," *Annals of the Faculty of Law in Belgrade*, no. 2/2011, p. 332.
[38]Zoran Stojanović, ibid., p. 680.
[39]Ibid.

[40]Details of these other tax crimes in: Gordana Ilić Popov, "Tax crimes in Serbian tax legislation," *Science-Security-Policy*, no. 1/2016, pp. 40–56.

legislature to amend the current regulations. As mentioned, "the omission of the property of the legally obtained revenues…does not automatically establish the duty to pay taxes concerning unlawfully obtained income, but it will lead to more confusion in practice."[41] Therefore, in our opinion, with the help of experts from the field of public finances, it is necessary to consider amending the tax laws, which would more clearly and precisely define the exact provisions concerning tax offenses and their implementation in practice. Finally, we must emphasize that only those countries with clear tax regulations that effectively manage their economic activities can achieve the necessary foundations for economic development and international cooperation in the fight against financial crimes.

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[41]Radmila Dragičević – Dičić, "Along with amendments to the Criminal Code," *Bulletin of the Supreme Court of Cassation*, no. 2/2015, p. 25.

The Legal Status of Nuclear Energy in the United Arab Emirates: Great Ambitions, Great Partnership, Sustainability and Complete Respect of International Law

Amer Fakhoury

Abstract

The UAE's peaceful nuclear program has a strategic position and an essential and dynamic role in supporting the country's growth by promoting energy security and diversifying the economy. This paper describes the current status of the legal aspect of nuclear energy in the United Arab Emirates in light of international multilateral and bilateral agreements. As the industrial progress of societies increases in the UAE, the need for nuclear energy becomes a major priority. Interest in nuclear power has been revitalized as a result of unpredictable fossil fuel prices. For the Emiratis, the traditional energy of sources such as oil, coal, and natural gas, will be depleted in a century, as well as the traditional sources constitute a significant risk for the environment both when extraction and transport or when producing energy. In this direction and since the traditional sources are limited, officials in the UAE believe that it is necessary to find new alternatives to energy, so the UAE has turned its attention to nuclear energy. The United Arab Emirates is one of the leading countries in the Arab region that has realized this importance and has started to speed up the process by installing many projects to establish peaceful nuclear reactors that comply with international legal standards in terms of safety, environmental protection, security and non-proliferation. In 2009, the UAE President approved Federal Law by Decree No 6 of 2009, Regarding the Peaceful Uses of Nuclear Energy.

Keywords

Nuclear energy • IAEA • CTBT • NPT • Environment • International law

A. Fakhoury (✉)
American University in the Emirates, Dubai, United Arab Emirates
e-mail: amer.fakhoury@aue.ae

1 Introduction

Nuclear energy is one of the most critical energy sources worldwide, providing about 11% of the world's electricity (Kaplan et al. 2017). At the begging of this research, it is essential to mention what are the advantages and disadvantages of nuclear energy (Akyüz 2017). We must point out that there is a historical conflict between supporters and opponents of nuclear energy, especially between two ideas: nuclear energy may decrease state's energy dependency on other countries, and the different idea is nuclear energy poses severe risks to the environment, which may affect human health and lives. We have to admit that the accidents such as Chernobyl (International Atomic Energy Agency 2006) and recently Fukushima (Sanger and Wald 2011) a few years back have increased people's fear of nuclear energy however that there are many reasons that are pushing countries to resort to this energy such as Low fuel consumption compared with fossil fuel stations; it's a clean source because it does not release chemicals and pollutants during use; It produces enormous amounts of energy; The radiation emission rate of nuclear power plants is relatively low; The long-term operation of the stations for up to 40 years is a decisive advantage of nuclear power. However, we are to take into consideration the following points: The cost of nuclear energy is especially expensive for those long-term stations; The urgent need for vast amounts of water to run nuclear reactors; Storage of radioactive waste in seismic-free zones. Difficulty in disposing of radioactive waste; The existence of significant concerns centered on the public safety of the population of the land. There are several Middle Eastern countries with nuclear power programs currently operating or planned, but the size and maturity of the proposed nuclear programs in addition to the challenges vary from country to country (Ahmed 2018). Nuclear energy has an important role to play in the United Arab Emirates' future, which has the most developed program in the region. Energy is indispensable for all countries. Nuclear energy

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offers the UAE with the occasion to develop a clean, reliable, and efficient source of electricity. A recent analysis conducted by official UAE entities has concluded that national annual peak demand for electricity is likely to rise to more than 40,000 MW's by 2020, reflecting a cumulative annual growth rate of roughly 9% from 2007 onward (United Arab Emirates 2009).

Nuclear energy is one of the types of energy used to generate electricity. It is defined as the energy produced by controlling fission or fusion reactions. This energy is seen by scientists as a real source that is not running out.

The United Arab Emirates needs more electricity to power new sectors for manufacturing and construction and healthcare. With the growth of the new industry comes an increased population, and increased use of energy and water to power the economy (The Emirates Nuclear Energy Corporation (ENEC) 2018). In 2007, the UAE Government conducted an extensive study into the nation's growing energy demands and electricity generation capacity. The study found that existing and planned electricity supply would not meet future demand. Like many developing economies today, the UAE was faced with an urgent need to develop additional sources of energy to power its growth, while addressing the realities of climate change and the need to deploy cleaner, low-carbon technologies (The Emirates Nuclear Energy Corporation (ENEC) 2018).

The UAE is rich in many national resources, specially oil, gas, however, other resources such as water, consider a direct challenge, so The UAE resorts to desalination. Abu Dhabi will build the world's largest water desalination plant to serve the emirate and other parts of the UAE (Sebugwaawo and Khaleej Times 2018).

Nuclear energy emerged as the right choice for the UAE because it is a safe, clean, and proven technology, it is commercially viable, and it delivers significant volumes of base load electricity with nearly zero emissions. Nuclear energy will diversify the nation's energy supply while ensuring our future energy security. Investment in nuclear energy will also drive the growth of a significant, high-tech industry in the UAE and provide high-value jobs for decades to come (The Emirates Nuclear Energy Corporation (ENEC) 2018).

With the development of its peaceful nuclear energy program, the UAE is moving decisively forward with an energy portfolio that is adequately diversified and balances our nation's need for constant and growing electricity supply with a responsibility to implement cleaner, low-carbon technologies.

The reasons for countries to search for nuclear energy differ, but the UAE has announced on more than one occasion that there are four main reasons that have made it take essential steps towards nuclear energy.

Four reasons have been mentioned according to the official responses from UAE's officers

1. Nuclear energy can generate large, stable volumes of base load electricity 24 h per day, 365 days per year, regardless of the weather. The investment in nuclear energy will help the UAE to develop more diversified and environmentally friendly energy solutions for both domestic use and foreign distribution (The Emirates Nuclear Energy Corporation (ENEC) 2018).
2. It will enable the nation to reduce its emissions, diversify its energy supply, increase energy security, and bring the benefits of affordable, clean, reliable energy to a growing population.
3. It will help the UAE meet its sustainability commitments —By 2020, the UAE's four operating power plants will save 12 million tons of carbon dioxide being released into the air every year. That's the equivalent volume of 420 million Toyota Camry cars.
4. The technology is also proven. As of July 2015, 30 countries worldwide are operating 438 nuclear reactors for electricity generation, and 67 new nuclear plants are under construction in 15 countries (The Emirates Nuclear Energy Corporation (ENEC) 2018).

2 UAE Nuclear Energy Policy: Transparency, Non-proliferation, Safety and Security, International Standards

UAE's nuclear program is "an example of transparency in providing the energy needs by commitment towards non-enrichment or recycling, with the help of some governments and institutions of other countries, and under the supervision of IAEA. "The IAEA recommends that a nuclear law must be consistent with a general legal and regulatory framework of the country and reflect the level and focus of its nuclear program if it wants to be efficient and effective. It would also be quite beneficial to ensure maximum alignment and consistency between national nuclear legal systems, despite the individual needs of the national legislative system" (Stoiber et al. 2010).

The Constitution of the UAE (*see the spirit of article 12, article 20, article 40, article 47/4, article 60/7, article 125 and article 147*) recognize the priority of universally recognized provisions of international law of the UAE, is an integral part of its legislation system. We believe that legal rules related to nuclear powers are in complete respect of international law standards. The UAE released its Policy on 'The Evaluation and Potential Development of Peaceful Nuclear Energy' (United Arab Emirates 2009). This policy

is made on the most rigorous standards of safety, transparency, and security, making UAE an ideal country to be followed, especially from the Middle East for nuclear energy. The policy highlights six key principles (United Arab Emirates 2009):

1. The UAE is committed to complete operational transparency.
2. The UAE is committed to pursuing the highest standards of non-proliferation.
3. The UAE is committed to the highest standards of safety and security.
4. The UAE works directly with the IAEA and conforms to its standards in evaluating and establishing its peaceful nuclear energy program.
5. The UAE is developing its peaceful domestic nuclear power capability in partnership with the governments and firms of responsible nations, as well as with the assistance of appropriate expert organizations.
6. The UAE is committed to conducting its peaceful domestic nuclear power program in a manner that best ensures long-term sustainability.

These policies are protected in several instruments, including the UAE Federal Nuclear Law signed in October 2009.

2.1 Complete Transparency: The Way to National and International Trust

Getting the confidence of the local and international community on nuclear energy is something that cannot be demanded but something that can be gained, which certainly needs time. We must not lose sight of the importance of confidence at the regional and international levels. Building confidence takes time, and rebuilding it takes much longer. One of the things that will speed up the confidence with the international community is the stability of the regime and the peaceful relationship with the international community. Another point that promotes International confidence is the accession to international conventions.

I believe that the UAE has been able to win the confidence of the international community through several positions, as its permanent position that diplomacy will always be the key to resolving the region's crises. The UAE's vision for a secure and prosperous future for the international community stems not from a theoretical philosophy but from a sincere desire to advance progress. Moreover, based on a real and successful development experience witnessed by the international community as a whole. Its Constitution reflects the elements of its success based on cooperation, understanding, and compromise between all its authorities and components. The belief of the UAE leadership in human and civil values is firm, its true love for peace and its pursuit of human progress and cooperation for the happiness of societies based on social justice through the establishment of justice and the establishment of security and stability throughout the world. Based on that, the UAE acknowledges that transparency in nuclear energy, vis-à-vis stakeholders, domestic civil entities and international organization specially IAEA, is essential to gain domestic support and assure the international community, potential bilateral partners and international nuclear supervisory bodies of the peaceful intentions of any nuclear program undertaken by the UAE (United Arab Emirates 2009). For that previous reason, the UAE will establish a Nuclear Energy Program Implementation Organization (NEPIO) to evaluate and potentially implement a peaceful nuclear energy program within the UAE.

2.2 The Highest Standards of Non-proliferation and Commitment to International Law

The United Arab Emirates (UAE) is a member of the majority of treaties, organizations, and regimes related to non-proliferation. Thirteen international conventions and agreements have been signed by UAE, which is often referred to as a model for the nuclear peaceful country in the region. In 1987 UAE signs Convention on Early Notification of a Nuclear Accident (International Atomic Energy Agency 1987); 1987 UAE signs Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (International Atomic Energy Agency 1986); 2000 UAE concludes the UN Comprehensive Test Ban Treaty (United Nations Office for Disarmament Affairs 2018); 2003 UAE signs Comprehensive Safeguards Agreement; 2003 UAE signs Convention on Physical Protection of Nuclear Material (International Atomic Energy Agency 1979); 2005 UAE concludes the International Convention for the Suppression of Acts of Nuclear Terrorism (Perera 2005); 2009 UAE signs the Convention on Nuclear Safety (International Atomic Energy Agency 1994); 2009 UAE ratifies the Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste (International Atomic Energy Agency 1997); 2010 UAE ratifies the Additional Protocol to the Safeguards Agreement (International Atomic Energy Agency 2018); 2012 UAE ratifies the Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage of 1997 (International Atomic Energy Agency 1998); 2012 UAE ratifies the Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention (International Atomic Energy Agency 1992); 2014 UAE ratifies Convention on Supplementary Compensation for Nuclear Damage (Federal Authority for Nuclear Regulation 2018). We will discuss in brief some of them as follows:

2.2.1 UAE and Treaty on Non-proliferation of Nuclear Weapons (NPT)

One of the most important treaties in terms of nuclear energy and non-proliferation is NPT (Treaty on the Non-Proliferation of Nuclear Weapons (NPT) 2014). This treaty has been signed in 1968 and entered into force 1970 and was extended indefinitely on 11 May 1995. The NPT is a landmark international treaty whose objective is to stop the spread of nuclear weapons and weapons technology, to encourage collaboration in the peaceful uses of nuclear energy and to promote the goal of achieving nuclear disarmament (United Nations Office for Disarmament Affairs 2018). A total of 191 States have joined the Treaty, including the five nuclear weapon States. The UAE became a party to the Non-Proliferation Treaty in 1996. The UAE also is a member of the International Atomic Energy Agency (IAEA) since 1976 and cooperates with the Missile Technology Control Regime. The UAE is a partner nation on the Global Initiative to Combat Nuclear Terrorism.

2.2.2 A Safeguards Agreement Between UAE and IAEA

In addition to NPT, A safeguards agreement with the IAEA was signed in 2002 and entered into force in 2003 (International Atomic Energy Agency 2018). It is essential to know in this field the importance of this kind of safeguards agreements. According to IAEA, the vast majority of safeguards agreements are comprehensive safeguards agreements that have been concluded with non-nuclear weapon States parties to the NPT (International Atomic Energy Agency 2018). Under a comprehensive safeguards agreement, the IAEA has the "*right and obligation to ensure that safeguards are applied on all nuclear material in the territory, jurisdiction or control of the State for the exclusive purpose of verifying that such material is not diverted to nuclear weapons or other nuclear explosive devices*" (International Atomic Energy Agency 2018).

2.2.3 UAE and the Right to Enrich Uranium

Is there a right to UAE to enrich uranium under International Law? The only provision under international law that could provide an answer and some clarification to this question is article 4 from NPT of 1970. This article has mentioned some terms that seem clear and visible for some interpreters and ambiguous and unclear for others. For the Americans and some western countries, Article 4 of NPT is silent on the matter. It neither confers a right nor denies a right. However, The NPT treaty language is quite clear. The article says that "right of all the Parties to the Treaty to develop research, production, and use of nuclear energy for peaceful purposes" is an inalienable right. Yes, the article does not directly mention enrichment, but I believe that enrichment for peaceful purposes is implicitly recognized as a right by the NPT. Otherwise, what is the importance to give states parties the right to develop research, production if that does not include the enrichment? However, the leaders in the UAE have taken a wise and clear position by informing the international community that they will not recourse to uranium enrichment. There is no doubt that the position of the UAE has a respectable impact from the international community and confirms the UAE's position on the peacefulness of its nuclear program, especially in light of the political issue related to the nuclear program of the eastern neighbor.

2.3 UAE and IAEA Convention on the Physical Protection of Nuclear Material CPPNM

UAE joined this convention in 2003. The Convention on the Physical Protection of Nuclear Material which was signed at Vienna and New York on 3 March 1980 is the only international legally binding undertaking in the area of physical protection of nuclear material.

It establishes measures related to the prevention, detection, and punishment of offenses relating to nuclear material (International Atomic Energy Agency 2018). The CPPNM obligates parties to: "make specific arrangements and meet defined standards of physical protection for international shipments of nuclear material for peaceful purposes and undertake not to export or import nuclear materials or to allow their transit through their territory unless they have received assurances that these materials will be protected during international transport in accordance with the levels of protection determined by the Convention" (International Atomic Energy Agency 1979).

2.4 UAE and UN Comprehensive Nuclear Test Ban Treaty (CTBT)

It is necessary to mention at the beginning that CTBT, which UAE is party since 2003, is a multilateral treaty that bans all nuclear explosions, for both civilian and military purposes, in all environments (United Nations Office for Disarmament Affairs 2018). Two primary obligations are imposed on states as per article 1 from the convention: "1. *Each State Party undertakes not to carry out any nuclear weapon test explosion or any other nuclear explosion, and to prohibit and prevent any such nuclear explosion at any place under its jurisdiction or control*. 2. *Each State Party undertakes, furthermore, to refrain from causing, encouraging, or in any way participating in the carrying out of any nuclear weapon test explosion or any other nuclear explosion*" (United Nations Office for Disarmament Affairs 2018).

The UAE is a leading country in urging the cessation of nuclear tests. The Comprehensive Nuclear-Test-Ban Treaty

Organization (CTBTO) has praised the efforts made by the United Arab Emirates to maintain international peace and stability and its support for the efforts to halt nuclear armament. UAE, like other State parties to the (CTBT), has the right to establish nuclear projects in a peaceful and legal framework. Article IV and Its branches says in this matter that "*The States Parties undertake to promote cooperation among themselves to facilitate and participate in the fullest possible exchange relating to technologies used in the verification of this Treaty in order to enable all States Parties to strengthen their national implementation of verification measures and to benefit from the application of such technologies for peaceful purposes. The provisions of this Treaty shall be implemented in a manner which avoids hampering the economic and technological development of the States Parties for further development of the application of atomic energy for peaceful purposes*" (United Nations Office for Disarmament Affairs 2018).

The Comprehensive Nuclear-Test-Ban Treaty (CTBT) is a building block of confidence, as it guarantees that no nuclear tests will occur. It is a common factor between the landlocked and non-nuclear weapon States and constitutes a solid basis for further dialogue and expansion of cooperation.

3 Partnerships with Responsible Nations and Appropriate Experts

The agreement of Non-Proliferation of Nuclear Weapons (NPT(of 1968 is the cornerstone of the cooperation agreements signed or will be signed in the future by the UAE with other developed countries in the nuclear field. The preamble, as well as article IV para two clearly explains the right of all State parties to use nuclear energy for peaceful purposes. The preamble says clearly in the that "*The benefits of peaceful applications of nuclear technology, including any technological by-products which may be derived by nuclear-weapon States from the development of nuclear explosive devices, should be available for peaceful purposes to all Parties to the Treaty, whether nuclear-weapon or non-nuclear-weapon States*" (United Nations Office for Disarmament Affairs 2018).

In the same direction article IV, para 2 highlights the idea as follows "*All the Parties to the Treaty undertake to facilitate, and have the right to participate in, the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy. Parties to the Treaty in a position to do so shall also co-operate in contributing alone or together with other States*" "*to the further development of the applications of nuclear energy for peaceful purposes, especially in the territories of non-nuclear-weapon States Party to the Treaty, with due consideration for the needs of the developing areas of the world*" (United Nations Office for Disarmament Affairs 2018).

Based on that principle, it is the right of the UAE, according to international law, to contract with the nuclear-armed state in order to benefit from their expertise and experience. I must go further by saying that it is the duty of the developed countries to cooperate sincerely with the UAE. The United Arab Emirates considers nuclear cooperation with the international community is one of the main pillars in the success of its nuclear energy plans. Ten agreements have been signed for the moment. It was headed towards some of the leading countries in this field, particularly South Korea and the United States, France, Argentina, UK, Japan, Australia, Canada, Russia.

Since 2008, date of adoption of the policy on the Evaluation and Potential Development of Peaceful Nuclear Energy, UAE moved with courage and with steady steps, by signing bilateral agreements with nuclear-supplier countries, bearing in mind the international obligations relating to nuclear energy.

3.1 The U.S.–UAE 123 Agreement for Peaceful Civilian Nuclear Energy Cooperation

The peaceful nuclear cooperation between the United States of America and the United Arab Emirates, which entered into force on 17 December 2009 and enabled the UAE to receive nuclear know-how, materials, and equipment from the U.S (Embassy of United Arab Emirates, US 2018). "Under the terms of this agreement, the UAE will gain access to significant capabilities and experience in the peaceful use of nuclear energy. This will allow the UAE to develop its civilian nuclear program to the highest standards of safety, security, and non-proliferation. The agreement will also open opportunities for US firms to be active participants in the UAE nuclear energy program" (Embassy of United Arab Emirates, US 2018).

3.2 UAE and the Ad hoc Initiative

In addition to the fact that the UAE is a member of several international agreements related to nuclear energy and non-proliferation, the UAE is supporting several ad hoc initiatives as follows:

3.2.1 UAE and Megaports Initiative

The Megaports Initiatives was set up by the U.S. Department of Energy's (DOE) in 2003 to scan and screen as much container traffic as possible at high-volume international seaports for unique nuclear and other radiological materials.

UAE was the first Middle East state to join the Department of Energy's Megaports Initiative, aimed at stopping illicit shipments of radioactive material. The UAE has committed to the International Convention on the Suppression of Acts of Nuclear Terrorism and is a signatory to the Arab Convention for the Suppression of Terrorism.

3.2.2 UAE and UN Security Council Resolution 1540

On 28 April 2004, the United Nations Security Council unanimously adopted resolution 1540 (2004) under Chapter VII of the United Nations Charter which affirms that the proliferation of nuclear, chemical and biological weapons and their means of delivery constitutes a threat to international peace and security. The resolution "*obliges States, among other things, to refrain from supporting by any means non-State actors from developing, acquiring, manufacturing, possessing, transporting, transferring or using nuclear, chemical or biological weapons and their means of delivery*" (United Nations 2018). Resolution 1540 (2004) imposes binding obligations on all States to adopt legislation to prevent the proliferation of nuclear, chemical and biological weapons and their means of delivery, and establish appropriate domestic controls over related materials to prevent their illicit trafficking (United Nations 2018). In this direction, UAE issued Federal Law No. 13 of 2007 on commodities that are subject to import and export control procedures.

3.2.3 UAE and the Proliferation Security Initiative (PSI)

This initiative has been launched on May 31, 2003, which is a global effort that aims to stop the trafficking of weapons of mass destruction WMD, their delivery systems, and related materials to and from states and non-state actors of proliferation concern. When UAE has signed this initiative, it accepted the PSI Statement of Interdiction Principles, which commits participants to establish a more coordinated and effective basis through which to impede and stop WMD, their delivery systems, and related items. The UAE commit to interdict transfers to and from states and non-state actors of proliferation concern to the extent of their capabilities and legal authorities; develop procedures to facilitate the exchange of information with other countries; strengthen national legal authorities to facilitate interdiction, and take specific actions in support of interdiction efforts.

3.2.4 UAE Nuclear Program and Sustainability

The UAE convinced that the most environmentally friendly and most sustainable solution to its energy requirements is electricity generated by nuclear plants (The Emirates Nuclear Energy Corporation (ENEC) 2018). Therefore, nuclear reactors are destined to become the UAE's second most important source of energy in the UAE after natural gas, producing about 25 percent of the UAE's electricity by 2020 and ensuring the continued economic development of the nation. In order to implement its ambitions in terms of the nuclear program, UAE created in 2009 a sperate entity called ENEC (Emirates Nuclear Energy Corporation). Four letters are usually used by ENEC team which are (HSE & S): The Health, Safety, Environment, and Sustainability. ENEC has several teams to manage and monitor HSE&S; these specialized teams include Corporate HSE & S Team; Construction HSE & S Oversight Team (CPO); Nuclear Safety and Nuclear Safety Culture Teams; and Emergency Response and Business Continuity Teams. The below image clarifies the above idea (Emirates Nuclear Energy 2018). UAE developed and implemented a number of complete Environment, Sustainability and Corporate Social Responsibility programs which includes: Managing the Sustainability Working Group and related initiatives; Reducing the impact of ENEC's activities on the environment (e.g. reducing electricity and water use); and Managing the production of the ENEC Annual Sustainability Report (Emirates Nuclear Energy 2018). In 2009, the Federal Government had approved the creation of an independent nuclear safety regulator; the Federal Authority for Nuclear Regulation (FANR) divided the sustainability into the areas shown in Fig. 1.

"FANR protects the UAE's public, its workers and the environment by conducting nuclear regulatory programs in safety, security, radiation protection, and safeguards" (Federal Authority for Nuclear Regulation 2018), FANR also oversees the implementation of the UAE's obligations under the international treaties, conventions and agreements in the nuclear sector, and determines administrative standards, which support excellence in regulation.

