

Studies in Systems, Decision and Control 503

Abdalmuttaleb M. A. Musleh Al-Sartawi
Anas Ali Al-Qudah
Fadi Shihadeh *Editors*

Artificial Intelligence-Augmented Digital Twins

Transforming Industrial Operations
for Innovation and Sustainability

 Springer

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Preface

This publication focuses on the opportunities, challenges, and risks of Artificial Intelligence-augmented technologies for financial operations, innovation, and sustainable development. It focuses on AI and other industry 4.0 technologies such as digital twins and blockchain to furnish solutions for the current industrial revolution.

The purpose of this publication *Artificial Intelligence-Augmented Digital Twins* is to cover novel advances and developments related to AI, digital twins, and other industry 4.0 technologies mainly for organizations, education institutions, financial institutions, and the banking and accounting sectors. Furthermore, it provides a platform for multi-disciplinary research which we believe as editors enhances the vision of researchers in their own fields.

This book includes 52 unique and multi-disciplinary chapters. Submissions were reviewed in a double-blind process by scholars in the relevant fields. The authors in this edited volume provide beneficial insights into different topics. Their research and findings provide significant contributions to their respective disciplines. The following are some topics of interest included but not limited to:

- The Actual Impact of Metaverse on the FinTech Industry
- Utilizing Deep Learning Models (RNN, LSTM, CNN-LSTM, and Bi-LSTM) for Arabic Text Classification
- Metrics-Based Exploration and Assessment of Classification and Association Rule Mining Techniques
- Data Mining Approaches for Depression Detection on Social Media Twitter Dataset
- Exploring Business Faculty's Perception about the Usefulness of Chatbots in Higher Education

This comprehensive reference work is ideal for AI specialists, engineers, policy-makers, industry leaders, scientists, academics, practitioners, researchers, instructors, and postgraduate students. In addition, with regard to the academic discipline, the book chapters could be used in several courses related to AI, digital business innovation, marketing of financial services, big data, education, and online learning. We do hope the publication will be beneficial for them.

On behalf of the editorial team, we are grateful and thankful to many people who were involved in creating, writing, and developing this unique publication. First, we would like to thank our reviewers for their valuable feedback and contributions which have improved the chapters immensely. Second, we are grateful to our authors and the authors who participated in ICGER 2022 for their contributions and cooperation in making all the necessary changes to their chapters.

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October 2023

Abdalmuttaleb M. A. Musleh Al-Sartawi
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Introduction

Artificial Intelligence, Digital twins, blockchain technologies, big data analytics, and Internet of Things (IoT) are reconfiguring our perceptions of the world around us. These Industry 4.0 technologies are currently disrupting our economy and transforming the manner in which firms engage in their operations. Within this context, researchers and professionals aim to advance industrial operations thought and practice by examining how challenges may be prevailed via a digital twin. Digital twinning (DTW) is one of the top 10 technology trends in the last several years, due to its high applicability in the industrial sector, with more than 50% of IoT companies' teams having digital twin in their annual plan as a strategic mandate [2]. The integration of artificial intelligence and machine learning techniques with digital twinning, further enriches its significance and research potential with new opportunities and unique challenges. Historically, the digital twin concept was first presented in 2002 by Grieves et al. during a meeting at the University of Michigan Lurie Engineering Center on the management of product life cycles [4]. In 2014, [3] further defined digital twinning as a combination of three primary components: (1) a virtual twin; (2) a physical and corresponding twin (a physical object that can be a human, a system, a product, a model, or any other object such as a robot, a car, a power turbine, and a hospital); and (3) a back and forth data flow cycle between the physical twin and its virtual twin [3].

Digital Twinning aims to create a highly accurate virtual model of a physical system or process to simulate system behavior, condition monitoring, detection of abnormal patterns or errors, a reflection of system performance, and future trend prediction, which is highly beneficial for various sectors such as finance, banking, accounting, manufacturing, agriculture, and healthcare [5]. Moreover, it helps to map between virtual and real-world resources, which can in turn support to identifying known unknowns as well as also help to discover unknowns. More specifically, advancements in Artificial Intelligence are transforming what they can do in the fields of accounting, finance, and banking. DTW is also made increasingly more intelligent by AI agents, to the point where it can prescribe actions in the physical world, so that banks and other financial institutions can change, in real-time, with fact-based choices, alternate processes to prevent bottlenecking issues for example.

By deploying both AI and DTW, banks and accounting firms can obtain insights into their operations, allowing them to achieve significant benefits such as improved efficiency, cost savings, and enhanced sustainable development efforts. Therefore, DTWs are not only helping these firms to optimize operations and decision-making; they also play a critical role in enabling them to realize their ESG roles. According to the “Digital Twins: Adding Intelligence to the Real World” report from [1], 60% of companies across various industries depend on digital twins as a catalyst to improve operational performance as well as to fulfill their sustainability agenda. Therefore, by replicating the physical world, digital twins can support companies to better utilize resources, optimize supply and logistics networks, reduce carbon emissions, and improve employee safety [1].

Academics and professionals worldwide are very interested in DTW and its integration with AI to provide solutions for organizations and sectors. This book provides a discussion platform taking a contemporary approach to AI by linking it to other Industry 4.0 technologies. It provides varied insights into various concepts of AI and technologies, and their implications for businesses, financial institutions, and educational institutions.

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Anas Ali Al-Qudah
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Factors Affecting Artificial Intelligence-Enabled Virtual Assistants Incorporation: A Case Study of the Students of Mass Communication



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Abstract Evolving technology has facilitated our lives in a variety of ways. Especially, Artificial Intelligence-enabled virtual assistants play a significant role in managing multimedia files in smart devices, including laptops and computers. This research focused on multimedia file management in Cortana-facilitated laptops and personal computers used by university students in Pakistan. The researchers used Structural Equation Modelling to test the proposed conceptual model supported by the theory of reasoned action. Data was gathered from $n = 290$ students from $n = 2$ public sector universities in Islamabad, Pakistan. Results revealed that Beliefs about Artificial Intelligence are significantly affecting Behavioral Intention ($p > 0.053$), leading to Cortana Acceptance ($p > 0.000$). However, the relevant effects are also

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mediated by the Attitudes ($p > 0.0001$) and Subjective Norms ($p > 0.023$) to affirm the effect of Artificial Intelligence on the Cortana Acceptance. Thus, virtual assistants have become a mainstream product and are accepted by many users due to the useful outcomes attributed to their adoption. They provide maximum benefits to their users, indicating their design and implementation as linked with gratifying human needs in the best possible manner. Hence, this research adds to the literature regarding technology acceptance and the theory of reasoned action in Artificial Intelligence. Finally, the researchers have highlighted the study limitations and discussed practical and theoretical implications accordingly.

Keywords Artificial intelligence · Theory of reasoned action · Pakistan · Structural equation modelling

1 Introduction

Technology has significantly impacted our lives, including education, communication, information gathering, and entertainment. Alhumaid et al. [1] provide an example of how Artificial Intelligence (AI) has enhanced students' learning experiences through mobile learning applications. Another example is the implementation of AI in Learning Management Systems, where multimedia applications attract and engage students, improving their educational journey [2]. Additionally, AI has benefited students through content recommendation systems on social networks like YouTube, helping them find relevant educational material [3–6].

Virtual assistants powered by AI, such as Cortana, have played a crucial role in assisting students in various ways. Students often face challenges managing their files on devices, and virtual assistants provide support for file management and control [7–10]. Cortana considered a next-generation virtual assistant by Habes et al. [11], mainly benefits students in digital document management. As early adopters of technology, the young generation receives significant advantages from AI technologies integrated into their devices. Virtual assistants like Cortana utilize various communication gestures, including speech, images, videos, and other forms, to enhance human-computer interaction and maximize user benefits [5, 12–16].

This chapter emphasizes Cortana as a leading technological advancement [17], explicitly benefiting university-level Mass Communication students in Pakistan. The chapter is divided into sections, including an introduction, the citation of supportive literature to propose study hypotheses and a conceptual model, methodological approaches, and results and data analysis, followed by a relevant discussion.

Overall, technology, particularly AI, has transformed the educational experiences of students, and virtual assistants like Cortana have become essential tools for students in managing their tasks, files, and interactions, leading to enhanced learning outcomes and improved efficiency in various educational contexts. The chapter comprehensively explores these advancements and their impact on young university-level Mass Communication students in Pakistan.

2 Literature Review and Hypotheses Development

The theory of Reasoned Action, proposed by Vallerand et al. [18], is relevant to the conceptual model of the current research. This theory suggests that attitudes and behavioral patterns are connected in human decision-making processes. Trafimow [19] supports this idea by stating that our decisions to engage in specific behaviors are primarily influenced by expected outcomes [20–24]. The Theory of Reasoned Action aligns with this perspective, as [19] also emphasize that the acceptance and use of virtual assistants, like Cortana, are driven by perceived benefits associated with their usage. Cortana, a powerful virtual assistant providing voice command services for Windows 10 users, has been developed with multiple user benefits in mind, which has generated increased interest in its adoption [25–28]. A study conducted by Pasha et al. [2] further supports the significance of attitudinal and behavioral factors in the acceptance and utilization of AI-enabled intelligent assistant systems [29] Their findings, obtained through a case study approach, demonstrate that behavioral and attitudinal factors significantly influence the process of AI acceptance and implementation.

2.1 *Beliefs About Artificial Intelligence and Behavioral Intention*

A virtual assistant is a technological application that understands commands and ensures task completion. These virtual assistants are provided on multimedia remote devices, including laptops, personal computers, smart watches, mobile phones, and others [14]. According to Jönsson [14], one of the primary reasons behind the adoption of smart devices such as laptops is that these virtual assistants are pre-installed and help the users to save different types of content and find them whenever they want. Accompanied by the ease of use and increased accessibility, virtual assistants like Cortana, Alexa, Siri, and others are widely preferred by users to manage and keep their files saved on a device. These virtual assistants recognize voice commands. They combine computer chips, software, and microphones that act upon the users' commands and recognize and respond to them efficiently [20, 21].

H1: Beliefs about Artificial Intelligence have a significant effect on Behavioral Intention.

2.2 *Behavioural Intention and Cortana Acceptance*

Technological advancements such as virtual assistance through Artificial Intelligence have gained much popularity during the past few years. These assistants are embodied or disembodied agents that allow machine-user interaction in a natural language [22]. Students use these digital technologies to facilitate their every educational task [17,

30, 31]. Virtual assistants such as Cortana by Microsoft are mainly preferred when documents and other multimedia files are saved on a computer. Being one of the most preferred cloud systems, Cortana is of greater significance. Data files are just available just a single click away. That is why, today, even higher education institutions are interested in guiding and supporting students to use virtual assistants like Cortana to manage their data files [25].

H2: Behavioral Intention has a significant effect on Cortana Acceptance.

2.3 Attitude, Beliefs About Artificial Intelligence and Behavioral Intention

Today, Cortana is considered one of the most effective virtual assistants by IBM. That also saves a system that ensures safety from any potential malware attacks. According to Thakur and Han [25], introducing Cortana in Windows 10 ensures maximum user facility and satisfaction. Students, for example, pay special attention to user Cortana when saving several documents and other multimedia files. These files are saved on the cloud system, which further manages their content and provides them immediately when needed. This record-keeping capability of Cortana in Windows 10 distinguishes it from other versions of windows, further adding to the relative advantage of products and software developed by the relevant company [28].

H3: Attitude significantly mediates the relationship between beliefs about artificial intelligence and behavioral intention.

2.4 Subjective Norms, Behavioral Intention, and Cortana Acceptance

Cortana Acceptance can be considered a part of subjective Norms where Windows 10 users prefer using Cortana by watching others. Although virtual assistance like Cortana is available almost with every smart device, its usage varies from person to person [24]. According to Na et al. [32], the young generation specializes in having an AI-enabled virtual assistant. Soft Copies of their documents, images, videos, audio files, and others are needed to save on cloud storage. This cloud storage helps them save their files and search and provides them with a single voice command. Based on the benefits and services attributed to Cortana, windows10 widely prefers using Cortana, enjoys online multimedia file management, sharing their experiences, and inspiring others to adopt and use Cortana [19] (Fig. 1).

H4: Subjective norms significantly mediate the relationship between behavioral intention and Cortana acceptance.

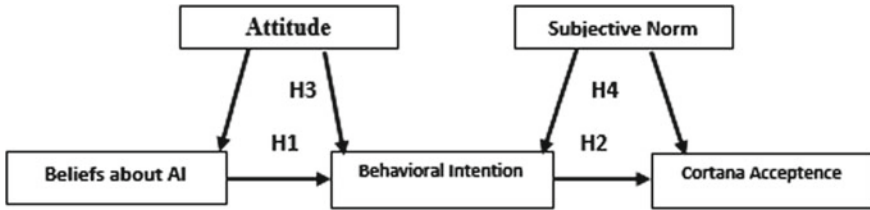


Fig. 1 Conceptual model

3 Methods

This research is based on a cross-sectional design, including data collection during a short, limited period. The researchers used structured questionnaires for data-gathering purposes. As noted, questionnaires help gather data directly from the respondents having a primary experience of a phenomenon [33]. Notably, the survey tool is designed by adopting scales from different resources (See Table 1). After data gathering, the researchers used SPSS and Amos 23 for the Structural Equation Modelling (SEM) [34].

3.1 Study Population and Sampling

The current research focuses on university students in Pakistan, specifically targeting a sample size of 300 students from two public sector universities in Islamabad, the Federal Capital City. The selected sample size aligns with the recommended minimum size of 200 individuals for Structural Equation Modeling (SEM) studies [50]. Convenience sampling was employed to select the participants, with the researchers verbally confirming their use of Windows 10 before proceeding with data collection [12]. The response rate for the research was 96.6%, with 3.4% of questionnaires eliminated due to missing or incorrect responses. Ethical considerations were considered, as the researchers provided informed consent to the participants by sharing essential details about the research topic, methods, and significance [51].

Table 1 Sources of survey items

S/R	Variables	Sources
1	Beleifs about AI	[29, 35–37]
2	Behavioral Intention	[10, 38, 39]
3	Windows 10	[40–43]
4	Subjective norm	[8, 44, 45]
5	Cortana acceptance	[46–49]

4 Data Analysis and Results

The researchers conducted the convergent validity analysis to examine the research constructs' internal consistency, as [52] suggested. In this regard, the researchers first calculated the Factor Loading and Average Variance Extracted values. Results revealed that most of the Factor Loading values surpass the threshold value of 0.5. Besides, the Average Variance Extracted surpasses the threshold value of 0.5 [34, 53]. Furthermore, the researchers examined the construct reliability of the measurement model. Results showed that the Cronbach Alpha values range from 0.721 to 0.875, and composite reliability values range from 0.714 to 0.926, surpassing the threshold value of 0.7 [18]. Thus, it is found that the convergent validity of the measurement model is successfully established (see Table 2).

According to Refs. [54–57] there are two criterion-based approaches to assessing the discriminant validity of the measurement model. These criteria involve Fornell-Larcker and Heterotrait-Monotrait Ratio scale. In the current research, the researchers also used both criteria to examine the discriminant validity of the measurement model. First, regarding the Fornell-Locker criterion, the squares of all the Average Variance Extracted values are greater than the correlation values given in Table 3. Further, the researcher calculated the Heterotrait-Monotrait Ratio of the measurement model. Results revealed that the HTMT value at 0.653 is smaller than the designated value of 0.90, indicating that the discriminant validity of the measurement model is affirmed [56].

Table 2 Summary of convergent validity analysis

Variables	Items	FL	AVE	CA	CR
Beliefs about AI	BLF1	0.558	0.687	0.739	0.714
	BLF2	0.817			
	BLF3	-0.062			
Behavioral intention	BHN1	0.905	0.933	0.875	0.709
	BHN2	0.902			
	BHN3	0.994			
Cortana acceptance	COR1	0.809	0.659	0.822	0.820
	COR2	0.510			
	COR3	-0.168			
Attitude	ATD1	0.841	0.757	0.792	0.926
	ATD 2	0.674			
	ATD 3	0.413			
Subjective norm	SBN1	0.994	0.950	0.721	0.862
	SBN2	0.076			
	SBN3	0.907			

Table 3 Fornel-Larcker criterion

	BLF	BHN	COR	AND	SBN
BLF	0.471				
BHN	0.258	0.870			
COR	0.227	0.125	0.434		
AND	0.035	-0.045	0.418	0.573	
SBN	-0.109	0.778	0.013	0.074	0.902

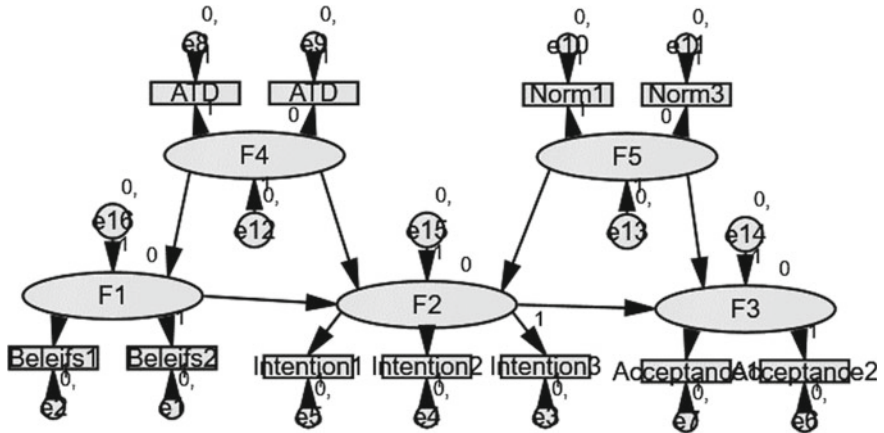


Fig. 2 Goodness of fit

4.1 Goodness of Fit

Goodness of Fit helps determine the extent to which the gathered data fits the expected observation [58]. Being one of the most important steps in Structural Equation Modelling, this research also involves the Goodness of Fit. Thus, the calculation indicated a chi-square value of $-3.485 (18)$ and a non-probability level at 0.001, along with the Fit Index (FMIN) value at 0.915 and Standardized Root Mean Square (RMSEA) value of 0.754. We found that the sample data fit the expected set of data. Figure 2 illustrates the graphical representation of the Goodness of Fit.

4.2 Hypotheses Testing

Finally, the researcher examined the structural relationships proposed between the study variables by conducting path analysis, including regression weights. As noted by Zumbo [54], despite regression analysis helping to determine the relationships

Table 4 Summary of hypotheses testing

Hyp	Relationships	Path	t-value	Sign
H1	BLF > BHN	0.344	1.593	0.053
H2	BHN > COR	0.573	11.764	***
<i>S/R</i>	<i>Relationships</i>	<i>Path</i>	<i>Indirect effects</i>	<i>Sign</i>
H3	BLF > ATD > BHN	0.123	3.212	0.001
H4	BHN > SBN > COR	-0.066	-2.269	0.023

between study variables, path analysis is an effective technique. Through path analysis, the researchers not only determine the significance of the proposed relationships but also examine the strength of the relationships through path assessment. Thus, path analysis in the current research validated all the research propositions. As shown in Table 4, the researchers proposed a significant effect of (H1) Beliefs about Artificial Intelligence and Behavioral Intelligence. Path analysis validated the effect of Beliefs about Artificial Intelligence and Behavioral Intention with a t -value of 1.593 and a significance value of $p > 0.053$. In the H2 of the study, the researchers proposed a significant effect of Behavioral Intention on Cortana Acceptance. Findings validated the proposed hypotheses with a t -value of 11.764 and a significance value of $p > 0.000$. Further, the researchers conducted a mediation analysis to examine the indirect effects of Attitude and Subjective Norms on the relationship between Beliefs about Artificial Intelligence and Behavioral Intention (H3) and the relationship between Behavioral Intention on Cortana Acceptance (H4). The researcher uses path analysis and the Sobel test to examine the proposed hypotheses. First, the indirect effect of Attitude on the relationship between Beliefs about Artificial Intelligence remained significant, with the path value at 0.123 and significance value at $p > 0.001$ (Indirect effect value 3.212). Besides, the proposed indirect effect of Subjective Norms on the relationship between Behavioral Intention and Cortana Acceptance also remained significant, with the path value at -0.066 and the significance value at $p > 0.023$. Therefore, the findings revealed that the students of mass communication in the selected institutions accepted Cortana as they have positive beliefs about its usage, which is well witnessed by Vallerand et al. [18]. Additionally, the acceptance behavior is significantly mediated by their Attitudes and Subjective Norms, as also validated by [28].

5 Discussion

According to Ali et al. [58], despite technology acceptance and incorporation having remained comparatively low in Pakistan, the young generation has shown an increased interest in it. Especially when it is about ease of use and usefulness, this study also witnessed Cortana as a virtual assistant accepted and used among the Young Pakistan students of Mass Communication under the propositions given by

Vallerand et al. [18]. As noted by Ajouz et al. [59], intelligent virtual assistants have become a mainstream product. Many users accept them due to the useful outcomes of their adoption as a part of technology evolution. They provide maximum benefits to their users, indicating their design and implementation as linked with gratifying human needs in the best possible manner [60].

Talking particularly about the study hypotheses, the first statement, "Beliefs about Artificial Intelligence have a significant effect on Behavioral Intention," the theme was focused on investigating the students' general opinion about Artificial, Cortana, and its usage. Respondents agreed that they consider Artificial Intelligence facilitating them in multiple ways [61]. They also agreed that Cortana is widely used and preferred due to its performance and multimedia file management system. Regarding the second hypothesis, "Behavioral Intention has a significant effect on Cortana Acceptance," the respondents were asked about their behavior towards Cortana as a virtual assistant, using this assistant on their personal computers and other remote devices, and their overall experience of using Cortana. Study respondents should strongly agree with Cortana's usability for their educational record management purposes. They also revealed that they consider Cortana an important approach, which is why they widely use Cortana in their computer systems. Besides, they indicated apposite experience attributed to their Cortana usage, ease of use, and useful outcomes.

In the third hypothesis, "Attitude significantly mediates the relationship between beliefs about artificial intelligence and behavioral intention," the respondents were asked about the role of their Attitudes, opinion, beliefs, and convictions in Cortana usage. Most respondents agreed that their attitudes, beliefs, and opinions are positive about Cortana usage and applicability for managing their educational tasks [25]. The respondents indicated their attitudes as influential when deciding to use Cortana for their documents and multimedia file management purposes. Finally, the last hypothesis, "Subjective norms significantly mediate the relationship between behavioral intention and Cortana acceptance". The study respondents agreed that subjective norms also strongly affect their Cortana (AI-based) acceptance. According to the respondents, their peers, friends, and teachers using Cortana also affect their attitudes toward adopting the relevant virtual assistant.

To sum up, the results indicated consistency with the existing studies witnessing the acceptance and incorporation of Artificial Intelligence and Virtual Assistants for multimedia file management in smart devices [19, 21, 24, 41, 46–51, 62]. The study respondents widely agreed that using the relevant virtual assistants is primarily due to their beliefs about its easy usage and offering convivence regarding file management functions [2]. Most respondents revealed that their positive beliefs further led to changes in their behavior and motivated them to adopt the AI-enabled, resulting in an instant adoption process. However, their attitudes remain a significant factor in their behavior toward adopting and using these virtual assistants.

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Understanding Consumer Attitude and Behavior About E-Commerce Platforms for Agricultural Products in India



Jolly Masih , Abhijit Bhagwat, Anurag Khare, and Dinesh Yadav

Abstract India is primarily an agricultural land, but the concept of E-agribusiness is not very popular in the country. However, with the growing popularity of E-commerce, people are now shifting towards E-agriculture for purchase of Agri-inputs like fertilizer, seed, plant protection chemicals etc. Online purchase of agriculture machinery and equipment has also gained momentum in the last few years. The research focuses on the profile of customers who shop the Agri-products based on various dimensions of online shopping as well as their demographic characteristics. The data collected has been analyzed based on stepwise cluster analysis and their profiles have been identified based on the results. Basically, four clusters of shoppers which are identified namely *surgical shoppers*-giving more importance to merchandise information and reliability attributes of online shopping; *digitally driven shoppers*-concerned about convenience and interactivity attributes; *power shoppers*-have more inclination towards navigation attribute; and *reluctant shoppers*- more affected by navigation and reliability attributes. Other than this promotions attribute which includes discounts, free gifts, attractive packaging, and combo packs is equally important for all the customers expect reluctant shoppers. Similarly design attributes which include colors, borders, graphics, pictures, styles, and fonts are also equally preferred by all shoppers except shoppers who belong to the reluctant shoppers. The present study aims to understand online consumer shopping behavior patterns for agriculture products to make the E-agribusiness stronger and more prominent in the country.

Keywords Agricultural E-commerce · Digitally driven shopper · B2B E-commerce

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1 Introduction

1.1 Agribusiness Making Its Way to E-Commerce

It is assumed that e-commerce has a lot of potential for growth in regards of both consumers and businesses alike, however its progress in India is still at a rudimentary stage in respect to the highly developed countries. E-commerce is concerned with the operational functioning of a variety of enterprises including agricultural business [1]. In India, we can find two key aspects of development for B2B e-commerce in agribusiness. First, the conventional enterprises of agri-food chain employ e-commerce solutions to fortify their market position and to enhance the existing functions. Second, is the emergence of new companies who are trying to gain benefit from the fragmented niche agricultural markets [2–5].