4 Conclusion

It is admitted that nuclear energy has become an obligation to use most of the technology in the world. Still, the main two reasons that encouraged the international community to recourse to Nuclear Energy are the threat of global warming, and it decreases the country's dependence on fossil fuels, which includes (oil, gas, and coal). However, the main reason that discourages some other countries from opening this file is the threat of the nuclear accident. However, UAE believes, like other countries, that nuclear power could make a significant contribution towards reducing greenhouse gas emissions. The most critical concern for the international community is to use nuclear energy merely for peaceful purposes and for that reason it is working hard to monitor the commitment of states to this matter via either international treaties, organizations, or ad-hoc initiatives. If the

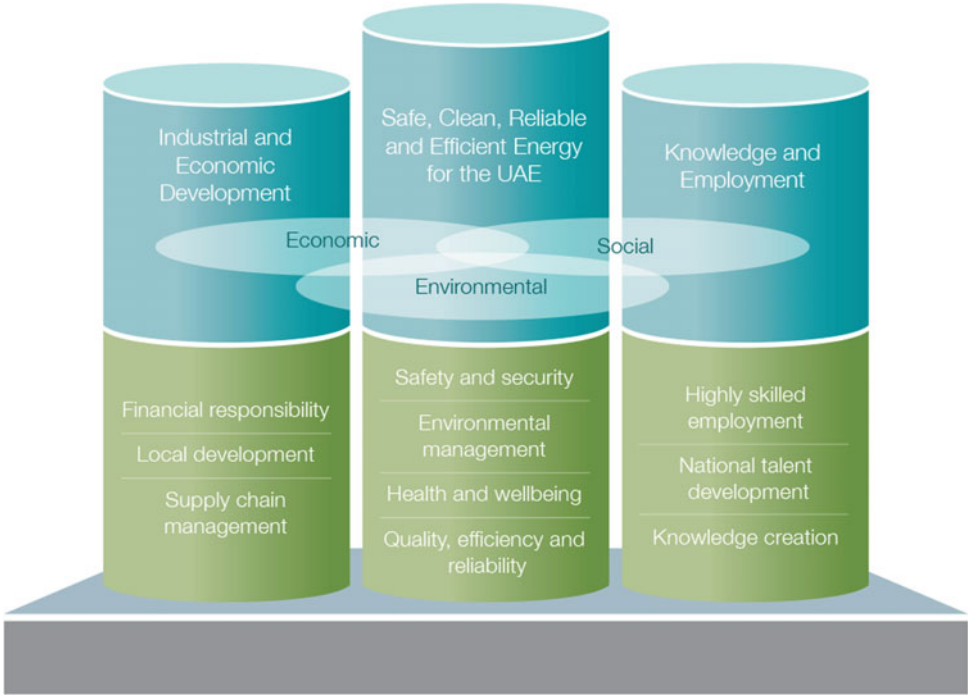

Fig. 1 Sustainability and Corporate Social Responsibility Program in the UAE (Emirates Nuclear Energy 2018)

decision-makers in the UAE are convinced that the proliferation of nuclear weapons would extremely augment the danger of nuclear war, however, they believe that the right to use nuclear energy for peaceful purposes is inalienable right as per the terms used by NPT (article IV). The UAE has the right to benefits form the peaceful applications of nuclear technology. A new chapter about nuclear power has been written in the last five years in the UAE. The leaders in the UAE, when they adopted the idea of the peaceful use of nuclear energy, were aware of the international challenges, in particular: Nuclear safety, removal of radioactive wastes, and proliferation of nuclear explosives. For that reason, UAE is collaborating closely with the International Atomic Energy Agency and qualified international companies. The UAE Nuclear Law of 1999 takes into account all commitments and obligations that drive from international instruments.

UAE, like other emerging nuclear energy states, is constructing its first nuclear power plants and bilateral contracts with specific states and international firms are signed, and the legal and regulatory infrastructure is well-developed. The UAE's policy on nuclear energy depends on the latest and advanced nuclear reactors (fourth generation) which have been designed to be safer and to have lower costs than currently operating reactors in other states.

In the UAE, and via the law of 1999, maximum priority has been given to Nuclear Safety, Radiation Protection, and Safeguards. However, enrichment and reprocessing are forbidden in the UAE. Independent regulator, Federal Authority for Nuclear Regulation (FANR), has been established to control all matters relating to the regulation of the Nuclear Sector. The nuclear policy of the UAE has acknowledged international welcoming having been viewed as being transparent and committed to international commitments. It is obvious; the legitimate ambition of the UAE is to produce electricity from nuclear power. UAE considers nuclear energy among the best answers for its sustainable economic growth. Thinking about future generations cannot be done by utilizing the current fossil fuels but by thinking about the new alternative, which is much more attractive.

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- 2008 UAE and France sign the Nuclear Cooperation Agreement.
- 2009 UAE and the United States of America sign Bilateral Agreement for Nuclear Cooperation including the 123 Agreement.
- 2009 UAE and Republic of Korea sign bilateral Nuclear Cooperation Agreement.
- 2009 UAE and Japan sign a bilateral Nuclear Cooperation Agreement.
- 2010 UAE and United Kingdom sign Agreement for Cooperation in the Peaceful Uses of Nuclear Energy.
- 2012 UAE and Australia sign Nuclear Cooperation Agreement.
- 2012 UAE and Canada sign Nuclear Cooperation Agreement.
- 2012 UAE and Russia sign Nuclear Cooperation Agreement.
- 2013 UAE and Argentina sign Nuclear Cooperation Agreement.
- 2013 UAE and Japan sign Nuclear Cooperation Agreement.

FANR Arrangements/Agreements with Foreign Regulators (Federal Authority for Nuclear Regulation 2018)

- 2010 FANR and Republic of Korea Institute of Nuclear Safety sign Implementing Arrangement.
- 2010 FANR and United States Nuclear Regulatory Commission sign Cooperation Arrangement.
- 2011 FANR and Korea Institute of Nuclear Safety sign a Special Agreement.
- 2011 FANR and Korea Institute of Nuclear Non-Proliferation and Control sign Implementing Arrangement.
- 2011 FANR and Finnish Radiation and Nuclear Safety Authority sign Bilateral Arrangement.
- 2013 FANR and The French Institute for Radiological Protection and Nuclear Safety sign Cooperation Arrangement.
- 2013 FANR and The Norwegian Institute for Energy Technology sign Associated Party Agreement.
- 2013 FANR and Australian Radiation Protection and Nuclear Safety Agency sign Cooperation Arrangement.
- 2015 FANR and United States Nuclear Regulatory Commission renew a Cooperation Arrangement on Nuclear Safety Matters.
- 2015 FANR and Republic of Korea Atomic Energy Research Institute sign a memorandum of Understanding on Cooperation in Nuclear Safety.
- 2016 FANR and the US Department of Commerce Bureaus Industry and Security (BIS) sign MOI related to transfers of Nuclear—Related Dual use Items & Information Sharing.
- 2016 Implementation Arrangement between FANR and the National Institute for Nuclear Science and technology of The Public of France concerning Education and Training.
- 2016 IA between the FANR and the Institute for Radiological Protection and Nuclear of Republic of France Concerning Research and Development.
- 2017 MOU between FANR & The Canadian Nuclear Safety Commission for Cooperation & Exchange of Information in Nuclear Regulatory Matters.
- 2017 MOU between FANR & the Office for Nuclear Regulation of the Great Britain for the exchange of information and Cooperation in the area of Regulation of Safe Nuclear Energy use for Peaceful Purposes.

FANR Agreements with National Stakeholders (Federal Authority for Nuclear Regulation 2018)

- 2011 FANR signs Memorandum of Understanding with the Critical National Infrastructure Authority.
- 2011 FANR signs Memorandum of Understanding with Khalifa University of Science, Technology and Research.
- 2012 FANR signs Memorandum of Understanding with the National Transport Authority.
- 2012 FANR signs Memorandum of Understanding with the National Emergency, Crisis and Disasters Management Authority (NCEMA).
- 2012 FANR signs a Memorandum of Understanding with the Abu Dhabi National Oil Company (ADNOC).
- 2013 FANR signs Memorandum of Understanding with the Telecommunications Regulatory Authority (TRA).
- 2014 FANR signs Memorandum of Understanding with the Environment Agency—Abu Dhabi (EAD).

- 2014 FANR signs Memorandum of Understanding with the Department of Civil of Aviation in Sharjah.
- 2015 FANR signs Memorandum of Understanding with Abu Dhabi Occupational Safety and Health Center.
- 2016 FANR signs Memorandum of Understanding with General authority of ports border and free zones security.
- 2016 FANR signs Memorandum of Understanding with Insurance Authority.
- 2016 FANR signs Memorandum of Understanding with Federal Customs Authority.
- 2016 FANR signs Memorandum of Understanding with National Center of Meteorology & Seismology.

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The Role of General Education in Students Perspective: The Case of Higher Education in Dubai, UAE

D. F. Antiado, Fermin G. Castillo, S. Y. Marzouki, and M. I. Tawadrous

Abstract

General Education is part of the curricular structure of any program in any colleges and universities around the world. Its contribution to the principal/concentration and courses makes the students more aware of the ethical, moral, and societal well-being of the society they are in. Thru the years, we have seen that General Education started to evolve on what it is today because of modern development, migration, multicultural diversity, competition, and more. The purpose of this study is to assess the students view on the significance and relevance of General Education. Also, it explores the areas for improvement in General Education and how it can be sustained and linked to the social responsibility of students. This paper serves as an eye-opener on the value and importance of General Education in molding responsible and ethical students.

Keywords

General education • Arts and sciences • Assessment • Improvement

1 Introduction

General Education is part of the curricular structure of any program in any colleges and universities around the world. The Commission for Academic Accreditation (CAA) under the Ministry of Higher Education of UAE recognizes the importance of General Education. As stipulated in CAA Standards 2011 for General Education (3.4), *all* students taking undergraduate programs that require 2 years or longer must complete a broadly-based General Education courses in the following areas: (1) English, Arabic, or other languages; (2) the humanities or arts; (3) the natural sciences; (4) information technology or mathematics; and (5) the social or behavioral sciences. Upon completion of the General Education courses, the students are expected to demonstrate the ability to express their ideas adequately and/communicate orally and written; able to reason scientifically, quantitatively and critically; and use technology in accessing, evaluating, organizing, and communicating information. The mastery of this broad knowledge, skills, and competencies enable students to respond to the current and future needs and/requirements of a sustainable society—productively meet the needs of the labor market and develop their civic-mindedness and sense of responsibility (awareness and involvement in solving social issues) in one's local, national and global environment.

The acquisition of broad knowledge, skills, and competencies, which are tenets of General Education are essential to a country's sustainable development. The World Economic Forum, Executive briefing report (2017) on the "Future of Jobs and Skills in the Middle East and North Africa" stressed the important role of education and skills development in harnessing the human capital potential in the Middle East and North Africa. As indicated in the report, the MENA region is currently experiencing skills mismatch which is impeding business growth by 40% where creativity, independent thinking, problem-solving, soft skills, and other necessary skills were found lacking.

MENA region is faced with the challenge of closing the current skills gap and needs to exert effort to build the skills responsive to a technologically advanced knowledge economy. The gap may be attributed to the courses offered in their freshmen years, which is the foundation of their

D. F. Antiado (✉)
American College of Dubai, Dubai, United Arab Emirates
e-mail: arizdjonde@yahoo.com

F. G. Castillo
University of Fujairah, Fujairah, United Arab Emirates

S. Y. Marzouki
Helwan University, Cairo, Egypt

M. I. Tawadrous
City University College of Ajman, Ajman, United Arab Emirates

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knowledge and mental development as a student and as a young professional.

To meet the challenges of the twenty-first century and beyond, do students believe that they have been equipped with the necessary skills and/competencies to gainfully participate in the economy and demands of society as a whole?

1.1 Statement of the Problem

This research aimed to assess how well the General Education (GE) Program achieved its objectives and able to respond to students' needs. Specifically, it aimed to answer the following:

1. What is the assessment of students on the specific items measuring General Education (GE) Courses' significance and/relevance?
2. What are the strengths and areas of improvement of the General Education Program?

1.2 Scope and Limitation

The research study focused on the value of General Education as part of the university requirements and at the same time as courses in general. The scope of the study involved the assessment of the relevance of General Education as supporting courses. Also sought to find out the value of General Education and its impact on student learners. Purposive sampling was used and hence may not be fully representative of the population; however, the samples are an attempt about student learner's response. Respondents bias may have occurred as they may have different views and understanding about General Education. This research study is confined in Dubai, United Arab Emirates.

2 Research Methodology

The research study used purposive sampling in order to identify its objectives in determining the response of working professionals. In the case of the United Arab Emirates, there are many "yuppies" which we can see in government as well as private organizations. Because of these growing numbers of young professionals, the value of General Education in their professional development needs to be developed if not sustained. According to the Annual Economic Report 2017, the total labor force in UAE in 2016 was 6,330,540. The labor force participation rate was about 91% of the total male population aged 15 years and above. The rate of participation in the female labor force was about 42 percent of the total female population (UAE Government Portal 2018).

The research focused on how students view General Education in general. A one-page questionnaire (consisting of 11 questions), was floated to working students taking GE courses under the degree programs—Business, Media, and Law in one of the private CAA accredited universities of Dubai, UAE. Clarifications were entertained in order that students understood what was asked. The said questionnaire was pre-tested for modification and improvement. The questionnaire was also translated in Arabic–English(vice versa) for easy understanding of the respondents. Out of the questionnaires distributed, a total of 255 respondents had returned. Mean ratings for all the items were computed to determine the overall rating of the General Education Courses. To find out the distribution of responses per item, percentages had been computed/calculated.

The mean ratings had been rank-ordered. The first three top items indicated the strengths of the General Education Program, and the three lowest items indicated the areas where the GE program needs further development or improvement.

The computed mean scores were interpreted based on the following:

Range	Interpretation
0–0.83	I do not know
0.84–1.67	Strongly disagree
1.68–2.51	Disagree
2.52–3.35	somewhat agree
3.36–4.19	Agree
4.2–5.00	strongly agree

3 Population and Samples

A total of 255 working students served as respondents in this study. However, of the total number of respondents, only 252 gave information on the number of General Education (GE) courses that were taken. Table 1 shows a summary of respondents across the number of GE subjects taken.

Table 1 shows that there are more respondents who fall on the cluster of 4–6 GE subjects taken with 117 respondents. It is followed by 7–9 cluster with 76 respondents.

Table 1 Summary table of respondents

Number of GE subjects taken by the respondents	N
1–3	59
4–6	117
7–9	76
No information	3
Total	255

4 Review of Literature

The related studies highlighted the development of broad skills and competencies which were deemed necessary in the entry and advanced levels in the workplace as perceived by employers. A need to redesign the General Education program had been proposed in these studies.

4.1 The Relevance of General Education

General Education courses serve as building blocks of a curriculum for degree-seeking and transfer students which seek to broaden learners' horizons and provide the "general experience" to effectively respond and address diverse environmental challenges in a creative, critical and analytical, and innovative manner (Daily Herald 2006). The relevance of taking courses outside a student's specific field of study provides the opportunity for the student to explore new ideas, areas of interest and/perspectives, understand global issues and diverse ideas, act ethically, and work and or interact effectively with groups coming from a diverse background.

The General Education courses are described as "capstone education" which is aimed at unlocking an individual's potential, drives one to learn more beyond the assumptions one holds and encourages one to value continuous learning throughout one's life (Johnson 2010).

Majority of employers agreed that a candidate's demonstrated capacity to think critically, communicate clearly, and solve complex problems is more important than their undergraduate major (General Education in the 21st Century 2007). Based on a study conducted in the United States entitled "Optimistic About the Future, But How Well Prepared? College Students' Views on College Learning and Career Success," new graduates surveyed perceived themselves as prepared for their future careers. However, employers who were surveyed (400 respondents from organizations managing at least 25 employees) do not have the same perception (Hart Research Associates 2015). The results of the survey are summarized in Fig. 1.

The efforts of developing a broad range of skills had been perceived as very important to ensure the employability of new graduates. As stated, "today's economy increasingly requires youth to have digital skills. However, these do not add value unless they are well paired with cognitive skills, and other skills, such as creativity, communication skills, teamwork and perseverance" (OECD, Report (OECD 2015). Further, barriers to employability are created if the social and emotional skills of new graduates lack such as poor work ethics.

Antiado et al. (2016) conducted a research study on "Locus of Control of Young Emirati Professionals" where the environment is regarded as a factor which may affect or change their shared values, beliefs, and behavior. Therefore, General Education may help them to better learn and grow

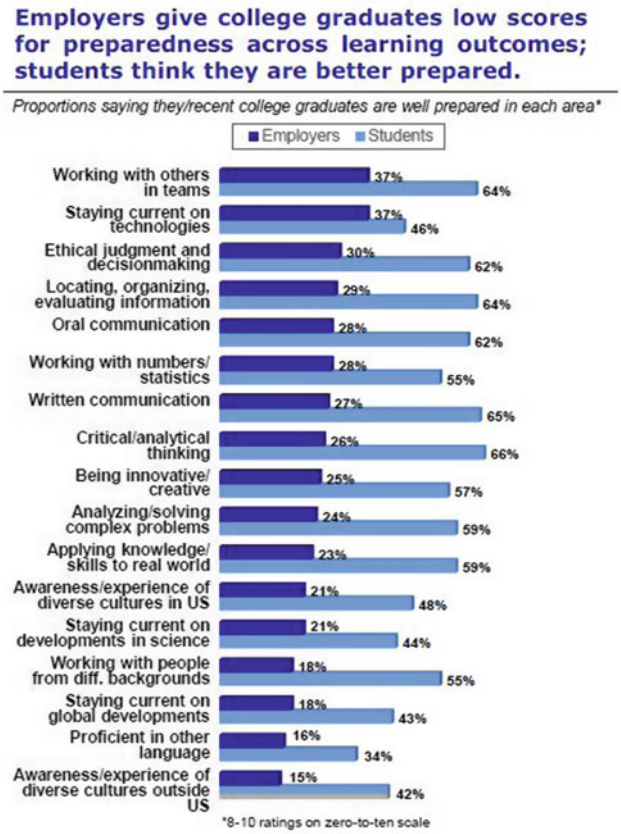

Fig. 1 Preparedness across Learning Outcomes as perceived by U.S. Employers and Students. *Source* https://www.aacu.org/sites/default/files/files/LEAP/2015StudentSurveyReport.pdf

professionally with the values and professional ethics, which they can apply to their workplace. If the society has a homogenous environment, then we can expect the same results, however, if they are exposed in a multicultural and diverse environment, then there is a tendency that their shared values, beliefs, and behavior will change.

4.2 Reforms Needed for General Education

Key findings from an Employer Research (Hart Research Associates 2018) identified vital college learning outcomes which employers from business executives consisting of owners, CEOs, presidents, C-suite level executives, vice-presidents and directors; and 500 hiring managers considered as very important (see Table 2).

From 2014 to 2018, the global learning outcomes which employers perceived as very relevant were: the ability to analyze and solve problems with a workforce coming from different backgrounds and cultures, from 72 to 83%; and ability to locate, organize, and evaluate information using multiple sources from 56 to 65% (Hart Research Associates 2018).

Three relevant classifications/categories had been identified (Hart Research Associates 2016). I. Intellectual and Practical Skills II. Personal and III. Social Responsibility and Integrative Applied Learning. Under I. Intellectual and Practical Skills, the essential learning outcomes that need to be proficiently demonstrated by graduates are oral communication, teamwork skills with diverse groups, written communication, critical thinking, and analytic reasoning, complex problem-solving, information literacy, innovation and creativity, technological skills, and quantitative reasoning. The importance of focusing on the achievement of learning outcomes related to II. Personal and III. Social Responsibilities include making ethical judgment and decision-making; working independently by being able to set priorities and managing time and deadlines; and being self-motivated by having the ability to take the initiative and being proactive. Another important learning outcome that was given importance is the ability to apply knowledge in real-world settings (Integrative Applied Learning). The three important components are valued by the employers cutting across majors to ensure success at the entry and advanced level.

Nine percent (9%) or one out of 10 students understood the learning outcomes of liberal education offered by the General Education curriculum of Association of American Colleges & Universities (ACCU) members (Hart Research Associates 2016). The rationale of the General Education program must be understood and to achieve this, students need to see the relevance of General Education in assisting them to achieve personal and professional development; and General Education curriculum should be continuously modified in response to diversifying characteristics of students such as age, life, and professional experiences (Hart Research Associates 2015).

Pedagogical innovations had been recommended to enrich undergraduates' educational experiences and stress the relevance of General Education to meet the challenges of the twenty-first century (Report: General Education in the 21st Century 2007):

1. Sustain a culture supporting general education by actively and continuously striving to educate all stakeholders and on the value, rationale, and aims of general education;
2. Include civic engagement activities with research and reflective analysis as part of general education.
3. Link freshman-sophomore seminars in line with the purposes of general education by focusing on timely and problem-oriented topics, or encouraging faculty to choose seminar topics related to contemporary social problems and issues within their areas of expertise.

Table 2 The learning outcomes valued by executives and hiring managers which highly cut across majors

Learning outcomes	Business executives (%)	Hiring managers (%)
Able to effectively communicate orally	80	90
Critical thinking/analytical Reasoning	78	84
Ethical judgment and decision-making	77	87
Able to work effectively in teams	77	87
Able to work independently (prioritize, manage time)	77	85
Self-motivated, initiative, proactive: ideas/solutions	76	85
Able to communicate effectively in writing	76	78
Can apply knowledge/skills to real-world setting	76	87

Source https://www.aacu.org/sites/default/files/files/LEAP/2018EmployerResearchReport.pdf

4. Involve undergraduates in research activities in academic, laboratory, and "field" settings.
5. Continuously improve and evaluate instruction and teaching methods of general education.

For the past 5 years, majority of Association of American Colleges & Universities (ACCU) members reportedly had given priority to redesign the General Education program which involved integrating knowledge, skills, and application (67%); applied to learn experiences (61%); cross-cutting skill development (51%); and some remained on broad knowledge acquisition (32%) (Hart Research Associates 2015).

The above literature on the relevance and reforms needed for General Education draws a compelling justification to reassess the current General Education programs as well as redesign the General Education curriculum to respond to challenges of a knowledge-based economy contributing toward sustainable development in the twenty-first century.

5 Results

The following tables show the view of working students (respondents of the study) on the General Education program.

Table 2 shows that the students somewhat agree with items number 3 and 10, and agrees with items 1, 2, 4, 5, 6, 7, 8, 9, and 11.

To come up with a better picture of how General Education is viewed by the respondents, frequency of students per ratings was explored in every item of the questionnaire. Tables 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 and 13 show the results.

Table 4 shows the frequency of students per rating of Item 1, which states that the General Education program is a valuable part of the respondents' education. More than 80% of the respondents' cling to the idea that General Education is a valuable part of students' education; 47.5% agrees, 25% strongly agrees, and 20.8% somewhat agrees on the item. A tiny percentage of the respondents do not believe in the item. There is 1.2% of the respondents who are not decided on the item. In general, the respondents agree that the General Education program is a valuable part of the respondents' education.

The table above shows the frequency of students per rating of Item 2, which states that some of the best classes are General Education classes. More than 80% of the respondents' cling to the idea that some of the best classes are General Education classes; 41.2% agrees, 27.8 somewhat agrees, and 22% strongly agrees on the item. Only 8.3% of the respondents do not believe in the item. A tiny percentage of the respondents are not decided on the item. In general, the respondents agree that some of the best classes are General Education classes.

Table 6 shows the frequency of students per rating of Item 3, which state that students have enriching experiences of the General Education courses. A significant percentage of the respondents' cling to the idea that students have enriching experiences of the General Education courses.

Table 3 Assessment of students per item

Descriptive statistics			
Items	N	Mean	Interpretation
The general education program is a valuable part of my education	255	3.867	Agree
Some of the best classes are general education classes	255	3.725	Agree
Students have enriching experiences in the general education courses	255	3.263	Somewhat agree
I expect that general education courses will help me in my career	255	3.663	Agree
General education provides broad exposure to several fields of study	255	3.357	Agree
The general education courses utilize innovative and different teaching methodologies to enhance my learning	255	3.451	Agree
The general education courses develop my skills in using technology	255	3.533	Agree
I can perform practical projects to link theory with practice	255	3.545	Agree
The general education courses focus on exciting and relevant programs to enhance my communication, mathematical, critical thinking skills; and understand myself, society and culture, as well as health and environmental issues	255	3.816	Agree
The general education program is relevant to current issues faced by students	255	3.318	Somewhat agree
The general education courses are designed to meet the educational needs of graduates in the twenty-first century and beyond	255	3.494	Agree

Table 4 Frequency of rating of respondents in Item 1

Rating	No. of Students	Percent
Do not know	3	1.2
Strongly disagree	5	2.0
Disagree	9	3.5
Somewhat agree	53	20.8
Agree	121	47.5
Strongly agree	64	25.1
Mean rating	3.867	Agree

Table 5 Frequency of rating of respondents in Item 2

Rating	No. of Students	Percent
Do not know	2	0.8
Strongly disagree	5	2.0
Disagree	16	6.3
Somewhat agree	71	27.8
Agree	105	41.2
Strongly agree	56	22.0
Mean rating	3.725	Agree

Table 6 Frequency of rating of respondents in Item 3

Rating	No. of students	Percent
Do not know	23	9.0
Strongly disagree	4	1.6
Disagree	18	7.1
Somewhat agree	81	31.8
Agree	96	37.6
Strongly agree	33	12.9
Mean rating	3.263	Somewhat agree

Table 7 Frequency of rating of respondents in Item 4

Rating	No. of students	Percent
Do not know	8	3.1
Strongly disagree	7	2.7
Disagree	23	9.0
Somewhat agree	56	22.0
Agree	92	36.1
Strongly agree	69	27.1
Mean rating	3.663	Agree

A total of 8.7% does not believe in the item. Only 9.0% of the respondents are not decided on the item. In general, the respondents somewhat agree that students have enriching experiences of the General Education courses.

The table above shows the frequency of students per rating of Item 4, which state that students expect that General Education courses will help them in their career. More than 80% of the respondents cling to the idea that students expect that General Education courses will help them in their career. Only a total of 11.7% does not believe in the item. There is 3.1.0% of the respondents who are not decided on the item. In general, the respondents agree that students expect that General Education courses will help them in their career.

The table above shows the frequency of students per rating of Item 5, which states that General Education

Table 8 Frequency of rating of respondents in Item 5

Rating	No. of students	Percent
Do not know	9	3.5
Strongly disagree	6	2.4
Disagree	35	13.7
Somewhat agree	75	29.4
Agree	95	37.3
Strongly agree	35	13.7
Mean rating	3.357	Agree

Table 9 Frequency of rating of respondents in Item 6

Rating	No. of students	Percent
Do not know	6	2.4
Strongly disagree	6	2.4
Disagree	23	9.0
Somewhat agree	87	34.1
Agree	98	38.4
Strongly agree	35	13.7
Mean rating	3.451	Agree

Table 10 Frequency of rating of respondents in Item 7

Rating	No. of students	Percent
Do not know	4	1.6
Strongly disagree	7	2.7
Disagree	31	12.2
Somewhat agree	71	27.8
Agree	91	35.7
Strongly agree	51	20.0
Mean rating	3.533	Agree

Table 11 Frequency of rating of respondents in Item 8

Rating	No. of students	Percent
Do not know	9	3.5
Strongly disagree	3	1.2
Disagree	18	7.1
Somewhat agree	80	31.4
Agree	100	39.2
Strongly agree	45	17.6
Mean rating	3.545	Agree

provides broad exposure to several fields of study. More than 70% of the respondents' cling to the idea that General Education provides broad exposure to several fields of study. Only a total of 16.1% does not believe in the item. There are 3.5% of the respondents who are not decided on the item. In general, the respondents agree that General Education provides broad exposure to several fields of study.

Table 9 shows the frequency of students per rating of Item 6, which states that the General Education courses utilize innovative and different teaching methodologies to enhance students' learning. More than 80% of the respondents' cling to the idea that the General Education courses utilize innovative and different teaching methodologies to enhance students' learning. Only a total of 11.4% does not

Table 12 Frequency of rating of respondents in Item 9

Rating	No. of students	Percent
Do not know	7	2.7
Strongly disagree	6	2.4
Disagree	15	5.9
Somewhat agree	55	21.6
Agree	88	34.5
Strongly agree	84	32.9
Mean rating	3.816	Agree

Table 13 Frequency of rating of respondents in Item 10

Rating	No. of students	Percent
Do not know	17	6.7
Strongly disagree	9	3.5
Disagree	15	5.9
Somewhat agree	80	31.4
Agree	103	40.4
Strongly agree	31	12.2
Mean rating	3.318	Somewhat agree

believe in the item. There are 2.4% of the respondents who are not decided on the item. In general, respondents agree that General Education courses utilize innovative and different teaching methodologies to enhance students' learning.

Table 10 shows the frequency of students per rating of Item 7, which states that the General Education courses develop student's skills in using technology. More than 80% of the respondents' cling to the idea that the General Education courses develop student's skills in using technology. Only a total of 14.9% does not believe in the item. There are 1.6% of the respondents who are not decided on the item. In general, the respondents agree that the General Education courses develop student's skills in using technology.

Table 11 shows the frequency of students per rating of Item 8, which states that students can perform practical projects to link theory with practice. More than 80% of the respondents' cling to the idea that students can perform practical projects to link theory with practice. Only a total of 8.3% does not believe in the item. There are 3.5% of the respondents who are not decided on the item. The respondents agree that students can perform practical projects to link theory with practice.

Table 12 shows the frequency of students per rating of Item 9 which states that the General Education courses focus on exciting and relevant programs to enhance students' communication, mathematical, critical thinking skills; and understand self, society, and culture, as well as health and environmental issues. More than 80% of the respondents' cling to the idea the General Education courses focus on exciting and relevant programs to enhance students' communication, mathematical, critical thinking skills; and understand self, society, and culture, as well as health and environmental issues. Only a total of 8.3% does not believe in the item. There are 2.7% of the respondents who are not decided on the item. In general, the respondents agree that the General Education courses focus on exciting and relevant programs to enhance students' communication, mathematical, critical thinking skills; and understand self, society, and culture, as well as health and environmental issues.

Table 13 shows the frequency of students per rating of Item 10, which states that the General Education program is relevant to current issues faced by students. More than 80% of the respondents' cling to the idea that the General Education program is relevant to current issues faced by students. Only a total of 9.4% does not believe in the item. There are 6.7% of the respondents who are not decided on the item. In general, the respondents somewhat agree that the General Education program is relevant to current issues faced by students.

Table 14 shows the frequency of students per rating of Item 11, which states that the General Education courses are designed to meet the educational needs of graduates, and beyond. More than 80% of the respondents' cling to the idea that General Education courses are designed to meet the educational needs of graduates in the twenty-first century and beyond. Only a total of 7.5% does not believe in the item. There are 6.7% of the respondents who are not decided on the item. In general, the respondents agree that the General Education courses are designed to meet the educational needs of graduates in the twenty-first century and beyond.

Table 14 Frequency of rating of respondents in Item 11

Rating	No. of students	Percent
Do not know	17	6.7
Strongly disagree	4	1.6
Disagree	15	5.9
Somewhat agree	70	27.5
Agree	98	38.4
Strongly agree	51	20.0
Mean rating	3.494	Agree

Table 15 Rank order of mean ratings of all items

Rank	Item	Mean
1	The general education program is a valuable part of my education	3.867
2	The general education courses focus on interesting and relevant programs to enhance my communication, mathematical, critical thinking skills; and understand myself, society and culture, as well as health and environmental issues	3.816
3	Some of the best classes are general education classes	3.725
4	I expect that general education courses will help me in my career	3.663
5	I can perform practical projects to link theory with practice	3.545
6	General education courses develop my skills in using technology	3.533
7	The general Education courses are designed to meet the educational needs of graduates in the twenty-first century and beyond	3.494
8	General education courses utilize innovative and different teaching methodologies to enhance my learning	3.451
9	General education provides broad exposure to several fields of study	3.357
10	The general education program is relevant to current issues faced by students	3.318
11	Students have enriching experiences in the general education courses	3.263

The strengths of the General Education Program (top 3) as perceived by the respondents which are shown in Table 15, indicated that their GE courses were considered a valuable part of their education with a mean rating of 3.867; the GE program focused on interesting and relevant programs which enhanced their communication, mathematical, critical thinking skills, and understanding of oneself, the society at large as well as health and environmental issues (mean rating of 3.816); their GE classes were perceived as having some of the best classes (mean rating of 3.725); and General Education courses were perceived as helpful in their future careers.

On the other hand, the areas which GE needs to reinforce further or further improve are indicated in the lowest three mean ratings (Table 15): a need to provide enriching experiences in the GE courses (mean rating of 3.263); a need to address the current issues faced by students (mean rating of 3.318); provide broader exposure to a number of fields of study (mean rating of 3.357) and enhancement of learning using innovative and varied teaching methodologies (3.491).

At a vantage point, the respondents are working students, and more or less have an idea about the relevance and/usefulness of the General Education program to their current job and day to day experiences.

6 Conclusion and Recommendations

Based on the review of the literature and results of the study, the General Education program as assessed by the respondents is relevant, and in general, the students have a favorable attitude toward the General Education Program. Since the respondents of the study are working students and can gauge the relevance of General Education as applied to their work and day to day experiences, explains why they hold positive view toward General Education program in general.

Continuous effort must be exerted to orient students of the relevance of the General Education program to their careers at the entry and advanced level. The future workforce requires a multiplicity of skills to manage the complexity and diversity in work in a volatile economy, a higher level of thinking is required (analysis, critical thinking, creativity, innovativeness) and the need to be responsible global citizens of a highly interconnected world.

Areas of improvement should focus on making the respondents' learning enriching, responsive to the current issues and broader exposure to several fields of study for General Education and utilization of innovative and varied teaching methodologies. Suggested innovations to explore and further improve the General Education program include: initiating freshman–sophomore seminars aligned with purposes of General Education such as time and problem-oriented topics, or encouraging faculty to choose seminar topics related to contemporary social problems and/issues within their areas of expertise; as part of the General Education program, organize civic engagement activities with research and reflective analysis as part General Education; and conduct research activities in academic, laboratory, and "field" settings.

General Education is equally the same in importance as other courses and should be sustained if not further developed or enhanced. The course entrepreneurship and innovation had already incorporated across the curriculum in the United Arab Emirates. This only means that they welcome any courses that will benefit society in general. Moreover, the value of integrating knowledge, skills, and application should be given importance than just mere acquisition in the General Education curriculum. It must cover the three important learning outcome areas, namely: Intellectual and Practical Skills; Personal and; Social Responsibility, and Integrative Applied Learning. Curriculum design of the General Education program should consider strengthening the employability or career readiness skills of students such as ability to work with and learn from each other through group activities or tasks; engage in-class activities that promote awareness of current developments in the sciences and/global issues; ability to find, evaluate information—critically and analytically in individual or group reports, assignments or projects; encourage more opportunity to express ideas orally; become more aware of diverse cultures; learning a foreign language and other broad transferrable skills.

The continuous improvement and evaluation of instruction and teaching methods of General Education must consider the varying characteristics of students such as age, lifestyles, and professional experiences to ensure relevance of the General Education program.

7 Future Research Work and Study

There are many interesting topics in General Education, which is very valuable for future research and study. In the case of the United Arab Emirates, we can explore the possibilities of making a comparison among its major emirates Abu Dhabi, Dubai, and Sharjah as they are the home of many students. General Education courses should be given the same treatment as other courses. Perhaps topics related to multicultural diversity and sustainability as additional courses in General Education can be a good option. Also, the entrepreneurship and innovation as additional courses in the General Education can be good electives or mandatory courses. There are many sustainable issues, and discussions in General Education that can be explored, therefore integrating its contribution to the well-being of the student learners would be fundamental if not significant.

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The Role of Humor in Sustainable Education and Innovation

Mrabet Jihene, Riadh Ben Rejeb, and Pascal Le Maléfan

Abstract

The information is surrounding us, which is analyzed consciously and unconsciously in everyday routine. The education should be more than a task to be accomplished, and it should be a philosophy to adopt and to follow in each day routine as it is the cornerstone of any development. Therefore, we have to guarantee its quality and efficiency to make this development sustainable. John Goodlad (1997) emphasized the fact that the role of the classroom climate is a significant factor in explaining the difference in the quality of educational establishments. Mitchell Bradshaw (2010) describes the school climate as an essential synergy existing between students, teachers, and administrators. This research demonstrates the importance of the humor in the class dynamic as a Communication Facilitator, a predictor factor of student mental health and an actor of school success. Also, to identify the role of humor in the adolescent process through the study of the functioning of the preconscious, the narcissism, the individuation process, and the socialization. The research conducted through the use of a cross-clinical, quantitative, and qualitative method starting by administrating a humor questionnaire exposing the humor style of the adolescent. Then we took from each group of humor a sample, and we evaluated their personality through the Thematic Apperception Test. Results showed that the type of humor used by the adolescent could be a good predictor of his social relations and his ability to build a stable identity. These findings are of great interest in enhancing classroom climate and improving the learning process.

Keywords

Adolescence • Humor • Sustainable education • Learning

1 Introduction

George Orwell described humor as a small revolution, revolution on language, on the meaning of things, on ancestral knowledge and laws. Humor requires the establishment of a work of connection between representation and affect. It would allow the transformation of the representation of things into a representation of words. Mickael Benyamin (2013) insisted on the fundamental role played by the preconscious in adolescence as responsible for the psychisation of excitations from the unconscious. It is also a guarantor when its functioning is not hampered to establish the pleasure of thinking among the adolescent. In the opposite case, it causes decompensation on the somatic as well as the psychological side.

Moreover, if we focus on researches carried out around the world (Theories of Pasquali 1990; Grimm and Pefley 1990; Buckwalter et al. 2003; Bourque 2004) on humor, we often find it attached to physical and mental health. The work of Camilo Ortiz (2000) has shown that humor allows a reliable identification with the therapist and is, therefore, a useful therapeutic tool for mental disorders. It allows us to laugh at the doors of the unknown, of what terrorizes us and of what makes us suffer.

Sigmund Freud has already noted since 1905 that humor does not always generate laughter. It manifests itself in many forms: comic, sarcasm, irony, black humor, puns, or wit. Regarding this diversity of forms, we have been wondering if an eventual link could relate humor to personality. Are we

M. Jihene (✉) · R. B. Rejeb (✉)
Faculty of Humanities and Social Sciences of Tunis, Tunis, Tunisia
e-mail: Jihene.mraber@aue.ae

R. B. Rejeb
e-mail: riadhbenrejeb@yahoo.fr

M. Jihene · P. Le Maléfan (✉)
University of Rouen Normandie, Rouen, France
e-mail: Pascal.lemalefan@orange.fr

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all capable of producing humor? Do we all have the same sense of humor?

Various researchers focused on the study of humor such as Sigmund Freud (1905) by exploring the wit, Ziv Avner (1976) by studying the relationship between humor and learning, Henri Bergson (1900) by investigating the mechanics of laughter, Rod (2010) by establishing the development of the integrative approach in psychology of humor, Jerry Suls (1983) by implementing the cognitive theory of humor, Sibony (2010) by considering the sense of humor, and Geneviève Besson et al. (2010) who were interested in the relationship between work and humor.

On social and academic terms, Avner Ziv discovered in 1976 that there is a positive correlation between the use of humor, improved learning, and increased creativity. Ten years later, Jean. M Civikly demonstrated that the use of humor in the classroom allows for optimal relational exchange. Zajderman in 1993 demonstrated that humor reduces anxiety and improves attention and memory. It also promotes mental flexibility, improves the productivity of teamwork and harmonizes social relationships according to the work of Clouse, Spurgeon, and Morreall in 1997. John Goodlad (1997) emphasized the fact that the role of the classroom is a significant factor in explaining the difference in the quality of educational establishments. Mitchell Bradshaw (2010) describes the school climate as an essential synergy among teachers and administrators. Davies (2015) also uncovered that student comprehension is increased when professors use wit. McCabe et al. (2017) discovered that using humor in class increases attention and focuses and helps to reduce the relationship gap between instructors and students. These results were consolidated later by Bourguinat and Lorgnier, highlighting the group cohesion aspect.

The heterogeneity of the approaches studying the humorous process allowed us to identify different types of humor and these are used differently from one person to another according to one's personality, one's weaknesses fragilities, one's experience, and one's first childhood relationships.

2 Conceptual Framework

2.1 Humor

The Larousse dictionary defines humor as "a form of mind that strives to emphasize the comic, ridiculous, absurd, or unusual character of certain aspects of reality." This form of mind is concealed behind a seriousness and consists in detaching from pleasant and unusual aspects of reality. Simpson and Weiner (1989) argue that humor is the ability to perceive what is ridiculous or amusing and the ability to express it in the form of a joke. "The faculty of percussion what is ludicrous or amusing, of expressing it in speech, writing, or other composition: jocose imagination or treatment of a subject".[1] Freud argued in 1905 that humor is a process that allows the person to avoid adverse effects. Jacqueline Verdeau-Paillès (2000) followed the same path and added that humor is language; a mean of expression that often conveys a different meaning from that which is stated. It plays on and with words to facilitate the communication of messages that can be marked by censorship or suffering. It constitutes an element of relationship life, a transmitter of information, stimulation, and initiation to action. It also represents a look at oneself, a way of laughing at one's pains, showing off, and having fun.

The humor is verbal, but it also relies on the nonverbal. It is present in all forms of verbal expressions and comic action through mimicry, ironic smiles, laughter, grimaces, gestures, and behavior. JacquelineVerdeau-Paillès (2000) states that humor is a conscious and intentional social construction, but also semi-conscious and involuntary. It is flexible and adaptable to all situations, ambiguous because of its association between seriousness and its opposite. Humor can be nice, aggressive, or playful. It takes shape under several manifestations with a degree of kinship more or less critical such as comedy, farce, self-deprecation, irony, sarcasm, cynicism, the word of mind, and black humor.

2.2 Teenager Humor

Surprised by the violent puberty, the teenager finds refuge in his social group by playing the role of a self-contained envelope. Humor seems to be also a good mediator for taming traumatic effects. Moreover, Benyamin (2013) emphasizes that the drive must be tamed by language; To which Jean Claude Rolland (1998) adds that the speech serves as a defense against the excitation coming from the unconscious, thus protecting his homeostasis. The momentary renunciation of the principle of pleasure seems to be a perilous task in adolescence requiring the existence of ethical narcissistic foundations. Humor seems to be a good compromise consisting of an attempt to represent effects by words without having to abandon the pleasure principle. The humor allows to put away the drive charge perceived as invasive and distressing and allows secure emotional management.

Fragile teenage narcissism uses this process to thwart the various pathological schizoid, manic, depressive, or even persecutory forms that are becoming more and more burdensome in the face of adult mockery. Humor allows the

[1]In Martin, R.-A.: The psychology of humor: An integrative approach. Elsevier, Burlington, p. 5 (2007).

adolescent to access language safely. By the play of words, it becomes possible to transgress the rules, to explore the potentialities, and to test the limits. Thus Sudres (1997) was tempted to question adolescent humor with 181 high school students between the ages of 15 and 20 in the Toulouse region. High school students generally define humor as a testimony of well-being. According to them, humor would serve to decompress and take pleasure, to escape from reality, to make links more easily with others, and to value oneself with others. Humor also appears to be an excellent facilitator of classroom learning and a non-threatening work environment. According to Henri Danon Boileau (2004), adolescents often position themselves as objects of laughter. This laughter is not about self-destruction but more about the existence of social repairing; the teenager must be able to laugh at the other like the other would be able to laugh at him, so he would not shut himself up in the displeasure of being the laughing stock of others and would not sink into discordant psychotic laughter. In adolescence, laughter necessarily dismisses the idealized imagos of childhood, thus discovering the lack of the other, "the folds of the other". Serge Lesourd (2005) adds that it is the lack perceived in the other that causes him/her anguish and emptiness. This is how the recurrence of the maternal theme in the insults of teenagers often appear to offend mothers. Teenage laughter, in its violence, is assimilated, according to Paul Laurent Assoun (1999), to action in its disrespectful character of the "adult" norms. It would testify of the fall of the father/the father fall (of the law of the father) by revealing the insufficiency of his person. Laughter would be a kind of revenge for this all-powerful paternal imago, but at the same time, more delicately, an impulse of pity for the birth father.

Social conventions, norms, and laws are the forbidden. It would transform a forbidden laugh to a refreshing laugh, a laugh catharsis of aggression, laughing about the father with the father, who would fund the limit of the subject and asses his identity as a person. Teenage laughter also has an uncontrollable component. Indeed, it is when the subject finds himself/herself in the impasse of putting into words and repression that laughter breaks out.

2.3 Humor and Classroom Climate

Creating a learning climate is one of the most critical factors of success among students. John Goodlad (1997) emphasizes the role of the classroom as a significant factor in explaining the difference in the quality of educational establishments. The classroom is defined by Satheesh (2009) as the atmosphere created by the instructor in the physical environment of learning to enhance interaction with students. The role of the teacher is to create a positive social climate, promote self-esteem, and help students achieve their academic goals. According to Wilkinson and Ansell (1992), the emotional climate of the classroom is directly related to the achievement of academic excellence. Meirovich (2012) also emphasized the importance of favorable effective climate in the classroom and its role in improving students' performance. They also insisted on the strong relationship between the emotional experience of students in the classroom class and how well they concentrate, memorize, and learn.

Hillman (2001) insisted on the role of humor as a facilitator of learning and he suggested four aspects to be considered: enhancing the learning process through humor, using humor as a mediator for socialization, teaching the concept of humor to use it as a communication tool and modeling the use of humor in order to smooth the process of learning. Powell and Anderson tried to investigate, since 1985, the relation between humor and teaching. They noticed remarked that students reported they learned more from teachers with high humor skills. These results have been supported by Wanzer and Frymier, who found that student responsiveness to learning is improved with professors using humor in their teaching style. According to White's study, over 80% of both faculty and students believe humor plays a prominent role in relieving stress and improving concentration. Devadoss and Foltz (1996) and Ralph Ocon (2015) proved that the humorous climate in the classroom increases attendance. It reduces anxiety and boredom and increases comprehension and creativity (Berk 2003). Humor was associated with helpful, trusting, and cooperative teachers. This is how Humor can contribute to humanize and defuse anxiety by encouraging the thinking process.

3 Methodology

In this research, we propose to explore the link between the different types of humor or non-humor emitted by adolescents and the quality of their psychic work in the narcissistic, objective, and social spheres. Would there be differences in the psychic functioning of the teenager according to the quality of his/her humor? Moreover, if there is any difference, how would it manifest itself and what would it mean? Our population consists of a group of 180 students aged between 13 and 16 years, consisting of 94 girls and 86 boys. We collected our data from three colleges high schools in different regions of Tunisia. Indeed, we appealed to 60 students belonging to Omrane Supérieur high school the College Omrane Supérieur located in the capital, Tunis. The second part of the sample, consisting of 120 students, was taken from a school in El Kalaa el Kebira in Sousse and a high school college in Sahline in Monastir. We tried, through this sampling, to cover different regions of Tunisia

representing the north, the center, and the south of the country.

The psychological examination of our research topics was done in two parts: the first consisted of delivering a questionnaire to identify the type of predominant humor in each subject and thus to obtain a categorization of our sample according to the different types of humor. To do so, we adopted the approach of Martin (2010) who established a model categorizing humor into two broad categories: adapted humor and non-adapted humor. The first type consists of self-enhancing humor and affiliative humor that are positively correlated with openness and extroversion, emotional stability, and ethical narcissistic foundations. The second type of humor, non-adapted, is divided into aggressive humor and self-derisory humor. The aggressive component seems to be one of the commonalities between these two subtypes; in the first, it would be directed outwards, and in the second it would be directed toward itself. These two categories are positively correlated with anxiety and depression and negatively with emotional stability and being perceived as pleasant by others. Aggressive humor is linked to aggressive acting out and hostility toward others. We used the Humor Styles Questionnaire elaborated by Martin in 2003. The items are open situations that the teenager has to complete humorously. The questionnaire was then processed by a content analysis that classifies the answer given in self-enhancing humor, affiliative humor, aggressive humor, or self-derisory humor according to the categorization of Martin et al. (2003).