1.2 E-Commerce's Value Creation in Agribusiness

E-commerce's value in formation of agricultural and food markets will be most fruitful when the e-commerce firms operate effectively throughout the supply chain system. The major issue is that the e-commerce firms, have faced many obstacles in staying in business especially due to seasonal and perishable nature of agricultural commodities [3, 4]. The aim of this research study is to identify customer clusters or characteristics that are linked with successful adoption of e-commerce firms along the agricultural and food supply chain. Pertinent e-commerce and agricultural e-commerce literature suggests a series of characteristics that are responsible for the success of agricultural and food ecommerce firms [4–7]. Agricultural e-commerce presents a unique challenge when using the specified taxonomy to categorize it accordingly, since a farm or any type of agricultural production is a business, but also at the same time presents characteristics of market power such as price taking behavior which is most generally associated with consumers. Few studies have classified agricultural initiatives into four categories: content providers, agribusiness-to-grower, agribusiness-to-agribusiness, and commodity futures and derivatives markets. As information costs go down, as commonly observed with e-commerce, several outcomes may occur. Consumers will have the ability and freedom to make direct purchases from manufacturers [5, 6]. In E-agribusiness vertical integration is of less importance, consequently causing participation of more firms with a higher niche marketing or specialization and outsourcing. Business-to-business e-commerce enhances the performance of the supply chain by lowering inventory levels, transportation costs, and order to delivery lead time. E-commerce will revolutionize the marketplace not only by lowering the cost of logistics but also by deterring market thinness and facilitating liquidity. These alterations will prompt firms to reorganize and thus increase productivity gains [6, 8].

1.3 Challenges of E-Agribusiness

E-Agribusiness can be termed as E-Business that specializes in agricultural goods or services. Typical seasonal aspects of the agricultural sector and its participants may cause some inherent obstacles to the enforcement of E-Business practices [7, 8]. Opposition to the evolving business practices, old tradition, and lack of a sense of familiarity with current technology may be a significant issue in agricultural sectors. Similarly, management traditions may make swift development and execution of new business models and strategies more tedious for agricultural firms compared to businesses in other industries. Place, industry structure and participant demographics are also limiting factors. All these raise many essential questions for discussion [8, 9].

Some researchers presume that niche products (e.g., specialty crops and locally processed foods) from agriculture can be sent for direct consumption on the online market. Consumers looking for high-end agriculture produce these days are looking for fresh products online (e.g., at Nature's Basket) [9]. None the less, customer's innate need to physically inspect the products before purchasing will be a persistent challenge to some E-Agribusiness for the foreseeable future [10–12].

1.4 Positive Impact of E-Agribusiness on Socio-economic Status of Farmers

The launch of the mobile app “Kisan Suvidha” by Prime Minister Narendra Modi is expected to gain significant popularity and potentially bring about a transformative impact on Indian agriculture. India possesses the second-largest smartphone market globally, with 87 million rural mobile internet users. Furthermore, as agriculture is the backbone of the Indian economy, employing over 60% of the workforce, the app is anticipated to attract a large user base and revolutionize the agricultural sector in India [11]. The Government of India is also taking proactive measures to address the unfulfilled requirements of farmers throughout the agricultural value chain. These initiatives include schemes like the Soil Health Card Scheme, Parapargat Krishi Vikas Yojana, National e-Governance Plan (NeGP), m-Kisan, and more [12–17].

The present study aims to understand online consumer shopping behavior patterns for agriculture products to make the E-agribusiness stronger and more prominent in the country. The objective of the study is to form the clusters of respondents participating in the study according to their shopping behavior in relation to E-agribusiness.

2 Methodology

The study was conducted in Jaipur district of Rajasthan, India. Survey questionnaires were distributed to visitors visiting a Flower exhibition at Jawahar Kala Kendra organized by Kitchen Garden association, Jaipur, Rajasthan, India. All the primary information was gathered through a well-defined questionnaire and an in-depth interview of 100 respondents.

A stepwise cluster analysis method was applied to cluster the respondents based on the attributes of online shopping. These attributes were measured on a metric scale. Although this method works on both categorical and continuous variables, only continuous variables have been considered for this analysis. The exploration of natural groupings (clusters) through this method is based on a certain algorithm. This method used the Euclidean distance measure to assess the distance between two clusters. Akaike's Information Criterion (AIC) has been used to determine the number of clusters and goodness of fit of clusters formed. Interpretation of clusters was done based on attributes of online shopping. In the next stage, cluster profiles were obtained by cross tabulating the cluster membership with the demographic variables.

3 Analysis, Results and Discussion

A two-step cluster analysis was applied on the data collected from the primary survey. The variables considered were the opinion of the respondents on various attributes of online shopping in case of agri-business products. These attributes were Merchandise, Convenience, Interactivity, Navigation, Reliability, Promotions, and Design. They all were measured on the metric scale. The AIC values in the Auto-Clustering table suggest a four-cluster solution because at cluster four, AIC value shows a change in values i.e. the values are decreasing and suddenly it shows an increasing trend after cluster 4. Thus, a four-cluster solution is found to be most appropriate.

The goodness of fit of the model obtained by the AIC techniques is given in Table 1.

Table 1 and Fig. 1 reveals the likelihood of two things; first, whether there are distinct clusters and second, the statistical significance of the results obtained. The AIC method results in a coefficient that ranges from -1.0 to $+1.0$. However, for all practical purposes, a coefficient that ranges from -0.5 to $+1.0$ is acceptable and a good solution. The AIC method establishes that there are four distinct clusters. There is also 'good' cohesion within the obtained clusters and 'good' difference between them.

Table 2 represents the cluster distribution. There are 15 numbers of cases each in cluster 1, 2 and 4 except in cluster 3 there are 55 numbers of cases.

Table 1 Auto-clustering

Number of clusters	Akaike's information criterion (AIC)	AIC change	Ratio of AIC changes	Ratio of distance measures
1	509.694			
2	435.628	-74.066	1.000	1.011
3	354.206	-81.422	1.099	1.317
4	307.301	-46.905	0.633	1.179
5	311.513	4.212	-0.057	1.080
6	265.021	-46.492	0.628	1.076
7	266.151	1.130	-0.015	1.262
8	268.635	2.484	-0.034	0.949
9	284.989	16.354	-0.221	2.074
10	304.177	19.188	-0.259	1.008
11	319.131	14.954	-0.202	1.185
12	336.000	16.869	-0.228	1.369

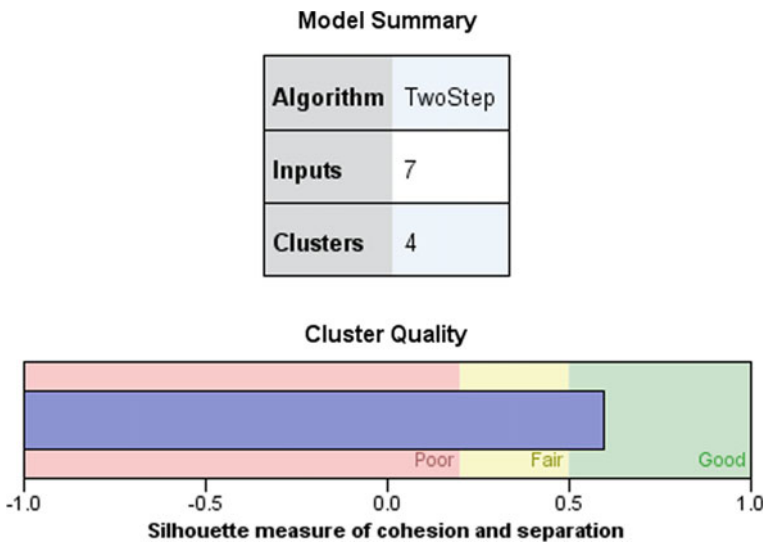


Fig. 1 Model summary

3.1 Interpretation of Clusters

For interpreting the clusters, the clusters centroids are examined. The cluster centroid based on above mentioned seven variables are given in Table 3.

Table 2 Cluster distribution

		N	Percentage of combined	Percentage of total
Cluster	1	15	15.0	15.0
	2	15	15.0	15.0
	3	55	55.0	55.0
	4	15	15.0	15.0
	Combined	100	100.0	100.0
Total		100		100.0

It is apparent from the table that the Promotions attribute which includes discounts, free gifts, attractive packaging, and combo packs is equally important for all the customers but will be more preferred by cluster 4 customers. Similarly Design attributes which include colors, borders, graphics, pictures, styles and fonts are also equally preferred by all customers except customer who belongs to cluster 4. The following are the characteristics of customers of various clusters based on Table 3.

1. The customers of cluster 1 give more importance to Merchandise information such as product information, assortment, and price. They also have a positive attitude towards Reliability attribute which includes company information, transaction security and privacy policies. They have low importance to convenience and interactivity. Hence this cluster is named as the Surgical Shoppers.
2. The customers of cluster 2 are more concerned about Convenience and Interactivity attributes. Convenience includes timely delivery, ease of ordering and product display. Interactivity includes customer support and improved search functions. Hence this cluster is named Digitally Driven Shoppers.
3. The customers of cluster 3 have more inclination towards Navigation attribute which include time to load home pages, expected waiting time to download pages of the site and waiting information. This cluster is named the Power Shoppers.
4. The customers of cluster 4 are less concerned about the Merchandise, Convenience and Design attributes but are more affected by Navigation and Reliability attributes. Hence this cluster is named the Reluctant Shoppers.

Thus, cluster 1 and 2 customers may comprise of those customers who prefer high-quality agriculture produce and will look for fresh products online [9, 18–21].

Business-to-business e-commerce improves supply chain performance and E-commerce also will restructure the marketplace which will promote firms' reorganization and thus further productivity gains [6, 22–25]. Improved reliability and navigation can influence the choices of the customers belonging to cluster 4.

Table 3 Centroids

Cluster	Merchandise		Convenience		Interactivity		Navigation		Reliability		Promotions		Design	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
1	3.6667	0.48795	1.3333	0.48795	1.6667	0.48795	4.0000	1.46385	7.0000	0.00000	5.6667	0.48795	5.6667	0.97590
2	2.3333	0.48795	4.0000	0.00000	5.0000	0.00000	1.0000	0.00000	2.6667	0.48795	6.3333	0.48795	6.6667	0.48795
3	1.5455	0.50252	3.0909	0.79983	3.4545	1.08556	5.3636	1.16052	3.0000	2.01843	5.2727	0.87039	6.6364	0.64875
4	1.0000	0.00000	2.0000	0.00000	4.0000	0.00000	5.0000	0.00000	6.0000	0.00000	7.0000	0.00000	3.0000	0.00000
Combined	1.9000	0.94815	2.8000	1.03475	3.5000	1.25126	4.4500	1.83883	4.0000	2.24733	5.7500	0.94682	5.9500	1.43812

3.2 Cluster Profile

The clusters are obtained by cross tabulating the cluster membership with the demographic variables. The following are the various tables for this purpose.

It is clear from the Table 4 that in the clusters of digitally driven shoppers and the power shoppers, there are more males than females but it is just opposite in case of reluctant shoppers. In case of surgical shoppers, males and females are approximately same in numbers.

Table 5 depicts the distribution of customers belonging to various clusters based on age. It shows that surgical shoppers are the majority in the age group of 20–35 years while digitally-driven shoppers belong to 10–35 years category. The power shoppers have a wide range of customers in different age groups i.e., from 10 to 50 years. The reluctant shoppers are more than 35 years of age.

The Table 6 gives the distribution of shoppers based on their educational qualifications. Most surgical shoppers and digitally driven shoppers are either graduate or postgraduate. The power shoppers and the reluctant shoppers are either graduate or having education up to class 12.

Table 7 gives the information of shoppers of different clusters based on their occupation. Most shoppers of clusters 1 and 2 are either students or have private job.

Table 4 Clusters * gender cross-tabulation

		Gender		Total
		Male	Female	
Clusters	The surgical shoppers	7	8	15
	Digitally-driven shoppers	9	6	15
	The power shoppers	34	21	55
	The reluctant shoppers	6	9	15
Total		56	44	100

Table 5 Clusters * age cross-tabulation

		Age				Total
		10–20 years	>20–35 years	>35–50 years	>50 years	
Clusters	The surgical shoppers	3	8	2	2	15
	Digitally-driven shoppers	5	5	3	2	15
	The power shoppers	14	16	17	8	55
	The reluctant shoppers	3	2	6	4	15
Total		25	31	28	16	100

Table 6 Clusters * education cross-tabulation

		Education				Total
		Upto 12th class	Graduate	Post graduate	Doctorate	
Clusters	The surgical shoppers	3	5	5	2	15
	Digitally-driven shoppers	3	6	5	1	15
	The power shoppers	12	27	10	6	55
	The reluctant shoppers	6	7	2	0	15
Total		24	45	22	9	100

The power shoppers are either students or in govt. job whereas the reluctant shoppers are having mixed occupation, but they are in business also.

From Table 8 the surgical shoppers and digitally driven shoppers have income less than 1 lakh whereas the power shoppers and the reluctant shoppers have their income less than 5 lakh.

Table 9 gives the monthly expenditure on online shopping by different clusters. It is clear from the table that most of the surgical shoppers are spending more than Rs.1500 on online shopping. In the case of spending by digitally driven shoppers, it

Table 7 Clusters * occupation cross-tabulation

		Occupation				Total
		Student	Business	Govt. job	Private job	
Clusters	The surgical shoppers	5	3	2	5	15
	Digitally-driven shoppers	6	1	1	7	15
	The power shoppers	19	8	18	10	55
	The reluctant shoppers	4	5	2	4	15
Total		33	17	24	26	100

Table 8 Clusters * income cross-tabulation

		Income				Total
		<1 lakh	1-5 lakh	>5-10 lakh	>10 lakh	
Clusters	The surgical shoppers	7	3	3	2	15
	Digitally-driven shoppers	7	3	2	3	15
	The power shoppers	19	17	12	7	55
	The reluctant shoppers	4	7	2	2	15
Total		33	30	21	16	100

Table 9 Clusters * money_spend_per_month cross-tabulation

		Money_spend_per_month				Total
		100–500 INR	>500–1000 INR	>1000–1500 INR	1500 and above INR	
Clusters	The surgical shoppers	5	0	0	10	15
	Digitally-driven shoppers	0	5	5	5	15
	The power shoppers	15	15	15	10	55
	The reluctant shoppers	5	0	5	5	15
Total		25	20	25	30	100

is in the range of Rs.500 to more than Rs.1500. The Power shoppers and the reluctant shoppers spend a mixed amount of money in all ranges.

4 Conclusion

This research demonstrates the shoppers’ profile of Agri-based products as per various dimensions of online shopping as well as their demographic characteristics. The data collected was analyzed based on two-step cluster analysis and their profiles have been identified based on the results. There were four clusters of shoppers which are identified. The following conclusion can be drawn based on results obtained:

1. Other than this promotions attribute which includes discounts, free gifts, attractive packaging, and combo packs is equally important for all the customers but will be preferred by reluctant shoppers. Similarly design attributes which include colors, borders, graphics, pictures, styles and fonts are also equally preferred by all shoppers except shoppers who belong to the reluctant shoppers.
2. Surgical shoppers give more importance to merchandise information and reliability attributes of online shopping. They are mostly females in the age group of 20–35 years, either graduate or postgraduate. They are students or in private jobs earning less than 1 lakh and spends more than Rs. 1500 monthly on online shopping.
3. The digitally driven shoppers are more concerned about convenience and interactivity attributes. They are mostly males in the age group of 10–35 years and are either graduate or postgraduate. They are students or in private jobs earning less than 1 lakh and spends between Rs. 500 and Rs. 1500 monthly on online shopping.

4. The power shoppers have more inclination towards navigation attribute. They are mostly males in the age group of 20–50 years and graduate. They are either students or in government jobs with income less than Rs. 5 lakh and spends between Rs. 100 to Rs. 1500 monthly on online shopping.
5. The reluctant shoppers are more affected by navigation and reliability attributes. They are mostly females in the age group of 35–50 years and studied either up to 12 or graduate. They have mixed occupation, earning less than Rs. 5 lakh and spend either Rs. 100–500 or more than Rs. 1000 monthly on online shopping.

This profiling of the shoppers of Agri-products based on various dimensions of online shopping as well as their demographic characteristics can effectively help agri-businesses in improved understanding and categorization of their target customers. Such categorization can also help businesses in better product development and subsequently result in improvement of awareness building campaigns effectively targeting customer segments besides improving buying processes tailored to the associated buying behaviors.

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Antecedents and Consequences of Business Model Innovation: A Theoretical Model



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Abstract The importance of business model innovation (BMI) in determining firm performance has been widely acknowledged. However, a comprehensive understanding of the antecedents that drive BMI is still lacking. This conceptual model aims to address this gap by proposing a relationship between learning orientation, absorptive capacity, and strategic flexibility and BMI. Our model suggests that firms with a strong learning orientation, high absorptive capacity, and high levels of strategic flexibility are more likely to engage in BMI. Moreover, we posit that BMI has a positive impact on firm performance, including financial and strategic outcomes. This conceptual model provides a foundation for future empirical research to test these relationships and shed light on the antecedents of BMI and its impact on firm performance.

Keywords Business model · Business model innovation · Absorptive capacity · Learning orientation · Business performance

1 Introduction

Business model innovation (BMI) has become a critical factor in determining firm performance in today's rapidly changing market [1–4]. Firms that are able to successfully innovate their business models are better equipped to respond to changing market conditions and achieve superior financial and strategic outcomes [5, 6].

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Despite its growing importance, there is limited understanding of the antecedents that drive BMI and the impact that BMI has on firm performance.

Foss and Saebi [3] point out that BM innovation—ostensibly a new source of innovation that “complements the traditional subjects of process, product, and organizational innovation” [7, p. 1032]—is less well understood, possibly because the BMI literature is more recent than the BM literature. However, it is rapidly increasing, implying that BMI is a significant phenomenon that must be conceptualized and theorized on its own. While BM and BMI are undoubtedly related, BMI research adds the dimension of innovation, raising a number of critical theoretical and empirical questions: What are the drivers, facilitators, and impediments to BM innovation? Under what conditions can BMI provide a sustained competitive advantage? Is BMI only found in the upper echelons, or can it also be found at lower levels of the organization? However, due to the nascent nature of BMI research, such fundamental questions are not currently being posed, addressed, and answered in a systematic manner.

Furthermore, Previous research has explored various factors that influence BMI, including firm size, industry structure, and firm resources [3, 8]. However, these studies have not fully captured the complex interplay between a firm’s internal resources and its ability to engage in BMI. The dynamic capabilities theory [9] provides a useful framework for understanding this relationship, by focusing on the firm’s ability to build, integrate, and reconfigure its internal resources in response to changing market conditions.

This study aims to address the gaps in the previous literature by focusing on three key antecedents of BMI within the dynamic capabilities theory: learning orientation, absorptive capacity, and strategic flexibility. We propose that firms with a strong learning orientation, high absorptive capacity, and high levels of strategic flexibility are better equipped to engage in BMI, allowing them to adapt to changing market conditions and achieve superior performance outcomes. Moreover, we posit that BMI, as a dynamic capability, enhances a firm’s performance by allowing it to respond to changing market conditions and achieve better financial and strategic outcomes. The purpose of this paper is to provide a conceptual model of the relationship between learning orientation, absorptive capacity, strategic flexibility, BMI, and firm performance within the dynamic capabilities theory. The model serves as a foundation for future empirical research to test these relationships and contribute to our understanding of the dynamic capabilities that drive BMI and its impact on firm performance.

2 The Business Model Concept

In recent years, scholars have shown keen interest in the BM concept and the BM has emerged as a key research area in the fields of strategy and entrepreneurship [6, 7, 10–14]. This growing interest in the concept is manifested by the growing number research projects, academic and practitioner oriented books, and the wide use of the

concept by journalists, consultants, business managers, and board directors [15, 16]. A review of BM literature has been carried out by [7, 17], and more recently by [18].

The BM has been conceptualized as a firm's framework for making money [19], and it captures the key relationships in a venture on a number of levels including production, strategy and economic aspects [20, 21]. Although various definitions have been proposed for the concept, there is a growing consensus that a BM describes the logic of the firm and how it intends to create, deliver, and capture value [11, 22, 23]. More specifically, [20, p. 494] states that "*a business model depicts the content, structure, and governance of transactions designed so as to create value through the exploitation of business opportunities.*" For them, the BM concept has the potential to be a bridge between entrepreneurship and strategy due to its focus on value creation. Therefore, novel BM is defined as a framework for capturing and appropriating value by carrying business activities in a unique way compared to other rivals [24].

2.1 *Origins of the BM Concepts in Academic Research*

Although BMs growing prominence has been primarily linked to the dot.com bubble (from 1998 to 2001), its use in the academic literature dates back to the 1950s [25]. Teece [11] points out that BMs have been essential to trading and economic regimes since barter exchange era and links the popularity of the concept to the proliferation of internet and the emergence of the digital economy. Other authors argue that the BM concept has similarities with other concepts from the management literature, e.g. "business idea" [26], "business concept" [27] and "theory of business" [28].

To track the origins of the concept in academic literature a Google Scholar search was conducted for the term "business model" in academic peer reviewed journals. The database search was conducted in 30/12/2022 and produced 22,900 "title" hits. The results show that the academic interest in the BM construct is quiet recent; 19,000 out of 22,900 "title" hits were in fact published after the year 2010 (see Fig. 1).

According to [29], the public started to use and talk about BMs in the early 1970s. At that time, the concept was mainly used in relation with business modelling [30]. In consequence, most of BMs literature during that period was published in journals of Informational Technologies such as the Journal of System Management. From the 1970s to early 1990s the concept has been used in parallel with other terms from the fields of computer science and system modelling, e.g. Computerized Model, Computer Assisted Modelling, and Information System [29]. Therefore, it can be noted that the conceptualization of the BM concept has been influenced to large degree by the development of business modelling and information system during this period.

The advances in information and communication technologies during 1990–1995 lead to an increased interest in the concept by both researcher and practitioners. During this period, other themes increasingly began to shape people understanding of the concept, although, most published work was connected to the same fields of computer science and business modelling. For example, scholars in the strategy

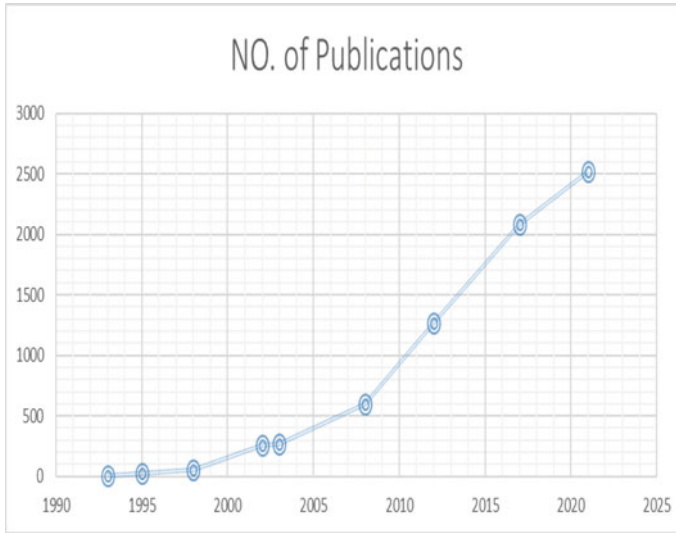


Fig. 1 Publication by year. *Source* Google Scholar, 30/12/2022, 22,900 title hits

context have used the BMs in connection with other terms such as revenue model or relationship management [29, 30]. The advent of the “new economy” and the proliferation of internet increased the BM popularity within business enterprises [11, 12, 15]. Magretta [31] suggested that the BM concept became widely used after the introduction of personal computer and the spreadsheets. Along with the growth of e-commerce/e-business activities, there was also a substantial increase in number of publications.

Scholar’s efforts have been also directed towards identifying the strategic components of the concept, rather than using the term as a modelling tool. In this literature has BMs linked to competitive advantage and to business performance. While some authors considered the BM as distinct but related to the concept of strategy [32], others point out that concept can be used to integrate various strategy perspectives [27]. Chesbrough and Rosenbloom [33] argue that the development of the BM as a management concepts has been influenced to a large degree by the field of business strategy rather than business modelling. Recently, scholars have started to emphasize value creation and value capture, which are now considered as one of the main elements of the BM concept [11, 22, 24, 34, 35].

2.2 *Review of the BM Innovation Literature*

BMI can be distinguished from other forms of innovations. Schumpeter [36] have identified five different types of innovation including new products and services, new methods of production, new sources of supply, exploitation of new markets,

and new ways of organizations. While the majority of the existing literature focuses on the first two types of innovation, this study explores the last type; i.e. new ways of organizations, which is currently termed by scholars as BMI. Although BMs are fundamental for commercializing new products or new technologies, they are certainly different from product or technological innovations [2, 33, 37]. Hence, rather than inventing new product and service, BM innovators seek to redefine their value proposition i.e. reconfigure what product and service is and how they will be delivered to customers which may lead to superior performance outcomes [2, 11, 38].

Conceptualization of BM innovation

There has been a lack of clarity and consensus among researchers over the definition and extent of BMI. According to [3] one study stream has seen BMI as a process (e.g., search, experimentation, transformation), whereas another has viewed it as an outcome [39]. Another classification system, suggested by Volberda et al. [40] divides creative business models into four quadrants based on replication–renewal and strategy driven–customer driven characteristics. Another group of scholars has adopted the architectural approach of innovation in business models, focusing on the interconnections between the activities of the BMI process [2, 41]. Researchers have also categorized BMI based on the degree of innovation and extent of change in existing business models. On the one hand, some researchers have proposed that BMI may only affect a single component of the business model value processes, such as value creation [2]. On the other hand, others have argued that it may affect more than one, if not all, of the components of the BM and the architecture that connects those components [42]. Still other researchers have argued that a complete recombination of all components and the underlying architecture connecting them must be a prerequisite for BMI (e.g. [43]). Accordingly, [22] introduced the CANVAS framework, which characterizes BMI as a collection of nine fundamental building pieces that illustrate the rationale behind how a company functions and innovates its business model.