The second part of our psychological examination is the passing of the projective test: The Thematic Apperception Test of Henry Murray. After processing the sampling categorization through the humor questionnaire, we took from each group of humor a representative sample, and we evaluated their deep personalities through Thematic Apperception Test. These tools will serve to clarify the problematic of our subjects, to provide in-depth data on the structure of their personalities, to highlight their psychic dynamics and to try to identify the link with the used type of humor. The method adopted throughout this research will be a cross-clinical, quantitative, and qualitative method targeting a better understanding of this humorous process within the adolescent phase.

4 Results

The findings of the questionnaire made it possible to distinguish at the level of this sample 5 composite groups of the four types already set up by Martin, to which we will add a fifth category: "non-humor" responses.

Out of a total of 180 subjects, we noticed that the majority of adolescents express an aggressive type of humor (112 subjects) or resist producing it in the "non-humor" category (62 subjects). The rest of the sample is weakly distributed over the other categories of humor. We note six subjects whose humor is predominantly affiliative, five whose humor is predominantly self-enhancing, and only two whose humor is predominantly self-derisory.

4.1 Self-enhancing Humor

According to Martin (2003), it is accepted humor and not detrimental to others. It is presenting a comic view of the world. It is an element of adaptation to stress having the fun of any incongruous element. It is negatively correlated with neuroticism and negative emotions and correlates positively with emotional stability, optimism, good self-esteem, and a tendency to be pleasant in social interactions. The group of teenagers belonging to self-enhancing humor highlights an investment from the relational sphere to the seductive side. Narcissistic self-representation is equitably invested between positive and negative valence, and conflict avoidance is weakly formulated. The religious lexicon is used in terms of shoring on the protective and benevolent image of God. Depending on a paternal figure whose use denotes a cultural and a social legacy constituting a reliable reference. Adolescents are producing self-enhancing humor resort to the use of positive proverbs.

The TAT analysis allowed us to highlight the psychic processes in common with the category of self-enhancing humor. The protocols are predominantly based on the avoidance of the conflict, which constitutes an adolescence psychological specificity. These protocols are also marked by the establishment of phobic processes. Inhibition acts as a functional restriction and is associated with borderline processes that can be likened to depressive withdrawal. Thus, the anti-depressive movement is put forward, overinvesting the positive valence and the negative valence of the object. Adolescents also resort to irony giving a satisfactory outcome to depressive anxiety. The narcissistic defenses revolve around the mobilization of the subjective test overinvesting the characters on the boards as a representation of the teenager. The use of the labile sphere is essential, certifying the investment of interpersonal relationships. It testifies of the recognition of otherness and allows fluid and tempered projection of the internal drives. This relational framework allows the flexible and nuanced dissemination of aggressive and sexual impulses. The nuanced affective expression testifies of a connection between effects and representation in the context of a rich history of rebounding and events. The use of control defense mechanisms is average and is part of the reference of the external reality used to frame the narrative and give it a structure. The primary sphere is used weakly and comes to feed associations

temporarily. This shows the flexibility of preconscious operation.

Based on these different specificities of the preconscious and their contributions in terms of mental balance for the developing adolescent, we have succeeded in demonstrating that the group of subjects producing self-enhancing humor has an excellent internal dynamic, at the level of which the connection between representations and affects is made smoothly. The preconscious plays correctly its role of the screen, and the defenses are not massive testifying of a well-managed movements drives. The thought is fluid and associative capacities are of good quality, giving evidence of real pleasure to think and to dream. The parental imagos are well internalized and seem sufficiently competent to ensure the implementation of the subjectivity of the adolescent who succeeds inappropriately investing the social sphere.

4.2 Affiliative Humor

The type of humor is described by Martin as comic humor in which the use of jokes is increased. The self-derisory component is present in the jokes, but it is not harmful to the issuer; it serves instead appease others. It is tolerant and non-hostile humor aimed at strengthening the group's cohesion and creating new relationships. It is positively correlated with openness, positive self-esteem, and the tendency to produce positive emotions and negatively correlated with anxiety and depression.

At the interview, we have noticed that the subjects belonging to this humor group have suffered losses that they try to replace by a massive resort to the social sphere in which they project their aggressive impulses and find identifying figures accompanying their psychic development.

These adolescents show a narcissistic representation of the self, invested equitably between the positive valence and the negative valence and a good investment of the relationship sphere seductive side. Conflict avoidance is weakly expressed and reflects a developmental adolescent process. Recourse to the religious sphere is expressed in terms of support for God's benevolent, protective, and avenging qualities. Vengeance is here left to the divine because it is perceived as destructive and threatening. The teenager gets rid of feelings of anger or hatred felt toward others by resorting to the justice of a higher authority belonging to a socio-cultural legacy.

Cultural references are marked by the frequent use of a play on words often combining two contradictory terms or a metaphorical expression sometimes signifying the avoidance of the conflict and at other times a masked aggressiveness. The anxieties are put into words in a subtle game denoting a certain secularization set up.

The TAT analysis allowed us to analyze psychic processes in common with the category of affiliative humor. The protocols are predominantly based on the avoidance of the conflict with the establishment of phobic processes. The conflicts are, thus, put at a distance utilizing a trivialization of the latent solicitations of the narrative or by the tendency to take refuge in intra-narrative silences when the fantastical resonance becomes too oppressive. Inhibition acts as a functional restriction and is associated with borderline processes that can be likened to depressive withdrawal. Thus, the anti-depressive movement is approached by overinvesting the positive-valence shoring function and calling upon the clinician as a reassuring and protective object facing this foreign material. Adolescents also resort to irony giving a satisfactory outcome to depressive anxiety. The narcissistic defenses are marked by the idealization of the self-representation or the positive-valence object.

The other is perceived mostly in a positive way and is often apprehended as a double narcissist. This lack of distance at times blurs the boundaries between oneself and the other, undermining identity boundaries, probably reflecting a momentary flicker as the subjects recover immediately. The use of the labile sphere is essential reflecting the investment of interpersonal relationships. It testifies of the recognition of otherness and allows fluid and tempered projection of internal drives. The nuanced emotional expression testifies of a connection between affects and representation. The use of defense and control mechanisms is equal to the use of labile mechanisms. This would inform us about the need to mobilize control mechanisms in a rather significant way in order to fight against the emergence of threatening instinctual experiences. Obsessive processes are actively mobilized. Verbal precautions come to account for a resistance to use affirmation accentuated by many hesitations between different interpretations, thus fighting against the unconscious impulses that try to reveal themselves. If this happens, the cancelation is then advanced, declaring null and void the previous interpretation magically erasing the drive representative. The reactionary formation and the isolation of the characters or the abrupt change in the speech are also appropriate and come to support the control of the drive expression. The primary sphere is used weakly and comes to feed associations temporarily. This shows the flexibility of preconscious operation.

Adolescents belonging to the type of affiliative humor strive to avoid aggressive drive emergence, and for this, they put in place dual defensive mechanisms to avoid conflict and control it. Aggressive impulses are actively controlled and not projected on external objects, thus causing the logical destructuring of speech and inflicting certain prejudices on internal balance. Indeed, as René Kaës (date) indicates, the identity of each individual asserts himself in front of the group and fortifies his narcissism facing what is foreign to it.

It projects outside the anxiety of the group and strengthens the internal cohesion ensuring a favorable environment to "pretending" games. The group then becomes a space where the action is played not as a failure of mentalization but as a staging of the fantasy serving the activity of remembrance, and thus participating in the work of customization and structuring of adolescent impulses. The preconscious analysis of adolescents belonging to the group of affiliative humor reveals the existence of an excellent inner dynamic marked by functional capacity of connection between representations and effects. At times this connection is disturbed and let go to the surface an exacerbation of the emotional component that is probably supported by the group effect. This is supported by Joyce McDougall (1989) who adds that sharing an exalted emotivity would fuel a common belief. This emotional contagion is worth a great passion ensuring the internal cohesion of the group. Thus the screen function is ensured, and the barrier is functional against the threats of the ego. The thought is fluid, and the associative capacities are of good quality testifying of pleasure to think. However, we notice occasional disorganization regarding the fantastical reactivation requiring the implementation of an essential dodging effort. The exercise of subjectivity suffers from a slight instability probably due to the adolescent process which itself undermines the identity and identification bases, but the presence of benevolent and idealized internal objects forms a basis of security in the face of the instinctual shock. The investment of the social sphere is of good quality and allows adolescents to separate serenely parental imagos outside new mature identifying models.

4.3 Aggressive Humor

The type of aggressive humor consists mostly of sexist or racist jokes. It is illustrated by offensive and socially unacceptable forms such as irony, sarcasm, and black humor. It is positively correlated with aggressive acting out, hostility toward others, anxiety, and depression. Moreover, it is negatively correlated with emotional stability and the tendency to be helpful to others. At the interview, subjects belonging to this humor group suffer from conflictual relationships with their parents that are described as invasive, absent, or non-rewarding. The relationship with peers is often marked by aggression and rejection.

In the questionnaire, these adolescents show a narcissistic self-image that is positively invested more than negatively. This could argue for a perceived narcissistic threat. The avoidance of the conflict is formulated weakly, and this is explained by the peculiarity of this group in its trend of acting out. Teens belonging to the type of aggressive humor are described as impulsive and quite aggressive in their reactions. The use of religious references is essential and oscillates between positive and benevolent support, the evocation of an imminent threat and the need to establish a psychic framework offering structuring landmarks. The majority of subjects appeal to the benevolent divine figure, protecting them from any possible danger. God and the Prophet Muhammad are quoted in an admiring framework that makes them identificatory figures to follow protecting from the devil and bewitching. Adolescents also address religious rules such as prayer, fasting, the declaration of faith, Syria (in its extreme relation to religion), and the Coran. The recourse to the religious would probably serve as a bulwark against the emergence drive seen as threatening for these adolescents in need of psychic structuring.

This group uses proverbs, humor, and a play on words illustrating the feeling of injustice, the feeling of being overwhelmed by the events, death, the evil eye, the relational investment loss, and the instrumentalization of the people. The analysis of the TAT allowed us to analyze the psychic processes in common to the category of aggressive humor. The protocols are based predominantly on conflict avoidance and the establishment of phobic processes. Conflicts are thus put at a distance utilizing stories with a marked tendency, avoiding the development of conflicts. The characters are evoked anonymously, avoiding personal involvement. Inhibition acts as a functional restriction and is associated with borderline processes that can be likened to depressive withdrawal. Thus, the anti-depressive movement is actively approached by overinvesting the negative valence and calling on the clinician as a reassuring and protective object facing this foreign material. Teenagers also resort to spin, winks, irony, and humor, putting in place so many processes ranging from a simple manic turnaround to a broader and more structuring elaboration of production. Humorous. The narcissistic defenses are also essential and are marked by the use of personal references, freeing themselves from the solicitation of the instruction, and self-centering on oneself excluding the other from the investment. We also note an emphasis on the effect that becomes the identifier of the protagonist or the different characters on the board. The protocol of adolescents belonging to the type of aggressive humor often mobilizes responses focusing on actions and routine tasks testifying the lack of integration of fantastical resonance. This signals the dependence of the subjects on the external objects overcoming the internalization failures of the internal ones. The expressed effects are circumstantial, contributing to the failure of the internalization of instincts. The boundaries are sometimes blurred, highlighting their fragility between oneself and the other testifying of an identity vacillation supported by the use of the process of cleavage. Adolescents belong to the type of aggressive humor resort in the second place to the sphere of control testifying of the establishment of rigid methods used to repel the drive emergence. They rely on social, moral, and

common-sense references in order to stay safe by developing conflict.

The labile processes are moderately used testifying of the investment of the interpersonal relations expressing nuanced effects. The link between effects and representation is maintained coherently. The effect sometimes surpasses the mechanisms of control and expresses itself in haste by entering directly into the speech and making exclamations outbidding the representative-affect in the service of the repression of the representative representation. Adolescents also attach themselves to seductive narcissistic details that testify of the importance of objects investment. The primary sphere is marked by the massiveness of the projection staging an inadequacy of the theme stimulus escaping the latent solicitations of the pictures. The thought dissolves in front of individual pictures and the loss of the logical markers sign the fragility of subjects. The wrong object is evoked as an object on which the aggressive impulses of adolescents are projected. Effects and representations are massive and lead to the absence of distance or criticism by imprisoning the ego of the subject under a grandiose and a positive image. Probable causality is troubled by the lack of relevance of the link between a thought or an act and its consequence. This intrinsic disorder leads to a structural failure plunging the speech at times into a blur testifying of the infiltration of thought by primary processes. It is in this sense that the associations take on a manic appearance proof of the precipitation of thoughts or their flight.

The preconscious analysis of adolescents belonging to this group reveals the existence of a moderately good internal dynamic, parasitized by the passage to the act or the emergence of primary processes. The capacity of connection between effects and representation is good enough but are sometimes troubled probably because of the emphasis on aggression; the most important is the effect and not the representation. Jacques Schiavinato (2002) attributes the role of "double narcissistic" that can be positive or negative to the group of adolescents. Positive when it serves as a support for the restoration of a weakened personality and negative narcissism when it serves as a space for projection of the destructive impulses inside constituent members. The group is a space where repression and censorship are lifted by the collectivity, which allows the individual to release the pressure he/she has on his/her unconscious impulses. Emotions are liberated; exalted reinforcing the common belief of all internal power. The process of permeability is infiltrated by primary processes hindering the pleasure of thinking of the adolescent, and the screen function is sometimes flawed, leaving back primary processes disorganizing psychic dynamics. The acting out shortcuts the thought process. He comes to testify to protection put in place by the teenager in order to distance the violent fantasies engaged with a defective maternal and/or paternal object. Drieu (2006) argues in this sense that certain forms of acting in adolescence can be a way to take the initiative when the thought is overwhelmed. At other times, on the contrary, these acts no longer have an interactive aim but may reflect a situation of influence or be the mark of impulsivity. The exercise of subjectivity shows an unstable identity and identification and testifies of the absence of suitable internalized objects. Raymond Cahn (date) evokes three movements that go together to serve subjective appropriation in adolescence: the appropriation of the sexual body but also thought ideals and limits. This process is even more difficult as the break-in of incestuous and parricidal fantasies is strong. The lack of control of the internal excitations feeds on insidious traumatic issues that are reactualized. The object investment is defective because the mobilized narcissism serves mainly to repair the teenage narcissistic flaw. Freud (1913) states in this sense that unbroken selfishness preserves from the disease, but in the end, one must begin to love others in order not to get ill. Jeammet et al. (2006) adds that making one with the other is to show an excessive need for him, referring to an insufficient image of one's self. This dependency tortures the teenager and pushes him to seek to get rid of it. The more you need each other to know who you are, the less you can tolerate his contribution. It leads you even more to confrontational mode.

4.4 Self-derisory Humor

Self-derisory humor consists of self-deprecation in order to please others and gain their sympathy. This humor often signifies a narcissistic flaw and increased dependence on others. It is positively correlated with anxiety and depression and negatively correlated with emotional stability and the tendency to be agreeable to others.

At the interview, subjects are withdrawn, they try to escape the eye, and their speeches are provoked. The analysis of the TAT allowed us to analyze the psychic processes inherent in the category of self-derisory humor. The protocols are predominantly based on the avoidance of conflict and marked by the establishment of phobic processes. Conflicts are thus avoided using a trivialization of the stories put in place in front of the boards presented. The teenager plunges the narrative into vagueness, leaving the reasons for actions or relationships between the characters ambiguous. The phobic processes are also illustrated by the judicious use of intra-narrative silences charged with anxiety about the latent contents of the pictures. The anti-depressive movement is moderately approached, choosing the clinician as the only prompt support that is willing to help the teenager. This testifies of a lack of introjection of good parental supporting figures. Subjects belonging to this category of humor tend to overinvest external reality. The material presented does not

seem to awaken any memory, association, or emotional reaction. The use of the narcissistic sphere is weak and is marked by personal references, thus freeing itself from the solicitation of the instruction and self-centering on oneself, excluding the other from the sexualized investment. These adolescents focus on the sensory and the perceptive analysis testifying their dependence on external objects to overcome the object internalization flaw. They use the outside to express their inside. Subject resorts second to the sphere of control, showing the establishment of rigid processes used to repel the drive emergences. The speeches are brooded, thus blocking the evolution thoughts that are bogged down in a sterile repetition of words. When the adolescent manages to brave the inhibition and the impulse tends to be expressed, the cancelation takes place disavowing the evoked conflict immediately. Primary processes take over the labile sphere. They come to testify of alteration of the speech through different syntax disorders and verbal cracks. This argues for a failure of the secondary process, causing an alteration of the perception marked by the scotomization of particular manifest objects. This expresses the refusal to see elements that can trigger any conflict. Objects are perceived as damaged or ill influenced by the projection of the inner negativity; a self that is probably threatened in its identity foundations. The massiveness of the projection pushes teenagers to question the intentionality of specific pictures. They feel persecuted by others. The resort to labile processes, although weak, comes to announce an object investment that remains limited and marked by a stifled and threatening emotional expression. This emotional blockage short-circuits the establishment of the relational sphere.

5 Non-humor

This last group that we have defined is the group of teenagers reluctant to humor grouped under the name non-humor. Indeed, some individuals take refuge in seriousness and refuse access to laughter or smile because of their sexual, social, psychological, and identical dimensions. At the interview, subjects belonging to this group of humor express an essential attachment to the parental figures who seem to be the only source of support and narcissism. The social sphere is minimal and when it is invested, it is marked by rejection and strangeness. In the questionnaire, these adolescents show a narcissistic self-representation with a negative valence added to an avoidance of the conflict. The investment of the relational seduction sphere is minimal.

The use of religious references is essential, and it oscillates between the need for benevolent shoring, the evocation of an imminent threat and the need to establish a psychic framework offering structuring landmarks. The majority of subjects appeal to the benevolent divine figure, protecting them from any possible danger. God is also summoned to lift the injustice on them. Some mention the satisfaction of parents insisting on this value in order to consolidate their dependence on them, mainly the maternal figure. The sinister evil figure is evoked with all its agonizing component. Teenagers also discuss religious rules such as prayer and the Coran.

TAT protocols are predominantly based on the avoidance of the conflict and the establishment of phobic processes. Adolescents set up restricted stories to avoid conflicting evocation and plunge the narrative into the vagueness, leaving the reasons for the acts or the characters' relations ambiguous. Characters are introduced anonymously, devoid of family or social status serving the avoidance of personal involvement. They develop moderately narcissistic defenses illustrated by a focus on the subjective test that describes in a delicate and nuanced way the effects experienced by the protagonists of the story. The narcissistic representation of the self or the object is presented with negative valence. The elaborated story freezes sometimes blocking the drive movement and aborting the intrapsychic conflict. Emphasis is placed on the effect which becomes the only representative of the various protagonists on the picture. The anti-depressive movement is moderately addressed by overinvesting the negative valence of the shoring function. Faced with this lack of support and capacity, adolescent subjects cling to the elements of external reality marked by the restriction and the absence of conflict. The effects are circumstantial, dictated by propriety overcoming the failure of the internal emotions. The prohibition does not emanate from an internalized superego, and the desire of the subject is not taken into account. Adolescents use secondarily the sphere of control testifying to the establishment of rigid processes used to repel the drive emergence. Speeches are undermined by verbal precautions and hesitations between different interpretations of a defensive movement facing the representation of loss that underlies the narrative. Primary processes take over the labile sphere. They come to testify of alteration of the speech through different syntax disorders and verbal cracks. This argues for a failure of the secondary process accentuated by a blur of discourse that is drowned in the primary processes highlighting a dissociation of thought. This structural disorganization is added to a flight of ideas illustrated by associations by contiguity and unlogic jumps resulting in contradictions in the discourse, dressing incoherence. The persecution is pregnant in the stories of these teenagers, pushing them to question the intentionality of the picture. The other intensifies the confusion of identity faced with a subjectivity already severely in point.

The secularization of impulses fails because of the psychic precariousness of the subjects and their failure to internalize containing and reassuring objects. The social sphere is difficult to invest because they fear instincts emergence takes over and paralyzes the identificatory movements.

6 Discussion

Sibony (2010) said that to laugh is to shake one's identity. It breaks the identities, summoning the need to repair them later. It is against the irreparable that laughter or smile is born. This second position of being in misery and consoling ourselves at the same time throws us into the position of the one who comes by his narcissistic superiority to heal our wounds. Thus the "I" doubles up, and humor takes place. This twofold position tickling the person's identity supports while giving him the joy of being another and being able to return to himself, provides the adolescent, seeking for choice, the possibility to control his external, and especially internal environment. This is how humor can give a chance to the adolescent to play and create scenarios to facilitate the management of internal frustrations and the transition to an adult position.

The humor proposes to work the space between two persons that Sibony (2010) names the third. According to him, humor is an act of will where laughter escapes. This willingness to cope with the growling tumult within the adolescent dynamic will have to rely on the preconscious quality of the subject. Producing humor is about being able to link the representation of things and the representation of words; playing on the double meaning of a word or an expression offering the adolescent the capacity to relieve suffering and to establish meaning. This cloak of invisibility that some teenagers like to put on serves to deceive death while recognizing its existence, to deny the narcissistic flaw while exacerbating it, while exposing it to the others in order to prevent it from possible external threats. Humor keeps the link to the other even if the other is harmful and malicious.

However, when humor is inaccessible, and the creative abilities are aborted, what remedy remains to a teenager thrown into his own lions' den; a pit where there is nothing more than violence, where the only link still possible is marked by the seal of destruction. Jeammet (2006) says that destruction is the creativity of the poor; if he is not able to create, at least he can destroy.

Benyamin (2013) draws a parallel between mental and preconscious activity, which is also endowed with these same specificities. In the absence of mentalization observed more specifically in adolescents reluctant to humor, we note the existence of an operative thought characterized by a mode of factual thinking obstructing the passage to all fantasizing. The subjects overinvest the perceptive, thus defending the effects of the deficiency of the hallucinatory realization of the desire.

The ideal ego, in its narcissistic omnipotence, would replace a weak superego. According to Laxenaire (2007), the superego that originates in social anxiety is squeezed out by the released instinct that a creed allows. It offers to the ego a narcissistic power that the individual seeks. Thus he would voluntarily constitute himself slave of the ordinary, unique thought. These non-humoristic teenagers suffer from a lack of internalization of the rules and limits weakening their superego. This superego, which is rooted in social anxiety, is short-circuited and the impulses are released, serving a megalomaniacal narcissism often making the nest of the most reprehensible acts. Identical and identification instability with the absence of internalization of proper objects makes these adolescents suggestible individuals to manufacturers of ideologies. These gurus constitute themselves as a paternal figure, object of admiration.

The sample from which we have established our research is relatively representative and distinguishes a predominance of aggressive humor to comic-aggressive, mocking, ironic, or even sarcastic. This is also supported by the words of Judith Nagy (1998), who argues that inappropriate humor is correlated with aggression and can manifest as sarcasm or irony. Kamieniak (2005) argues that adolescent humor is more aimed at the instinctual discharge than the economy of effect through mockery, joking, parody, pettiness, and wit, or even irony, cynicism and derision. All of these types imply a specific relation of the subject to himself and the other. He connects the demonstrations of mockery and parody with the mischievous aspect of the child who plays with adult authority and the manifestations of cynicism and derision with the distress of the wounded and humiliated a child. Teenage humor would consists of a back and forth between these two positions making the nest of the maturative process. One of the specificities of adolescent humor is the difficulty of managing internal objects. The teenager, unlike the adult, looks for himself when he built relations with others. He needs to recognize himself in the other, to form bonds with his fellow beings in order to be able to identify himself to them. Managing the conflicts of others, similar to his ones, allows the adolescent to organize himself in a secure affiliative link. However, aggressive humor could become, pushed to its extreme, a weapon of relational destruction. It would lead to the exclusion of the other, thereby hindering the process of reconstruction. It would then serve to accentuate the differences and to distance any possibility of identification to the other being locked in the aggressive paranoiac humor without joy. Teenagers using

this type of humor verbalize a feeling of persecution toward their peers or adults belonging to the social sphere. Some adolescents approach, in this sense, the fear of others in terms of fear of contamination or people taking advantage of them.

The humor should be handled with caution during what Jean Pierre kami naik calls the "love moments" of adolescence. The narcissistic issue is essential, and the internalized, rejected, or deficient parenting images play a fundamental role in the construction of a stable identity allowing commitment to a secure object relationship. Kamieniak (2005) points out that there is no specific use of humor in adolescence because it would be more like a character acquired through the work of adolescence, but we could talk of adolescent humor. Humor in the wild somehow subject to drive excitation that tries to tame. This humor is drenched with aggression and adolescent violence to create a bond with it, to ensure the sense of continuity threatened by the pubertal break-in. Sibony (2010) brings humor to the game of the spool that is launched and that we catch up. This game of Fort da described by Freud reassures the child about the return of the mother and helps to support its absence by establishing the permanence of the object. The spool launched here is not the mother but oneself. Sibony (2010) adds that we play to launch, to lose, to meet, jubilant each time at this movement of loss, and reunion. This progression–regression game, ensured by preconscious permeability, provides the teenager with a feeling of the permanence of himself, facing the feeling of strangeness. This diurnal reverie put into words participates in the secularization of drives and develops a pleasure to think and to play with his own and other's thoughts.

The other that we desire, the other that we have, the other that escapes us, the other that threatens us, the other sometimes objectified, instrumentalized, and sometimes elevated to the rank of the all-powerful executioner. Gutton (1991) states that the body and the imaginary stick to the puberty and that the words are enactments and vice versa. The adolescent sublimation would be the inscription of this new puberty in the interstices of the infantile flaw. It constitutes this trajectory of effects that the teenager borrows traveling from primary to secondary school. This innovative act would serve to repair oneself, as Janine Chasseguet Smigel (1971) testifies. Moreover, it is by sharing his singular experience with the other that he succeeds in setting up the process of para-excitation against internal attacks. Didier Anzieu said that creating is about letting oneself work in one's conscious, preconscious, unconscious thought and also in one's body, as well as their junction, their dissociation, their reunification that is always problematic. It is a reinterpretation of the infantile in the light of new pubertal potentialities. This reading implies a continuity between the past, the present, and the future to come. It integrates the traumatic elements and ensures, through the preconscious work, their transformation into mature elements. This recourse to humor as a sublimatory tool of primary impulses guarantees the establishment of the continuity of pleasure to think by creating a favorable climate for learning. The renewal of this energy to learn would be, according to Van den Branden (2015) the essence of sustainable education.

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TQM in Higher Education for Sustainable Future

Fermin G. Castillo

Abstract

Total Quality Management (TQM) had gained increasing interest and application in higher education over the last decades. This paper presents the concept of TQM in a higher educational institution on how they can sustain TQM for a sustainable future. Higher educational institutions must first understand that in order to function effectively and efficiently, they must determine the exact ends they wish to achieve and adopt the most rational method and style in pursuing them. "From customer satisfaction to customer delight," is the vital message of Total Quality Management (TQM). There is a need to identify and apply the relevant concepts of TQM to every aspect of academic units; i.e., teaching, research, community services, and administrative supports. The integral part of TQM advocates at the higher educational institutions is primarily top management, senior administrators, and faculty member/staff.

Keywords

TQM • Quality practice • Benchmarking • Sustainable • Higher educational institutions

1 Introduction

TQM and QA are applied to business, corporate, and industry but its application to academe setting has been trial and error or even experimentation. Around the world, colleges and universities of higher learning begin to realize the value of TQM in their search for quality standards. TQM in academe is already in its adolescence to maturity stage, which requires many components. TQM is focused not only on product/service quality but also the means to achieve and sustain it. Quality control, quality assurance, and quality improvement play an essential role in the academic settings on how to apply those components of TQM. The value of each component is designed to establish excellent and smooth standard operating procedures which make TQM an ideal practice in the academe. The role of each component is interrelated to each one so that the practice of TQM will be achieved in the long run. What is matter most is the ability of the academic institution to fulfill its task and achieve their goals? TQM is usually applied to products and services, but in terms of quality as a gauge in an academic institution, the question remains to be subjected to debate and arguments. Many scholars may answer this question on the views of academic accreditation where their institution possesses the international accreditation that is well-known all over the world.

1.1 TQM in Education: The Priorities

Many colleges and universities all over the world started to realize the value of TQM in their organization. Due to stiff competition in the academic environment, which makes the educational institution to move further as it is today. Globalization of higher education has become a fact, just like products that can be sold locally. We should also remember that globalization will not only play critical elements in upgrading if not enhancing the education sector. Each institution has its views on the aspect of quality as it satisfies its customers. Total Quality Management in higher education means continuous improvement of quality courses for students, excellent campus facilities, competent faculty members, reliable staffs, and most of linkages and support by their government. In order to accomplish TQM in the

F. G. Castillo (✉)
University of Fujairah, Fujairah, United Arab Emirates
e-mail: fermin@uof.ac.ae

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academe, the three (3) essential aspects should be developed in order to reach further success in the future.

1. Excellent customer service
2. Staff, faculty, and administrator involvement
3. Higher education compliance.

Customers are the reason for the business existence, and in the case of an academic institution, it is the students. Who is our customer? That was an interesting question that needs to be answered by the school administrator. The student is the customer since they are one of the sources of income and revenue for some academic institutions. Therefore, on the part of an academic institution, they have to think of ideas to provide excellent customer service for the students. Usually, the starting point for customer service is the reception or information center. They are the first on the line to meet students, parents, and other parties involved. In order to accommodate the potential prospect, the front liner should be correctly oriented. Also, they have to put staffs who can communicate in various languages and dialects. On this regard, the brochures and other documents related to the institution should be readily available, and at the same time, they should have an information card so they can get in touch with their prospective students and parents.

Speaking of staff, they are the technical and support group of the academic institution. They are responsible for the inquiry, admission, and more importantly marketing the academic institution. Many academic institutions classified their organizational chart into the academic and administrative departments. Each department has its department and units accordingly. They are created for specific functions in the organization. Creating a multicultural diversity of staff is very important rather than forming a homogeneous workforce. There are many known benefits of multicultural diversity in the academic institution like learning the best practices from other nationals, including their language. As many staffs have diverse experience, this will help the academic institution to gain experience with these people. Aside from that those staffs may have a strong linkage to fellow citizens, which can be a magnet in attracting new and prospective students. Therefore, on the part of the academic institution, they have to think of employing diversity for a different strategic purpose and connections. From engagement to empowerment is the new role for the staff to develop their competency at the same time to enable them to achieve better heights.

Faculty members of the teachers are the ones in front of the customer, which is the student. As an educational institution, we are the drivers for the economy of any nation around the world, and teachers make other professions possible. Therefore, they have to hire only qualified teachers with a track record of achievement and success. The different academic institutions have its faculty recruitment criteria. This varies across institutions and organizations as the case may be. Faculty members must possess ethical values aside from their knowledge, skills, and abilities. The academic institution is the place where right conduct and behavior being groom to be future professionals. So the teacher must be in that tune to mold their students and be the example they can be.

For the administrator, the leadership role is significant because they are the ones managing the whole organization. The administrator checks the whole operations of the academic institution strategically. Because there are many academic institutions that are competing with each one, in order to stand and survive the competition there must be a refined mission and vision statement that will encourage harmony and competitive spirit to its staffs and faculty members. Usually, the leader of any academic institution is the one who leads the organization to the next level. It can be moving forward or backward as the case may be. Even for new staffs and employees who are recently joining the institution, it can be the upgrade they need or worse they are the downgrade. In order to satisfy their wants and needs, the administrator should take into consideration what they can offer to them. This will now be a question on quality aspects that institutions can give them.

Staff, faculty, and administrator involvement in the process is significant in order to accomplish its objectives. All of them must work together and not compete together because this will make the academic institution in different directions. There must be a clear policy, rules, and regulations in order for each one to know the boundaries of their works.

Higher education compliance is perhaps the bread and butter of any academic institution because they are the main reasons for existence. What we mean here is that all higher education institutions must follow and adhere to the authorities so that they comply with academic accreditation and quality assurance. They are the one who issues and revokes licenses and permits for operations.

2 Literature Review

TQM can be defined as a general management philosophy and a set of tools which allow an institution to pursue a definition of quality and a means for attaining quality, with quality being a continuous improvement ascertained by customers' contentment with the services they have received (Michael et al. 1997). Total quality management is the result of the process needs continuous improvement at the end. Of course, we need to measure and compare in order to see the

before and after then make the necessary adjustment as the case may be.

The term total quality management can be defined in different means and ways. Its definition started to evolve over the years.

> British Standards Institution standard BS 7850-1:1992 "A management philosophy and company practices that aim to harness the human and material resources of an organization in the most effective way to achieve the objectives of the organization." (Hoyle 2007)
> International Organization for Standardization standard ISO 8402:1994.
> A management approach of an organization centered on quality, based on the participation of all its members and aiming at long term success through customer satisfaction and benefits to all members of the organization and society. (Pfeifer et al. 2200)
> It is safe to say that different organizations have different approaches as to the application and meaning of total quality management. Perhaps it is the customer who can tell how they define total quality management based on their experiences with companies and/or organization delivering them the products/services.

2.1 The Functions of the Higher Education

1. To build an organization that provides products or services that are considered quality by those who use them and meets their expectations. In the case academic institution, we have to build a product which is the academic services for the students. When we talk about a quality product, it should start from each and anyone's responsibility. We always want to provide and deliver quality education but are we giving back quality service to our end-user. We must know our target market and deal with them accordingly.
2. Universities bring closer to the community through the extension of knowledge and its applications for problem-solving. The academic institution must reflect on its ability to involve the community. We have to understand that academic institution has a social responsibility to its community; they are served by being the bridge in helping them. Thru various activities and involvement in the community, they are serving they need to lead by example by doing.
3. To encourage teachers and students and through them in society, general attitudes and values are needed for developing the individual and society. The academic institution must look for sustainable activities that will help society at large. Not only that they must involve the students on this project so that in the future, but they will also understand the real meaning of education beyond the four corners of the room.
4. To encourage the right way of leadership skills and helping the individuals to develop their potential in the workplace. The academic institution is the home of knowledge and beyond. Aside from educating future managers and leaders of the next generation, we must train and develop their leadership skills, by assigning the projects that involve society at large, including communities.
5. To seek and develop new knowledge by engaging vigorously in the pursuit of truth and interpreting ancient knowledge, beliefs in the light of new needs and discoveries. As an academic institution, we should be the one to provide them the necessary tools for research and development. Overall, we have to ask our management and people if we have enough people to help our students and at the same do they have enough experience in that?
6. To provide society with competent, trained professionals inclined with a sense of social purpose, the academic institution must think of professional growth and development of its staffs and faculty members. They should empower them to do great things for their professional growth as this will help the academic institution in regaining its credibility and reputation in both the short and long term. Invest in their future as they will handle things in good hands. The academic institution must work together with the society for the common good.
7. To promote equality and social justice to reduce social and cultural differences through the diffusion of education (Ramadan 2011). Nowadays, we have seen academic institutions with various multicultural diversities in management as well as staff and faculty members. That equality and treatment among employees will help the academic institution to attain greater heights by embracing a different culture, which in term will help them to achieve their mission and vision.

Osseo-Asare and Longbottom (2002) mentioned a model for TQM implementation in higher educational institutions, and they propose, enabler criteria which affect performance and help organizations to achieve excellence. These "enabler" criteria are leadership, people management, policy and strategy, partnerships and resources, and processes. They also suggest "result" criteria, including customer satisfaction and impact on society. Leadership is a significant part of any organization, but in the academic institution, it is the direction that matters. It can be moving forward or

backward or even in any direction as the case may be. The leadership role is very challenging because leaders must send the message clearly and accurately to its follower; otherwise, it will give them the opposite.

Sangeeta et al. (2004) consider the education system as a transformation process comprising inputs of students, teachers, administrative staff, physical facilities, and process. The processes include teaching, learning, and administration. Results include examination results, employment, earnings, and satisfaction. The inputs are the one who contributes to the process which includes primarily the students, faculty, and staff, including the administrator. If those inputs are correctly in place, then we can see better output at the end. By bringing quality students during the admission process and their academic years, they were appropriately taught, then the output/outcome will be better. On the part of the staff and faculty members if they are competent and with necessary work experience, then we can see good results. This is true in the case of facilities and infrastructure which what is inside that matters than what is outside and visible to naked eye.

According to W. Edwards Deming, Total Quality Management (or TQM) is often associated with the development, deployment, and maintenance of organizational systems that are required for various business processes and try to improve quality by ensuring conformance to internal requirements (Deming 1986). Deming's view on quality management triggers many gurus in the total quality management to identify more issues in measuring those gaps and application of the necessary tools needed. It is essential that both qualitative and quantitative data are available in order to calculate and compare the gaps. Moreover, from gaps, the necessary continuous process must take into consideration with the corresponding action and not talk.

3 Issues and Discussions on Total Quality Management: On Sustainability

The academic institution is like a house as its foundation TQM should be very solid as its framework. According to (Tulsi 2001) the University and Colleges must have the following approaches as summarized below:

1. Identifying customer needs
2. Specific quality standards
3. Benchmarking
4. Identifying gaps in the existing system
5. Planning for improvement
6. Implementation for improvement plans
7. Monitoring and evaluation
8. Modification of plans.

In identifying the customer needs, as an academic institution, we have to ensure that we are giving what is necessary to our customers. If more than essential we have to ensure that we have the necessary logistics in delivering quality services for them. In academic institutions, they are our students and parents. In order to satisfy their needs, we have to offer them value-added services like competitive tuition fees as well as world-class facilities that are designed for learning and development for their siblings. In order to identify customer needs, we must look for means and ways to satisfy their requirements. In order to sustain the students, the academic institution must provide a healthy learning environment for them. Listening to student's suggestions may be a good option for administrator and think of the suggestion from a valued customer.

Specific quality standards apply to the program offerings offered by an academic institution. Many standards are applied to the academic institution which depends on the accrediting body (can be the local or international accrediting body). These quality standards may be different in each country or region, but the essence of quality remains the same. It only depends on the recipient if they are satisfied or not. Otherwise, quality can be just a word without meaning or purpose. In order to sustain the operations of an academic institution, they must conform to the standards set by the accrediting body; otherwise, they will in probation or worse the license maybe revoke. To ensure compliance with the generally accepted quality standards, the institutional assessment and quality department must ensure that quality across the department must be practice. It is the responsibility of everyone and anyone. Documentary evidence and documentation of quality best practices must be sustained nor improve in order to achieve the ideal performance of the academic institution.

Benchmarking is one of the best practices of quality management, but there is no clear and flat approach for benchmarking as it varies across institutions' capability and capacity. Benchmarking is a word that defines and compares the institution from within. Usually, the institution looks for top institutions and compares what they have rather than improving on things then see where they are. It is suggested to create your benchmark and maximize the potential of the institution by following at least the local accrediting body and comply with it. The bottom line in any benchmarking should be prioritizing the value of students and should be on the top of the agenda. By sustaining the academic institutional operations, this will help the organization to identify their competitive advantage over others.

Identifying gaps in the existing system will help the academic institution to compare what needs to be done against and how to do it better. Identifying the gaps will help them to identify the critical areas of improvement. Gaps help

the academic institution to think of better things to improve while looking forward to continuous improvement. A lot of colleges and universities are now implementing e-services in terms of their records management, which is eco-friendly and efficient. The established system should be secured so that unauthorized uses can be avoided. It can be a comparison of paper works to automated or computerization. Shifting from another system should make things useful and efficiency; but not costly on the part of the institution.

Planning for improvement is always the goal of any institution but are there improvement happening remains to be the question. On top of it, planning for improvement is an institutional output as a whole. Each department or unit must work together for the common good in order to achieve a better position. Each of them must provide an action plan in order to achieve each department's goals, which in the end will contribute to the organizational improvement. While planning is thinking, the implementation is the action of the plan which needs to be seen. Usually, the implementation is the critical part because it is the execution of strategies where you will see if it is decisive move or not. Is it the right move or not remains to be seen in action?

Monitoring and evaluation are one of the responsibilities of the quality assurance department, which is enforced to the whole organization. Many people have seen that quality assurance as the department should be the starting point of the quality, but it should be across the department. Quality is everyone's responsibility, and that should be the case. The only problem is that other departments are not aware that they can also start working on quality things. Quality assurance serves as a monitoring aspect of the academic institution if they can keep things in proper order, which is error-free. Quality improvement can be defined as the changes to the existing process or practice that will change things.

- Input (students, teachers, administrative staff, physical facilities, and process).
- Process (teaching, learning, and administration)
- Output (examination results, employment, earnings, and satisfaction)
- Outcome (Achievement of PLO/CLO, competitive graduates, high retention rate and better services)
- Impact (Program Offers, Employment, Graduates)
- Sustainability (Quality and Competitive Institution, Industry Placement and Future Managers/Leaders of the Country).

The following TQM Model in Higher Education showcases thru the Modified IPO Model with the inclusion of Outcome, Impact, and Sustainability. Each of the variables identified has similar roles in the model. Each of the following has its corresponding role in the success and failure of the model.

- Input (students, teachers, administrative staff, physical facilities, and resources)

In terms of Input, the students, teachers, administrative staff, physical facilities, and resources are an integral part of the input. They are the starting point of the journey toward the process. Students are the heart of the input wherein they are the reason for the institution to exist. Teachers are the representative of the institution and serve as frontline. Therefore, the institution must hire competitive and multicultural faculty members. Aside from that, the administrative staff must also come from a different diverse background. This will help the institution because students may be the same as staff's nationality/ethnic group. The physical facilities and resources should be world class and should serve the student's basic needs and wants.

- Process (teaching, research, learning, and administration)

In terms of Process, the teaching, research, learning, and administration are form part of the process. Teaching is the aspect of the process because it is the delivery of the instruction that matters. On how the teacher teaches the student is an essential piece of the process. If the delivery of the lecture is done correctly, then the students will be the one to recommend the institution to others. This will help them to gain a reputation and image in general. Research and publication of the teachers make the institution to be on target as far as its contribution to society. More importantly, dual-purpose like accreditation and ranking. Learning as a process because different faculty members, staffs, and administration, in general, have different backgrounds and inclination. This will help them to work synergy for the welfare of the institution. Teaching and research is the most essential aspect of the process because the teaching part will be addressed to the learner. A satisfied student will recommend the institution to others; therefore, teaching as a service needs to be appropriately delivered. Research helps the institution to be recognized in by the community and beyond. It is not only part of institution's primary agenda, but higher education authority started to impose research as one of the qualifications by the teacher. In the terms world ranking, there are weights on the research and publication by the institution, including the citations by authors.

- Output (examination results, employment, earnings, and satisfaction)

In terms of Output, the examination results, employment, earning, and satisfaction are the main outputs of the

equation. As a matter of fact, after teaching, then examination results will show if the student did learn or not. After learning the employment will come, which will serve as a test if the graduates are in the pool of talents in the industry/corporate and business world. Many stakeholders/shareholders are always looking into the profitability of the institution, even if it is not their primary goal of business existence. Except if the institutions are not for profit, still the primary source of income and revenue for any organization is the tuition fees. The number of enrollees can be a good point of reference but not absolute. The tuition fees and other collections by the academic institution will be used and budgeted accordingly to its operations. Looking for industry and corporate partnership/linkages can be an ideal choice for an institution looking for support.

- Outcome (Achievement of PLO/CLO, competitive graduates, high retention rate, and better services)

In terms of Outcome, the achievement of Program Learning Outcomes and Course Learning Outcomes needs to be measured. These analytics will help the faculty members which assessment instruments are consistent and dependable. Competitive graduates are always the primary goal of any institution as the degree earned needs to be tested in the real world. High retention rate is always the outcome of the quality instruction where the students learned from their teachers and recommended the institution among their circle. As a result, the institution may look for other areas for improvement, which will make the institution likable and friendly.

- Impact (Program Offerings, Employment, and Graduates)

In terms of Impact, the program offerings, employment, and graduates are the results of better services and quality education. The program offerings may be accepted in society because of its outstanding field where the society started to recommend the program. Employment is one of the significant contributions once the student graduated from the institution as part of nation-building. They are now contributory to the economy and society as they part of it. Graduates are the actual product of the institution where they are the image and reflection of the institution wherever they go. They will always carry that torch of knowledge for the rest of their lives and to generations to come.

One of the most critical aspects of the impact that will provide higher education to the next level is the employability of its graduates. Employability is the capacity to move sufficiently within the labor market to realize potential through sustainable development for individuals; employability depends on knowledge, skills, and abilities, they possess and the way they use the assets. Job realistic competencies are of three sets, i.e., necessary academic, higher order thinking, and personal qualities. Quality assurance system should enable the student to influence academic policy (Harris and Forsyth 1995).

Higher educational institutions are producing graduates in large numbers than they can manage and try their best to fit in the corporate and industry. Some organization observes that higher educational institution failed to prepare them in the real world.

Therefore, graduates may be employed or in-place in different sectors or industries. This can be solved by introducing industry practitioners in the academe. Not only the institution can have gained valuable experience to external experts but also they can prepare their curriculum and syllabus according to the demands of the market and needs. This will help the academic institution to be more competitive. It will also create a linkage between academe and industry at the same time.

- Sustainability (Quality and Competitive Institution, Industry Placement and Future Managers/Leaders of the Country)

In terms of Sustainability, quality and competitive institution, industry placement, and future managers/leaders of the country are their significant contribution. Yes, it's true want our institution to be of quality and at the same time competitive at both ends. This can be achieved if the inputs are quality as the starting point. Quality must start from each part of the process so that the end result will be quality and not quantity. Usually, institutions have their quality assurance department, however, because academic institution needs an external review to inspect. Therefore, it is becoming part of their responsibility to ensure that everything is operating and within the standard. Aside from that, the accreditation of the institution matters the most because it is the reason why institution exists that is they are accredited by the higher education/any authority in education/accrediting body. Quality has both absolute and relative connotations. The concept of absoluteness is quality props up the morale of the higher education system at the delivery end (institution) and the receiving end (students). Quality dimensions seem to have two implications, such as the functionality of the output and meeting the necessary standards. Hence, the quality of a higher education system may be seen from norms and standards, which may evolve depending on the need of the hour. In the twenty-first century, the different components required for enriching the higher education system should be included in the teacher preparation programs for sustaining the quality in a teacher. Therefore, sharing of the experiences among institutions on

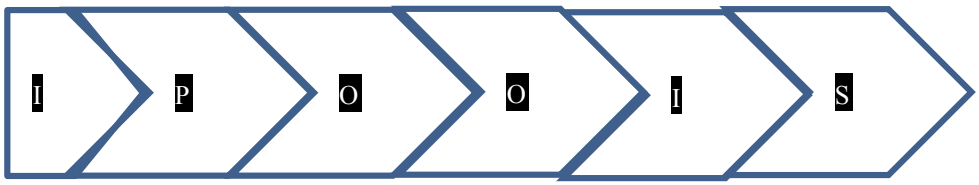

Fig. 1 TQM model in higher education

quality issues may generate ideas for evolving norms and strategies for their quality assurance of management processes, curricular inputs and practices, and the evaluation system as well (Vendhan and Sumathi 2013).

In order to sustain the academic institution, all of the elements stated in Fig. 1 TQM Model in Higher Education should be present. Each one plays a vital role in its success and its everyone's responsibility. The mindset of each member in the academic institution should be looking forward to the future while creating significant output. Sustaining the operations is a challenge to any institution because the cost involved in the operations will determine if they operate entirely and operationally.

After the student graduated from the institution the next thing to know is where they are? That is why influential alumni will make the institution to have better networks and connections which will help them for future employment and references. We are grooming the next managers/leaders for tomorrows, therefore, we must teach them the right values and ethics. This will educate their hungry minds to be productive in society and promote nationalism.

3.1 Barriers to Providing Total Quality Management (in General)

Passive resistance is the most potent weapon ever wielded by man. According to Benjamin Tucker, the following barriers prevailing the institution to provide quality education and practice.