Antecedents of BMI

Early research on BMs have been centred around defining the concept, clarifying its meaning, and listing its main components (e.g., [20, 27, 33, 44, 45–47]), but with the increase in the number of BMs, especially after the dot-com bubble, scholars interest have been shifted toward identifying BM archetypes and taxonomies [22, 48–51]. While there is growing number of studies that have investigated the importance of change arising from BM innovation, these studies did not address the antecedents to such change. Based on our review of the BM literature, this study focus on four key antecedents; namely; Absorptive Capacity, Learning Orientation, and Strategic Flexibility.

Over the past two decades, research published in the field of strategic management has emphasized the significance of absorptive capacity in achieving higher firm performance. Absorptive Capacity is defined by Zahra and George [52] as a company's capacity to acquire, assimilate, transform, and exploit new knowledge. Absorptive Capacity is theorized, from a learning perspective, to contribute to firm innovation and, in turn, facilitate sustainable competitive advantage by enhancing knowledge transfer. In this study strategic flexibility is defined in line with [53] as the capacity to identify innovation opportunities, commit resources to new courses of action, or reverse ineffective resource deployment. Based on the review of extant organization learning literature, two conceptualization of learning orientation appear to have an increased prominence. The first group of scholars broadly define LO as the development of new knowledge or insights that can potentially influence behaviour through values, norms, and beliefs rooted in the organization culture [54]. Other scholars, however, conceptualize LO in a way that reflects the need for a new set of behaviours [55]. Learning orientation enhances the organizational knowledge capability [56] and also helps organizations in searching for information and assimilating, [57–63] developing and creating new knowledge and, thus, it can be considered an important driver of BMI.

Consequences of BMI

A growing body of literature has investigated the strategic benefits of novel BMs [1, 64] and the potential for a firm's BM to be a subject of innovation in itself [18, 35, 65]. In this literature novelty is achieved through the discovery of new BMs rather than products or technologies in an existing industry [2]. Firms who emphasize BM innovation are expected to benefit in three main ways [2, 66]. First, they will be able to create value for customers at low cost. Second, they are likely to develop sustainable competitive advantage. Finally, BMs can be used as a powerful competitive tool.

Research on the consequences of BMI can be classified into two streams. The first stream focuses on link the "act," or process, of BMI to outcome implications (see [67, 68]) and those that examine the effects of various types of BMs on firm performance (e.g., Huang, Lai). In the first scenario, research assumes a process perspective and investigates whether an innovative adjustment to the current BM results in higher performance outcomes. Aspara et al. [67], for instance, compare the financial performance implications of BMI to those of replication, whereas [69] find that BMI aimed at disrupting the industry chain, revenue model, or organizational boundaries does not result in any significant variation in financial performance across the various types of BMI. [70] found that, in the context of entrepreneurial enterprises, firms that adjusted their BMs over time and in an inventive manner experienced a beneficial impact on venture performance. In the second scenario, research does not establish a direct correlation between BMI and performance outcomes. Instead, they conduct empirical tests to determine the effects of various BM designs on innovation performance.

Zott and Amit [6] after distinguishing between novelty- and efficiency-centered BM designs, showed a positive correlation between novelty-centered BMs and business performance in entrepreneurial firms. In a later study [71], these same authors

demonstrate the significance of product market strategy and business model (BM) design compatibility in boosting firm performance. After adopting the same differentiation of novelty- and efficiency-centered BM designs, Wei, et al. [72] investigated the compatibility of exploitative and exploratory innovation with various BM designs to enhance the growth of Chinese enterprises.

3 Theoretical Model

Based on our review of literature, Fig. 2 illustrates the study theoretical model. The first part of the model defines the key antecedents' drivers to BMI. The second part aims at investigating the link between BMI and business performance. More specifically, it argued that a firm's absorptive capacity, learning orientation, and strategic flexibility collectively represent a unique resource or a capability which contributes to the development of innovative-business model, as well as the nature of the impact of such advantage on business performance.

The dynamic capabilities theory provides a useful framework for understanding the relationship between a firm's internal resources and its ability to adapt to changing market conditions through business model innovation (BMI). This conceptual model proposes that learning orientation, absorptive capacity, and strategic flexibility serve as antecedents to BMI. Our model suggests that firms with a strong learning orientation, high absorptive capacity, and high levels of strategic flexibility are better equipped to engage in BMI, allowing them to adapt to changing market conditions and achieve superior performance outcomes. Moreover, we posit that BMI, as a dynamic capability, enhances a firm's performance by allowing it to respond to changing market conditions and achieve better financial and strategic outcomes. This conceptual model provides a foundation for future empirical research to test these relationships and contribute to our understanding of the dynamic capabilities that drive BMI and its impact on firm performance.

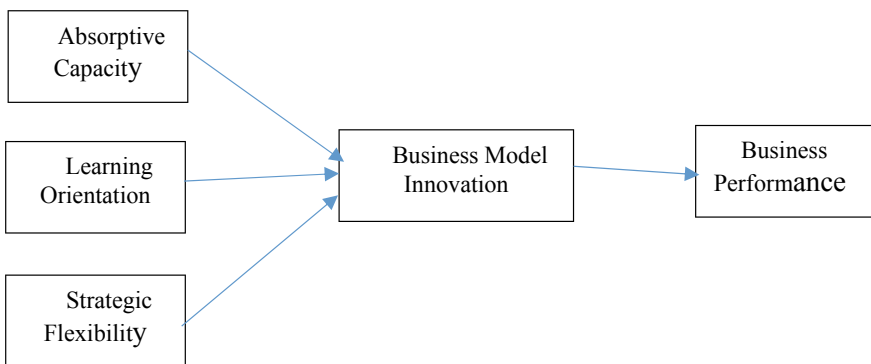


Fig. 2 Research model

4 Conclusions

The key objective of this study is to examine the antecedents and consequences to BMI in the manufacturing and service sectors, which has been largely neglected in prior BM research. Our model provides implications of academic scholars as well as practitioners. While research focusing on defining the BM concept and listing its main components is important, progressing research on BMI requires researchers to explore the key antecedent driver of novel BMs, which this study has attempted to accomplish. This study also highlights the importance of BMI for business managers. Our review suggest that BMI can be viewed as an alternative to product or process innovation. Furthermore, an appropriately deigned BM can be an important source of competitive advantage and superior business performance.

5 Future Directions

Future research can be conducted to explore the impact of business model innovation on firm competitiveness. This could include studies that compare the competitiveness of firms with different types of business models, as well as studies that analyse the impact of business model innovation on a firm's ability to compete in its market. Furthermore, more research is required to explore the role of strategic agility in enabling firms to successfully adopt new business models and improve performance. This could include studies that examine the characteristics of firms that are able to quickly and effectively adapt to changing market conditions and adopt new business models.

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Financial Management Information System in Developing Countries: A Review of Literature



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Abstract Financial Management Information System (FMIS) has continuously been a significant aspect in public financial management reform in developing countries. Accordingly, there have been many empirical studies on FMIS from different perspectives. However, very few of those studies had attempted to do a literature review on the subject. This current study offers an extensive review of literatures on FMIS. Using Google Scholar, this study identified 109 academic articles and conference papers on the subject published between 2010 and 2022. An analysis was conducted on those articles and papers to identify the demographic characteristics, research methodologies, and research themes employed. The features of the literatures were summarized using Microsoft Excel 2016, focusing on the sum of publications, types of sources, subject areas, contributions by country, most active institutions, authorship, keywords, as well as analyses of titles and abstracts. It was found that a majority of the articles were journal and conference publications, that most of them were published by The Strategic Journal of Business and Change Management, and that Kenya contributed the largest percentage of articles. Additionally, it was found that the most frequently used research methodologies are the cross-sectional and survey approaches, and that most of the studies conducted an

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analysis at the individual level. Meanwhile, the IS success and technology acceptance models were found to be the most popular for examining FMIS. The findings are expected to enrich the existing body of knowledge on FMIS.

Keywords Developing countries · FMIS · Public financial management · Literature review

1 Introduction

Among the ongoing issues faced by developing nations include financial distortions, ineffective resource allocation, unethical behaviour, and budgetary shortfalls [1]. These issues have had a negative impact on the society as well as on economic growth and business operations. Developing countries are encouraged to enhance their public financial management (PFM) as one of the strategies to address these issues [2].

PFM reforms are acknowledged as a force that can aid in obtaining, managing, and allocating public resources in a transparent and efficient manner [3]. PFM could facilitate the effective provision of public services, generate wealth and employment, and enhance economic growth [4–6]. By providing pertinent, accurate, and trustworthy information, effective PFM speeds up the decision-making process for financial policies and ensures the generation of transparent and accountable public financial reporting [7–14].

According to [1], the majority of poor nations' budget execution and accounting systems were or are supported by human labour or antiquated, inefficient software programmes. The performance of PFM systems as well as the accurate and timely processing of data for budget planning and reporting would be negatively affected with the usage of manual or antiquated procedures. Budget management has been reported to be badly impacted by outdated and antiquated budgeting procedures, leading to resource misallocation and poor management of government resources [1, 13, 14]. As a result, governments struggle to accurately, completely, and transparently report on their financial situation; the lack of information has made governments less transparent and accountable [4, 15–21].

The World Bank noted that considering these unusual circumstances, e-Government is a crucial instrument for enhancing PFM and increasing the transparency of decision-making by allowing access to more pertinent information [19]. The Financial Management Information System (FMIS), an electronic government system, speeds up the creation of government budgets and aids in a more effective and efficient transmission of government processes. FMIS is a computer-oriented system that could enhance financial control, budget management, and reporting, hence increasing the PFM of the government [22]. According to [1], FMIS is sufficient, reliable, accurate, current, and relevant for addressing the informational needs of users. As a result, creating an FMIS has become a must for creating a PFM that is more effective [15, 23–27].

From 1984 to 2010, the World Bank had financed 87 FMIS projects (e.g., government FMIS, Integrated FMIS, Public Sector Management Project, Treasury Systems Project) in a total of 51 nations, amounting more than US \$2.2 billion out of which US \$938 million was allocated for FMIS-oriented ICT solutions [4, 25]. These systems play such a crucial part in the PFM success of developing nations and have progressively become more complicated. Accordingly, many empirical studies on FMIS have been conducted from different perspectives (e.g., FMIS impact, FMIS successful implementation, the challenges of FMIS implementation). Even so, very few of those studies (e.g., [25]) had reviewed or surveyed past studies on the performance of FMIS, or had examined the findings, limitations, and possible directions for future studies. Due to this, the purpose of this work is to examine the results of existing research on the topic and offer new directions for future studies. Consequently, the current study seeks to provide answers to the following research questions by compiling recent conceptual and empirical articles: (1) What are the current FMIS research demographic characteristics? (2) What methodologies and methods have been utilised in the extant FMIS research? and (3) What themes have been investigated in prior FMIS research?

The organisation of this paper is as follows: Sect. 2 discusses the definitions for FMIS, the types of FMIS, and its history in brief. Section 3 elucidates on the research methodology, specifically the search procedures and selection criteria employed in past studies. Section 4 presents and discusses the findings, specifically the demographic characteristics, the methodologies used by previous studies, the analysis of the FMIS-related theories and themes, and the text analysis of the previous studies' titles and keywords. Lastly, Sect. 5 concludes the study and presents the study limitations as well as suggestions for future research directions.

2 Literature Review

2.1 Definition of FMIS

FMIS has no established definition that is acknowledged worldwide [2]. In other nations, the system goes by different names such as FMIS in Uganda, integrated FMIS in Gambia, Ghana, and Nigeria, or government FMIS in Iraq, Egypt, and Jordan [4]. Because each system has various features, different countries use the phrase in slightly different ways [22]. In general, these systems are very similar. FMIS is employed in this current study.

According to [28], FMIS is a computer software application which unifies crucial accounting and budgetary operations to advance data security and management effectiveness so as to ensure thorough financial reporting. According to [2], the PFM functions of the government are handled by a network of computerised systems.

In order to guarantee transparency and accountability in the allocation, usage, and control of the existing financial resources of all ministries and governmental

departments, FMIS serves as an integrated computerised system which connects all the financial and accounting operations of numerous ministries, financial centres, governmental departments, and budget institutions with the MoF [28].

It is evident from the many definitions provided by researchers that the idea of FMIS is viewed from different viewpoints or perspectives. Yet, most definitions lean heavily towards the automation of government accounting and financial operations. The definition of FMIS by [15] is deemed appropriate for this study. i.e., an integrated IS that links the MoF with all accounting and financial activities across numerous ministries, departments, and governmental agencies. This may also imply that FMIS stands for the automation of the financial system of the government.

2.2 *FMIS Functions*

FMIS enables the government to properly account for, manage, and oversee public sector transactions in line with the applicable rules and regulations [29–34]. This shows that government institutions, including the federal, state, and municipal governments regard FMIS as an integrated system [35, 36]. PFM's FMIS component is crucial for governments. The specific goal of the FMIS initiative in poor nations, according to [37, 38], is to support the function of PFM.

FMIS enhances the reporting process and financial control, which in turn boosts the government's PFM [20]. Namely, FMIS aids the government and users in producing more trustworthy, thorough, accurate, and timely financial information, hence resulting in a more efficient, transparent, and accountable PFM [15]. Additionally, FMIS enables the financial control of the MoF and the administration of other ministries, speeds up the interchange of financial information between users, and aids users in making timely decisions.

In general, FMIS covers seven major functions: financial and accounting processes, cash management, payment management, receivables and revenue management, budget preparation and implementation, procurement management, and project management.

3 **Research Methodology**

As a foundation for the current work, this part focuses on earlier articles on FMIS. The selected articles' authors, study design, population, research methodology, publication type, and conclusions are identified and described. This literature evaluation was conducted in May to September 2022, and keyword searches were used to find the relevant literatures [39, 40]. Utilizing keywords to find relevant articles on a particular subject is a good search strategy [41–44]. Following [37] recommendations, we picked different keywords but with similar meanings to generate more related articles as the wording that is most pertinent to this paper's theme namely

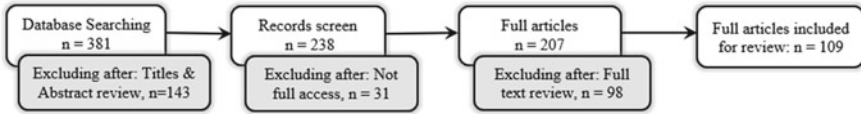


Fig. 1 FMIS LR information flow diagram

“FMIS initiatives” only produced little results. Thus, we used the keywords “integrated FMIS”, “government FMIS”, “public FMIS” in our search for the relevant articles. Google Scholar was employed for this purpose, particularly in searching for articles published over the 2010–2022 period. To screen the articles generated, those published in other languages (e.g., Arabic, Chinese, Indonesian, Spanish and Ukrainian) were excluded. In short, only articles written in English were selected. Also excluded are all unpublished theses.

The initial literature search produced 381 publications on FMIS. In the second stage, the selected articles’ titles and abstracts were reviewed. A total of 238 articles were left for additional examination after 143 articles were excluded from the second stage assessment as they did not satisfy the required criteria. The authors were only able to access 207 studies as a result. A total of 109 papers were assessed to be significant for further analysis after extensive reviews. The steps in the whole literature search procedure are shown in Fig. 1.

4 Results and Discussion

The results and discussions of the literature review are compiled and presented in this section, hence describing the analysis of the FMIS studies. These include the year of publication, review based on country, type of publications, research methodologies used by the previous studies, analysis of adapted information system (IS) model, research themes, and text analysis of the document titles and keywords.

4.1 Demographic Characteristics

4.1.1 Year of Publication

Examining the papers according to the year of release enables the researcher to track trends and changes in the level of interest in the research topic over time [45–49]. The number of works published on FMIS between 2010 and 2022 is shown in this section. A total of 5 articles were published in 2010 and three in 2011. The lowest number of articles published was in 2012 with only three articles, whilst the highest number was in 2017 with 20 articles. The publication of FMIS-related articles has

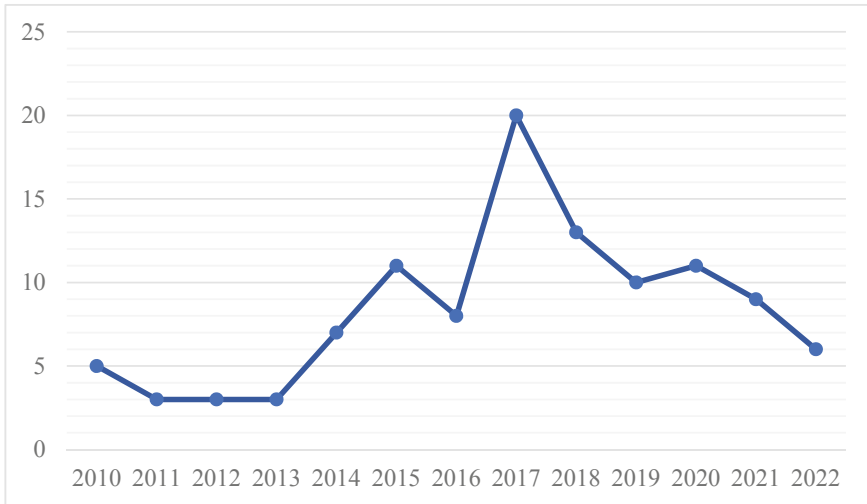


Fig. 2 Document by year

been decreasing since 2017. The number of publications on FMIS-related studies is expected to increase after 2022. Figure 2 illustrates the publication trend of FMIS studies over the period of 12 years.

4.1.2 Review Based on Country

Studies on FMIS had been conducted across developing nations. The analysis of these research, which was based on country location, gives a quick overview of how FMIS is addressed in various regions. The studies were carried out in Africa, Asia, Europe, and South America. In this section, the studies are examined based on the “sources of primary data”. Thus, for this section, we exclude all conceptual studies. This brings to a total number of 92 empirical studies out of 109.

There were overall 23 nations surveyed. Kenya is ranked first in the category with 26 published studies (28%), Indonesia with 13 (14%), and Ghana and Jordan with 11 (12%) each. Table 1 shows the geographical distribution of the studies.

In summary, Table 1 demonstrates that about 63% of the empirical investigations on FMIS were conducted in African nations, especially Kenya (e.g., [3, 5]), Ghana [35, 45], and Nigeria [46, 47]. Moreover, nearly 26% of the studies were conducted in Asia. Less research was conducted in Europe and South America, which may be related to their progress in PFM reform relative to the less developed nations.

Table 1 Review based on country

Country	No. of publications	Percentage
Kenya	26	28
Indonesia	13	14
Ghana	11	12
Jordan	11	12
Nigeria	8	9
Uganda	5	5
Other countries	18	20
Total	92	100

Note Only countries with more than five publications are presented in this table

Table 2 Type of document

Type of publication	Frequency	Percentage
Journal article	80	73.5
Conference paper	14	13
Book chapter	5	4.5
Report	4	3.5
Working paper	4	3.5
General manuscript	1	1
Teaching cases	1	1
Total	109	100

4.1.3 Document and Source Type

Analysis was also carried out on the distribution of publication types as found through Google Scholar. This research identified 7 different publishing types (see Table 2). In terms of frequency of use, journal articles made up 73.5% of all publications, with conference papers coming in second place at 13%, book chapters (4.5%), reports (3.5%), working papers (3.5%), general manuscripts (1%), and teaching cases (1%).

As shown in Table 2, the articles are divided into five categories of sources, with journals accounting for the majority of sources with 83 documents (76%), conference proceedings with 15 documents (14%), international agencies with seven documents, local agencies with two documents, and book series with two documents.

4.1.4 The Most Active Source Title

As shown in Table 3, multiple articles with the same theme were found from international conferences and scholarly journals published between 2010 and 2022, including The Strategic Journal of Business & Change Management (3.6%), The

Table 3 Publishers of FMIS research documents

Source title	Frequency	Percentage
The Strategic Journal of Business and Change Management	4	3.6
Int. Journal of Advanced Engineering and Management Research	3	2.7
International Journal of Economics, Commerce and Management	3	2.7
International Journal of Innovative Research & Development	2	1.8
Asian Review of Accounting	2	1.8
International Journal of Business and Social Science	2	1.8
Critical Perspectives on Accounting	2	1.8
IOSR Journal of Business and Management	2	1.8
Journal of Physics: Conference Series	2	1.8

Note Only journals with more than one publication are presented in this table

International Journal of Advanced Engineering and Management Research (2.7%) and The International Journal of Economics, Commerce and Management (2.7%). Likewise, some other leading journals were also found to carry articles with similar themes including Asian Review of Accounting; Critical Perspectives on Accounting, and IOSR Journal of Business and Management. The rest of the 87 sources only published one document. This illustrates how diverse and wide the publishing environment is for FMIS researchers.

Also examined are the top publishers on FMIS, i.e., those which have published more than two FMIS-related papers. Emerald Publishing Limited was found as the leading publisher on FMIS with seven publications, followed by Springer Nature with six publications, and Reexplore with five publications. Other publishers contributed three publications each (e.g., IGI-Global, The World Bank Group, USAID, Wiley) [50].

4.1.5 Number of Author

In terms of number of authors, it was found that one document could be written by one to seven authors. A total of 45 publications were written by a two-author team, whilst a six-author team and a seven-author team contributed one paper each (i.e., [51, 52]). A total of 25 articles were written by a single author (e.g., [53, 54]), whilst 27 papers were written by a three-author team (e.g., [34, 53]). A four-author team published six research papers (e.g., [55, 56]), and finally a five-author team published four articles (e.g., [57, 58]). It was also discovered that a total of 253 writers had published 109 research studies. Table 4 lists the authors with three or more published studies along with their affiliations.

Based on the above, it is clear that FMIS studies are still scarce with only 19 related papers available out of the 109 initially identified. Each author only contributes a few articles to this topic, spread out across a large number of authors.

Table 4 Most productive authors

Prolific authors	Affiliation	No. of articles
Sanja M. Mutongwa	Jaramogi Oginga Odinga University	4
Samuel N. Simpson	University of Ghana	3
Lexis A. Tetteh	University of Professional Studies	3
Anthony J Rodrigues	Jaramogi Oginga Odinga University	3
Ali Hashim	Development Research Group, World Bank	3
Moritz Piatti	Development Research Group, World Bank	3

Note Only authors with more than two publications are presented in this table

4.2 Research Methodologies

The analysis of all 109 documents was presented in the previous section using conceptual and empirical methodologies. However, in this section, only empirical papers are taken into account. Therefore, conceptual papers are not included in this study. Hence, a total of 92 pertinent publications were taken into account for additional analysis.

4.2.1 Research Approach Used

Our findings show that no study had used the longitudinal technique, despite the widely acknowledged usefulness of longitudinal research when analysing consumers’ attitudes about technology over a certain period. A cross-sectional methodology had been used in all of the investigations (e.g., [59–65]). Hence, it is proposed that additional longitudinal investigations will be necessary in the future. More longitudinal studies on IS should be conducted, according to [66–70], as longitudinal assessments allow researchers to conduct in-depth analyses of how IS is really used and its outcomes.

4.2.2 Methodological Approach Used

Using the data presented in Table 5, it shows that more than 68% of the previous studies had used a quantitative approach for collecting data related to FMIS, followed by those that used a qualitative method. Only a small number of studies had used a mixed-method approach.

Table 5 shows that 63 of the articles (68%) are quantitative in nature (e.g., [56, 71]), whilst 18 articles are qualitative (e.g., [36, 72]). Only 11 articles were mixed method based (e.g., [49, 73]). Hence, it can be concluded that FMIS studies are primarily conducted using a quantitative approach. 4.2.3 Review based on unit of analysis.

Table 5 Research methodology

Method used	Number of articles	Percentage (%)
Quantitative	63	68
Qualitative	18	20
Mixed method	11	12
Total	92	100

It was found that 90 of the FMIS studies had been conducted at the individual or user level (e.g., [74, 75]). Only two studies had focused on the organisation level (i.e., [57, 76]). It was also found that none of the studies had examined FMIS from the combined perspective of the individual and the organisation.

4.3 Research Themes

4.3.1 Analysis of the Adapted Theories

The importance of using an underpinning theory in IS research is clear as it provides the framework for each individual study [42, 77–82]. Many theories are frequently applied in IS studies [39, 41]. These ideas aid in understanding the application, assessment, implementation, and accomplishment of FMIS. The purpose of this study is to critically examine how frequently such theories are employed in FMIS-related works. Taken as a whole, the most used theories in the FMIS studies are summarised in Fig. 3.

From our literature review, a total of 48 out of 109 studies built their research questions and objectives using the underpinning theory (by adopting or adapting it).