1. Systems and procedures
2. Culture
3. Organizational design and
4. Management practices.

Systems and procedures are always part of any organization wherein this system and procedures started to evolve over the years as a result of operations. Systems pertain to the structure and method on how to get things done according to the arrangement or practice. To establish a proper system required experience and knowledge on the subject matter. Systems help the academic institution to achieve the operations of its course offering and what they can offer to its target. Procedures are the steps of the process that needs to be accomplished. These procedures will help them to assess the preparedness of the institution in documenting the steps to be followed, which serve as a guideline.

Culture can be a factor because it can be interpreted in different means and ways by employees and people. Culture is a way of life which was transferred across generations and practice by the institution. It can be defined as the personality of the organization as viewed by the customers and its employees. The organizational design reflects the step by step methodology where the workflow implements the plan of action. This requires implementation and action in order to accomplish the mission and vision of any institution.

Management practices are the operational part of the process where the employees are working toward the institution's main business or purpose of existence. Usually, the management practices are decisions from the top management and were sent down the line. They are responsible for the choice of priorities that needs to be fulfilled. This management practice needs more democratic in order for the employees and top management to work together for the common good.

4 Conclusion and Recommendation

Total quality management is the result of delivering quality service to the valued customer, which is the student. Total quality management needs to be sustained in any academic institution because it will help them to operate and manage their academic affairs. Total quality management is a philosophy that must be transformed into actions than words. There are many institutions who are implementing total quality management across their operations, but the intriguing question is for how long they can be on that level of maturity. Total quality management is everyone's responsibility, and each one should work for it. Focusing on excellent customer service is still the best application of quality while sustaining the operations to be the best they can be. It is not only achieving that success but for how long they can be in that level possess more significant challenges. This is true in many tops and highly rank universities because the pressure is high for them to deliver the goods accurately or they will lose their run. Staff, faculty, and

administrator are vital ingredients for total quality management as they play a vital role in its success and failure. On the part of the top management, they must think for their future direction and work for it by supporting the ideas of staffs and employees. Moreover, lastly, in sustaining the future of the academic institution, they must adhere to the standards set and sustain their operations. There are many standards and quality management that can be applied to higher education. Many institutions are now toward international accreditation and academic upgrades. Future studies may be related to international accreditation and its value for the institution. The short-term and long-term strategic planning of the institution and how it can be sustained is a perfect research area since many institutions have this kind of plan.

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Urban Performance and Sustainable Environment: Ajman as a Case Study

Bouzid Boudiaf

Abstract

Urban Performance is an assessment tool that can achieve a Sustainable Environment, as it can be an effective tool for the decision-makers by highlighting the different physical and socio-economic potentialities and impacts of each district or sector, or even city. However, the ability of existing assessment tools to achieve such objectives is limited, and reduces the reliability of the results and sometimes prevents the realization of sustainable environment. This paper studies the urban performance and sustainable environment in Ajman, UAE. In U.A.E, there is an increased recognition of the need for sustainable environment and the development of assessment tools has begun. The methodology used in this paper consists of defining the indexes of the urban performance at the city level, then by looking at the different districts in Ajman, determining and evaluating each index through the categories for each index and through the attributes that constitute each category. The analysis of these attributes leads us to establish a framework for the assessment of the urban performance.

Keywords

Urban performance • Sustainable environment • Sustainability assessment

1 Introduction

World population, currently about 6.3 billion, is expected to at least double during the present century. In 1990, just 15% of the world's people were urban; today the figure is closer to 50% and by 2030 it is likely to be at least 60%.

The cities of the world take up 2% of the world's land area, consume 75% of the world's resources: 50% in buildings, 25% for transport, and 25% for industry and produce most of its waste.

In the U.A.E., cities are expanding at an unprecedented speed. This abnormal growth destabilizes the balance between natural resources and the morphological characteristics of each city.

If the percentage of urban population will continue to increase, so to what extent and what is the impact of this growth on cities and agglomerations and how could they support themselves?

Such phenomenal urban growth, mainly in the developing countries, leads to a Social, Economic, and Environmental metamorphoses. If the city is the place of conviviality, culture and concentration of opportunities for activities and services, the city is also the place for insecurity, precariousness, stress, and all sorts of pollution. The city is a complex system where Environmental, Economic, and Social subsystems are interconnected. Nowadays, there are different tools for the assessment of the urban performance. A few weeks ago, due to the excessive human exploitation and interventions, and in terms of footprint the earth reached a stage where the resources are decreasing. The urban performance seeks to assess the sustainability of each city through the interaction of the environmental efficiency, the economic efficacy, and the social equity. These challenges are behind the increase of interest in research on environment and sustainability. Several research efforts in the field of sustainability, particularly in environmental decision-making, performance monitoring, policy evaluation, and benchmarking comparisons, are evolving within the scientific community.

With these challenges facing our cities, we are taking Ajman as a case study and through it we will review the performance of each district. We will end up with some recommendations dealing with how should we design in a way that our cities should be more sustainable and smarter.

B. Boudiaf (✉)
Ajman University, Ajman, United Arab Emirates
e-mail: b.boudiaf@ajman.ac.ae; Boudiaf.b@gmail.com

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2 Literature Review

Environmental considerations have gained significant importance for assessing a project's impact, both positive and negative, on the environment. Sustainability is an emerging field through the emergence of different researches on environment, socio-economic, and technologic aspects but still as fragmented branches due to the lack of coordination and other spatial and temporal considerations.

Diagram 1 illustrates the ecological footprint in 2010. In the left side, we have the countries presenting a deficit in the ecological footprint, and in the right side the reserve left. Nowadays, the whole world is deficient (Jenks 2008).

Sustainability assessment approaches may be categorized based on the hierarchical structure in their application, e.g., frameworks, analytical tools, and metrics. In other words, these approaches can be assessed using frameworks or structured protocols to study several options within the framework using analytical tools, and to define such project occurrences using metrics.

3 Sustainability Assessment

Table 1 highlights the chronological development of the main building environmental assessment methods. Measurement science is vital in evaluating environmental impacts to assess sustainability. Most of these methods are based whether on the Life Cycle Assessment or the Criteria-Based Tools. In general, performance score assessment tools use prescriptive path based on individual assessment criteria, and LCA tools utilize performance path based on mathematical algorithms (or modeling).With indicators identified by the approaches above, there are approximately 600 tools, which measure the environmental, social, and economic dimensions of sustainability. The development of the assessment tools commenced in 1990 with the introduction of the first tool Building Research Establishment Environmental Assessment Method (BREEAM) in UK. Five years later, the French system High Environmental Quality (HQE) was established, followed by Leadership in Energy and Environmental Design (LEED) in the States in 2000. The Comprehensive Assessment System for Building Environmental Efficiency (CASBEE) in Japan and Green Star in Australia was developed in 2001 and 2002, respectively (Cheng and Behzad 2016).

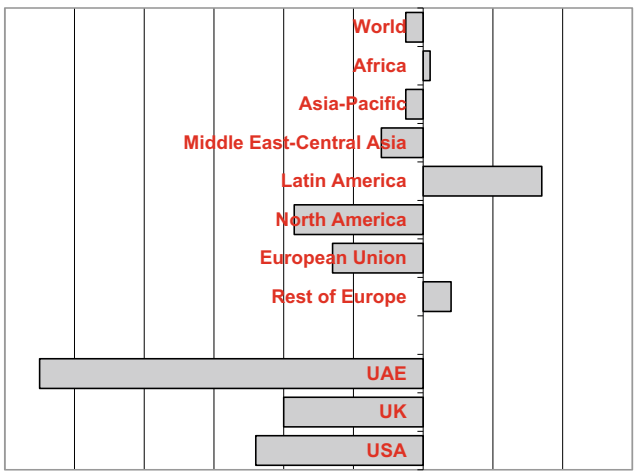


Fig. 1 Ecological footprints

Table 1 Tools of sustainability assessment

Year	Assessment tool	Tool type	Country
1990	BREEAM	CBT (criteria-based tools)	UK
1995	EQUER	LCA (life cycle assessment)	France
1997	ATHENA	LCA LCI	Canada
1998	LEED	CBT	USA
1999	BEAT	LCA	Denmark
1999	ECO-QUANTUM	LCA	Netherlands
2002	BEES	LCA LCC (life cycle cost)	The USA
2003	Green STAR	CBT	Australia
2004	CASBEE	CBT	Japan

However, the use of the Life Cycle Assessment (LCA) and the Criteria-Based Tools (CBT) in one assessment tool is on the rise. The integration of the assessment methods (Spatial or Temporal) is intended to overcome the shortcomings of each path and improve the accuracy of the assessment results. Time boundary refers to the target period for assessment. In the past, most conventional LCA tools focused on construction materials. These days, however, there has been a tendency to see a building itself as "product." As a result, time boundary generally covers a whole life from construction to operation.

In terms of spatial boundary, it can cover from whole space including building site to construction materials. In case of performance rating assessment, quantitative estimation is not included and the entire boundaries from building site to materials are usually covered. In case of LCA tools, on the contrary, precision analysis targeted only in limited stages.

3.1 Sustainable Evaluation: Tools

The different tools and principles used in the evaluation of environment are summarized in Table 2. These tools, for the evaluation of the sustainability, have been developed to

Table 2 Tools and principles of sustainable evaluation

Tools	Principles
Reductionists	Use a single measurable indicator as a tool for the evaluation: a single dimension, a single objective, and a single scale of analysis. As sample cost-benefit assessment
Non-reductionists	Methodological choices constitute the main tools in the evaluation of the impacts of the project on the environment. The multi-criteria assessment is one of the examples of this tool
Economic-monetary	Economy and Monetary are the leading indicators for the evaluation of the project. Cost-benefit assessment and whole life costing as samples
Biophysical models and thermodynamic method	This method consists of evaluating the environmental impacts by considering the resources invested in the production of good and/or service. Life cycle assessment is one of the tools

support conscious environmental decision-making. They are classified as reductionists and non-reductionists tools. The selection of the evaluation tool lies with the analyst's particular worldview or subject of expertise, which is ultimately projected upon a particular project. Thus, the tool becomes the yardstick to evaluate the sustainability of the project at hand (Srinivasan et al. 2011).

4 Presentation of the Case Study

The presentation of the case study is structured into three main parts:

The First Part describes briefly the context, the constraint, and the potentialities of the city from the physical and spatial points of view. The objective is to highlight the tools required to achieve the efficiency whether ecologically, socio-economically, or socio-culturally of Ajman in 2030.

The ambition from this study is to cover the main cities in the U.A.E. by 2021 and this is the least thing that we can have in terms of gratitude, acknowledgment, and contribution toward U.A.E.

The Second Part is dealing with the urban performances of the cities. It consists firstly by presenting the methodology adopted for the evaluation of the three main rubrics:

- Green City index;
- Active City index;
- Lively City index.

These indexes allow us to determine the LOCAL PERFORMANCE CITY INDEX which will lead us to establish the classification of the performances of the cities and the/or the districts of one city.

The Third Part is the synthesis of the analysis whether per attribute for each rubric or per district or city by taking into consideration the three rubrics. We will end up highlighting that the coordination and concertation between districts or cities should be one of the keys to the strategic planning for the desired and aspired new urban development (Boudiaf 2017).

4.1 Master Plan of Ajman 2030

The main aspects that should be taken into consideration might be classified as follow:

1. Physical;
2. Socio-economic;
3. Fluidity;
4. Psychological.

Physical: This aspect should lead us to strengthen the character of each district that constitute the city. The character of the city will be analyzed from the urban design point of view with the objective to avoid the physical segregation and the social fragmentation. The main tools used for the identification of the character are the typology of the buildings, the state of the buildings, and the socio-ethnic composition of the district. This aspect will help us to avoid the phenomena of the decay and the deterioration observed in the historical areas in many cities whether in U.A.E or in the Arab World.

Socio-economic: The two main objectives from this aspect are firstly the use of the new technologies of information and communication as a tool to achieve an adequate relation between the social needs (in terms of facilities, infrastructure, migration between employment and housing) and the availability of the land. Secondly, to avoid the speculation mainly in areas requiring some actions such as urban regeneration or revitalization.

The development of the city with different centers is one of the required approaches to avoid the dichotomy between the center and the periphery of the city, as it is a tool for avoiding the physical and social segregations. The polycentric development is one of the ways insuring the development of the whole city in a balanced way, as it will lead us also to reduce the vulnerability of the existing buildings from the natural and technological causes of decay.

Fluidity: The objectives of this aspect are to enhance the quality of the built environment and the easy accessibility to the facilities in the city. The second objective is to strengthen

the polycentric approach. The new subdivision is based mainly on the development of the network with the objective to create a coherent urban growth of the city. The new urban development concretizes the creation of new districts. The main challenges for these new districts are the performances of the network, the infrastructures, and the new technologies on management of the cities. This management consists of collecting the data, updating the tools of planning, and the involvement of the population in the process of the management (Boudiaf 2018).

4.2 Methodology

The use of the term urban performance in urban development is mainly related to the quality of life and welfare. In agenda 21, it was considered, the urban performance was considered as a tool for the evaluation of the urban development. The different Charters and International Conferences (mainly Leipzig in 2007, Berlin in 2012 and Paris in 2016) confirmed and strengthened that the urban performance as a fundamental tool for classification of the city.

Quality is an intrinsic notion that its definition and appreciation depends on the socio-cultural and socio-economic contexts.

Performance means implicitly the success, the remarkable outcome, and we distinguish different types of performances: Sportive, Technics, Economic, and Energetic. The notion of performance is strongly linked to the idea of ranking which means that the classification should be done on criteria and scale determined in advance. In 2006, the USA created the Environmental Performance and the idea from it was to evaluate, compare, and improve the efficiency of the environmental policies for 163 countries. Sixteen criteria were identified and the evaluation was done on a scale of 100 points. Among the criteria, one can mention the following: Health, Waste, and Natural Resources. The ranking of the cities can be done according to the targets, for example, the wealthiest cities, the polluted cities, the cheapest cities, the dangerous cities, and the attractive cities.

Bearing in mind that each classification is done on the base of some specific criteria. Most of the time, these criteria are defined a priori by some multinational companies, the corporation, and the media.

The performance at the district level is done with the objective to highlight the potentialities and dysfunctions in the district. The main aspects taken for the description of the district are as follows:

1. Population;
2. Area;
3. Density;
4. Footprint;
5. Land use;
6. Typology.

4.3 Why Ajman

Ajman as a pilot project but the objective is to cover the main cities in the U.A.E. (bearing in mind that Abu Dhabi and Dubai have already their places in the new typology of the INTERNATIONAL CITIES). Our interest in the U.A.E is based on our belief that the integrated and concerted urban development is one of the conditions leading to a sustainable city.

The characteristics of each Emirate and its main city are illustrated in Table 3. We can notice that the difference in the density can be explained by the fact of the superficies, the aspects privileged are determined by the objectives assigned for each Emirate (Boudiaf and Mushatat 2011).

In the Master Plan developed for 2030, shown in Fig. 1, we notice that the main infrastructure is behind the determination of six zones, the vocation of each zone relies on the history, the physical potentialities and the location in the city. Each zone has its own community Center (Ajman Municipality, Urban Planning Department 2017).

The Challenges:

Bearing in mind that the fourth Industrial Revolution that we are going through will have a great impact on our socio-economical environments. This is another reason for choosing Ajman as a pilot project due to its size and its unprecedented, spectacular and rapid urban growth.

The urban growth of Dubai-Sharjah and Ajman as a megacity lead us to consider that the challenges for a happy environment can be categorized into three main objectives that constitute the fundamental principles of sustainable urban development.

These objectives are as follows:

- Enviornmental efficiency;
- Economic efficacity;
- Social equity.

The city of Ajman is divided into six sectors. This subdivision is done according to the main streets as highlighted in Figs. 1 and 2. At the first glance, we can notice that the areas and densities are heterogeneous. The density has a great impact on the repartition of the facilities and the services (Ajman Municipality, Urban Planning Department 2017).

According to Table 4, one can confirm the idea of zoning (Sector) developed in the Master plan. It is also illustrating the concentration of some activities and services (education

Table 3 Characteristics of the UAE

Emirate	Main cities	Area (km^2)	Population (Inhab)	Density. (Inhab/km^2)	Characteristics	Aspect privileged	Main objectives
Abu Dhabi	Abu Dhabi; Al Ain	67,000	2800.000 inhabitants and by 2030 it will be 3.5 M	42	Diversification of the economy, 85% of the total oil output capacity	Built environment	Capital City; international cultural and world tourism global image
Dubai	Dubai; Hatta	4114	3100.000 and by 2030 it will be 4 M	750	Real estate; finance; oil	Economical pole	World class city modification of the urban fabric
Sharjah	Sharjah; Khor Fakkan	2600	1400.000 and by 2030 it will be 2 M	540	Industry; tourism; education	Aesthetic and cultural values	Arab culture city and industry symbolical aspects
Ras Al Khaimah	Ras Al khaimah	1680	250.000	150	Agriculture; material of construction	Improve quality of daily life	Improve the quality of urban life
Fujairah	Fujairah	1150	230.000	200	World's largest livestock shipping companies	Concentration of maritime activities	Creation of services as network
Oum Al Quaiwin	Oum al Quaiwin	750	75.000	100	Experimental basis for prawns and fish	Improve of quality of daily life	Ad equation cost/efficiency
Ajman	Ajman	260	340.000 and by 2030 it will be 2 M	1300	Agriculture; ship repair and garment industry	Attract investors and creation of new districts	Improve the quality of urban life

or Commerce or Industrial activities) according to the location of the sector in the city (Ajman Municipality, GIS Department 2017).

Environmental efficiency: Bearing in mind the climatic change and the expected energetic crisis, we are supposed to use reasonably the natural resources with the objective to enhance and sustain the quality of life.

Economic efficacy: This aspect is based on the compatibility of the activities and their flexibility. This aspect should be understood in terms of potentialities of investment based mainly on the comfort, the security of the inhabitants, and the development of the required facilities. The economic efficacy is based on the compatible and diversified economic activities. The economic efficacy is also conditioned by the globalization and the competition between the different urban systems.

Social equity: The adequate repartition of the required institutions and facilities, equal and diversified social repartition are the main indicators of the socio-environmental quality.

These three objectives constitute the basic criteria for the evaluation of the Local Performance City Index. This performance will be highlighted mainly through the following:

- The social cohesion which is fundamental for attracting the developers and the competition of the city at the regional level;
- The local performance will definitely highlight the opportunities in terms of employment and urban facilities;
- The urban growth is also based on the social innovation that enhances the character of the city and stimulates development with the objective to preserve the identity and the authenticity of the main places of the city.

The Local Performance of Ajman City will be used as a tool to highlight the principal dimensions of the city: Ecological, Socio-Economic, Spatial, and Organizational. It is also a tool for identifying the dysfunctions and the potentialities of the city.

Figure 3 shows the limits of the different districts in the city (Ajman Municipality, Urban Planning Department 2017). This subdivision relies on the infrastructure available and the density. There is a conformity between this map and the one developed per sector. The evaluation of the performance per district is more accurate and is more interesting for the decision-maker, as this evaluation will highlight the potentialities and the dysfunction in each district. The main difficulty faced is the

Fig. 2 Strategy of AJMAN urban development (2030)

collection of the data available in different organisms and institutions. The difficulty is that the limits of the areas or districts differ from one institution or organism to another, and also some data are not from the same period.

The performance at the district level is done with the objective to highlight the potentialities and dysfunctions in the district. The main aspects taken for the description of the district are: Population, Area, Density, Footprint, Land use, and Typology.

4.4 Local Performance City

The Local Performance City is assessed through three main indexes as shown in Table 5 which are as follows: Greenery, Activities, and Lively. Each index is defined by five categories, and each category contains some attributes. The classification of the attributes was done by giving a weight to each attribute (Boudiaf 2017).

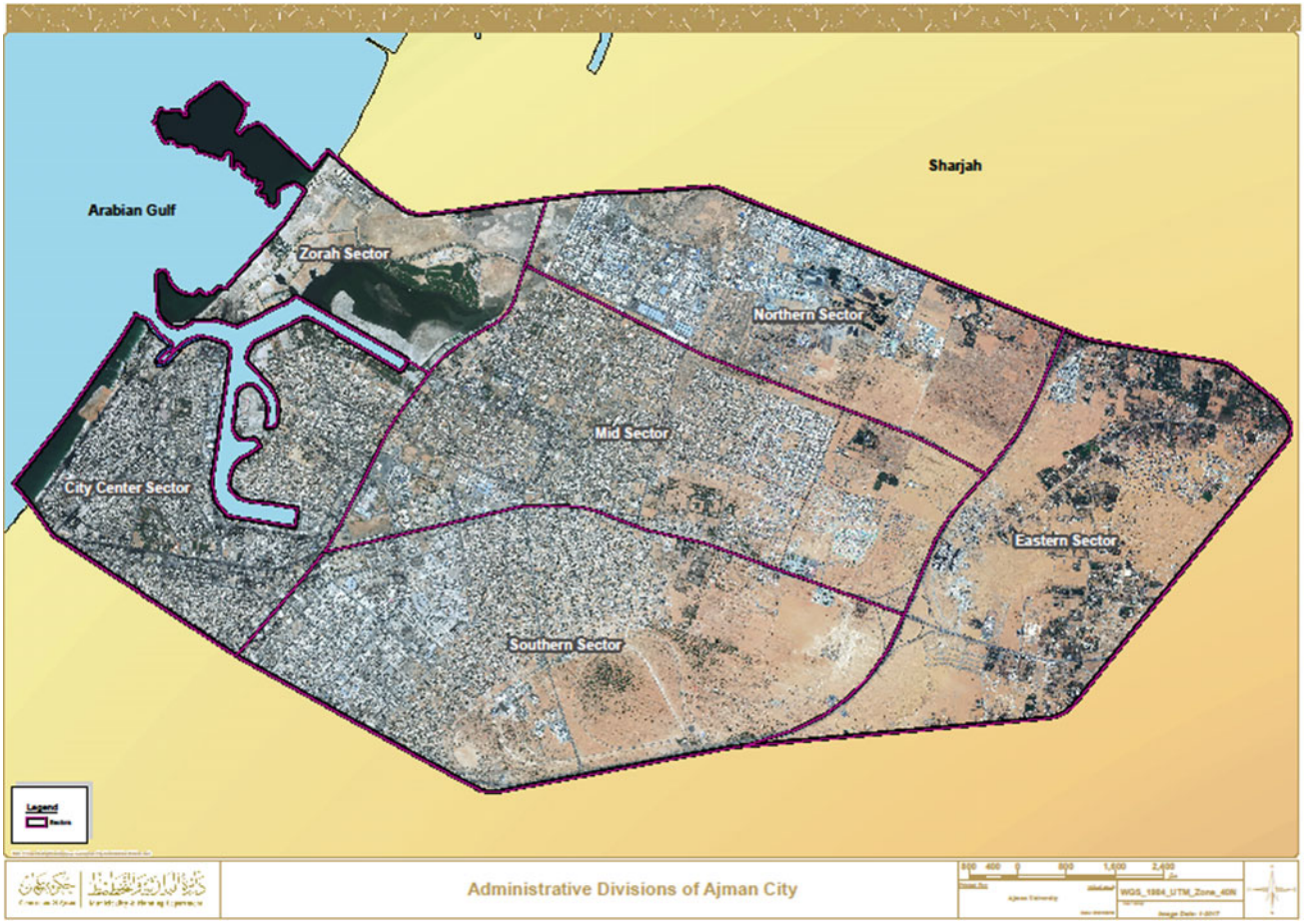


Fig. 3 Subdivision of Ajman City per sector

Table 4 Repartition of the activities per sector

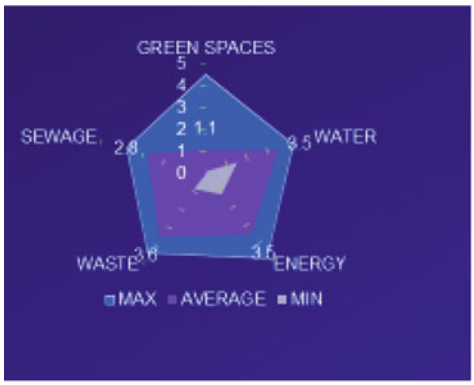
Category	City center sector	Eastern sector	Mid sector	Northern sector	Southern sector	Zorah sector
Category	Total area	Total area	Total area	Total area	Total area	Total area
Natural spaces	**0**	**0**	**0**	**0**	**0**	*1.99* km^2
Agriculture (Km^2)	0.3400	*8.83*	0.376	0.174	0.24	0.70
Parks	0.175 Km^2	0.10 Km^2	0.059 Km^2	**0**	**0**	**0**
Urbaned parcels (Km^2)	11.268	18.42	18.58	14.55	21.71	13.59
Category	Total number	Total number	Total number	Total number	Total number	Total number
Commerical buildings	*1243*	109	309	145	779	**1**
Industrial buildings	19	0	54	*1016*	*1056*	1
Communication towers	19	6	*49*	19	30	3
Public bus stops	*16*	2	11	3	12	0
Hospitals	0	0	2	0	1	0
Health club	2	0	2	**0**	**0**	**0**
Studs	1	0	1	0	0	1
Schools	20	0	*35*	0	3	0
Shopping malls	7	0	3	1	2	0
Museums	**1**	**0**	**0**	**0**	**0**	**0**
Parks	3	1	3	**0**	**0**	**0**
Beaches	1	**0**	**0**	**0**	**0**	1
Hotels	**15**	**0**	**0**	**0**	**0**	**0**
Hotel apartments	*19*	0	2	0	2	0
Associations	2	0	3	**0**	**0**	**0**

4.5 Al Nakheel and Rumailah as a sample for the evaluation of the district performance

In the evaluation of the district performance, we used the following a scale: Well above average, Above average, Average, Below average, and Well below average.

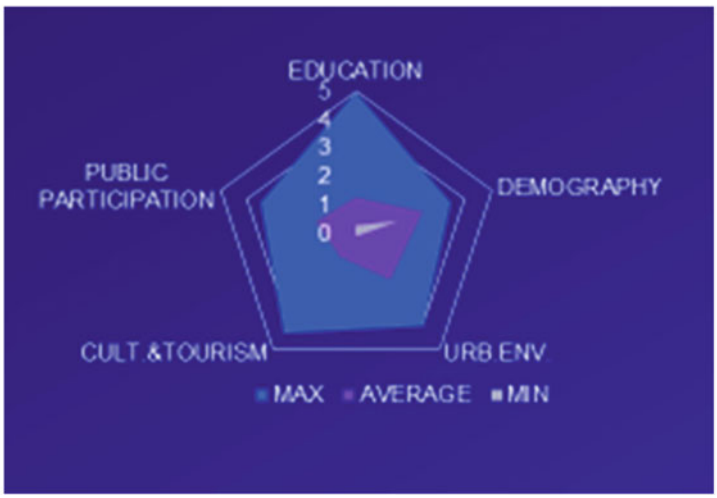
Below is just an illustration of one sample of a district for the evaluation of the district performance.

The evaluation of the Local Performance in the case of Ajman City is done through the evaluation of the districts of Ajman City. In Table 6, the evaluation is done on the base of the indexes, categories, and attributes as presented in Table 5. In Table 6, the performance can be read whether by attribute or by district. The attributes or districts having their performances highlighted in red mean that their performance is below the average. Through this table, one can establish the priorities per district and/or by attribute (Diagram 2).



GREEN INDEX

ACTIVITY INDEX



LIVELY INDEX

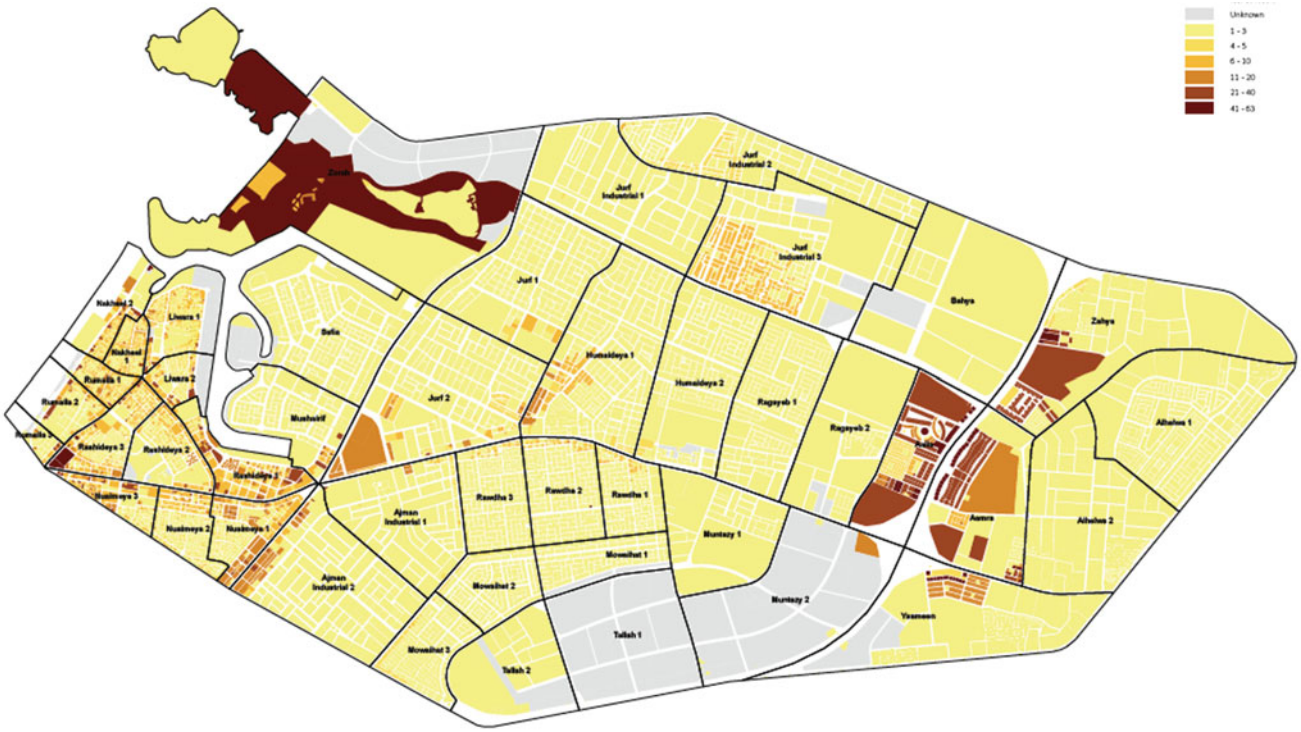


Fig. 4 Presentation of Ajman City per district

Table 5 Tools of assessment of the local performance

Index	Category	Attribute
Green city	Green public space	Natural spaces, agricultural spaces, green urban spaces, land use
	Water	Water consumption, storage capacity, quality of the network
	Energy	Consumption of electricity/family. Consumption of electricity/agriculture. Electrical equipment consuming too much electricity
	Waste and pollution	Chronic illness, motorization, facilities and sources of pollution
	Sewage	Production of waste, capacity of collecting, recycled waste, connection to the network
Active city	Activities	Commercial activities and facilities, industrial zone, economical activities, unemployment
	Hazard	Presence of hazard, fragile population, quality of network
	TIC	Connection to Internet, telephone, repartition of the agencies
	Economy	Accessibility to land use, availability of land use, public transport
	Environment and management	Dynamism of the authorities, means of communication
Lively city	Education, health and sport	Repartition of the infrastructure (health and sport), repartition of the schools, other types
	Demography	Occupied and active population, young population, level of education
	Urban environment	Open and green spaces, state of the buildings, facilities and services, potentialities
	Culture and tourism	Facilities and services, accommodation, values of the buildings
	Public participation	Association, technical assistance

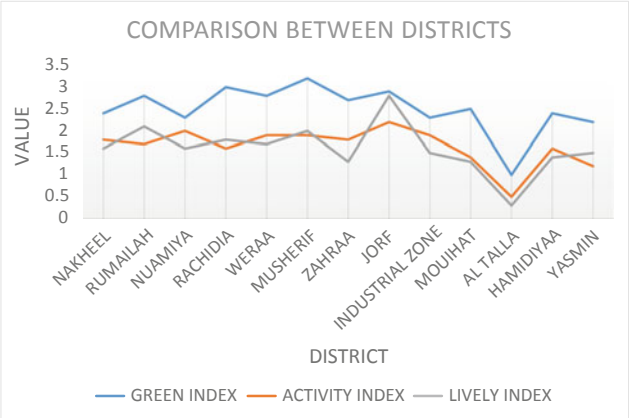


Fig. 5 Comparison between districts

Table 6 Evaluation of the local performance

INDICATOR	GREEN INDEX					ACTIVITY INDEX					LIVELY INDEX					PERFORMANCE
	CATEGORY					CATEGORY					CATEGORY					
DISTRICT	G1	G2	G3	G4	G5	A 1	A2	A3	A4	A5	L 1	L2	L3	L4	L5	
NAKHEEL	1.3	3.5	4.0	3.5	2.7	1.0	2.2	2.1	0.9	2.2	1.6	2.5	1.3	1.3	1.5	2.1
RUMAILAH	0.3	2.8	4.5	4.0	3.6	3.6	0.7	1.6	1.5	1.4	1.5	2.2	3.3	2.5	2.4	2.4
NUAMIYA	0.3	3.2	3.5	3.3	3.7	2.5	2.0	2.5	4.4	2.3	0.6	2.2	2.7	0.6	1.3	2
RACHIDIA	0.4	3.2	4.2	3.8	3.7	2.8	1.8	0.6	1.9	0.5	1.7	2	3	1.2	0.6	2.1
WERAA	1.5	3.4	2.9	4	1.3	0.8	1.9	3.2	1.6	2	1.4	2.7	1.5	1.1	1.4	2
MUSHERIF	3.8	3.2	2.2	3.4	3.6	1.7	0.2	2.4	3.5	1.8	1.8	2.8	3.2	1	1.9	2.4
ZAHRAA	1.4	3.4	3.2	3.8	2,4	1.9	2.3	2.6	0.2	2.2	0.5	1.9	1.7	0.1	1.1	1.8
JORF	0.8	2.4	1.3	2.8	2.8	1	1.5	2.8	4.2	1.2	4.5	3.5	3.2	1.3	1.7	2.5
INDUSTRIALZONES	0.3	3.2	3.4	2.8	2.7	1.4	2.2	1.7	1.2	3.2	1.3	2.5	1.2	0.7	1.8	1.8
MOUIHAT	0.3	3.2	3.5	4.0	2.4	1.4	1.4	2.2	1.2	0.5	0.6	1.6	2.6	0.2	1.6	1.7
RAWDHA	1.6	3.2	4.1	3.7	4.2	1.0	1.4	2.7	0.8	1.4	0.8	2.2	1.5	0.3	0.6	1.8
TALLA																
HAMIDIYAA	1.5	3.1	3.1	4.1	2.8	1.7	1.2	2.4	2.0	2.3	0.9	2.6	1.5	1.2	0.7	2
YASMIN	1.3	3.2	2.2	2.9	3.1	0.9	1.4	2.7	2.3	0.6	0.4	3	1.8	0.2	0.9	1.8
PERFORMANCE	1	3	2.7	3.3	2.7	1.4	1.4	2.1	1.7	1.5	1.2	2.3	2	0.8	1.3	

5 Conclusion

In this paper, we presented the typology of tools for the evaluation of the sustainability of the environment. Each district is considered as an ecosystem. Among the Indexes discussed in the paper, Green Index, Activity Index, and Lively Index coupled with Life Performance for assessing building and its environment. The main aspects found in the case study can be summarized as follows: the adoption of a holistic approach whether for the management or the determination of the facilities and services; the promotion of the awareness of the citizens and their involvement in the process of the growth and determination of the facilities and services. For future development, the informed activities and the decayed and fragile areas that are source of pollution and social segregation need to be controlled. As we need to encourage the investment in the NTIC with the objective to end up with a cleaner environment. The negative aspects faced in the development of this work are the heterogeneity of the scale for the evaluation that need to homogenized; also the data from different institutions and organisms that

should be of the same date or period; highlighting the correlation between the size of the district, the city, and the selection of the indicators.

The next step is to evaluate the performance of the historical center in the development of the touristic activities.

Table 6 might be used as a tool to review the main orientations developed in the strategy of the Urban Development of Ajman city.

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Use of Advanced Organizers in Learning Conservation Concepts Among Secondary Students for Sustainable Development in Nigeria

Auwal Kassim Abubakar

Abstract

This study investigated the effect of advanced organizers on retention and performance in conservation concepts among secondary Biology students in Jahun, Jigawa State, Nigeria. One hundred and thirty-seven (137) students were randomly selected from eleven (11) senior secondary schools that constituted the sample for the study from a total population of one thousand two hundred and twenty-five (1225) SSII students in Jahun zone. The study adopted the pretest, posttest, and post-posttest quasi-experimental, and control group design. The students in the experimental group were taught using the lecture method enriched with advanced organizers while those in the control group were taught using lecture method for 6 weeks. The topic taught was the conservation of natural resources from the senior secondary school curriculum. The instrument used for data collection was the Conservation Concept Performance Test (CCPT) with a reliability coefficient of 0.89. Two research questions and two null hypotheses were formulated and tested using independent *t*-Test at 0.05 level of significance. Pictorial and textual advanced organizers were developed and also a lesson plan was developed for experimental and control groups. The significant findings from the study include: obtaining a significant difference between the mean academic performance scores of students taught conservation concepts with advanced organizers and those taught without advanced organizers in favor of the former. There is also a significant difference between the mean retention scores of students taught conservation concepts with advanced organizers and those taught without advanced organizers in favor of the former. Based on the findings it was recommended that advanced organizers are used by Biology teachers to teach in senior secondary schools among others.

Keywords

Advanced organizers • Conservation of natural resources • Sustainable development • Academic performance

1 Introduction

Conservation is the act of wise and sustainable use of resources available in a given environment (Tiseer and Bello 2011). Natural resources are useful and finite attribution of environment. They are like money in the bank: they are available for human use if they are withdrawn (Etim 2006). Natural resources may be renewable and nonrenewable; they include Forest, Soils, Water, Air, Solar energy, Fossil fuel, Biodiversity, among others (Tiseer and Bello 2011). The notion of natural resources is, however, reflective of the economic social and cultural scientific and technological advancement of a given society (Etim 2006). Planning or conserving is one of the mechanisms to facilitate such withdrawing and prudent planning that must be predicated on or understanding of the characteristic of the research themselves. Conservation of natural resources is part of environmental education. Obianuju (2011) determines environmental education as a process that equips students or learner with knowledge, skills, values, and practices need to live in their environment. Human activities cause severe damages to the earth's environment, including the resources and threaten the future of humans and other species.

Sustainable development is the overarching paradigm of the United Nations. The concept of sustainable development was described by the 1987 Bruntland Commission Report as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable development is the imperative of the

A. K. Abubakar (✉)
Department of Science Education, Sule Lamido University, Kafin Hausa, Nigeria
e-mail: auwalkar00@gmail.com

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twenty-first century, the advanced use organizers to teach students concepts of sustaining natural resources to a level without jeopardizing the capacity of the future generation's requirements which is necessary especially at the lower level of education. This is because the present generation has no right to destroy the resources in the environment; they need to protect it as trustees and handover nature and its resources as it is the next generation.

It is a fact that learning became meaningful only when students relate their previous or preexisting knowledge with the new or intending learning outcome (Ausubel 1968; Agbeyenku 2011; Abubakar 2017). In the absence of the preexisting knowledge in the cognitive structure of the students to facilitate anchorage with the incoming information for meaningful learning to occur, Ausubel (1968) advocates for the provision of Advanced Organizers.

Advanced Organizer refers to information presented by an instructor that help the students organize new incoming information (Mayer and Richard 2003a, b). Ausubel (1968) as cited in Kirman and Shaw (2007) defined advanced organizers as:

> Appropriate, relevant, and inclusive introductory materials introduced in advance of new learning and presented at a higher level of abstraction, generality, and inclusiveness. Then the information presented after it. The organizers serve to provide the ideation scaffolding for the stable incorporation and retention of the more detailed and differentiated materials that follow.

Ausubel (1968) also explained that advanced organizers are not the same as summaries or overviews, which comprise text at the same level of abstraction as the material to be learned, but rather are designed to bridge the gap between what the learner already knows and what he needs to know before he can successfully learn the task at hand. An advanced organizer is a statement of inclusive concepts to introduce and sum up material that follows (Woolfolk 2001). An advanced organizer is information that is presented before learning that can be used by the learner to organize and interpret new incoming material (Mayer 2003). According to Kirkman and Shaw (2007), there are two categories of advanced organizers: expository and comparative organizers. Expository organizers function to provide the learner a conceptual framework for unfamiliar materials, and comparative organizers are used when the knowledge to be acquired is relatively familiar to the learner. Hence, familiarity with the new materials is the key to determining which type of organizers you will want to use. Dell (2007) pointed out that advanced organizers, whether expository or comparative, can take many forms these include advanced text-based organizers, visual or graphic advanced organizers. Advance organizer, whether expository or comparative, can take many forms. Simple Text or Statement, Graphic/visual organizers, task planner, Behavioral objectives.

Conservation of resources is one of the topical issues in the twenty-first century which requires a collective approach to handle, teaching secondary school students the knowledge of conservation of natural resources using advanced organizers teaching strategy is a modification of lecture method which will not only make the students to understand the concepts but will also make the them to realize the importance of conserving environmental resources as the future leaders in policy and decision-making.

Poopola (2010) defined academic performance as an expression used to present students' scholastic standing and which is a function of various factors such as the method of teaching, teacher qualifications, students home background, school environment, attitude, and interest among others. Performance is defined as the observable or measurable behavior of a person or an animal in a particular situation, usually experimental situation. This means that performance measures the aspect of behavior that can be observed at a specific period. To determine performance, a performance test is conducted. Abu Rabia (2008) defined performance test as the type of mental test in which the subject is asked to do something rather than to say something. The performance test is the type of test which throws light on the ability to deal with things rather than symbols (Diver 2012).

2 Statement of the Problem

Ecological issues are part of the contemporary challenges facing the world today. This has manifested in the form of the increasing rise in the world temperature leading to global warming, desert encroachment, the unpredicted pattern of rainfall, excessive flooding, and natural resource depletion among others. The study area is classified as an environmentally fragile area where the rate of environmental resilience is low in the face of the growing population; in addition, being a rural agrarian state, over 80% of the populace drives their livelihood through the direct exploitation of natural resources provided by the environment. Due to population increase, there is increased pressure and competition on limited natural resources. The forest resource survey of 1996–1998 in Nigeria revealed that the forest estate had decreased from 10 to 6% in 2016. It was estimated that 26,000 hackers of land are lost annually (NCF 2018). For this reason, understanding and conserving the environment and its resources become very necessary to ensure its sustainability.

The use of talk-and-chalk method of teaching leads to memorization of facts and concepts, and there is the need to find out the effectiveness of other teaching methods and strategies, relative to the traditional approach (Mankilik 2007; Olorukooba 2001; Adesoji and Ibrahim 2009). Ali

(2006) feels that the primary difficulty in learning science is the method by which the subject is being taught without regard to instructional materials, students' ability level to understand and to retain. Novak and Mosunda (2010) observed that teaching students to use memory strategies by employing appropriate teaching strategy will not only improve student thinking skill on the complex task of production, modeling, experimentation, and evaluation but will also assist learners to attain deep understanding of conceptual knowledge and will result in developing cognitive domain and retention of concepts. Afolabi (2010) and Salawu (2009), Abimbade (2007) and Njoku (2004) found that use of multimedia learning strategy has been useful in the teaching and learning of science subjects at secondary school level. By teaching students with models, they learn more, interact with each other better, and can conceptualize the concepts better than cooperative learning without models. Omosewo (2009) concludes that any study carried out on teaching methodology cannot be a wasted effort. Wachanga (2013) observed that many research works on advanced organizer teaching approach had been conducted in Kenya, yet little has been done on it in Nigeria, especially in Biology. This research work, therefore, will find out if the application of advanced organizers as enrichment of the lecture method will help to improve the performance and retention of senior secondary Biology students in conservation concepts.

3 Objectives of the Study

The objectives of the study are to:

1. determine the effect of advanced organizers on students' performance in conservation concepts.
2. find out the effective use of advanced organizers on the retention ability of secondary school Biology students in conservation concepts.

4 Research Questions

The following research questions guided the conduct of the study:

1. What is the effect of advanced organizers on the performance of secondary school Biology students in conservation concepts?
2. What is the difference between mean retention scores of students taught conservation concepts with advanced organizers and those taught with conventional lecture method?

5 Null Hypotheses

The study has the following null hypotheses formulated to guide the study at $p \leq 0.05$:

$\mathbf{H_{O1}}$ There is no significant difference between the posttest mean scores of students taught conservation concepts with advanced organizers and those taught using conventional lecture method.

$\mathbf{H_{O2}}$ There is no significant difference between the post-posttest mean scores of students taught conservation concepts with advanced organizers and those taught using conventional lecture method.

6 Methodology

The research design employed in this study was pretest, posttest quasi-experimental design using intact Biology classes. The population of this study consists of all Senior Secondary School students II (SSII) of Jahun Educational Zone offering Biology as a subject. There are eleven (11) senior secondary schools in the zone with a total number of One thousand two hundred and twenty-five students (1225) of 17–18 years average age. Simple random sampling technique was used to select two (2) schools out of the eleven schools. The main concepts in the study are conservation of natural resources which is contained in the SS2 Biology syllabus. Conservation Concept Performance Test (CCPT) was used as the instrument for data collection and it was pilot tested and validated and found to be reliable with reliability coefficient of 0.89. The topics chosen were conservation of natural resources; the contents were soil conservation, Biodiversity (Animal species) conservation, Forest and wetland conservation.

7 Data Analysis, Results and Discussion

Results from Table 1 show that the academic performance mean scores for the experimental and control groups were 21.17 and 11.89, respectively. The standard deviation for the experimental and control groups was 5.89 and 3.46, respectively. The mean difference was 9.28. This means the experimental group achieved higher than the control group, and this can be attributed to the treatment, i.e., the use of advanced organizers.

Results from Table 2 showed that the post-posttest mean scores for the experimental and control groups were 19.61 and 9.48 respectively, with the mean difference of 10.13 and the standard deviations for the experimental and control group were 5.91 and 2.65 respectively. This means the

Table 1 Mean and standard deviation of posttest scores of the experimental and control groups

Groups	N	Mean	Std. deviation	Mean difference
Experimental	73	21.17	5.89	9.28
Control	64	11.89	3.46	

Table 2 Mean and standard deviation of the post-posttest scores for the experimental and control groups

Groups	N	Mean	Std. deviation	Mean difference
Experimental	73	19.61	5.91	10.13
Control	64	9.48	2.65	

Table 3 Summary *t*-test analysis of academic performance mean scores of experimental and control groups

Groups	N	Mean	Std. deviation	Df	*t*-Value	*p*-Value	Decision
Experimental	73	21.17	5.89	135	11.04	0.00	Significant
Control	64	11.89	3.46				

Significant at $\alpha = p \leq 0.05$

Table 4 Summary of *t*-test analysis of post-posttest scores of experimental and control groups

Groups	N	Mean	Std. deviation	Df	*t*-Value	*p*-Value	Decision
Experimental	73	19.62	5.95	135	12.54	0.00	Significant
Control	64	9.48	2.65				

Significant at $\alpha = p \leq 0.05$

experimental group achieved higher retention level than the control group, and this can be attributed to the treatment, i.e., the use of advanced organizers.

Analysis from Table 3 shows that the experimental group has higher mean scores of 21.17 as compared to that of the control group with mean scores of 11.89. The *p*-value is 0.00 which is less than 0.05 level of significance at 135 degrees of freedom. Hence the null hypothesis was rejected. This means teaching with the advanced organizer is effective in enhancing student's performance in conservation concepts.