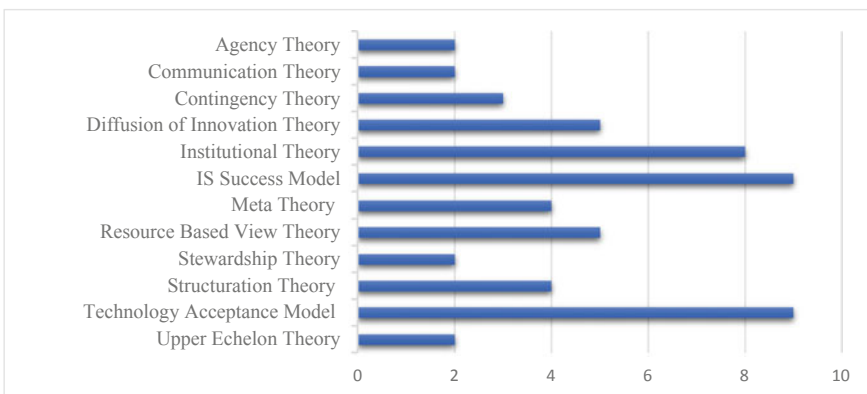


Fig. 3 Theories used in FMIS studies. *Note* Only theories with more than one appearance are presented in this figure

Generally, 23 theories/models were recorded in the literature review matrix. Specifically, the result shows that the Technology Acceptance Model (TAM) and the IS Success Model are the most frequently used with nine occurrences each (e.g., [13, 83–85]), followed by the Institutional Theory (e.g., [22, 35, 53]), the Diffusion of Innovation Theory (DOI) (e.g., [3, 54]), the Resource Based View Theory (RBV) (e.g., [86, 87]), the Meta Theory (e.g., [5, 88]), and the Structuration Theory (e.g., [36, 84]). The remaining theories had been used less than four times. Some theories had only one occurrence such as the Unified Theory of Acceptance and Usage of Technology (UTAUT) (i.e., [52]), the Actor-Network Theory (i.e., [57]), and the Stratified Systems Theory (i.e., [89]).

Some of the works had focused on validating certain constructs (e.g., [52, 76]), or testing the whole model within a single study to ensure its validity and applicability (e.g., [79, 83]). Others had either extended or re-specified the model with the addition of more variables (e.g., [13, 78]). While other studies have incorporated multiple models in a single study (e.g., [90, 91]).

However, from the previous analysis, approximately 56% (61 out of 109) of the previous studies had been developed with their own conceptual framework rather than adapting an existing theory. Hence, it can be said that IS models are not used very often in FMIS research.

4.3.2 Analysis of the Research Themes

Based on the review, it appears that researchers have looked at FMIS from a variety of angles, with the majority of them concentrating on its impact and effect (e.g., [34, 49, 51, 92, 93]). Several studies have concentrated on the efficient application of FMIS (e.g., [3, 94]). Meanwhile, [82] and others concentrated on the difficulties in implementing FMIS. Other studies examined FMIS user abilities [94–96], effective implementation [97–99], and performance determinants [99–103]. In general, we grouped the FMIS research themes into nine categories as shown in Fig. 4.

4.3.3 Text Analysis of the Document Titles

WordSift, a tool that enables researchers to quickly identify the key terms present in the text, was also used to create the word cloud analysis for the articles' titles. The word cloud's outcome with 200 maximum words and "n scale" setting is shown in Fig. 5. There were other phrases used in the document's title in addition to the search engine keywords used to locate FMIS-related articles. The most prominent words are 'governments', 'management', 'financial factors', 'effect', 'performance' and 'implementation'.

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How Can Higher Education Contribute to the 21st Century Employability Skills Through Use of Collaborative Learning Design in Business



Subhadra Ganguli

Abstract Twenty-first century jobs in the business sector need graduates with specific transferable skills due to technological disruptions, climate change and supply chain uncertainties in the post-COVID world. The paper uses the self-study method to discuss the potential impact of team formation, teamwork, and team presentations in developing employability skills amongst students. The model of study uses active student engagement techniques and alternative assessment methods in contrast to lecture based, passive learning and traditional assessments in a classroom. The final aim of the study is to develop employability skills among students at the undergraduate level and create lifelong learners with potential careers in business. Teams in F2F or virtual sessions are formed using self-selection method by the students. Students interact with each other in teams remotely and/or face-to-face and develop communication and technology skills (Asikainen et al. in *Stud. Educ. Eval.* 43:197–205, 2014). Teams work together throughout the semester to prepare and present the project and, in the process, develop several transferable or employability skills for career readiness in business. Peer evaluation of team presentations helps to develop critical thinking skills among students and enables them to recognize the value of providing and receiving critical feedback for future project preparation and presentation in their career.

Keywords Collaborative learning · Employability skills · Transferable skills · Jobs for the future · Business · Higher education

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1 Introduction

Principles of Macroeconomics course is a foundational course for students at the Bloomsburg Campus of the Commonwealth University of Pennsylvania for continuing to study intermediate or advanced levels of study at the undergraduate program.

2 Business World and Higher Education

One of the main concerns that industry practitioners express is the lack of preparation of new graduates to face the real world of business or work [1–3]. Higher education incorporates content specific knowledge which, in an uncertain business world, can be quite redundant when new processes, systems and innovations remain key to competition and customer satisfaction [1–3]. The current 2020s, with its COVID-19 pandemic disruptions and more recent AI-based ChatGPT, are examples where graduates or employees need to be resilient, adaptable, flexible, and technically savvy to navigate the evolving job market in business. Employers reiterate how it is crucial for graduates to develop not only knowledge but skills to work under uncertainty and further create solutions to problems in such an uncertain world [4]. Businesses also need graduates or employees who are team players, who can work and collaborate with teams both remotely and in person for acting under unprecedented situations. Leadership skills are crucial to business success as, in most cases, employees are placed in these vantage positions as major contributors to the business. Universities need to embed leadership skills in their courses to make future leaders in business become aware of such roles and responsibilities [2]. To this end, it becomes imperative that students develop some ideas of how to apply knowledge and critically think to analyze and formulate problem solving approaches in their disciplines. The higher order learning outcomes of critical analysis, synthesis, evaluation, and problem solving are essential for students to develop for 21st Century jobs. Instead of driving content in a foundation course like Principles of Macroeconomics, it may be more relevant for the students to think of one BIG idea to learn at the end of the course and beyond. Content overload may lead to stress and lack of interest in learning [5, 6]. This paper discusses the application of learning in the context of the uncertain real world using teamwork or collaborative assessment through team presentation. The paper demonstrates that the process of working towards the application of learning in a team-based presentation project has the potential to develop valuable transferable skills or employability skills for business which can be useful for making students job ready [7].

3 The Big Idea

Among several Student Learning Outcomes (SLOs) of the Macroeconomics course, one that is particularly relevant for this paper is that students should understand concepts taught in the course and be able to apply these to real life situations in an unknown context [8]. The present paper focuses on the impact of team formation and collaboration on developing employability skills, or transferable skills, in the case of synchronous virtual classes during the pandemic in 2020–2021 and in F2F classes during the post-pandemic period of 2021–2022. The central concept of a student-driven instructional model of active learning involving student engagement [1], as opposed to passive or lecture-based teaching, pivots around the formation and coordination within teams. This model includes innovative assessment techniques via team presentations where student application of learning in an unknown setting motivates higher levels of thinking and skills formation [9]. Additionally, the use of teams to develop presentations allows students to explore the format of collaborative learning through remote technology and team-building skills [10, 11]. Finally, instead of heavy, content-driving learning, students have been encouraged to contemplate the one “BIG IDEA” beyond the course—“How Can I Apply Macroeconomic Theory to Real World Situations to Countries Outside The USA?”.

4 Collaborative Learning

Collaborative learning or group work such as a team presentation can serve dual outcomes [10]. Besides fulfilling the task of delivering a team presentation, the process leading up to the preparation of the project can help students develop multiple employability skills or transferability skills. Underlying this idea of team presentation is the broader concept of using student-led active learning methods in a classroom—virtual or F2F. It is proved that active learning through student engagement in a classroom provides a better learning platform for students than the traditional approach of discourse or lecture-based passive learning techniques [12]. In a passive learning approach, students are mere observers in the learning process whereas in the former students can be actively involved by “doing” as opposed to “learning by listening” or “watching”. This paper considers collaborative learning in the context of team formation and teamwork using remote technology in the Principles of Macroeconomics course. Students work with their teammates throughout the course and collaborate on research to be presented at the end of the course. In the process of creating teams and preparing for the team presentation, students can build several transferable skills through roles and responsibilities within the project. These include communication, leadership, technology, flexibility, adaptability, resilience, lifelong learning, critical analysis, evaluation, creativity, and accountability [5, 6]. The paper uses the methodology of self-study by the author to examine the techniques of collaborative learning using team formation, project preparation and student presentations.

The non-traditional method of assessment using peer evaluation of each other's work helps to understand the role of critical feedback in a job.

5 Methodology

The Self-Study Method has been used in understanding how non-traditional methods of learning and assessment can be used in Principles of Macroeconomics course to improve student attention, interest, and retention of learning. Since the 1990s, self-study as a method of research in education contributed to teaching and public debates on outcomes on learning [13–16].

6 Employability or Transferable Skills

Transferable skills are more general in nature and can be applied to the real world such as a profession or workplace of graduates or interns. Transferable skills are technology skills, communication skills- verbal or written, leadership skills, critical or thinking skills, analytical skills, research skills, presentation skills, team building skills among others [17, 18]. The role of a “community” [19] in a classroom (F2F or virtual) can go a long way in fostering learning as well as developing technology related skills and human skills. Since Artificial Intelligence (AI), cloud computing and big data analysis are the features of Industrial Revolution 4.0 in the business world, college courses are adapting to include these in the curriculum. Additionally, since Artificial Intelligence (AI) is expected to make a lot of mundane, routine work in business and healthcare obsolete by absorbing them, most graduates will need to apply human skills to the jobs they will be tasked with [20, 21].

Resilience and adaptability are some of the important transferable or employability skills that have been identified as important by businesses in employees and new hires [14]. Other important human skills are negotiation, business communication and leadership [17]. Application of learning, preferably using technology, is also an important aspect for students to experience before getting ready for the job market.

7 Student Engagement or Active Learning

Within an active learning framework involving student engagement, it is more effective to have small groups of students work with one another to complete a collaborative project or regular assignments in the course. Again, instead of big groups, small teams tend to perform better in terms of working together due to less complication in arranging meeting times, scheduling collaborative work and supporting one another

through the course [8, 22]. Five to seven students seem to be a desirable number in a team where students can work comfortably among themselves to work on a project which is large and intellectually demanding [3, 12, 23, 24]. The literature presents various methods or ways in which an instructor can decide to create groups by taking into account diversity of the class, such as educational and ethnic background of students [10]. Some instructors let students self-select themselves [25]. One of the serious problems of letting students self-select into groups, without considering any other factor, could be lack of diversity in groups as friends tend to form a group or unbalanced groups, and other issues. However, students forming self—selected teams based on a common mutual interest among team members [25] can create a robust platform for team formation and teamwork. Team formation and teamwork lie at the heart of building employability skills among students in this research.

8 Relationship Between Active Learning and Student Engagement and Transferable Skills or Employability Skills

Employers usually want their employees to work in teams, interact with one another, exhibit camaraderie and fellowship in teams while working on projects and to be able to support each other collaboratively. While in a team, students learn to interact with team members virtually through emails and zoom platforms or video calls on WhatsApp outside of class for presentation preparation. Research and final team presentation preparation help students to learn communication in writing and to work using technology in creating presentation slides.

In this paper I will be discussing the idea of how formation of teams, using community building techniques and student interaction in teams besides active participation, can help in enhancing employability skills. The ability to work in a team can develop social skills such as the skills developed in working with others—a transferable skill that most employers expect graduates to possess. Group work can equip students with technical skills while they work on the presentation. Businesses work globally and the more students can align themselves to the use of technology and teamwork using remote connectivity, the better they are prepared for the digital world of business [26].

9 Student Driven Model of Collaborative Learning

The paper uses a collaborative model of learning where several steps are taken up by the student in teams after teams are formed as shown in Fig. 1. Community building [19] and student engagement are the two pillars of this learning technique of “doing using team presentation approach”.

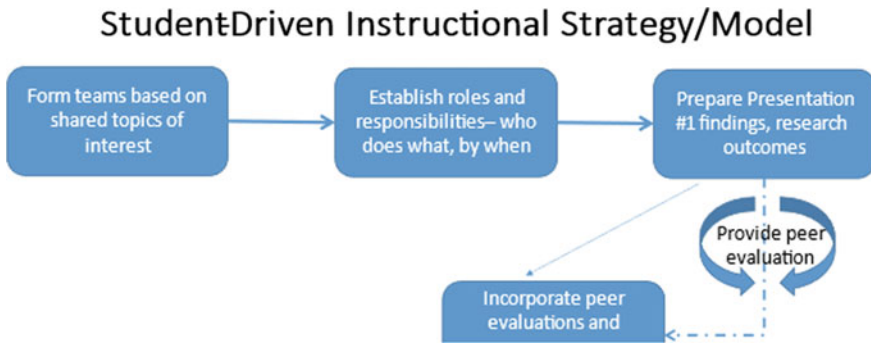


Fig. 1 Steps in the process of team formation and presentation creation can give rise to employability skills

9.1 Team Formation

Even before students think of self-selecting themselves in teams of three or four, they, individually, need to be able to identify a country of choice with a rationale as to why they are interested in traveling to the country or study the country. The students interact on the learning platform on the very first day of class, where they are instructed to write a brief introduction about themselves mentioning any interesting facts about themselves or their backgrounds. Additionally, they mention which country each one of them would be interested in travelling to someday and the reason behind it. Students are also asked to read posts of their peers and reply to at least two posts that interest them. Figure 2 provides an image of the instructions that I write on the learning platform and request students to take a few minutes to write their introductions and interactions with others. I carry out this activity in both F2F and synchronous virtual classes.

The number of students in class on Day 1 was 43 (evident from the number of threads posted) and the number of posts on this discussion topic was 120 which is approximately three posts per student present in the class—an introduction posted by each student and two reply posts per student to the other students in the class. This is shown in Fig. 2.

I then move on to the next stage of the team formation which is written in the form of a discussion post to be completed by students as team members once they have formed their teams. Figure 3 shows my discussion post announcement at this stage. The team's name reflects the country students choose to study for their presentation at the end of the term.

At the next step as identified in Fig. 1, teams are provided with a template which they fill out using their creativity, knowledge, and skills in teams as their final country presentation towards the end of the course. Filling this template with visuals, graphs, tables after conducting research and analysis using technology driven tools takes several weeks and various steps within the teams. Students meet in class and outside

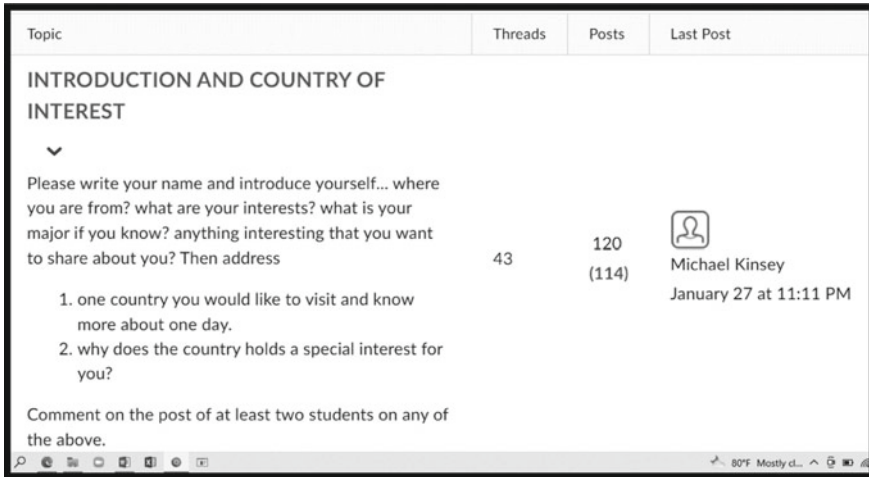


Fig. 2 No. of posts for introduction and country of choice. Reproduced from the learning platform of Commonwealth University

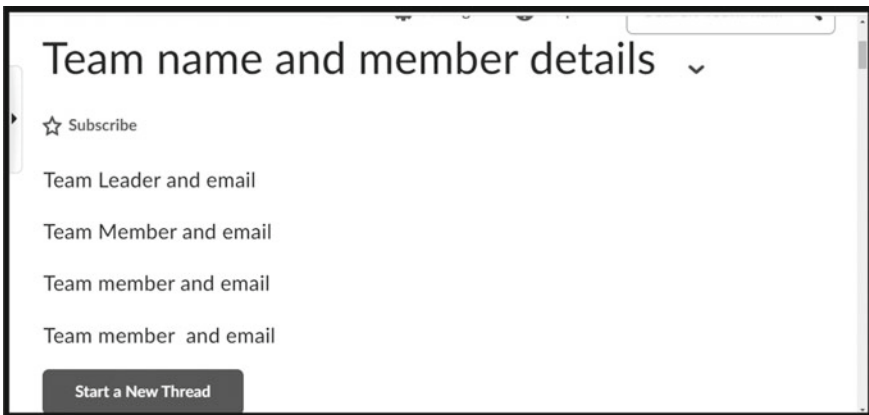


Fig. 3 Discussion posts for students to respond to for team details and team member roles and responsibilities. Reproduced from the learning platform of Commonwealth University

classes at their convenient times either virtually or in person for conducting research on the macroeconomic questions posed in the template. This relates to the application of learning in class in an unknown context of a country they are not very familiar with. The presentation requires students to discuss various Macroeconomic variables in the context of their country of choice which they read and learned in class. Teams undertake research of the country's macroeconomics using various suggested open data bases and information sources such as <http://www.imf.org>; <http://www.worldbank.org>, <http://www.oecd.org>, <http://www.unctad.org> and others. The process

Table 1 Template provided to students for presentation preparation

Slide	Expected content
Title slide	Macroeconomics of <insert name of country>; Challenges Posed by Covid-19 Pandemic; Role of Government in the context of the pandemic
Cover slide	Team: provide name and details of all members including team leader
Slide 1	Three macroeconomic variables (1, 2, 3) for the last 5 years and pre- pandemic (so between 2015 and 2019)
Slide 2	Analysis of your observations on 1, 2, 3 during 2015–2019
Slide 3	How chosen macroeconomic variables were affected during 2020 pandemic
Slide 4	Identify two or more macroeconomic policies—fiscal and monetary undertaken by government
Slide 5	How has the government performed in terms of the policies? Explain with reference to the policies you mentioned
Slide 6	References

of using technology, communicating with team members on the presentation preparation and taking up specific tasks in the presentation allows students to learn how to work in a team and hence develop the soft skills of communication, negotiation, accountability, leadership, time management, technology skills among others (Table 1).

9.2 Team Leader and Member Roles and Responsibilities

As soon as the teams are formed, the team needs to elect its leader who is now responsible for coordinating the activities of the team. Table 2 highlights the possible roles and responsibilities of the team leader and that of the other team members.

Table 2 Roles and responsibilities of team leader and team members

Role	Primary responsibility	Traits in focus
Team leader	<ul style="list-style-type: none"> • Team coordination • Overall timeline monitoring • Any other 	<ul style="list-style-type: none"> • Leadership • Communication • Negotiation • Time management
Other team members	<ul style="list-style-type: none"> • Research • Presentation preparation • Any other 	<ul style="list-style-type: none"> • Communication • Technology • Time management

9.3 Peer Evaluations

A study of [11] shows that peer assessment has perceived benefits for students in an introductory course in STEM. It shows evidence that students with different majors can provide useful peer evaluations. Peer assessment can be used in beginner courses in the university. In Principles of Macroeconomics Course at Commonwealth University, every team has the responsibility to evaluate and comment on each presentation except their own. They receive anonymized evaluation from the rest of the teams, and they provide the same to others. At the end of each presentation, students gather in teams to discuss the presentation content, presentation style, analysis of the country's macroeconomic policies studies and suggested policies by the team. They use a peer evaluation document provided to them by the instructor (in this case it is me) which provides the basic structure to lay down their critical comments and pass them on to the teams for considering future improvement. In the process students are made to appreciate the importance of peer evaluation in business where stakeholder views of the product remain critical. Figure 4 highlights the peer evaluation document which asks each team a set of three reflective questions on the presentation content and their rationale for highlighting the same. This provides students with some guidelines to provide critical feedback to their peers and accept relevant feedback from others for further enhancement of their presentation. In this case if students received a second chance for presenting then they can easily draw on the critical comments and work on those for improving future presentation. The process of peer evaluation has the potential for developing critical thinking and feedback on others' work.

10 Conclusion

The paper concludes that undergraduate students may be allowed to form teams with the help of communication and technology even at the beginning of university studies. Virtual/F2F interaction with teams using technology can enhance transferable skills or employability skills among students to begin with. Working together in teams to apply the macroeconomic concepts taught in the course to real world and unknown country policies and government actions can develop life-long learners. Team formation, collaboration and leadership experience gained in leading teams by team leaders add to creativity, technology, leadership, negotiation, and communication skills. Post-secondary education, embedding skills development, can prepare students to develop transferability skills needed for twenty-first century businesses. Such initiative can further create better employment opportunities for graduates. Businesses and universities need to exchange ideas and collaborate to create these opportunities to fill the gaps in skills. AI and automation are certain to make a significant number of jobs redundant in the industry. The remaining jobs need human skills at a deeper and more pervasive level to battle the uncertainties of a dynamic business environment threatened with climate change, global supply chain disruptions and invasive technology.

Peer Evaluation Document

Peer evaluation is one of the most powerful methods of providing constructive criticism and appreciation to your peers for their work and receiving the same for your improvement. You will be doing this always at your workplace and it is good to be able to start doing this from now as this education will prepare you for a lifetime of achievements! Good luck!

You and your team will receive the same points for the presentation and you will be reviewed by your peers using the following set of questions on a 10-point scale.

1. Identify **at least** one and up to three elements of the presentation that was/were noteworthy and why? 3 points]
2. Identify **at least** one and up to three elements of the presentation that need/s improvement and why? 3 points
3. Give **at least one and up to three suggestions** as to how the presentation can be improved by you and explain how and why that can be achieved. Giving critical feedback and peer review is an important part of learning and something you will do all the time in your future profession. Hence your feedback will be valuable for the presenting team. 4 points

Fig. 4 Peer evaluation document

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Innovation Through Computing Green Marketing and Its Effect on Consumer Purchase Intention



Yashodhan Karulkar , Pashmin Bandorawalla, Atreyee Banerjee, Ajitha Vasudevan, and Mahendra Parihar 

Abstract Recognizing the significance of environmental responsibility is crucial in today's world. Both businesses and consumers have a vital role to play in effectively managing natural resources to reduce environmental impacts and financial costs. It is imperative for every type of business to prioritize environmental responsibility beyond legal obligations, ensuring the sustainability of our environment for future generations. This paper focuses on understanding consumer reactions to green marketing and its influence on their purchasing intentions. It also highlights practices that can foster environmentally friendly decisions and lifestyles, ultimately contributing to the protection and preservation of natural resources for current and future generations. The primary objective of this study is to identify the factors that impact consumers' intentions to purchase green eco-friendly products. To achieve this, the research employs a simple purposive convenient sampling technique to succinctly outline the research objectives. The findings of this study provide clear insights into consumer behaviour towards eco-friendly products and the various factors that shape their purchasing decisions.

Keywords Green marketing · Green purchase intention · Green awareness · Green perceived risk · Green perceived value

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1 Introduction

Consumers today are more concerned about environmental degradation and negative impact of their uses of product and services on environment. The reason for this concern could mainly be attributed to visible climatic changes, global warming and increasing air and water pollution, etc. Thus, using green marketing not only provides organizations an opportunity to meet consumer expectations and address their environmental concerns, but also gain a competitive advantage and strengthen their consumer base.

The term green marketing is often interchangeably used with environmental marketing or ecological marketing. According to the American Marketing Association (AMA), marketing of products that are presumed to be environmentally safe is called as Green Marketing [1]. Thus, wide range of activities are covered under green marketing, which includes modifying the product, making changes in the production process and packaging, as well as modifying advertising or removing any activity that impacts the environment in negative way. Today, the Earth faces more environmental issues than ever before, hence it is imperative for companies to make and market themselves as environment friendly. Green marketing is emerging as a popular promotional strategy owing to increased consumer awareness and concerns. The concept of green or ecological marketing calls upon businesses to follow ethical and green practices while dealing with customers, suppliers, dealers, and employees. Based on this companies have started marketing themselves as green companies. A strong correlation between consumers' attention to companies' green marketing communication and green purchasing behaviour was identified. The results also confirm that individuals with higher educational levels and green attitudes and females are the most attentive to companies' green marketing communication [2].

2 Research Objectives

The fundamental objective of the paper is to study the effect of green marketing on consumers' purchase intentions, and involves the identification of multiple factors, their interrelationships, and the extent of their respective influences on each other and ultimately, on green purchase intention.

3 Literature Review

The term Green Marketing came into prominence in the late 1980s and early 1990s. The green marketing concept is broad and includes market responses in the design of products, production processes, packaging improvements, and advertising methods [3–6]. The term has also been described as an organization's efforts at designing,

promoting, pricing, and distributing products that will not harm the environment [7]. Green marketing stimulates green consumption behaviour by encouraging consumers to purchase green products, thereby reducing the generation of pollution. Encouraging consumers to contribute to the future of the planet by purchasing green products with less impact on the environment has become an important research topic. Understanding the factors influencing consumers' purchase intentions and decisions is necessary to improve the fit between green products and consumer needs and enhance market competitiveness [8].

Organizations apply green schemes to increase perceived value of their product and decrease perceived risk of their goods. Green goods are very beneficial for marketers because these are extra popular in the marketplace. Green promotion includes actions to develop distinguishing, rating and promoting goods and services that fulfil buyers' environmental necessities. All these benefits firms get only if there are green purchase intentions in the public [9–11].

Green Purchase Intention (GPI): Green purchase intention (GPIN) is simply defined as an intention to buy a service or product which is less or not harmful for the society and environment. It can also be defined as an internal wish, desire, and willingness of the people to buy a less harmful and environmentally friendly product. There is a developing trend in the people to use products that are less harmful for the environment. They are willing to pay more for such products, which have less effect on the environment. This willingness of the people to purchase environment friendly products called green purchase intention. Companies should practice such marketing activities that can influence consumer's attitude and create their intention to buy green products by changing the customer's evaluation [8, 12].

In an Indian study exploring cognitive factors influencing green purchase intention (GPI), the relationship with attitude towards green products (AGP) and green purchasing behaviour (GBP) was examined. The study identified significant factors impacting GPI, including AGP, Environmental Concern (EC), and Perceived Consumer Effectiveness (PCE). AGP also indirectly influenced GPI. However, the impact of Perceived Environmental Knowledge (PEK) on both AGP and GPI was limited. The study highlighted GPI as the primary predictor of GBP, serving as both an independent and dependent variable. The findings emphasized the strong predictive power of AGP on GPI, followed by EC and PCE. Notably, PCE had the least positive and significant impact on GPI [8].

A study examined how the use of green marketing by Starbucks, a well-known coffeehouse chain, influences consumers' purchase intentions and brand image. The study found that factors such as willingness to continue purchasing and using the green brand, trust in the brand's commitment to the environment, attachment to the green brand, and satisfaction with the green brand had the most significant influence on consumers' purchase intentions. These findings indicate that effective green marketing can help Starbucks enhance consumer loyalty, expand its customer base, and increase revenue [1]. Consumers trust to buy green product due to the following

reasons: The relationship between green perceived value and Starbucks consumer's green satisfaction is significant [13]. These findings are consistent with previous research, which found that green perceived value is one of the most influential variables in increasing consumer green trust and satisfaction. Consumer satisfaction with green products from Starbucks affects their trust in green products. These findings are consistent with previous research, which found that green satisfaction has a positive and significant effect on green trust, indicating that the higher a product's green satisfaction, the higher the product's green trust, and vice versa. Green Perceived Value has no significant effect on Green Trust. Green Perceived Value for Starbucks products does not have a direct impact on Green Trust. This finding is consistent with other researchers' findings that Green Perceived Value has a positive but non-significant relationship with Trust (Green Trust) because the critical value obtained is not significant. The indirect effect of Green Perceived Value to Green Trust via Green Satisfaction is more valuable than the direct effect. The research discovered a satisfaction variable (Green Satisfaction) that linked the perceived value variable (Green Perceived Value) with trust (Green Trust) [13].

It was suggested that the current linear economic model, acknowledges the importance of transitioning to a sustainable and circular economy is unavoidable. Understanding how the public perceives green products and brands can be a key enabler for the green product market's rapid growth. According to the findings, respondents who have a positive attitude toward green products have a higher level of green product satisfaction, which is critical in the purchasing process. This is strongly related to the level of knowledge about green products, which has an impact when viewed in the opposite direction—the importance of a product being green predicts the purchase of green products [14].

Environmentally conscious customers are more receptive to businesses addressing environmental concerns. Green marketing has been successful by targeting individuals who already prioritize environmental issues. Higher education levels are associated with a better understanding of the environment and a greater likelihood of engaging in environmentally conscious behaviours. Consumers with green attitudes, higher education levels, and females pay more attention to businesses' green marketing communications [2, 15].

As a result, soon, the scientific community should focus on reducing consumer scepticism toward green products, while also implementing an effective form of national regulation, because consumers want to ensure that green product claims are valid, and that green washing is not present. As a result, policymakers' roles become critical if changes are to be seen soon. Social norms and motivational factors are the ultimate determinants of our daily behaviour, and both can be shaped over time by government intervention.

4 Research Hypotheses

The following hypotheses are constructed by reviewing literature of previous studies.

Attitude (AGP) and Green Purchase Intention

Attitudes play a crucial role in consumers' purchasing decisions, reflecting their preferences and dislikes [16]. Recent studies conducted in India have demonstrated the relevance of attitudes in relation to purchasing intentions and behaviours for environmentally friendly products [7, 17]. Consumers with positive attitudes towards green products are more likely to actively choose and purchase such products [18]. In order to better understand attitudes regarding general green products and purchasing intentions for them, the current study aims to understand the following hypotheses.

H1: Attitude towards green purchase is co-related to green purchase intension.

Environment Responsibility, Attitude Towards Green Purchase and Green Purchase Intention

The hypothesis suggests that a higher level of perceived environmental awareness is associated with increased purchasing behaviour for environmentally friendly products. This is because previous research has not extensively examined the direct impact of environmental knowledge on buying intentions for such products [17]. Causal relationship between environmental awareness and purchasing behaviour for green products is inconsistent, especially in developing countries like China and India [19]. The level of perceived environmental awareness may be directly linked to a favourable attitude towards green products in emerging economies, which in turn influences the intention to purchase such products [7, 17, 19, 20]. Potential customers already possess a significant understanding of current environmental issues, which can positively influence their intention to purchase eco-friendly products. Additionally, prospective buyers associate the transition from conventional products to green products with addressing the environmental problems of today. Brand Image functions like a partial mediator in the link between environmental knowledge and purchase intention. That is, either directly or indirectly, the purchasing intention of potential customers can be influenced by their knowledge of various environmental challenges [21].

H2: Environment Responsibility is related to attitude towards green purchase.

H3: Environment Responsibility has a relation to green purchase intension.

Green Awareness, Attitude Towards Green Purchase and Green Purchase Intention

Green awareness (GAN) refers to consumers' understanding of a product's environmental impact and its benefits. Higher knowledge about a product lead to a greater likelihood of purchase. GAN plays a significant role in driving future green purchases [22]. Brand knowledge and awareness influence customer response to marketing efforts [23]. Customers with low knowledge and awareness of green products are

less likely to buy them. Consumers form opinions about environmentally friendly products only when they actively seek information [24].

H4: Green Awareness is related to attitude towards green purchase.

H5: Green Awareness has a relation to green purchase intension.

Green Price, Attitude Towards Green Purchase and Green Purchase Intention

Numerous studies highlight pricing as the primary factor influencing consumer purchasing decisions. The cost of green products poses a significant concern for businesses. Green pricing refers to finding a balance between customers' price sensitivity and their willingness to pay more for environmentally friendly features. Price is recognized as a strategic obstacle hindering consumer adoption of eco-friendly products. Price awareness and attitudes towards green products or green foods exhibit a negative correlation, as price-conscious consumers are reluctant to pay a premium for environmentally friendly items. However, there is a segment of customers willing to pay extra for sustainable goods [25]. Consumers' perceptions of value significantly impact their inclination to purchase green products. When customers perceive organic items as valuable, they are highly motivated to buy such products. Conversely, negative perceptions of value can deter consumers from purchasing natural products. It is worth noting that the cost of green items tends to be higher compared to conventional goods. Positive attitudes towards green products often involve a willingness to pay a premium for environmentally friendly goods and services. The willingness of consumers to purchase green or environmentally friendly products plays a pivotal role in their current and future buying decisions.

H6: Green Price is related to attitude towards green purchase.

H7: Green Price has an influence on green purchase intension.

H10: Green Awareness influences green price.

H12: Green price and Green perceived value are related.

Green Trust

GPIN is determined by GPT [26]. Buyers would have a higher GPIN if they had a positive encounter with the seller. Thus, GPIN was created by GPT. Customer GPIN would be positively impugned by customer GPT [26]. Customer GPIN is positively impacted by customer GPT [27].

H8: Green Trust is related to attitude towards green purchase.

H9: Green Trust has a relation to green purchase intension.

H11: Green Trust influences green price.

Green Perceived Value

The term "green perceived value" (GPV) refers to a customer's perception of all the features, benefits, and performance of a green product. The benefits and performance

of green products are comparable to those of non-green products, and they are also more environmentally friendly, which increases consumer perceptions of their value and increases sales. In addition to having a significant impact on GPIN, GPV is a crucial factor in sustaining long-term client relationships [20]. There is a favourable correlation between GPV and GPT.

H13: Green perceived value has an impact on green purchase intension.

H15: Green perceived value has an impact on green trust.

Green Perceived Risk

Perceived risk refers to customers' concerns that a product may not meet their expectations and fail to satisfy their needs. Customers who perceive risk may opt not to purchase a product to avoid potential disappointment or deception. The higher the perceived risk, the greater the likelihood of a customer altering their buying decision. Perceived risk encompasses uncertainty and unfavourable outcomes. In line with the concept of perceived risk, individuals tend to minimize perceived risk to maximize their utility [28]. Some businesses exploited this by labelling non-green products as environmentally friendly, aiming to attract customers and boost sales. Customers are now eager to reduce this habit [18]. If the risk were great, trust would decline and a low GPIN would be produced. Reduced perceived risk would enhance the likelihood that a product would be purchased and increase client buy intentions. Therefore, it proved that GPR is negatively related with GPT. If a customer has a high GPR there is a low chance that the customer will buy the product [28]. Risk perceptions have a strong positive relationship with negative consumption emotions. These negative emotions have a significant and direct effect on customer's trust [18, 29].

H14: Green perceived risk has impact on green purchase intension.

H16: Green perceived risk has an impact on green trust.

The effects of green perceived value and green perceived risk on green purchasing intention as well as the function of green trust were examined using a framework that was created. According to the study, green perceived risk has a negative impact on both green trust and green purchase intention while green perceived value has a favourable impact on both. Also, research revealed that green trust has a small but significant influence on green perceived intention as well as its antecedents, green perceived value, and green perceived risk. It concluded that resources should be put towards boosting perceived green value and lowering perceived green risk in order to increase trust and green purchase intention [3–6, 30].

5 Research Model

The following revised model—building on previous research [2, 8, 16–18, 21, 30–32]- has been proposed (Fig. 1).

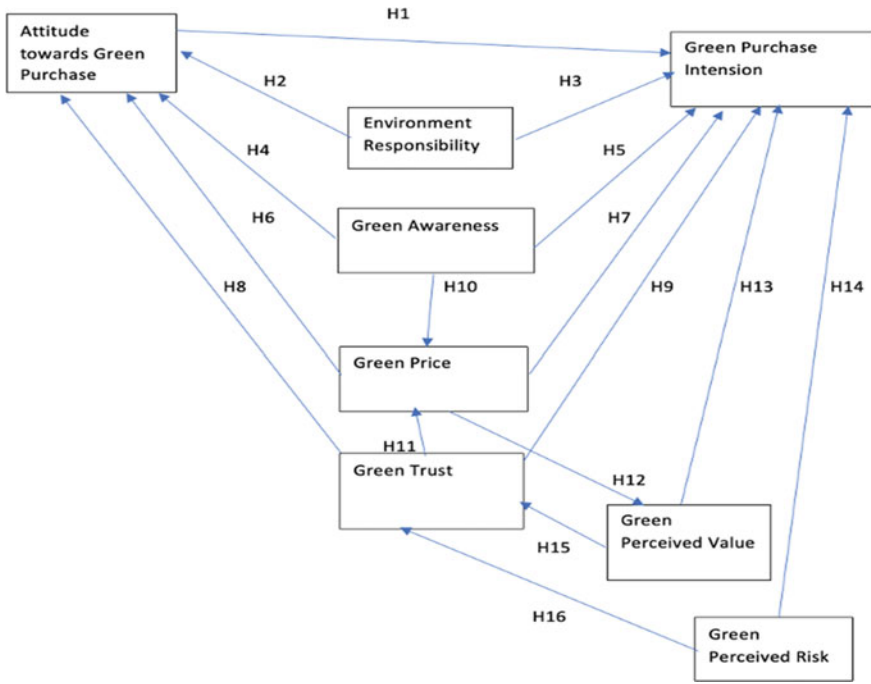


Fig. 1 Research model

6 Research Methodology

To test the relationships of the proposed model, a well-structured questionnaire was used. The respondents were from the state of Maharashtra, Delhi, Bangalore, Chennai, Gujarat, and West Bengal. The method of purposive convenient sampling method was used for the study. A total of 200 responses were collected and analysed. The models used for analysis are Chi-square method.

Data Analytics and Findings

A survey on the topic “**Effect of Green Marketing on Consumer Purchase Intension**” was conducted and each respondent’s perspective and response were studied. There was a total of 200 respondents. The aim was to deduce the awareness amongst people regarding green eco-friendly approaches and products and understand the effect of Green Marketing on people’s purchasing intentions. A structured questionnaire was used to test the relationship of the proposed model in the quantitative study. Indian English was used for field research because it is also an official language in India. The questionnaire is divided into two sections. The first section contains demographic information about the respondents or target population. For collecting responses, we used the purposive convenient sampling method for people

from across the country. We gathered data from people who fall between the age group of 13–80. Collected data of their level of education, employment, and education to get better insights about the kind of green knowledge among people. The second part includes questionnaire items that use a multiple-choice question to assess Attitude towards green purchase, Environment Responsibility, Green Purchase Intension, Green Awareness, Green Price, Green Trust, Green Perceived Value, Green Perceived Risk (Table 1).

Hypothesis Testing

Chi-squared = χ^2 Critical Chi-square = χ^2 , p-value = p.

Assumption: Level of significance = 90%.

i. **H1: Green Attitude → Green Purchase Intention**

While considering significance between GA and GPI, $\chi^2 = 10.0865865$ and $\chi^2 = 8.909358869$. This gives a p value of 0.06897425.

Analysis: Chi-squared > Chi-squared (critical) and p-value < 0.1

Result: H1 can be accepted. The study shows significant relationship between GA and GPI.

Table 1 Socio-demographic distribution of respondents

Variable	Category	Frequency	Percentage
Gender	Male	109	54.5
	Female	87	43.5
	Prefer not to say	4	2
Age	13–19	14	7
	20–25	160	80
	26–35	8	4
	36–45	1	0.5
	46–60	15	7.5
	61–80	2	1
Education	High school	9	4.5
	Bachelor’s degree	97	48.5
	Post graduate degree	94	47
Employment	Employed	55	27.5
	Self-employed	14	7
	Unemployed	13	6.5
	Student	118	59
Income	<10,000	112	56
	10,000–20,000	14	7
	20,000–50,000	28	14
	50,000-1L	30	15
	>1L	16	8

- ii. **H2: Environmental Responsibility → Green Attitude**
 While considering significance between ER and GA, $\chi^2 = 22.3464617$ and $\chi^2 = 12.59158724$. This gives a p value of 0.00104768.
Analysis: Chi-squared > Chi-squared (critical) & p-value < 0.1
Result: H2 can be accepted. The study shows significant relationship between ER and GA.
- iii. **H3: Environmental Responsibility → Green Purchase Intention**
 While considering significance between ER and GPI, $\chi^2 = 32.6229004$ and $\chi^2 = 30.30727194$. This gives a p value of 0.04461541.
Analysis: Chi-squared > Chi-squared (critical) and p-value < 0.1
Result: H3 can be accepted. The study shows significant relationship between ER and GPI.
- iv. **H4: Green Awareness → Green Attitude**
 While considering significance between GAw and GA, $\chi^2 = 7.01796734$ and $\chi^2 = 12.59158724$. This gives a p value of 0.31918879.
Analysis: Chi-squared < Chi-squared (Critical) and p-value > 0.1
Result: Accept Null Hypothesis. Reject H4. No significant relationship between GAw and GA.
- v. **H5: Green Awareness → Green Purchase Intention**
 While considering significance between GAw and GPI, $\chi^2 = 30.8364514$ and $\chi^2 = 28.41198058$. This gives a p value of 0.05738692.
Analysis: Chi-squared > Chi-squared (critical) and p-value < 0.1
Result: H5 can be accepted. The study shows significant relationship between GAw and GPI.
- vi. **H6: Green Price → Green Attitude**
 While considering significance between GP and GA, $\chi^2 = 0.92999645$ and $\chi^2 = 5.991464547$. This gives a p value of 0.62813622.
Analysis: Chi-squared < Chi-squared (Critical) and p-value > 0.1
Result: Accept Null Hypothesis. Reject H6. No significant relationship between GP and GA.
- vii. **H7: Green Price → Green Purchase Intention**
 While considering significance between GP and GPI, $\chi^2 = 5.93978199$ and $\chi^2 = 4.351460191$. This gives a p value of 0.09877278.
Analysis: Chi-squared > Chi-squared (critical) and p-value < 0.1
Result: H7 can be accepted. The study shows significant relationship between GP and GPI.
- viii. **H8: Green Trust → Green Attitude**
 While considering significance between GT and GA, $\chi^2 = 13.8448371$ and $\chi^2 = 18.30703805$. This gives a p value of 0.18018745.
Analysis: Chi-squared < Chi-squared (Critical) and p-value > 0.1
Result: Accept Null Hypothesis. Reject H8. No significant relationship between GT and GA.

- ix. **H9: Green Trust → Green Purchase Intention**
 While considering significance between GT and GPI, $\chi^2 = 41.8054153$ and $\chi^2 = 37.65248413$. This gives a p value of 0.01885745.
Analysis: Chi-squared > Chi-squared (critical) and p-value < 0.1
Result: H9 can be accepted. The study shows significant relationship between GT and GPI.
- x. **H10: Green Awareness → Green Price**
 While considering significance between GAw and GP, $\chi^2 = 5.03723271$ and $\chi^2 = 5.988616694$. This gives a p value of 0.1211311.
Analysis: Chi-squared < Chi-squared (Critical) and p-value > 0.1
Result: Accept Null Hypothesis. Reject H10. No significant relationship between GAw and GP.
 DEDUCTION: will have relation at lower significance.
- xi. **H11: Green Trust → Green Price**
 While considering significance between GT and GP, $\chi^2 = 5.62101052$ and $\chi^2 = 11.07049769$. This gives a p value of 0.344859.
Analysis: Chi-squared < Chi-squared (Critical) and p-value > 0.1
Result: Accept Null Hypothesis. Reject H11. No significant relationship between GT and GP.
- xii. **H12: Green Price → Green Perceived Value**
 While considering significance between GP and GPV, $\chi^2 = 4.79223899$ and $\chi^2 = 9.487729037$. This gives a p value of 0.30928687.
Analysis: Chi-squared < Chi-squared (Critical) and p-value > 0.1
Result: Accept Null Hypothesis. Reject H12. No significant relationship between GP and GPV.
- xiii. **H13: Green Perceived Value → Green Purchase Intention**
 While considering significance between GPV and GPI, $\chi^2 = 27.5922175$ and $\chi^2 = 26.49758019$. This gives a p value of 0.02543563.
Analysis: Chi-squared > Chi-squared (critical) and p-value < 0.1
Result: H13 can be accepted. The study shows significant relationship between GPV and GPI.
- xiv. **H14: Green Perceived Risk → Green Purchase Intention**
 While considering significance between GPR and GPI, $\chi^2 = 23.0200035$ and $\chi^2 = 31.41043284$. This gives a p value of 0.28781339.
Analysis: Chi-squared < Chi-squared (Critical) and p-value > 0.1
Result: Accept Null Hypothesis. Reject H14. No significant relationship between GPR and GPI.
- xv. **H15: Green Perceived Value → Green Trust**
 While considering significance between GPV and GT, $\chi^2 = 44.6673179$ and $\chi^2 = 31.41043284$. This gives a p value of 0.00122399.
Analysis: Chi-squared > Chi-squared (critical) and p-value < 0.1
Result: H15 can be accepted. The study shows significant relationship between GPV and GT.

xvi. **H16: Green Perceived Risk → Green Trust**

While considering significance between GPR and GT, $\chi^2 = 26.5379584$ and $\chi^2 = 26.49758019$. This gives a p value of 0.03034591.

Analysis: Chi-squared > Chi-squared (critical) and p-value < 0.1

Result: H16 can be accepted. The study shows significant relationship between GPR and GT.

Findings

Our revised model after analysis and testing every hypothesis: (i) Green Attitude and Green Purchase Intension have a significant relation (ii) Green Attitude and Environment responsibility are related. (iii) Environment Responsibility influences Green Purchase Intension. (iv) Green Awareness effects Green Purchase Intension. (v) Green Price influences Green Purchase Intension. (vi) Green Trust has relation to Green Purchase Intension. (vii) Green Perceived Value affects Green Purchase Intension. (viii). Green Perceived Value is related to Green Trust. (ix). Green Perceived Risk depends on Green Trust (Fig. 2).

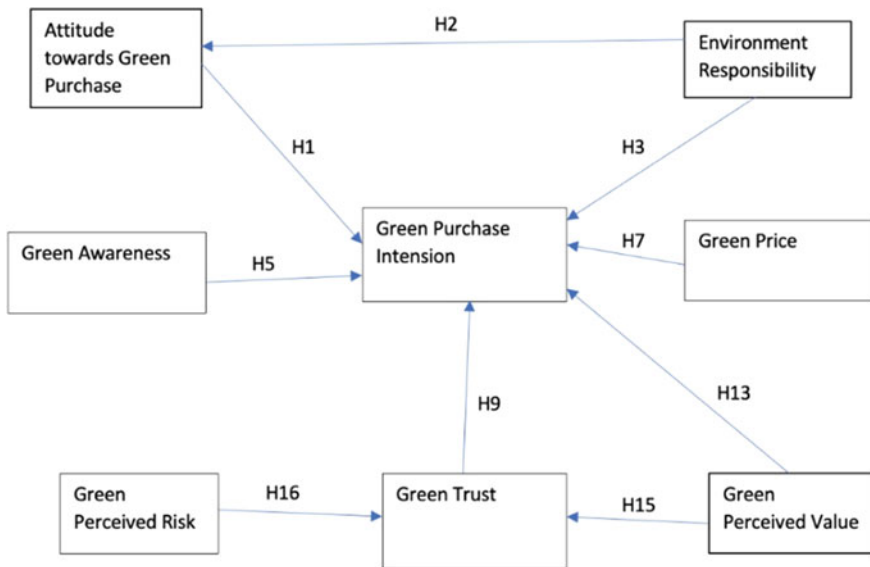


Fig. 2 Revised model after analysis and testing every hypothesis

7 Discussion of Results

Our Study demonstrates the relation between Green Purchase behavior and other inter connected factors. Out of the 16 hypotheses proposed, our study accepts 9 of them. Our findings suggest that Green Attitude affects the Green Purchase Intention of the consumer. Research conducted by other authors also support our claim [8]. Green Attitude also showed a relation to environmental responsibility, proving that consumers with environmental knowledge and responsibility have a positive green attitude [8]. Environmental responsibility has an influence on Green Purchase Intention. This finding is in line with previous research reviewed [8–12, 18, 21, 33, 34]. Customers with high level of environmental responsibility tend to understand the importance green and eco-friendly purchasing. Our study shows that green awareness has a relation to Green Purchase Intention which is contradictory to research reviewed [18]. However, there is no relation between green awareness and attitude towards green purchase. Green Price has an impact on Green Purchase Intention proving that people are price sensitive when it comes to buying green products. Marketeers must evaluate the Green Pricing for better results [2, 15, 25, 32, 33, 35–39]. Green Trust has a relation to Green Purchase Intention which is also confirmed by previous research [2, 18, 25, 33, 40–43]. There exists positive relation between Green Perceived value, Green Trust, and Green Purchase Intention. This is supported and analyzed by authors of multiple research papers [2, 18, 25, 33]. Our study supports the hypotheses that Green Perceived Risk is related to Green Trust, however the claim that Green Perceived Risk impacts the Green Purchase Intention was not significant. This finding differs from that of previous research which states the opposite [18].

Our research did not support certain hypotheses. This study did not find significant relation between Green Price and Green Perceived value, negating the research viewed during literature review [30]. There was no significance between Green Trust and Green Price. Some research suggests otherwise [25, 30, 33]. No relation between Green Awareness and Green Price, Green Trust and Green Awareness, Green Price and Green Attitude [2, 18, 25, 30, 32, 35, 39, 44].

8 Pratical Implications

The study's practical implications suggest that companies and organizations focused on environmental sustainability should target young customers, educate them about their products, and assure them of their availability. The research highlights that willingness to pay is a strong predictor of green purchasing behavior among young students. Therefore, marketers and policymakers should emphasize the cost of environmentally friendly products to encourage young consumers to make green purchases. It is important for businesses and organizations to consider the affordability and accessibility of green products. The study's findings can serve as a valuable resource when developing green marketing strategies for the Indian market.

They can guide the implementation of environmentally friendly marketing tactics and advertising campaigns that raise consumer awareness. Decision-makers can utilize these findings to create programs aimed at improving green purchase behavior, as consumers are more likely to buy green products when provided with such initiatives. The positioning of green brands plays a crucial role in influencing green purchase behavior, so it is important for marketers and management to emphasize the value of green products and minimize environmental risks by maintaining transparency in their organizational processes. Additionally, governments can contribute by producing documentaries on environmental issues and providing guidelines for reducing environmental impacts, which can enhance consumer awareness and knowledge of environmental concerns.

9 Limitations and Future Research

The study has limitations in terms of geographical scope, sampling method, and the generalizability of results. It focused on specific areas in India and used purposive convenient sampling, mainly targeting well-educated young adults. Therefore, the findings cannot be generalized to the entire Indian population. Additionally, the study only examined expressed behaviour rather than actual purchase behaviour, leaving room for further exploration on how expressed behaviour translates into actual behaviour. Future research could employ a longitudinal approach to study variations in purchase behaviour over time. The study also did not consider the influence of consumers' personality variables, which could be incorporated into future studies. Furthermore, researchers could explore the relationships between the proposed model and other cognitive measures such as green brand, environmental advertising, and green value to better understand green consumerism in the Indian and Asian markets. Lastly, investigating the role of consumer scepticism in shaping responses to green branding efforts should be a focus for future researchers.