The results from Table 4 show the value of 12.54 and *p*-value of 0.00 at $p \leq 0.05$ with the degree of freedom of 135. This shows that the experimental group has higher retention ability than the control group, hence the null hypothesis is rejected.

8 Discussion of the Results

The result of the analysis presented in Tables 1 and 3 shows that the students taught conservation concept with advanced organizer had a higher mean score than the students taught using lecture method alone. This result is in agreement with the findings of Chen (2013), Abba (2011), and Wachanga and Mwangi (2014) whose works found that advanced organizer enhances student academic achievement in science subjects. The findings of this study are also in agreement with that of Shihusa and Keraro (2009) that the use of advanced organizer teaching strategy results in the higher achievement of students in Biological concepts. However, the finding is not in agreement with the finding of Okey and Avwiri (2014) who found no significant differences in performance of mathematics students taught using advanced organizers and those taught without advanced organizers on the concept of electromagnetism. Usman et al. (2015) also indicated that there was no significant difference between the mean scores of posttest of students taught with advanced organizers. This significant performance with the use of advanced organizers could be because advanced organizers are subsuming bridges between prior knowledge and incoming new knowledge, which therefore aids the assimilation of new knowledge. Second, the pictorial organizer could be anchoring devices for enhancing learning so that students can have a straightforward comprehension of the concepts to be presented. Another reason could be that the advanced organizer, especially the pictorial type arouses student's attention to the lesson presented.

Tables 2 and 4 show the analysis post-posttest of the experimental and control group, which revealed significant differences in the retention ability of control and experimental groups in favor of the former. This result concurs with that of Ruangruchira (2002) and Agbenyeku (2014). However, this finding disagrees with that of Kundu and Tatoo (2002) who found a significant difference in the retention ability of male and female students taught with advanced organizers

9 Conclusion

Sustainable development is the imperative of the twenty-first century, the advanced use organizers to teach students concepts of sustaining natural resources to a level without jeopardizing the capacity of the future generation's requirements is necessary especially at the lower level of education. The study examines the concepts of advanced organizers, conservation of natural resources, and academic performance. The study adopted the use of the quasi-experimental design of pretest, posttest, and researcher-made test tagged. Conservation Concepts Performance Test (CCPT) was used to collect data. The pictorial and statement advanced organizers were developed by the researcher and used for the study. Based on the study, the following conclusions were made:

1. Academic performance on conservation concepts can be enhanced by the use of advanced organizers
2. Advanced organizers promote meaningful learning and of conservation concepts of students in secondary schools.

10 Recommendations

Based on the findings of this study, the followings recommendations were made:

1. The use of advanced organizers should be encouraged among secondary school Biology teachers in teaching conservation concepts where prior knowledge is lacking because, from this study, advanced organizers were found to be very useful in enhancing meaningful learning
2. Coeducational schools should encourage the use of advanced organizers as they are gender friendly. All gender could benefit from the use of advanced organizers during instructions.
3. Professional Associations such as Science teachers Association of Nigeria (STAN), Nigeria Educational Research and Development Council (NERDC) should develop a pictorial advanced organizer packages that could be used by science teachers in teaching to bridge the gap between prior knowledge and the new learning materials in other topics.
4. Science teachers should adopt the use of advanced organizers in teaching contemporary topics like conservation of natural resources in the environment.
5. Professional bodies, Federal, and State Ministries of Education in conjunction with environmental protection agencies like Federal Ministry of Environments should embark on training and retaining of Biology teachers to design and use advanced organizers through seminars, workshops on conservation of natural resources.

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Virtue Ethics, Technology, and Sustainability

William Cornwell

Abstract

Virtue ethics in the West received its first extensive elaboration and defense in ancient Greek philosophy. Requiring the cultivation of true character, both of the ethical and intellectual kind, virtue ethics emphasizes developing character traits such as courage, honesty, and practical wisdom over deploying abstract theoretical principles as a way of contributing to individual happiness and social harmony. With rapid changes in social structures and technologies, ancient and medieval virtues may seem quaint and irrelevant today. Is virtue ethics suitable only for the sort of premodern societies in which great virtue ethicists like Aristotle and St. Thomas Aquinas lived or does the theory have something essential to contribute to pressing contemporary debates?. This paper argues the situational form of virtue ethics: Some essential virtues are applicable in most times and societies, including our own, but they necessarily are expressed in a variety of ways in different circumstances. I then briefly explore contemporary versions of the virtues that would help us navigate a world of rapidly evolving technology that threatens to undermine environmental and social sustainability. These virtues, suitably updated, are as badly needed today as they were thousands of years ago.

Keywords

Virtue ethics • Philosophy • Technology

1 Virtue Ethics: Ancient Trunk and Modern Branches

1.1 Virtue Ethics in Ancient Greece

Virtue ethics in the West received its first extensive elaboration and defense in ancient Greek philosophy. The concept of virtue was not a philosopher's invention—Greek society idealized men who exhibited masculine virtues that often were tied to notions of wealth and military service, and the virtues and vices of men were the raw material of drama—but philosophers explored the concept of virtue in a more theoretical and abstract way, and in doing so, developed a distinctive class of moral theories known as "virtue ethics." Many key elements of virtue ethics appear in Socrates' thought and in Plato's ethics, but it was Aristotle who, in his *Nicomachean Ethics*, gave the first extant, comprehensive, and, in many ways, definitive articulation and defense of virtue ethics. After Aristotle, virtue ethics would be taken in different directions by Hellenistic and Roman philosophers like the Stoics, and St. Thomas Aquinas's thirteenth century synthesis of Aristotle's virtue ethics and Christian theology would set the standard for Catholic ethics ever since. Since the Renaissance, virtue ethics went into a slow decline in popularity in the non-Catholic Western world as the alternative theories of deontological ethics and utilitarianism gained ascendency. The last half of the twentieth century saw a strong revival of virtue ethics in Anglo-American philosophy, including the development of new approaches to virtue ethics, but despite these many varieties, there are some core elements that unify these approaches as types of virtue ethics.[1]

One fundamental component of virtue ethics is *a theory of human nature*. Virtue ethicists see human beings as being born with a set of potentialities that are a key part of our

W. Cornwell (✉)
American University in the Emirates, Dubai, United Arab Emirates
e-mail: william.cornwell@aue.ae

[1]For the first four items, I am indebted to Vallor (2016, p. 44), who follows but modifies the account from Van Norden (2007).

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fundamental nature, and among those are the potentials to develop character traits, understood as a stable disposition toward thought, feeling, and action. These acquired character traits constitute our *second* nature and are, unlike our first nature, in part a product of our choice.

The idea that we are born with potentialities, some of which will be actualized in the course of our lives, is uncontroversial. Most people also have found the claim that in normal human development, we acquire character traits that largely dictate how we choose to navigate the world to be commonsensical, although the theory can be challenged either from an existentialist direction that emphasizes freedom of the will over character dispositions or from a psychological perspective that argues that infamous experiments like the Milgram Experiment and horrible incidents like the My Lai Massacre demonstrate that our "stable dispositions" crumble under stress, but those are complex debates for another day.

A second core element is that *some character traits objectively can be categorized as virtues or vices*. If the language of virtue (arête, ἀρετή) and vice seems old-fashioned and today often is tied to less-than-universal religious conceptions of right and wrong, we can return to the Greek origins of the terms, which would be closer to *excellences* and *defects*. The tags we use are less important than recognizing that some of these dispositions are positive and should be promoted, whereas some are negative and should be avoided.

Third, the fact that some character traits are positive and some are negative is not treated as a fundamental fact. Rather, a theory of virtue ethics will justify why some character traits are desirable and others are undesirable. This usually is done in reference to an *overarching account of human goodness*. For Aristotle, the human good is traditionally translated as "happiness" (eudaimonia, εὐδαιμονία), although philosophers have widely discussed the inadequacies and false connotations of that term and suggested alternative translations like "flourishing," "wellbeing," or even a literal translation like "good guardian spirit."

Aristotle's eudaimonistic virtue ethics was a logical outgrowth of his broader philosophical view that all things had a final cause or function toward which they naturally strive. Happiness, Aristotle argued, was that final cause for humans and the virtues were an essential element to achieve that end. One reason that virtue ethics was slowly eclipsed after the Renaissance is that modern science dispensed with final causes, so humans were no longer seen as having a natural aim. As we shall see in the next section of this paper, functions or purposes reenter science with Darwin's theory of natural selection, and that provides a new foundation for Aristotelian-style virtue ethics.

A fourth essential component of complete virtue ethics is an account of moral development or, more specifically, *how the moral virtues are to be acquired*. Like other moral theories, virtue ethics should be action-guiding, which means that it should not only help us know what the virtuous person would do but how to become a virtuous person. The focus here would typically be on how to raise a child to become a virtuous person, how someone can cultivate his or her virtues, and what broader social structures might promote virtue. A related topic is to diagnose the conditions that lead to a vicious character or at least to certain vicious traits. Of course, virtue and vice exist in degrees and are comingled in us all, but psychology and social science can look at case studies and populations help us understand the genesis of different virtues and vices. Beyond noticeable differences in socialization, there probably are innate variations in our capacities, e.g., for empathy. This takes us back to the topic of human nature as a series of potentialities. Different individuals may have different ranges of potentialities, ranges presumably set by genetic and epigenetic factors. That is, there may not be a universal human first nature as assumed by empiricists like John Locke [at least, as he assumed of Europeans] but instead each person would have an individual first nature that at the population level leads only to statistical generalizations (e.g., 95% of humans have the capacity to empathize with other people to X degree, where "empathize" is given an operational definition).

A fifth point is that virtue ethics account for *ethical virtues as a subset of human virtues that include physical virtues and cognitive virtues*. The line dividing moral virtues from other virtues is not always clear. For instance, good moral reasoning depends upon general critical reasoning skills, and if one accepts, as I do, W.K. Clifford's famous arguments in "The Ethics of Belief" (1877) for moralizing epistemology and epistemologizing morality, then the cognitive virtues are themselves moral virtues, and vice versa, because there is a moral obligation to be a reasonable person. Although I prefer a more expansive account of virtue ethics that includes critical reasoning skills, in the end, I don't think much hinges on where one draws these lines, because the virtue orientation focuses on the development of the whole person and recognizes that virtues interact and reinforce each other in complex ways, regardless of how one wants to categorize types of virtues.

Finally, unlike deontological ethics and utilitarianism, virtue ethics *generally resist reductionist approaches that seek a single, absolute moral rule as the foundation of ethics*. Indeed, in professional philosophy, most virtue ethicists express skepticism about developing a code of pure, absolute principles. Ethics, as they see it, is a messy affair that can involve complex trade-offs that require the wisdom of what Aristotle referred to as "practical wisdom" (phrónēsis, φρόνησῐς). That is not to say that a virtuous person might not have a "code" that she follows, and such a person might even see the code as including absolute rules of conduct, such as never lying or stealing or blaspheming, but (a) as in the law and in religion, much depends upon how these rules are interpreted and how actions are described—there can be

interpretations that mostly build in exceptions to the rules (e.g., one might have an absolute rule against "killing" people but think it's permissible to "let people die" under certain circumstances) or that cleverly describes situations so that they do not violate the rules (e.g., killing persons is always wrong, but "collateral damage" in warfare is morally permissible) and (b) these sorts of strategies become especially important when the rules in the code prima facie give conflicting advice in situations of moral dilemmas.

1.2 A Contemporary Take on Virtue Ethics

The previous section discussed how Aristotle's ethics had been the most influential version of virtue ethics in the West. His ethical theory presupposed his metaphysical theory of final causes or purposes. The final cause of a human is happiness, and the moral virtues are essential elements of a happy life.

After the Renaissance, with the gradual displacement of Aristotle's science by mechanistic and quantitative scientific theories that excluded final causes, and with the development of principle-based moral theories that explained right and wrong in terms of a single principle and in that way was structurally similar to modern physics' ability to explain everything in terms of fundamental principles, virtue ethics increasingly became an afterthought outside of Catholic philosophy, where Thomism still reigns supreme.

Yet, Charles Darwin recognized that biology was incomplete without reference to some analog of an Aristotelian final cause because, as William Paley's *Natural Theology: or, Evidence of the Existence and Attributes of the Deity, Collected from the Appearances of Nature* (1802) had convinced Darwin when he was a student of theology, biological organs, and systems are purposeful, and that purposeful design and activity demands explanation: The eye exists to see, the heart exists to pump blood, the immune system exists to protect against infections and disease, and so on. Darwin over time came to believe that biology must acknowledge and explain these facts independently of Paley's theory that God designed unchanging species to have functional organs that enabled the species to survive in its environment, a supernatural story that already had been made untenable by the fossil record's revelation of evolving species. Darwin's theory of natural selection provided a scientific way to understand the story of that evolution and how it gives rise to functions and purpose. In this way, Aristotelian final causes, made newly respectable in biology, provided one avenue for a new foundation for virtue ethics.

Independently of developments in biology, G. E. M. Anscombe's influential 1958 essay "Modern Moral Philosophy" kick-started the revival of virtue ethics as a serious alternative to the consequentialist and deontological schools of moral theory that long had dominated academic philosophy outside of Catholic thought, and A. Macintyre's magisterial *After Virtue* (1985) gave further impetus to this trend, but what does a modern version of virtue ethics look like? The many answers that have been given to that question attest to the vitality of this renewed moral tradition. I previously have argued for a "modest and cosmopolitan" version of virtue ethics that "is a theory not of universal, highly specific actual or desirable patterns of behavior but universal capacities and needs. On this unpretentious conception of virtue ethics, there can be varied forms of life that enable people to live well, but these forms of life are possible and desirable only because humans share underlying human and animal natures characterized by innate sensibilities, capabilities, and limitations" that are a result of evolutionarily selective pressures on our ancestors (Cornwell 2011, p. 67).

My theory is a situationalist counterpart in virtue ethics to situationalist theories in deontological ethics. For instance, a situationalist deontologist can believe that different societies could legitimately make different end-of-life decisions (e.g., about whether to use extraordinary and costly medical interventions at the end of life) not because human life is less valuable in some societies than in others but because there can be relevant differences among societies, such as their overall wealth and ability to allocate enough resources for all of the medical needs faced in the society. That is, some societies may be forced to engage in medical triage because of limitations to their economic capacities, not because of a devaluing of life.[2] Similarly, in the theory of virtue ethics that I favor, we might expect a core virtue like reciprocity or returning favors to be found in all cultures and to be associated with other virtues like gratitude and justice, even though the expression of reciprocity would vary across societies for a variety of personal reasons (perhaps a poorer person cannot reciprocate a richer person's gift with something of equal material value) and social reasons relating to, for instance, the timing and publicity of reciprocation.[3]

Borrowing from R. G. Millikan, who from her first book (1984) forward has powerfully articulated and defended a

[2]See Pojman and Feiser (2009, pp. 46–47) for other examples of situationalism.

[3]Scientists long have investigated reciprocity and its evolutionary basis amongst other animals, especially primates. As F. B. M de Waal and S. F. Brosnan note: "The above considerations outline the steps of an evolutionary argument about how reciprocal cooperation may have come into existence. As such, it applies to organisms from fish to humans. This should not be taken to mean, though, that reciprocal help in human society is essentially the same as in guppies. This would be a fundamental error; the above theoretical framework only deals with the ultimate reasons for the existence of reciprocal exchange. That is, it provides an explanation for why animals engage in such behavior, and which fitness benefits they derive from it. It provides no explanation for how such cooperation is achieved, commonly referred to as the proximate explanation…." (de Waal and Brosnan 2006, p. 85). Thus, one might say that situationalism in virtue ethics is an analog to proximate explanation in the study of animal behavior.

theory of "proper functions," I think of the "pre-wired" virtues, like reciprocity, at least for a "typical" individual, as having evolved under certain conditions (what she calls "Normal" conditions, with the "N" capitalized to emphasize that Normality refers not to statistically normal/common conditions but to conditions when the behavior conferred adaptive benefit and hence was selected for) and, therefore, as being intelligible as a virtue only when those circumstances are present often enough to confer adaptive benefit. For instance, if there were only one person who engaged in reciprocity, it would cease to be beneficial for that person because the cost to the person would never be reciprocated with a benefit. So, one Normal condition for reciprocity is that other people are playing the same game. And if this game is beneficial enough, it may give rise to additional modes of cognition and behavior, such as social shaming, to encourage or enforce reciprocity.

I refer to reciprocity as pre-wired, not hardwired, to emphasize that what is innate is not specific reciprocal behaviors but rather a propensity to engage in reciprocal behavior according to preexisting cultural norms, which, of course, vary. This is similar to the distinction that N. Chomsky famously made in his theory of an innate, universal grammar, which involves being pre-wired to acquire any natural language, but not being hardwired with a specific language.

The pre-wired virtues will only get us so far, though, and this is where our higher order cognitive and behavior skills that underlie all the complexities we see in individual and cultural variation come into play. That is, we also get a form of cultural evolution in which certain types of behaviors under Normal circumstances are selected for within the culture, and these behaviors also have proper functions. It would be a fool's errand to claim that all of these second-order behaviors, which are basically cultural norms, are virtuous in the sense that we use the term in virtue ethics. Some, like rules of etiquette, which can become internalized to become habits, about where to lay the dessert spoon in a formal table setting, may involve little more than the ability of dominant social groups to use complex but mostly arbitrary behavioral tests to exclude large groups of people from accessing valuable opportunities, such as employment or educational opportunities. These sorts of behaviors are intelligible and explicable within a framework of proper functions, but they do not ultimately appear to provide any net benefit to society. Indeed, they probably are a net cost. Many cultural norms have this feature and involve, at bottom, a requirement to adopt the elite's way of doing things (e.g., speaking with the "proper" accent) to join the elite under conditions in which it is difficult for people outside of the elite group to master those norms and behaviors.

So, the cultural norms that are selected through a process of cultural evolution should be ones that work to the net benefit of society and, because they are adapted to the cultural conditions in which they arise, they must change as society changes. This is virtue ethics situationalism once again. Therefore, as advanced economies undergo profound technological changes, the virtues also must change to contribute to a sustainable, peaceful society in which all people have a meaningful opportunity to flourish.

2 Ancient Virtues for the Modern World: 2 Case Studies and Concluding Remarks

2.1 Courage (and Related Virtues Such as Valor and Resoluteness)

Aristotle thought of courage as having *both* an affective component of feeling fear to the right degree at the right times and toward the right objects (i.e., toward things that are truly dangerous) *and* a cognitive dimension of recognizing what dangers are worth facing. In the ancient world, courage primarily was thought as a martial or athletic virtue that would be optimally exhibited in the battlefield or arena of athletic competition, but our culture today sees courage through a much broader lens: The courage to quit a comfortable job and take a new one, the courage to speak your mind when other people might think less of you for that, the courage to acknowledge making a mistake and to accept the possible repercussions.

Technology will demand yet more of us in the way of courage, even as it might mitigate the need for traditional forms of courage. For instance, the use of drones and other unmanned weapons may reduce, but not eliminate, the need for a large infantry willing to exhibit the traditional forms of valor on the battlefield. Yet, by connecting us so widely, the Internet increases the need for other forms of courage, such as standing up to cyberbullies, defending innocent people and groups smeared through false news and propaganda that travels virally around the world within minutes, and so on. Of course, we should not have to rely on personal virtue only in these cases: governments, social media platforms, and the legitimate news media all have a vital role to play in combating these problems, but institutional efforts do not take individuals off the hook for aiding people suffering from virtual attacks, even when standing up for others may open us up to bad consequences. Think, for instance, of the parents of the children who were killed at Sandy Hook Elementary School in 2012. By spreading vicious and evil conspiracy theories that this mass shooting was actually a staged event to advance gun control, people like Alex Jones of Infowars have re-traumatized the parents by inspiring their audience to relentlessly harass the parents online, as well as by other means like threatening phone calls. Some of the parents had to move because of death threats against

them: "Social media and internet hosting companies are driven to preserve content that attracts viewers… at the expense of truth and civility. The question we must ask ourselves is, at what point will the societal environment be deemed so inhospitable, toxic and vile that we once again insist on dignity, honor and most of all, truth?" (Pozner and Pozner 2018). Seeing what has happened to these parents drives home the fact that there are real risks to speaking up and calling out this vile behavior, but protecting the innocent is one of the noblest uses of courage and is needed today in ways that Aristotle could not have anticipated.

2.2 Honesty (and Related Virtues Such as Reliability and Integrity)

Honesty traditionally has been prized as one of the most important virtues, and from an evolutionary perspective, it is easy to see why. Communication and cooperative activity can take place only in an environment in which there is sufficient trust. As Immanuel Kant noted, if nobody believed anybody else, all efforts at communication would be in vain, and biologists and game theorists have studied how much deception can take place in a system before dishonest free-riders fatally undermine the system they were taking advantage of. So, honest people play a crucial role in stabilizing a social system founded upon trust.

In the olden days of small communities, it was easy to know a person's character and to verify most of the information the person tells you. Today, technology has complicated this picture dramatically. The enormous volume of web pages and social media posts creates a deluge that most people are not competent to sort through, as the spread of fake news has shown. Clearly the average person needs to be educated with much better media literacy—this is where the virtues related to being a good and critical consumer of online media come in—and tech companies need to do much more to stop their platforms from being used (or abused) by people pushing propaganda or other false narratives for political or profit motives.

Advances in computing related to artificial intelligence and media production have the potential to exponentially worsen the current crisis of many people in free societies becoming more and more unmoored from the truth. Most of the "fake news" that is destabilizing many democracies have been relatively crude, simple, text-based fabrications. How will people react to being inundated with fabricated photos, video, and audio? The capacity for that is already here, and as the price point comes down and the finesse of the finished products improves, we can expect to be living in a hall of mirrors in which we are bombarded by realistic-looking but fabricated videos designed to destroy people's reputations, to undermine our understanding of current events, to push partisan or commercial agendas, and so on. As a recent New Yorker article explains about a viral, fake video (Rothman 2018):

> Although "Golden Eagle Snatches Kid" has been identified as fake, it's still been viewed more than thirteen million times. Matt Turek [a program manager at the Defense Advanced Research Projects Agency (DARPA)] predicts that, when it comes to images and video, we will arrive at a new, lower "trust point." "'A picture's worth a thousand words,' 'Seeing is believing'—in the society I grew up in, those were catchphrases that people agreed with," he said. "I've heard people talk about how we might land at a 'zero trust' model, where by default you believe nothing. That could be a difficult thing to recover from."
>
> As with today's text-based fake news, the problem is double-edged. Having been deceived by a fake video, one begins to wonder whether many real videos are fake. Eventually, skepticism becomes a strategy in itself. In 2016, when the "Access Hollywood" tape surfaced, Donald Trump acknowledged its accuracy while dismissing his statements as "locker-room talk." Now Trump suggests to associates that "we don't think that was my voice."
>
> "The larger danger is plausible deniability," [photo-forensics expert Hany Farid] told me.

So, we desperately need honesty in today's world, an honesty that is opposed to creating or causally spreading hoaxes, fake news, propaganda, and other toxins that are destroying the civic body. As S. Vallor writes, "The new communication habits enabled and fostered by ICTs [information communication technologies] are shaping how we define the truth, when and how often we tell it, when we expect to be told it, where and in whom we expect to find it, how we package it, how we verify it, and what we do with it and are willing to have done with it." (2016, p. 121). Again, this should not be seen as a problem solely for individual virtue: Institutions and organizations also have an important role to play by developing professional codes for when image manipulation is permissible and to develop tools for detecting manipulated images (Vallor 2016; Irwin 2016).

2.3 Conclusion

The intellectual foundation of virtue ethics is sound, and in briefly examining two ancient virtues, we see that they continue to be relevant today, even though they make different demands upon us because of advances in technology. Time today is too limited to discuss more of the virtues, but I would invite the audience to consider what some of Aristotle's other central virtues would look like in light of technological changes today: justice, magnanimity/generosity, and self-control. I think that reflection will reveal that although their concrete expression often will be different today from their manifestations in ancient times, they are as urgently needed now as they were then—indeed, perhaps even more so now if we hope to have a sustainable civilization that

maintains adequate levels of trust to sustain cooperative endeavors and that offers all of its members the opportunity to live happy, i.e., meaningful and satisfying, lives.

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