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The Actual Impact of Metaverse on the FinTech Industry



Anas Ali Al-Qudah 

Abstract This paper theoretically discussed the Implications of Metaverse in the Financial Sector based on facts and statistics already published around world. The most important fact is that the rapid advances in technologies in the past decade have certainly paved the way for an alternate financial order and Metaverse might be the big bang event for the existing financial order. Accordingly, Metaverse and related technologies may democratize the financial system and may enable communities to manage their economies rather than following the diktat of a centralized institution. In the near future the new technological advances will create new avenues of wealth creation for the financial sector and may require a totally different set of skills to be employed in the financial sector workforce.

Keywords Metaverse · FinTech · Financial industry · Cryptocurrency

1 Introduction

The metaverse's impact on the financial services sector embodies the next evolutionary stage in banking and fintech industry. Starting from the era of traditional banking where one-to-one customer interactions at the branch were de rigueur, with nil or very little customization—with a one-size-fits-all approach in terms of customer offerings—banking moved on from physical branch interactions to online or internet banking, with all banking transactions conducted through the mobile and internet. Even cash withdrawals didn't necessitate a visit to the branch since automated teller machines (ATM) became the new normal [1].

Then came the advent of open banking allowing customers to access their bank accounts via third party apps, which allowed direct linkage of bank accounts and related services with apps using application programming interfaces (APIs), which even cut down on the visits to ATMs. The fourth (r)evolution was the dawn of fully

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digitalized finance banking involving web 3.0, or in other words, using blockchain that gave rise to NFTs and cryptos [2].

Metaverse represents the fifth stage of the evolution in the banking and fintech industry, offering customers the experience of virtual banking. In a sense, one can say that the metaverse allows for the return of personalized banking with the help of virtual or augmented reality (VR/AR) [3].

By the end of this decade, it's widely expected that about 50% of banks globally will be using AR/VR as an alternative channel for customer transactions as well as for employee engagement. For instance, Bank of America has launched a VR training program for its employees that simulates real life customer interactions while BNP Paribas NSE 0.11% has launched an app that allows customers to conduct banking transactions using VR [4].

2 Metaverse: Implications for the Financial Sector

The technological evolution witnessed in the last two decades or so has been exponential to say the least; the velocity with which the technology has evolved, particularly in cyber space, is difficult to fathom. People in their 30s and 40s could still reminisce about the struggle of finding a stable internet connection or could recall the never-ending wait to download a MB size file. As of the beginning of 2022, total estimated global internet users amount to 5.2 billion (66% of the world population), a number that has grown from 16 million in 1995 when the internet was launched in the public domain [5]. Cyberspace has fast progressed from being a medium of communication and stored knowledge to being an efficient platform for business and trade; the transformation has been further accentuated by the onset of COVID-19. To put things into perspective, in 2019 (pre COVID-19) annual e-commerce sales were estimated to be USD 3.3 trillion, whereas the figure has reached an estimated USD 5 trillion for the year 2021 [6]. It is estimated that the e-commerce sales will cross the USD 6 trillion mark by 2023 accounting for more than 22% of global retail sales [7].

3 The Next Leap

The next phase in this Tech-Volution (technological evolution) is the advent of web 3.0 and penetration of Metaverse (virtual reality) in financial services. A crude way of defining Metaverse would be that "it is a way for consumers and businesses to interact in the virtual space using enhanced virtual reality technologies, where goods and services can be traded". Human interaction with the virtual world is not a novel idea as it has been used in some shape or form in gaming platforms. Metaverse will extend the application of virtual reality technologies from the entertainment and gaming industry to other aspects of life [8]. Experts envisage Metaverse reshaping the

landscape of global economy and particularly the financial services sector. Metaverse is expected to have a 360° impact on the financial services sector from customer engagement and onboarding to creating new products and business divisions, while rendering others redundant [9].

4 Recent Developments in the Financial Sphere

Using the metaverse as a way of interacting with customers is probably the most likely way that financial services companies will initially utilize the metaverse. For example, Kookmin Bank (one of the largest banks in South Korea), has created a virtual town consisting of a business center, a telecommunications center, and a recreation area on a Metaverse platform [10]. BNP Paribas has launched a VR (virtual reality) app that allows customers to use VR in their banking transactions, including account opening while Citibank has tested holographic workstations for financial trading. Employees play a critical role in amplifying a financial institution's brand [11], in this regard, Bank of America intends to conduct VR training for 50,000 employees. Recent research conducted by the Digital Banking Report shows that 47% of banking executives believed that customers would use augmented reality/virtual reality as an alternative channel for transactions by 2030 [12].

Web 3.0 hinges on “decentralization” and DeFi (decentralized finance) institutions are already emerging on the horizon, such as EQI Bank. Founded in 2018, EQI Bank is a fully regulated financial institution that allows its customers to deposit crypto and traditional assets [13]. The bank offers payment solutions for the real and the virtual world, e.g., the bank issues a debit card to its customers that can be used to pay for assets such as buying a piece of virtual land in certain Metaverses [14].

The advancement of Metaverse economies will be based upon adoption of cryptocurrencies as a medium for financial transactions. Cryptocurrency is very important for virtual financial ecosystems as it gives users a simple, secure, and transparent way to transact [15]. Thus, the importance and the role of fiat currencies (currencies issued by central banks) is expected to diminish as more and more business is undertaken in these virtual financial ecosystems.

Metaversials—users of Metaverses—can fully own their virtual lands and spaces in the Metaverse. The underlying blockchain enables users to prove ownership of the asset and develop their virtual real estate as they wish. The implications of this digital real estate revolution are being felt in an emphatic fashion; Republic Realm (a digital property investment fund) bought a parcel of virtual land for more than USD 900,000 [15].

As evident from the above, progression in the development of Metaverse will create new types of transactions and novel modes of ownership, necessitating a need for transparent insurance products and services and for policies and regulations that consider the vastly different landscape of decentralized finance. Collaborations and partnerships between traditional institutions and FinTech companies will be key as we move towards adopting web 3.0 [16]. Insurance companies might have to

create policies to cover specified risks to smooth functioning of Metaverses such as non-physical losses of virtual assets, hackings, data theft and network outages, etc. Metaverse and Web 3.0 will use blockchain technologies in ways previously unimagined for insurers, that means a strong commitment to innovation and tech adoption will be crucial for success [17].

5 Challenges

The advent of web 3.0, Metaverse and digital assets and currencies will cause serious disruption to the financial status quo [18]. At this point it is difficult to comprehend the scope and depth of this disruption and cumbersome to envisage, with certainty, the future of the financial services sector [19]. Having said that, one thing that is certain is the complexity involved in regulating decentralized digital assets and virtual marketplaces. Regulators around the globe already had their hands full with regulating crypto assets, and their woes will only increase with the emergence of Metaverse [20].

Financial integration of global financial markets and economies has been the backbone of globalization [21]. Furthermore, financial services have become increasingly centralized as regulators find it easier to implement controls in a centralized system [22]. The arrival of decentralized financial institutions and marketplaces will pose a serious challenge to the existing financial order which relies on centralization [23]. Moreover, as mentioned earlier, decentralized currencies (cryptocurrencies) will have an impact on the effectiveness of fiat currencies, which in turn will have an impact on the ability of central banks to implement desired monetary policies [24, 25, 26].

6 Conclusion

The cornerstone of the prevailing financial order is control, centralization, and concentration of wealth. Rapid advances in technologies in the past decade have certainly paved the way for an alternate financial order and Metaverse might be the big bang event for the existing financial order. Metaverse and related technologies may democratize the financial system and may enable communities to manage their economies rather than following the diktat of a centralized institution. The existing financial system is dominated by systemically large financial institutions (institutions that are too big and important to fail); decentralization of the financial system may erode the hegemony of such financial institutions. These technological advances will create new avenues of wealth creation for the financial sector and may require a totally different set of skills to be employed in the financial sector workforce.

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The Nexus Between Blockchain, Crypto Currencies and AI: With Case Study



Mohamed Bechir Chenguel 

Abstract After revolutionizing the health, automotive and the insurance industries, artificial intelligence is now changing the approach to trading, using blockchain. In addition to simplifying certain tasks perceived as tedious in the long term, AI offers crypto currency traders a new dimension that is more secure, confidential, and beneficial to their investment. Thus, maximizing profits while limiting losses. Through our research, we have attempted to examine the nature of the relationship between these two new technological concepts, namely artificial intelligence, blockchain and crypto currencies. The results of our analyses show that the relationship between AI and blockchain is two-way. AI is at the service of the blockchain, and vice versa. In addition, crypto currency traders require AI to control the volatility of virtual currencies. In addition, AI strengthens blockchains security. The latter is used by AI to provide it with the huge amounts of data it needs. Our contribution is that AI has now become and will be in the future the ultimate tool for all future technologies to facilitate human tasks.

Mots clés Blockchain · Crypto currency · Trade · Robot · Artificial intelligence · Web3

Jel Classification F30 · M15 · O30

1 Introduction

In the early 2000s, the financial crisis that took place at that time favored the emergence of blockchain. Very quickly, investors from all over Europe the United States, and Asia, started investing in platforms specializing in crypto currencies. And while the market has had its ups and downs, today its value has hovered around the \$339

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billion mark. In parallel with the growing evolution of the blockchain, artificial intelligence and big data are gradually becoming part of our daily lives [1–3]. Over the past few years, AI has gained popularity. Currently, more an increasing number of traders cannot do so without making a new digital currency investment [4]. Thanks to advancements in AI, they can now access more detailed analytics and statistics before making any decisions. Bots offer them a simple and effective way to identify the most profitable choices in a short period of time. They hope to obtain better return on investment. The Crypto currency operates on the same principle as the stock market. Just as the stock market can quickly go down or up, the value of virtual currencies is very volatile overnight [5, 6]. Changing legislation, an emerging potential player or even mining problems, the reasons for this rise or a sudden fall in blockchain products would probably never fit in a list. Indeed, the parameters to be considered are so numerous that it is impossible to make a precise prediction of price variations at a given moment. This is where AI solutions come in. With systems equipped with artificial intelligence, everything seems simpler [7]. They can collect millions of data per minute or even per second and offer you advanced predictive analysis of any blockchain transaction. The emergence of crypto currency support tools that integrate artificial intelligence leads to faster and stronger volatility. At the speed of the internet, they allow you to benefit from a new form of trading: stock market 2.0. Through this research work, our contribution is to see more closely how artificial intelligence has been able to integrate into the world of crypto currencies and how AI tools have been able to improve the use and optimization of crypto currency users. Our work will be presented as follows, in a first section we will present crypto currencies and artificial intelligence, and in a second part we will present the interaction between artificial intelligence and crypto currencies, and in a third part we will present a case study of an artificial intelligence and its use by traders in the management of crypto currency portfolios.

2 Definition of the Concepts

Artificial intelligence, commonly known as “AI”, is a technical concept that attempts to integrate human knowledge into machines. It can be said that the devices will be feasible to perform the actions that generally require human intelligence [2, 8–11]. For example, the lights will turn on automatically when you enter the room, the refrigerator will perform operations on its own, and there will be self-driving cars. Nowadays, it has entered several fields and every organization is becoming more and more mechanical. It has already established its position in the market and there are hardly any companies or firms left whose devices do not have AI technology [12–17]. Crypto currency can be termed as virtual currency which can be used to transact on digital platforms [18, 19]. It was an important step in regulating economic fluctuations and creating economy without inflation. It has opened new fronts to empower individuals in economic aspects. In fact, people use it to override

government rules and regulations. However, with the positive aspects of this new technology, it can be said that it has become a necessity in today's digitized world [12, 20–23].

2.1 Artificial Intelligence Features

It is true that machines have no bias between two individuals. All investors seem important and crucial to them. In fact, it seems like a blessing for those companies that need people to invest in their projects. But they fear that investors are unable to make decisions on their own and generally rely on others, which has a huge impact on their business. In this scenario, AI helps investors make rational and logical decisions [24, 25]. Thus, the automatic trade is activated, which leads to the growth and development of several projects and ultimately to the increase in the supply of money in the economy [14–17, 26]. So, in the world of crypto currencies which is more or less like institutional markets which generate data in megabytes, the task will be much easier if coupled with AI. This is because AI allows big data to be sorted in a shorter time and investment decisions can be made in less time and instantly [3, 23, 27]. There is no doubt at all that machines can outperform human beings [28]. Crypto currencies can be traded on blockchain platforms which are highly secure, reliable, and transparent. These are freed from centralized administration and are flexible in terms of performing operations. AI tools, if integrated with blockchain platforms, will also perform the functions according to the integral approach [26]. These tools help identify common patterns and develop executable strategies for them. In this way, these strategies can be used to earn money from the tokens that crypto currencies allow. Also, the integration of AI and crypto currencies is an integrated approach towards creating decentralized networks [29]. If processes become mechanical, then organizations will not have to hire large numbers of human resources to perform operations. This will save the cost of an organization and payment gateways will also become transparent and secure with blockchain [9, 30]. There are platforms that release payments automatically as soon as the task is completed. Thus, it can be said that crypto currency is real-time money because it can be transacted in seconds [31]. Trading or investing processes are the riskiest task in the economic world [32]. Cyber fraud and malicious attacks from hackers and third parties are on the rise. People can invest freely as there is no fear of cyber attacks because smart contracts are the strongest and most robust platforms where financial transactions are 100% safe [16]. They are considered the best options to speed up investment procedures. They also allow them to diversify their portfolios and earn considerable sums in return. Investors will not have unnecessary fears in mind. All of the above aspects are common, but the potential of AI and crypto currencies remains to be seen. The change the internet brought to the world 20 years ago will happen again through AI and crypto currencies. With the integration of AI and crypto currencies, trade execution will be limitless, diverse, and much easier. In addition, it will be a dedicated and trustworthy network [27]. The volatile market environment can be

analyzed better using machines than human brains can. AI-based technologies can accurately predict market consequences. There are many companies that practically develop the applications capable of performing both AI and crypto currencies.

2.2 *The New AI Lexicons*

As with all advanced technologies, it is difficult to understand the lexicon. To clarify this aspect, we will define the different terms used. What is web3? More than a new technology, web3 is a real revolution, a paradigm shift in the world of the web. To better understand web3.0, it is necessary to go back in time and take up the different phases of the web. (web1, web2) [33]. Initially, the internet was an online encyclopedia that allowed information to be consulted but without interactive content. The content was limited to light texts or images. The web2 is the web of cookies: In addition to reading and consuming the content, we can interact with it. The sites may collect our usage data to send us targeted advertisements, we can pay online and interact with other users [23, 34]. The improvement of internet connection infrastructures, thanks to fiber optics, 3G and 4G, has made it possible to offer more diversified content, with videos, sounds, better quality images and even 3D content [35, 36]. The web2 is characterized by social networks, in fact we no longer only consult the internet, and we participate in it. The considerable increase in the number of users has led to an explosion in the amount of data generated by web2.0, so much so that user data has become the basis of the business model of many tech giants. Web2.0 is the symbol of centralization, a handful of companies control the data, and the digital world [3, 26]. The data of more than 80% of the population is stored in the data centers of Google, Amazon, Twitter, etc. *The web 3.0*: Web3.0 takes up the principle of peer to peer, or decentralization, on which the blockchain is based. Rather than the data being centralized in the data centers of large companies, it is stored in a decentralized way and in several pieces and distributed among all the participants of the network. *NFT concept*: An NFT, or Non-Fungible Token, is a digital asset that takes the form of an image, sound, video, etc. It is attached to at least one owner via a digital identity (wallet) [3, 19]. Each NFT is associated with metadata that contains its basic information, such as the identity of the owner and the creator [37]. This metadata is recorded in a blockchain, which secures and makes NFT transactions more transparent. Even though the basic use of NFTs is purely artistic, they have a lot of applications in different industries. LVMH, for example, associates each luxury handbag with an NFT that the owner of the bag transfers to the buyer if he resells it. This helps to fight counterfeits.

Metaverse concept: Both web3 and NFT have contributed to the design of metaverses. Metaverses are virtual spaces that will create new forms of interaction between users. It is a new form of internet that is closer to reality [38]. We can attend virtual events completely recreated in 3D (such as concerts or weddings), we can watch sporting events in a more immersive way, work with colleagues, study from home with a VR headset, etc.

3 Artificial Intelligence and Blockchain

The applications of artificial intelligence for all technologies that rely on the blockchain are numerous. AI is involved in crypto currency trading, in the generation of NFTs or even for the construction of the metaverse [11, 14]. Crypto currencies are known for their high volatility which makes predictions very difficult. Nevertheless, some time series analysis techniques such as LSTMs make it possible to predict market trends, even if the models are much less efficient than for the stock market [6, 14].

3.1 Artificial Intelligence and Its Security Role for the Blockchain

AI technologies are used not only to obtain predictive analyzes of its financial assets on the 2.0 stock market but also to secure the blockchain. Indeed, although it is attractive, the universe of crypto currencies still has some flaws. These flaws, malware detect them in less than a minute and changes the course of virtual currencies fraudulently [1]. To better secure the blockchain, many committed players are leaning towards solutions designed with algorithms equipped with artificial intelligence. It would indeed be an easier way to reduce fraud and secure your assets in this world where volatility can turn everything upside down. AI goes even further by securing the mining of crypto currencies. Moreover, in addition to simplifying and securing transactions, the use of AI graphics cards in mining considerably reduces the exploitation of the energies necessary for the transfer of earnings [39, 40].

3.2 Blockchain at the Service of AI

The uses of artificial intelligence for blockchain were easy to find, as AI is already quite mature and research on this topic is already in place. Decentralized AI originated from the need to secure the data used to train a model. Decentralized and encrypted storage ensures data security and prevents falsification or loss. Blockchain can improve data traceability. The strength of the blockchain today lies in its security. This is what makes it usable for large financial transactions. When training an artificial intelligence model, you need to validate the provenance of the dataset. On the one hand to better assess the quality of the data and avoid leading to a biased AI. On the other hand, to ensure that the data has been collected in accordance with the regulations in force [20, 21]. When you transfer a dataset, you transfer an associated NFT. This operation would make it possible at any time to verify the origin of the dataset and to go back to its creation. Each action performed on the dataset can be recorded and visible. Still with a view to making the use and training of

models more ethical, the blockchain can offer more transparency as to the models that are offered on the different platforms and facilitate collaboration [41]. Thus, Microsoft has created a framework, Sharing Updatable Models, for the collaborative maintenance of machine learning models [42, 43]. The machine learning model is initially built via a smart contract on the Ethereum blockchain and it is open access, you can use it by paying the gas fees of the network. The user can then modify the model or add training data to make it more robust. The modifications are then tested in an automated way, from an initial test dataset which remains unchanged. If they have contributed positively to the performance of the model, the user is rewarded, otherwise he is penalized. The rewards are given either in the form of points on the platform, or in the form of financial compensation. The principle of points is very similar to that of Stack overflow and is based on the choices of other users to validate or not the proposed modifications. Financial compensation is calculated via another public smart contract and is based on several criteria such as the performance gain or the size of the dataset provided. As often in the world of blockchain and web3, the success of this type of project depends on the ability to create a dedicated and trusted community. The issues related to artificial intelligence and blockchain go beyond the purely technological framework and will challenge the entire web economy [13, 44]. The end of cookies implies the end of targeted advertising and therefore the questioning of the business models of several tech giants. AI, as in all fields, will be an important tool in the new world. Both for its construction and for its maintenance. Conversely, the blockchain will make AI more secure, more ethical and more collaborative, we will talk about decentralized AI. Important problems, such as the anonymization of data from certain industries, which until now remain difficult to deal with, could be solved via the blockchain.

3.3 The Impact of AI on Crypto Currencies and Blockchain

Artificial intelligence can be used to analyze market trends and predict outcomes, also it can be used to determine the evolution of the price of cryptocurrencies [45, 46]. AI is suitable for automated trading, which can be very useful in periods of high volatility, when it is not possible to analyze the market situation for a long period of time.

AI offer better security of user funds, in fact AI can provide additional protection to user wallets against unauthorized access or theft of their funds. In addition, AI offer more reliable prediction of market trends and improve the consensus mechanisms [14]. It will be more efficient than PoW (proof of work) or PoS (proof of stake). AI can also be used to match buyers and sellers, as well as help make predictions using algorithms [47].

For the Reduction transaction costs, the use of AI can help to reduce transaction costs by eliminating intermediaries. AI will be used in the blockchain, and cryptocurrency world is to enable a whole new set of applications that are not possible without it. For example, an AI-powered autonomous agent can make decisions based on data provided to it. Based on this data, it can automatically buy and sell cryptocurrencies on exchanges or even invest in token sales [5, 48]. Some have even gone so far as to say that it will be possible for an AI-powered autonomous agent to create their own cryptocurrency, funded by crowdfunding campaigns like ICOs... There are already several AI-based applications that use blockchain, with many more on the way [49]. In fact, according to a report by IHS Markit, global revenue from blockchain solutions is expected to exceed \$7.7 billion by 2022. Despite all the hype around AI, it's important to remember that it's still just a tool. Like any other tool, be it a hammer or a computer, the value of AI lies in how it can be used to accomplish a specific task [50]. Companies are using it in many ways today: from IBM Watson, which analyzes a person's data to make personalized health suggestions, to Tesla's self-driving cars, which crisscross America's roads. When artificial intelligence meets blockchain, a new world of possibilities opens for both technologies. We're not going to talk about the technical aspects of AI and blockchain, but we want to understand how the two can be used together [51]. Crypto currencies rely on this technology to function and have been successful in providing decentralized financial services to individuals. Artificial intelligence has appeared in the market but is not yet well understood by the general population. However, it is used in several areas and that includes cryptocurrencies [52]. Despite the great expectations raised by these technologies, their use carries risks. One of them concerns AI, in fact data collection that could lead to the manipulation of users' tastes based on their behavior [53]. Companies could thus influence people's choices. If this data were to be stolen, it would be a leak that could be very damaging to the privacy of users. It should be remembered that the user's personal information is valuable to hackers, and they seek it through different means. On the other hand, blockchain technology presents problems related to its security, since hackers can take advantage of its vulnerabilities and gain access to users' confidential information, such as passwords or exchange addresses. AI could be used within cryptocurrencies and blockchain; some of them are currently being explored while others are still mere speculation, [48, 54]. AI and Blockchain can make cryptocurrency mining more efficient and safer. AI can also be used to predict market prices using sentiment analysis on social media data [55]. AI can be applied to blockchain through the development of trading robots. These robots would be able to analyze large amounts of data and use it to make predictions regarding price movements in the market. Trading bots would likely be much more accurate than human predictions, giving them an edge when buying or selling a specific asset [56]. However, it is important to note that these bots will not always be 100% accurate. Therefore, their risk management systems must be well designed to prevent large losses from occurring.

Another application of AI is in the development of autonomous trading robots that act like human traders. These bots would have their own set of metrics that they would use to determine whether to buy or sell a certain asset, but they would also have access to social media feeds that would allow them to see what other people are saying about cryptocurrencies and other assets. This information can easily affect prices in the short term [57]. The problem with blockchain is that it requires huge amounts of electricity and computing power to operate. It takes dedicated ASIC miners who workday and night and who, in return, are rewarded with tokens. This system seems sound in theory, but when you look closely, you realize that it causes undue harm to the environment. And that's why AI can come in handy. The impact of AI on the blockchain industry will be massive, and as is always the case with new technologies, there are both concerns and opportunities. The convergence of blockchain and AI can enable the latter to autonomously create and trade financial products [11, 50, 58]. It can also make machines more trustworthy, given the immutable nature of blockchain. AI will allow machines to be fair and ethical, which could lead to them treating humans better than they already are. Blockchain can have a few applications for artificial intelligence, including making AI more efficient and transparent. Thanks to smart contracts, AI applications can be decentralized, operate on a network of nodes, and increase their reliability [2, 59]. Blockchain can also increase the efficiency of AI systems by helping them pool resources while maintaining security and privacy. The convergence of blockchain and AI can improve machine learning by leveraging distributed computing power and huge datasets. Improved machine learning will enable artificial intelligence to autonomously create and trade financial products, as well as provide insights that were previously unobtainable due to data limitations, improving financial markets in their whole. The data in Blockchain is known as "smart contracts", which are essentially self-executing contracts, with the terms of the agreement between buyer and seller written directly into lines of code [60]. This allows for a high level of transparency, security, and traceability, features not found in traditional contracts stored in databases [41]. According to the Harvard Business Review, 80% of all relevant data will be unstructured (i.e., scanned images, audio, or video files) by 2020. By its nature, the blockchain is a closed system, which generally only allows data to enter or leave the network through the network administrator. AI can read, understand, and correlate data quickly and comprehensively at incredible speed, bringing a new level of intelligence to blockchain-based enterprise networks. AI can also make blockchain networks more secure. The blockchain records transactions on a distributed public ledger that is tamper-proof thanks to its encryption, but that doesn't make it immune to hackers [10]. As with any other software system, hackers are constantly trying to break into blockchain applications. AI can help secure blockchains by automatically detecting and stopping unauthorized access attempts and other cyber attacks before they cause damage. AI adds intelligence to blockchain by giving decentralized networks the ability to learn from their own data and make decisions based on what they have learned, which previous generations of enterprise software were unable to do. For example, AI can help companies use decentralized applications (dapps) built on blockchain networks to perform sales transactions or manage supply chains more efficiently [27]. Using blockchain to store and distribute

AI models provides the audit trail companies need to comply with regulations such as GDPR (General Data Protection Regulation). A large percentage of the world's data is not used. One of the main reasons is that they are not organized enough to be usable. Blockchain platforms like IBM's are built to organize data, which opens the door for AI to make sense of it [45]. A blockchain platform can also store and distribute AI models, which provides an audit trail for training and deploying those models. The original model as well as all updates can be tracked through blockchain. The blockchain ensures that every party using an AI model always has access to the latest version. It also ensures that patterns cannot be easily tampered with or replaced without being detected. Blockchain platforms can become a trusted source of data for AI systems by organizing and storing large volumes of data from multiple parties, with or without permission [2, 59]. Once stored, AI systems can run algorithms on the secure, decentralized ledger to identify patterns and make predictions. At the enterprise level, this means that information could be shared more freely between business partners while maintaining privacy, as they would have a secure, immutable record of who has had access to what information.

4 Case Study: An Artificial Intelligence to Analyze Crypto Currencies

AI software dedicated to the management of crypto currencies are like intelligent financial instruments and are able to analyze each asset in the possession of traders.

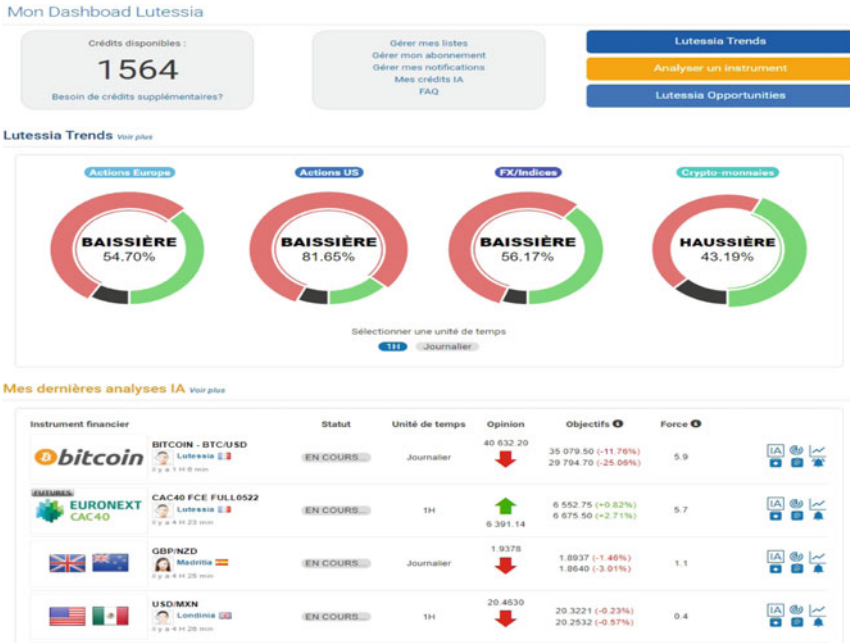
Resulting from the work of data scientists and data analysts, this software leads to objective and relevant results at the end of each analysis carried out on the data collected.

Like the emerging alternatives in the automotive industry, this software is equipped with high-performance scanners, capable of detecting more than a hundred, or even a thousand, winning scenarios. To do this, they use many technical indicators that can influence variations in market trend lines.

The analysis takes stock of technical supports, pivot points, price history and other important elements that could work in favor of your investment.

In most cases, AI solutions for analyzing a blockchain asset provide at least these following elements:

- A detailed summary of the analysis.
- A graph with a “REPLAY” mode to help decision-making.
- Encrypte data.
- Additionna analyses.



Lutessia is an artificial intelligence specialized in technical analysis. This AI instantly provides traders with technical analysis on the asset and time frame of their choice. Lutessia can analyze the chart of a stock, a stock index, a Forex currency pair, a commodity, and even a crypto currency. On each technical analysis, artificial intelligence provides an analysis summary, an invalidation threshold and price targets, a chart including plots, chart patterns and various technical indicators, signals and detections from market scanners, then all the details and summarized data used to build this technical analysis. Lutessia presents itself as the perfect decision-making tool on the financial markets. Traders and investors can use artificial intelligence to save time, to detect trading opportunities or more simply to compare their analyzes with those of our AI. Lutessia is the first artificial intelligence capable of analyzing the price charts of all crypto currencies. If you need a technical analysis of Bitcoin at a given moment or if you are looking for trading opportunities on various altcoins, this AI meets all your needs.

Created in 2019 by CentralCharts, the Lutessia artificial intelligence immediately appealed to all investors looking for technical analysis, trading opportunities and trading signals on crypto currencies.

- Analyzing crypto currencies is a long and tedious job.
- Each crypto currency must be analyzed over several time units before being able to determine trade opportunities to seize. The time spent analyzing crypto charts causes all traders to miss a significant number of trading opportunities.

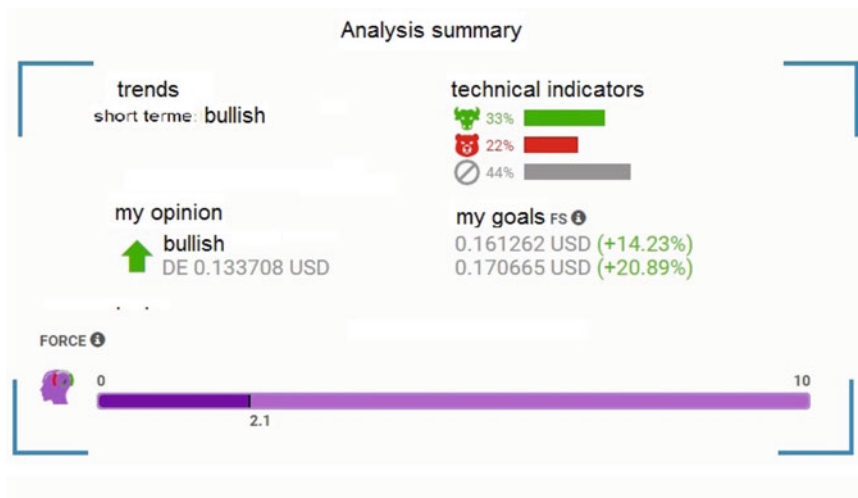
- From this observation, the CentralCharts team focused its work on the development of an artificial intelligence that would meet the needs of all crypto traders and investors.

4.1 What is Lutessia Artificial Intelligence?

Lutessia works with Big Data (large panel of data) which represents more than 19 million updated results thanks to more than 135 million calculations running in a loop.

- All price history.
- 9 calculation periods and 4-time units
- 18 technical indicators
- 6 market scanners (charts, Japanese candlesticks, technical indicators, volumes, gaps and records)
- More than 150 detections from these 6 market scanners
- More than 120 trend or momentum signals from technical indicators and moving averages
- The resistances and support, as well as the ProRealTrend of the ProRealTime platform.

From this BIG DATA, Lutessia manages to generate a technical analysis that will be easily readable and interpretable by all investors. Within seconds, it performs analytical work that would have required hours for any professional technical analyst.



But Lutessia's analysis does not stop at a few plots on a graph. It offers traders all the elements that allowed it to generate this analysis. On each trade opportunity or analysis, the AI details all the data and signals from the scanners and other CentralCharts analysis tools.

4.2 Analyzing a Crypto Currency with Lutessia

With a simple click on its avatar, Lutessia subscribers can request the AI to obtain its analysis on the crypto currency of their choice. After selecting a time unit, subscribers immediately receive the AI analysis and opinion on their favorite crypto currency. If this analysis does not reach objective 1 set by the AI, the credit that has been consumed is Refunded. Each month, Lutessia subscribers benefit from 40 credits to request the AI at any time on the crypto currency and the time unit of their choice.

Trading method of our artificial intelligence

To analyze the markets, Lutessia uses the power of Central Analyzer, a Big Data tool. To master and take full advantage of this huge source of data, artificial intelligence uses the method of "one-way trading" to generate its technical analyses. The "one-way trading" method is a simple method allowing each trader to set a framework and rules of conduct for their trading.

This method makes it possible to avoid many so-called "classic" errors, such as the desire to always be in position, the desire to take all market movements or the desire to open a trade that does not correspond in any way to the strategy. Normally applied by the trader. To summarize this trading method, you must first define whether you are a trend or counter-trend trader, rather a scalper or a swing trader (regardless of the time unit), and you must respect all the trading rules or the psychological rules that will have initially been set by your strategy or by yourself. In its original version, the one-way trading method integrates the analysis of two-time units: a long unit of time which will allow you to define the "one way to trade" and a short unit of time which will allow you to define the trading opportunities to be seized according to your trading strategy.

In summary, we obtain a so-called "trend" chart and a so-called "signals" chart. On the "trend" chart, one or more levels are determined which will make it possible to define the "LONG ONLY", "NEUTRAL" and "SHORT ONLY" zone. Then on the "signals" chart, all that remains is to wait for trade opportunities to arise in the direction defined by the "trend" chart.

To explain the method of one-way trading, we take simple price levels. But one can imagine that the “one way to trade” is determined according to a chartist figure or a technical indicator. Ex: the price is in a bullish channel... If the price remains located in this bullish channel, it is “LONG ONLY”. The price is below its 50-moving average. If the price remains below this moving average, it is “SHORT ONLY...”

Examples for explanation

A trader determines the trend on the daily chart and his trading signals on the chart. On the daily chart, the tools used by the trader cause the price to appear bullish above €100, bearish below €90, and there is total indeterminacy between these two levels. The trader will therefore set to be “LONG ONLY” above €100, “SHORT ONLY” below €90, “NEUTRAL” between €90 and €100.

EX 1: the price is at €110, and the trader obtains a BUY signal with his trading strategy on the 1H chart. Can he open a LONG position? Answer YES.

EX 2: the price is at €80, and the trader obtains a BUY signal with his trading strategy on the 1H chart. Can he open a LONG position? Answer NO. As the price is in the “SHORT ONLY” zone of the trend chart, the trader should only allow himself to trade SHORT positions, and refrain from all LONG positions (even if he obtains an excellent buy signal on its signal graph).

EX 3: the price is at €95 and the trader obtains a BUY signal with his trading strategy on the 1H chart. Can he open a LONG position? Answer NO.

The price being in the “NEUTRAL” zone of the trend chart, the trader should not allow himself any trade with respect to the signals sent by his trading strategy on the chart.

Receive trade opportunities with Lutessia AI

If Lutessia makes it possible to obtain an analysis at a given moment on your crypto currency, this is not necessarily the best time to intervene. Indeed, the price can just as easily be located close to objective 1 as to the invalidation threshold when generating your technical analysis. Indeed, Lutessia only offers you its analysis at a given moment. This is why CentralCharts created the “Lutessia Opportunities” service.

Analyses Lutessia Opportunities

Analyser le marché afin d'y détecter des opportunités de trade est un travail long et fastidieux. Avec Lutessia Opportunities, notre IA le fait pour vous ! Lutessia scanne en permanence l'intégralité du marché pour vous offrir ses meilleures analyses et de nouvelles opportunités de trades.

En savoir plus : Lutessia FAQ - Gérer mes notifications

Crypto-monnaies

Instrument financier

Instrument financier	Statut	Unité de temps	Opinion	Objectifs	Force
HARVEST FINANCE - FARM1ETH Lutessia 87 à 19 min Cliquez ici	EN COURS	1H	0.031100 ↓	0.030550 (-1.13%) 0.027500 (-11.00%)	8
INSURACE (X100000) - INSUR1ETH Lutessia 12 à 20 min Cliquez ici	EN COURS	1H	23.76 ↓	19.77 (-12.91%) 18.95 (-16.52%)	7.5
AMPLEFORTH - AMPLUSD1 Lutessia 87 à 2 H 47 min Cliquez ici	EN COURS	Journalier	1.12 ↑	1.30 (+8.33%) 1.51 (+25.83%)	8.6
AXIE INFINITY SHARDS - AXS1BTC Lutessia 87 à 2 H 48 min Cliquez ici	EN COURS	Journalier	0.001129 ↓	0.000865 (-14.02%) 0.000581 (-42.25%)	8.2
DIGG - DIGG1ETH Lutessia 17 à 3 H 18 min Cliquez ici	EN COURS	1H	5.97 ↓	5.47 (-6.01%) 4.97 (-14.60%)	7.9

Lutessia artificial intelligence constantly scans all crypto currencies to directly offer you its best analyzes and new trading opportunities. For each opportunity selected by the AI, the profit/risk ratio is always greater than 1:1 and can reach 1:8 on the best opportunities offered.

Dashboard Lutessia AI

The Lutessia dashboard will allow you to follow your subscription, your AI analyses, your credits and the latest opportunities by market: And with the latest “Lutessia Trends” tool, follow live AI opinion on a complete market or on a list of the crypto currencies you have in your portfolio: The permanent AI scans are used. Lutessia does not select trade opportunities but uses all its scans to offer its overall opinion on a crypto portfolio, on a list of instruments or on the financial market of your choice.

5 Conclusion

AI and blockchain are technologies at the cutting edge of innovation. Both are poised to revolutionize the way we interact with technology and could have far-reaching implications for industries as diverse as healthcare, logistics and finance. But, and perhaps most importantly, they both have the potential to democratize access to data and information that was previously inaccessible or controlled by centralized institutions. Artificial intelligence (AI) is a term that refers to a wide range of technologies that can learn from their environment, make predictions, and take action in order

to accomplish tasks. AI allows machines to see, hear, speak, and think like us. AI is already powering many aspects of our daily lives through smart personal assistants like Siri or Alexa and other smart devices like Google Home. Blockchain is a distributed ledger technology that allows a decentralized network of computers to maintain an up-to-date record of all transactions made on the blockchain. The most well-known implementation of blockchain technology is bitcoin (BTC), which enabled a “trustless” peer-to-peer financial system without any intermediaries. AI is one of the hottest topics in tech right now, with companies like Google playing a pivotal role in developing smarter machines that can automate entire industries. AI isn’t just about cellphones: Blockchain and AI are two of the most talked about technologies in recent years. The rise of bitcoin and other crypto currencies, as well as companies like IBM Watson, have sparked a lot of interest in both areas, but what do they have to do with each other? The convergence of Blockchain and AI may seem unlikely. After all, AI is about building intelligent machines that can make decisions by processing data.

What does this have to do with Blockchain Distributed Ledgers? It turns out that these two seemingly unrelated technologies can help each other in powerful ways. Artificial intelligence has profound applications in the world of finance. Machine learning can be used to predict stock market trends, for example, allowing investment firms to make trades with a high chance of success. However, the finance industry still needs humans for many tasks, including analyzing those predictions and making the final deals. Machine learning is a subset of artificial intelligence that focuses on developing computer programs that can access data and use it to learn on their own. Machine learning algorithms build a mathematical model from a sample of data, so that the computer program can use that model to make predictions or make decisions without being explicitly programmed to do so.

The first use case we will explore is how Blockchain can improve machine learning algorithms by providing more accurate data. Machine learning algorithms require large amounts of data for training purposes. However, since many companies strictly protect their data, it is difficult for researchers to obtain enough data. As time goes on and more and more computers gain the ability to process data on their own, we could see fully automated systems from investment firms made up of only AI algorithms. This would obviously require a new kind of financial system, one that grants AIs full ownership of their assets and allows them to liquidate them whenever they choose. When it comes to the intersection of crypto and artificial intelligence, two completely different aspects come into play.

Big banks have invested a lot of money in AI over the past few years. This is the case of JP Morgan, which has been interested in AI for several years now. From an investment perspective, a lot of people are trying to figure out what will happen if the big banks start using their own in-house technology to start trading crypto currencies with their clients.

When training an AI system using datasets, you need large amounts of high-quality data. And this is where blockchain can help you. Using blockchain technology, you can store and distribute AI models, as well as track and audit them. If you’re working with datasets that can be stored on the blockchain, then AI agents could use that data

without accessing sensitive information like names or addresses. Our contribution is to explore the nature of the relationship between AI and crypto currencies, and we presented a case study on an artificial intelligence that manages crypto currency wallets. For future implications, we hope that future research work can give empirical justifications and present estimation models on the nature of the interaction between Artificial Intelligence and crypto currencies.

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The Advantages and Difficulties of Using AI and BT in the Auditing Procedures: A Literature Review



Sajeda Abdel Rahman Hamdan and Abdullah Khaled Al Habashneh

Abstract The objective of this study is to provide a comprehensive analysis of the advantages and obstacles related to the implementation of Artificial Intelligence (AI) & blockchain technology (BT) in the field of auditing. The article reviews existing research on the impact and utilization of Artificial Intelligence & blockchain technology in Auditing procedures, focusing specifically on the advantages and difficulties they present. The utilization of AI & BT in auditing procedures offers various advantages, including it strengthens efforts to combat fraud and promotes compliance with international standards, it expedites audit tasks, resulting in time and effort savings, it enhances audit quality by reducing human error, ensuring the reliability and relevance of information, it encourages the advancement of traditional auditing practices while decreasing the reliance on human involvement in auditing and accounting roles, leading to cost savings and decreased risk of errors. Nevertheless, the utilization of AI and BT in auditing also presents difficulties such as high implementation costs, the need for continuous learning on AI developments by auditors, and concerns about security vulnerabilities, potential attacks, as well as the presence of racial biases within blockchain programs used in auditing procedures. This paper significant to provide a comprehensive evaluation of the problems encircling the current and future utilization of Artificial Intelligence & blockchain technology in auditing procedures. By addressing these critical matters and concerns, policymakers and stakeholders can develop a deeper understanding of the impact of AI and BT on economic and social growth. Consequently, this understanding can inform future policies that enhance business practices, reduce fraud incidents, expedite audit tasks, improve audit quality, and minimize human error, thereby contributing to economic and social development. While there is extensive literature available on the utilization of AI & BT in auditing procedures, there remains a lack of comprehensive understanding regarding the advantages and difficulties associated with these processes. This study bridges that gap by providing policymakers with valuable insights into the utilization of Artificial Intelligence & blockchain technology in auditing.

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Keywords Auditing procedures · Advantages & difficulties · Artificial intelligence · Blockchain technology

1 Introduction

The era of technological transformation has ushered in significant advancements in various aspects of life, with AI & BT emerging as two transformative technologies. These technologies have revolutionized the industrial landscape by replacing human intelligence through digitalization [31, 32]. Rapid technological progress is profoundly reshaping the world, presenting both complexity and opportunities for business growth. In this context, organizations are faced with challenges and benefits in utilizing technological decision tools [16, 17]. As a result, companies are generating vast amounts of data, necessitating a proactive approach to adapt to evolving tools based on advanced technology. This enables businesses to analyze the generated data for both the analysis of challenges and the identification of opportunities [13–16].

Previous literature has extensively examined the impact of Artificial Intelligence (AI) and Blockchain Technology (BT) on the audit procedures [4–7, 10–12, 19, 28, 34–37, 41–44, 46]. However, these studies do not consolidate the advantages and difficulties of Artificial Intelligence & blockchain technology utilization in the auditing procedures within a single paper. Therefore, the objective of this study is to contribute to the existing knowledge by providing a comprehensive understanding of the benefits and obstacles associated with the utilization of Artificial Intelligence & blockchain technology in the auditing procedures. This will be achieved through a systematic review of relevant literature. Although previous reviews have explored the utilization of Artificial Intelligence & blockchain technology in the auditing procedures in the accounting literature [1, 2, 22–29, 40–43], there is still a need to consolidate and present the findings in a comprehensive manner.

The utilization of Artificial Intelligence (AI) & Blockchain Technology (BT) in the auditing procedures has witnessed significant growth in recent years. Researchers have explored the impact of these technologies on auditing, acknowledging both positive and negative outcomes [4–6, 10, 17–19, 37–39, 49].

This surge in literature on Artificial Intelligence & blockchain technology utilization in the auditing procedures can be attributed to the significant benefits these technologies offer to Organizations and their stakeholders, along with the increasing apprehensions regarding corporate fraud [8–10, 33, 46–50].

The topic of utilization Artificial Intelligence & blockchain technology in the auditing procedures has been investigated using various research methodologies, including archival data analysis, survey investigations, and experimental studies [18, 28, 33, 41]. This diverse body of research not only encompasses a wide range of perspectives but also addresses numerous research problems and issues related to the utilization of Artificial Intelligence & blockchain technology in the auditing procedures.

Regardless of the significance & breadth of the utilization Artificial Intelligence & blockchain technology in auditing procedures domain, there remains a need for a exhaustive literature review on the advantages & difficulties associated with their utilization. Such a review would provide a consolidated understanding of the existing knowledge and shed light on the potential advantages and obstacles faced when implementing Artificial Intelligence & blockchain technology in the auditing procedures. By filling this gap in the literature, researchers can contribute to the advancement of this field and provide valuable insights for practitioners and policymakers alike.

The primary purpose of this study is to consolidate and synthesize the substantial body of practical research conducted in the context of utilization Artificial Intelligence & blockchain technology in the auditing procedures. By undertaking this synthesis, the study purpose to provide a comprehensive overview of the current state of knowledge in this field. Additionally, the paper seeks to identify any existing gaps or areas that require further exploration in the utilization of Artificial Intelligence & blockchain technology in the auditing procedures.

Through this analysis, the study purpose to highlight potential fruitful areas for future research. By identifying these gaps, researchers can direct their efforts towards addressing specific aspects that have not been extensively studied or require further investigation. This approach will contribute to advancing the understanding and application of Artificial Intelligence & blockchain technology in the auditing procedures and will guide future research endeavors in this domain.

This paper makes several key contributions to the utilization of Artificial Intelligence & blockchain technology in the auditing procedures literature. Firstly, it examines the significance of utilization Artificial Intelligence & blockchain technology in the auditing procedures, accentuating the possibility advantages & difficulties associated with their implementation.

The paper specifically emphasizes the benefits of AI utilization in the accounting and auditing professions, showcasing how AI can enhance and improve various aspects of these fields. It also discusses the advantages of BT utilization in the audit procedures, illustrating how blockchain technology can contribute to increased efficiency and improved audit quality.

Furthermore, the paper addresses the challenges related to the utilization of AI in the audit procedures, recognizing potential hurdles that organizations may face when implementing AI technologies. It also discusses the challenges associated with the utilization of BT in auditing, highlighting considerations and potential obstacles.

In addition to these contributions, the paper provides a research agenda that outlines future directions for investigation in the field of AI and BT utilization in auditing. This research agenda serves as a roadmap for further exploration and development of the accounting process, fostering advancements in auditing practices.

Overall, this paper significantly contributes to the understanding of the advantages and difficulties associated with the utilization of Artificial Intelligence & blockchain technology in the auditing procedures. It highlights the potential impact on fraud reduction, the reduction of human involvement in auditing and accounting, increased efficiency and speed in audit tasks, as well as the enhancement of overall audit

quality. By providing these insights, the paper adds valuable knowledge that directly impacts the development of enterprises and their shareholders through the utilization of various tools and techniques.

2 Background

2.1 Background of Auditing Procedures

The audit Procedures plays a crucial role in comprehending the significance and relevance of adopting Artificial Intelligence (AI) and Blockchain Technology (BT) in the audit field. Auditing involves a series of actions undertaken by auditors to gather evidence and make informed judgments and opinions about the financial statements. Due to the varying internal control systems and risk factors present in each client, no two audit procedures are identical. However, AI and BT offer adaptable solutions to enhance efficiency at every step of the audit procedures, creating a seamless continuum where the output of one step becomes the input for the next [22–28].

According to a report by rendering spot to [44–47], the audit procedures can be categorized into four stages: Planning, Fieldwork, Audit Report, and Follow-up Review.

During the Planning stage, the auditor informs the client about the audit and conducts a formal meeting with the management of the firm to discuss the audit objectives. This phase also involves gathering information on critical processes and developing a plan for the remaining audit steps.

The Fieldwork stage is where the auditor assesses the effectiveness of the controls identified during the preliminary review. The auditor verifies if the controls are operating as Explained by the client.

The data collection stage concludes accompanied by the compilation of principal results,

Which will be used to prepare the ultimate edition of the audit report [50–53].

The auditor compiles an initial report during the audit report stage, which is initially shared with the operating management of the unit. The report then undergoes a review process by the client before the exit conference takes place [54–56].

The Follow-up Review stage involves reviewing the client's response documents and verifying if the necessary actions have been taken to resolve the audit findings. Testing may be conducted to ensure the desired results have been achieved. Any unresolved findings are addressed in the follow-up report.

Kanakriyah [26] emphasize that the audit procedures can focus on various aspects, including a firm's systems, applications, information processing facilities, system development activities, enterprise IS architecture, and communication networks.

According to [27, 57], the audit procedures can be summarized into four main steps: pre-planning, planning, understanding the entity and risk assessment, documentation, and completion and reporting.

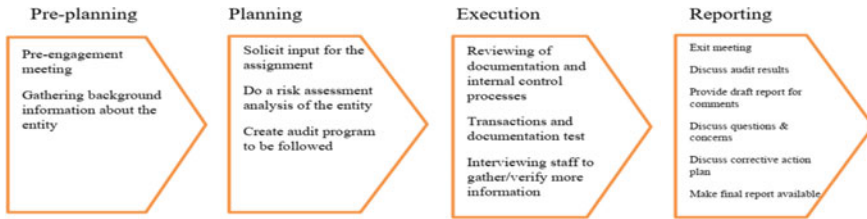


Fig. 1 Audit procedures model, Source [5]

The first step in the audit procedures is pre-planning, which involves assessing whether it is appropriate to accept new clients or continue working with existing ones. Auditors evaluate the internal processes and procedures of the company to make an informed decision. This step assists auditors in evaluating whether to accept or reject a client, the subsequent phase is planning, where auditors develop a comprehensive plan for the entire audit procedures. While unexpected events may occur that require adjustments to the audit strategy, the planning process results in an audit scheme that designates the period, scope, trait, and overall audit roadmap, the succeeding phase involves understanding the entity and risk assessment. During this phase, auditors gain a thorough understanding of the client’s control environment and assess the risk of material errors. This understanding provides auditors with insights into the client’s operations and the industry in which it operates, the last phase in the audit procedures is completion and reporting. In this stage, auditors evaluate the relevance & appropriateness of the evidence collected during the audit. The completion procedure necessitates auditors to verify that the entire process has been meticulously recorded and that the substantiating materials are appropriately arranged. Finally, auditors prepare and present the audit report based on their findings (Fig. 1).

2.2 Background of AI

Over half a century ago, the term “Artificial Intelligence” was coined during the Dartmouth Conference in 1955, marking a significant milestone in the field of machine intelligence [21, 48, 58]. John McCarthy, a renowned computer scientist, provided an initial definition of artificial intelligence as “the science and engineering of creating intelligent machines” [21].

Hernandez-Orallo [24] further elaborate on the concept, describing artificial intelligence as the ability of a system to accurately interpret external data, learn from it, and utilize those insights to accomplish specific objectives and tasks by means of adaptable adaptation.

Initially, technological advancements aimed to revolutionize specific industries; however, as time progressed, technology has become an indispensable component across all sectors. It continues to play a crucial and ever-evolving role in our perception and interaction with the world. A notable illustration of this can be found in

the World Economic Forum Shift report (2015), which highlighted that 75% of the respondents, including 816 chief executive officers & experts from the information and communications technology sector, believed that a critical turning point would occur when 30% of companies conducted audits using AI by 2025. This statistic underscores the growing significance of artificial intelligence in shaping various aspects of business operations.

The utilization of AI technology in the field of auditing is not a novel concept, being an essential tool that has assisted computer audit specialists in making sound decisions for an extended period of time [20, 59]. However, as technology continues to advance, with the growing accessibility of vast amounts of data and improved control over processing, it is expected that artificial intelligence will have a significant influence on the field of auditing in the coming years [28, 60].

The exponential growth of data necessitates auditors to augment their processing capabilities while upholding the efficiency and accuracy of the audit procedures. One approach to achieve this objective is the integration of Artificial Intelligence-based technology in auditing, which entails automating tasks and replacing manual input with AI systems that transform inputs into outputs. In fact, it is challenging to envision any facet of auditing that would not benefit from Artificial Intelligence assurance or the assistance provided by Artificial Intelligence technologies [28, 61].

2.3 Background of BT

BT revolutionizes the transfer of valuable digital assets, such as currency, by eliminating the need for a third-party intermediary. It functions as a chain of blocks, facilitating the establishment and recording of asset ownership between parties [3, 32]. In numerous areas of financial relationships and accounting, BT presents an innovative solution to overcome the limitations of centralization, which often leads to delays and substantial fees in operations.

BT offers a novel approach to record, process, and store financial transactions [45]. While still in its early stages of development, BT technology has garnered significant attention from prominent entities such as the Big Four accounting firms and various financial institutions due to its immense potential in operational and service processes, particularly in the field of auditing [11, 30] (Fig. 2).

3 Research Design

The research design of this study can be best characterized as a review article, following the framework outlined by [36]. The primary objective of this study is to provide comprehensibility of the advantages & difficulties associated with the utilization of AI & BT in the auditing procedures, drawing on a comprehensive

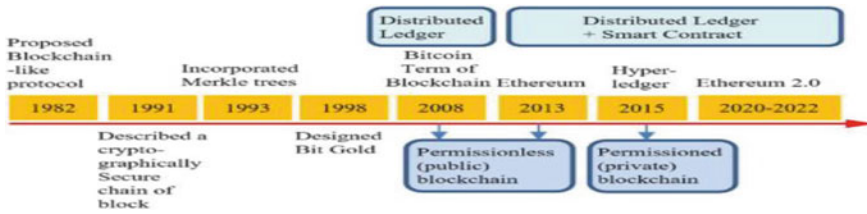


Fig. 2 History of block chain, Source [18]

review of existing literature in this field. To align with the research aim and objectives, a two-stage approach was undertaken to identify relevant articles on the impact of AI & BT on the auditing procedures.

In the first stage, a search was conducted using specific keyword strings, including combinations such as “Artificial Intelligence” and “Auditing Process,” “Artificial Intelligence and Blockchain in Auditing,” “AI and BT utilization in Auditing Process,” “Benefits and challenges of adopting AI and BT in Auditing Process,” “Fraud reduction and efficiency enhancement in auditing through AI integration,” and “Cost implications and security vulnerabilities in adopting blockchain technology in auditing.”

To retrieve relevant studies, the following databases were reviewed: Elsevier, EBSCOhost, Wiley Online Library, Scopus, Taylor and Francis Online, and Springer Link. Additionally, special issues of journals like the International Journal of Accounting Information Systems and Blockchain: Research and Applications were examined. Moreover, journals that occasionally publish research on the impact of AI & BT in the auditing procedures were also considered.

The second stage of the study involved a snowballing search technique, wherein the reference lists of all the articles identified in the first stage were thoroughly examined. The search was focused solely on articles published in English, as there were limited studies conducted on this topic in Jordan, particularly investigating the effects of AI and blockchain technologies on the audit procedures in one article. The majority of the pertinent articles were published in the past few decades. The identified articles were critically analyzed, and those discussing the utilization of AI and blockchain in the auditing process were selected for inclusion in the review.

4 Findings

4.1 Advantages of Incorporating Artificial Intelligence in Auditing

- Enhancing compliance with international standards while simultaneously mitigating fraud.

- Accelerating audit procedures to streamline efficiency, while concurrently elevating audit quality, minimizing human error, and ensuring the integrity, reliability, and relevance of information. Furthermore, promoting the evolution and enhancement of traditional auditing.

Several research papers have consistently shown that the utilization of AI in place of manual entries yields notable benefits in terms of reducing human error, expediting audit tasks, and upholding data reliability [12, 34, 47]. AI systems, when employed for entries, not only enhance efficiency but also possess the ability to identify fraudulent activities within financial statements and provide regular contract reviews with recommendations. Additionally, these AI systems have the capability to collect and analyze information, thereby facilitating auditors in pinpointing critical areas that necessitate further attention. Consequently, the audit profession is actively adapting to this transformation brought about by Artificial Intelligence, in order to remain aligned with these advancements.

Al-Okaily et al. [5] argue that with the exponential increase in information and data today, Auditors encounter the challenge of augmenting their processing capability while upholding the efficacy and dependability of the audit procedures. To address this issue, the investigation carried out a semi-structured interview involving nine expert auditors hailing from the prominent big four auditing firms in Sweden, aiming to explore the utilization of AI tools in their auditing processes. The findings provide compelling evidence that the use of Artificial Intelligence has a significant favorable effect on audit quality.

The study reveals that the incorporation of Artificial Intelligence systems maximize the efficiency of every stage in the audit procedures, leading to improved professionalism and compliance with international standards, particularly the International Financial Reporting Standards (IFRS). Furthermore, the research emphasizes the advantages of using advanced technological audit systems instead of traditional tools. Notably, the main advantage of Artificial Intelligence in the audit procedures is its ability to minimize mistakes that previously necessitated repetitive work for auditors. The interviewees unanimously agree that the integration of AI reduces the burden of labor-intensive tasks, thereby mitigating the risks associated with errors, manipulation, and omissions.

Al-Sayyed et al. [4] emphasize the role of AI techniques in data collection for the audit procedures, enabling a deeper comprehension of its various stages. The rapid growth of data in the information age has necessitated the integration of AI technology in the audit sector, enabling efficient and timely data analysis with minimal effort. This integration ultimately enhances the quality of audits, enabling auditors to cope with the challenges imposed by the evolving landscape.

Gepp et al. [19] conducted a study to investigate the significance of AI in the auditing and accounting domains. The findings suggest that AI paves the way for a more favorable and conducive environment in these fields. The paper concludes that AI has the potential to improve various aspects of accounting and auditing, shaping a more efficient and effective landscape.

Petticrew and Roberts [46] conducted a thorough investigation into the utilization of artificial intelligence (AI) as a means to prevent accounting and auditing fraud, as well as to enhance the overall quality of accounting information. Their study identifies several critical areas where AI should focus its efforts to become a competent and well-rounded tool in the field of accounting.

A thorough analysis of strategies conducted by [28] highlighted the growing impact of artificial intelligence (AI) on the auditing and accounting field. They emphasized the significance of current knowledge technologies and discussed their implications for human auditors and the overall audit procedures. According to the authors, contemporary AI tools have advanced scanning capabilities, enabling them to effectively identify pertinent accounting information from diverse sources such as bills, contracts, and transactions [28].

Alles and Gray [10] conducted a study to explore the role of artificial intelligence (AI) in audit procedures within prominent international accounting firms. The research focused on examining the influence of AI on audits and its implications for auditing professionals. Notably, the study highlighted that AI tools have the capability to detect anomalies in company records, particularly concerning unusually high sales figures or transactions occurring shortly before the end of a reporting period, additionally, noteworthy payments are made promptly following the conclusion of the reporting period [10].

According to [17], advancements in AI have the potential to significantly benefit human endeavors. This study aims to examine the effect of AI on the accounting and auditing profession, focusing on the effects it has on various tasks within the field. Specifically, the research suggests that automated technologies are more likely to replace prospective tasks such as bookkeeping or process-driven assignments, as compared to higher-value specialties that require professional judgment. Additionally, the study confirms the widespread belief that the younger generation of accountants should possess the knowledge, understanding, and preparedness to collaborate effectively with AI systems.

In the study conducted by [33], it was highlighted that despite the efforts made by professional auditing bodies to promote the utilization of contemporary auditing techniques, particularly computer-assisted auditing (CAATs), among audit firms in Jordan, the utilization of computers in auditing techniques remained relatively low. To address this, Mansour employed a qualified questionnaire that was distributed to 200 external auditors, aiming to gather data on their acceptance and use of CAATs. The findings of the study indicated that auditors currently rely on CAATs, as these tools enable them to perform data analysis without the need for large sample volumes. However, it was also noted that the organization and processing of data still require significant human efforts.

Several recent studies [3, 23] have examined the impact of AIS & BI on the performance of Jordanian banks and insurance companies. These studies have consistently demonstrated the positive effects of AIS and BI in terms of increased profitability, risk reduction, informed decision-making, improved operational efficiency, and the timely preparation of relevant financial statements.

Two studies explored the role of AIS in internal and external control. Study [9] focused on AIS's influence on internal control efficiency in Jordanian commercial banks. Findings showed a positive impact between AIS attributes (relevance, reliability, timeliness, understandability, completeness, and verifiability) and internal control. Recommendations were made to prioritize AIS implementation for improved performance in Jordanian banks.

In terms of external control, Alaba and Ghanoum [8] examined the influence of AIS on audit procedure effectiveness. The research concentrated on external auditors' viewpoints, emphasizing their perception of AIS as a crucial factor in enhancing the quality of external audits. The findings indicated that AIS plays a significant role in improving audit quality, specifically in areas such as audit planning, testing procedures, risk assessment, and implementation. Furthermore, the study identified the existence of high-quality computer applications within Jordanian audit firms, emphasizing their capability to leverage AIS effectively.

According to [43], the increasing automation in audits will lead to a shift in emphasis from traditional auditing procedures such as ticking and tying and vouching to a greater focus on comprehending the overall picture presented by the data. There will be a stronger emphasis on comprehending inputs and assumptions, as well as identifying and evaluating trends, patterns, and outliers. Audit firms recognize the importance of leveraging advanced technology to achieve an efficient and effective audit procedures. For instance, EY has made a significant investment of \$400 million in applying big data analytics to its audit practices [7].

A similar perspective was found in a study conducted by [25] in Malaysia, rather than Sweden. The study involved auditors from various firms, including PWC, Deloitte, KPMG, AT THEY, BDO, and other auditing companies. Their findings align with the aforementioned insights, indicating that artificial intelligence (AI) has a positive impact on the effectiveness of all stages of the audit procedures in Malaysia. The integration of AI significantly enhances the performance of the audit procedures.

4.2 Advantages of Utilization BT for Auditing

- The utilization of Blockchain Technology (BT) in auditing and accounting reduces human involvement, leading to cost savings and the elimination of time delays. This, in turn, minimizes the potential for human error in these tasks.
- Blockchain utilization in auditing and accounting enhances efficiency in various aspects, such as data recording, settlement, and reviewing processes.

According to research papers [1, 29], Blockchain Technology (BT) has the potential to substantially decrease the human involvement in the accounting profession and could potentially eliminate it entirely in the Coming time. These studies also suggest that Blockchain Technology can eliminate time delays by enhancing the accuracy and relevance of financial statements. This is particularly beneficial in reducing delays

caused by auditors when dealing with the increasing number and size of financial statements.

According to a study conducted by Issa et al. [41] at RMIT University in Australia, shed light on the importance of BT in the accounting and audit domain.

The study identified several crucial topics currently discussed in the blockchain ecosystem, including corporate governance, transparency, trust, blockchain-enabled continuous auditing, innovative contract applications, and the changing roles of accountants and auditors. The researchers aimed to provide practical implications for accountants and auditors regarding blockchain development.

The research highlighted that one of the key advantages of Blockchain Technology, as emphasized by accountants and auditors, is the increased efficiency it brings to accounting data recording, settlement, and review processes. By leveraging blockchain, accountants and auditors can save both time and costs associated with these tasks, thereby minimizing the potential for human mistakes. Conversely, the research also acknowledged a limitation of BT in its ability to detect fraudulent transactions.

In another study conducted by Kokina et al. [32], the role of auditing and accounting performance was examined in the context of blockchain technology. The research revealed that BT offers novel methods for recording, processing, and storing transactions and financial information. It has the potential to significantly transform the accounting profession and reshape the business ecosystem. The findings of the study indicated that auditors face both opportunities and challenges as a result of the impact of blockchain on auditing.

The four major accounting firms have made significant investments in leveraging big data to enhance customer service quality. Deloitte took the initial step in the BT (Blockchain Technology) initiative in 2016, highlighting how it reduces auditing time and enables the creation of smart contract applications for automated invoice payments. Building on this, Ernst & Young (EY) became the first consulting firm to accept Bitcoin services in 2017, expanding its offerings to facilitate commercial use of BT technology. In the same year, KPMG collaborated with Microsoft to foster joint efforts that integrate Blockchain Technology into the fabric of their operations. On the other hand, PwC introduced digital asset services leveraging Blockchain Technology in 2017 and has set a goal to integrate Blockchain Technology into direct production systems by 2025. These developments have been discussed by various sources.

4.3 Difficulties of Incorporating Artificial Intelligence in Auditing

- The significant cost involved in ensuring auditors' adherence to AI systems and keeping them up-to-date with the latest advancements in AI utilization for auditing purposes.

According to [38], the application of artificial intelligence (AI) in the auditing process presents significant challenges, primarily due to the high implementation costs and the need to train internal auditors in AI. Additionally, there is a requirement for continuous updating of AI systems to keep up with the latest developments, which incurs additional expenses for companies. This situation poses a considerable challenge for organizations with limited financial resources. Likewise, [6] asserts that auditors must possess a fundamental understanding of AI, enabling them to identify both the risks and opportunities associated with its implementation. They should be prepared to redefine their roles and adapt to the automation of various auditing procedures. This adjustment necessitates a comprehensive training program for auditors, which adds to the financial burden faced by organizations.

4.4 Difficulties of Adopting Blockchain Technology for Auditing

- The integration of blockchain technology in auditing programs poses the problem of encountering security vulnerabilities, susceptibility to attacks, and the presence of racial biases.

According to [49], the utilization of blockchain technology in internal audits is hindered by data security challenges, current issues, and legal barriers. One of the main challenges faced by audit firms in adopting blockchain is the absence of a centralized authority to report cyberattacks. Additionally, reaching consensus rules among all participants proves to be difficult when acting as an organizational agent.

An example highlighting the significance of a secure environment for blockchain utilization is the Ethereum theft incident that occurred on June 17, 2016. During this incident, an unidentified hacker successfully stole approximately \$50 million worth of Ethereum. The breach was attributed to a vulnerability within the software used to manage Ethereum wallets. This event underscores the crucial role that a secure security environment plays in the successful implementation of blockchain technology [37].

5 Conclusion

According to Table 1, a qualitative review of the literature revealed numerous themes encompassing both the Advantages and Difficulties associated with the utilization of Artificial Intelligence (AI) and Blockchain Technology (BT) in the auditing procedures. Drawing from previous literature reviews and the analysis conducted in this paper, it is evident that AI and BT utilization in auditing holds significant potential across various applications. This field not only extends its reach to accounting and

Table 1 Research synopsis

Advantages utilization of AI & BT in audit procedures	Difficulties utilization of AI & BT in Audit procedures
<ol style="list-style-type: none"> 1. Enhancing fraud prevention while simultaneously improving adherence to global compliance standards 2. Accelerating audit procedures to optimize time and resource utilization, while elevating audit quality, mitigating human error, ensuring information reliability and relevance, and fostering advancements in traditional auditing practices 3. Minimizing human involvement in the auditing and accounting profession through the integration of technology enables accountants and auditors to achieve cost savings, eliminate time delays, and significantly mitigate the risk of human error 4. Enhancing the efficiency of auditing and accounting processes in data recording, settlement, and review activities 	<ol style="list-style-type: none"> 1. The significant expense associated with implementing artificial intelligence in the auditing procedures, alongside the challenge of ensuring auditors stay abreast of the latest advancements in AI utilization for audits 2. The integration of blockchain technology in auditing introduces potential security vulnerabilities, risks, and susceptibility to attacks. Additionally, there is a concern regarding the presence of racial biases within the utilization of blockchain programs for auditing purposes

auditing but also requires a multidisciplinary approach, integrating financial, technological, adjudicative, and investigative knowledge. Consequently, the integration of AI and BT in auditing procedures augments the value of the services auditors can offer to enterprises, ultimately enhancing their overall impact and contribution to the field.

The utilization of AI and BT in the auditing procedures opens up numerous opportunities for stakeholders. Clients and experts can leverage these advancements to provide specialized services that combat fraud and enhance the credibility of the auditing profession. Meanwhile, students and educationalists have the chance to expand their knowledge and understanding of auditing and accounting by incorporating AI and BT concepts into their learning. By embracing these opportunities, stakeholders can thrive in an evolving industry and contribute to the advancement of auditing practices.

future research in utilization AI and BT in the auditing procedures should focus on maintaining a high standard of auditors by implementing stringent entry controls, improving the quality of educational programs to align with practical requirements, and increasing public recognition through workshops that enhance awareness of fraud and highlight the role of AI and BT in auditing in mitigating fraud risks.

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Big Data Analytics and Its Impact on Corporate Sustainability Disclosure in the Digital Era



Nahla Ibrahim and Abeer M. M. Abdelhalim

Abstract The study aimed to investigate the impact of big data analysis on the corporates' sustainability disclosure. It is applied to a selected sample of listed companies in the Saudi stock market; a quantitative approach was used through a survey distributed to a number of (500) accountants and financial managers in the selected companies and the number of valid returned responses was (350). Findings revealed that big data analytics significantly influenced and improved corporate sustainability disclosure, except for the fourth hypothesis, which examines the effect of the barriers to using big data properly on corporate sustainability disclosure development. The current study contributes to literature dedicated to examining big data analytics and its impact on corporate sustainability disclosure and can be applied as a reference in emerging economics.

Keywords Big data analytics · Corporate sustainability disclosure · Digital era

1 Introduction

The accelerated technological development and its various applications change many business models, as they can provide new digital solutions that enabled companies to maintain and develop customer relationships more efficiently, which is considered a competitive advantage that can generate added value, information technology plays

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a crucial role in the era of industry 4.0 on the business performance [1], digital transformation refers to the development and the use of new technologies in the fourth industrial revolution such as big data analytics to achieve breakthroughs in business models and performance [2].

Industry 4.0 applications produce unlimited volume and timely data, scientific evidence does not provide a way of controlling or slowing down this abundant production of data, on the contrary, it is evidenced that the data will increase by leaps and bounds over time [3], and this forced information practitioners to constantly search for new solutions for storing, processing and analyzing the data and take full advantage of the desired value, and even the potential value that is not taken into account from this data [4].

The issue of sustainability in companies has attracted the attention of many researchers, for all its three pillars (environmental, social, or economic), especially from the accounting point of view, and sustainable accounting has an important role in achieving the integration of sustainable business systems, to prepare sustainability reports that show the environmental, social and economic performance of the company [5], and from the traditional accounting had to take into account the effects of sustainability at the company level, by extracting, analyzing and using environmental and social information of monetary value to improve the environmental, social and economic performance of the company, based on which decisions are taken [6]. The accounting profession is limited to the scope of shareholders' interests and preserving them only, but rather goes beyond the matter to extend to identifying and measuring the environmental and social impact of activity and taking it into account [7], and thus accounting added to its goals a new dimension that is the social and environmental dimension along with its economic dimension [8].

Recently, corporate sustainability reports have become more demanding, and companies seek to respond to stakeholder expectations concerning financial and non-financial metrics. The global interest in these reports and their disclosure has created opportunities and challenges for accountants, by expanding their responsibilities towards governance, risk management, strategic management, and sustainable development, and this requires developing the skills of accountants to prepare and disclose sustainability reports.

The increase in the volume and diversity of data in the current business environment has led to many companies benefiting from this data and analyzing it. For example, the majority of companies do not benefit from the data of their customers' transactions, but if customer data is analyzed and processed, these customers can be evaluated and relationships with customers can be developed to achieve a competitive advantage [9], identifying the most important data for the business and directing future decisions, understanding customers' needs and preferences, increasing sales, enhancing efficiency, improving operations and customer services, in addition to improving risk management and improving profitability [10].

Where companies that adopt big data applications face a major challenge of how to control it, as storing, managing, and optimally utilizing this data is a real problem [11], and big data, in contrast, also provides a competitive advantage if it is efficiently used and analyzed, as it provides a deeper understanding of the variables in the corporate

context, and this helps officials to make correct and accurate decisions which means a greater opportunity to achieve competitive success in the overall performance [12].

The most important recent changes and developments in the local and international arena are increasing interest in the issue of achieving sustainability as one of the main pillars for achieving development [13]. In this context, awareness and investment thinking among individuals and institutions have changed, and the dimension of sustainability has become one of the main determinants of investment decisions [14]. As investors are no longer interested in evaluating the financial performance of the company only, but rather in achieving a high level of financial performance while maintaining good levels of environmental, social, economic, and governance performance [15].

From the foregoing, it is clear that the level of disclosure of sustainability reports in Saudi companies has not yet reached what it has reached in developed countries, and the failure of companies to disclose these reports has led to giving the impression that companies do not play their role in social responsibility, so there is increasing pressure on these companies. The need to expand disclosure and provide information on environmental, economic, social, and governance performance and not be limited to the disclosure of financial performance required by the mandatory disclosure framework, with reports on its impact on society and how to manage this impact.

Hence, attempts to use big data analytics beneficially have become a common concern of corporates, however, they face the challenge of the unprecedented level of semi-structured and unstructured big data [16, 50–53], which they have to use and manage to be innovative, effective, and competitive. Accordingly, the current study raises the following question: **What is the impact of big data analysis on corporate sustainability disclosure in the digital era?**

2 Literature Review and Hypotheses Development

2.1 *Big Data*

Big data is one of the newest digital applications that become a trend regarding the massive flow of data [17], and the importance of big data lies in discovering opportunities to reduce costs, improve risk management, and enhance business efficiency. It is considered a store of value when it is transformed into information to develop the economy [18, 57], saving a lot of time and money in the case of companies applying data management practices that take into account the requirements of downloading huge data, improving the quality of accounting information, providing a highly competitive advantage for organizations, supporting integrated reports more effectively, rationalizing decisions, and helping companies to reach To results to find realistic solutions to develop them [19, 20, 58].

Big data is considered a technological application capable of revolutionizing the way companies operate [21], therefore this will certainly affect accounting science as

it is a social science that is highly vulnerable to any changes in the surrounding environment [22], and therefore the accountant must anticipate these changes that result from technological development, which necessitates new standards and methods for data collection and analysis [23, 35].

There is extensive interest in the literature on big data and its impact on accounting practices, however, we argue that the goal of accounting remains the same as providing information to decision-makers, and accountants have used tools to record this data, whatever its source [24, 41], although the use of big data poses new challenges. For the profession, accountants are used to making changes related to the types of information provided [25, 26], where the importance of this data lies not in its size as much as in what we can do with it, and big data can be used in the following areas: Financial and accounting services, tax services, banking services, industry [24–28, 59].

On a business scale, there are many challenges faced by organizations regarding the ever-increasing volume of big data, the massive and rapid growth in the amount of data, random search and retrieval within the big data, data diversity, and availability of practitioners and analysts specialized in big data analytics to extract information that suits the organization's needs and have good capabilities and flexibility in use and development [29, 30].

2.2 Corporate Sustainability Disclosure

The importance of disclosure on sustainable development lies in the increasing demand of companies to be more disclosed not only their financial performance through their financial reports, but also their performance in the main social, ethical, and environmental issues [31], as stakeholders often seek information other than that required by the mandatory disclosure framework, to include information on the company's environmental and social performance [32, 43, 54–56].

The methods of disclosure about corporate sustainability, and therefore about the sustainable development of companies, are represented in one of the following two methods: The first method (merger method): by merging traditional economic information with social and environmental information in the main financial statements, and the disclosure method takes one of the following two forms (the list of economic and social operations The social and economic income statement, the second method (separation method): where the social and environmental performance is disclosed in separate reports on the financial statements and their appendices, and these reports take the following forms: Descriptive reports The costs and benefits of social responsibility are disclosed in a descriptive manner without analyzing these costs or Benefits, reports that disclose the costs of social responsibility without disclosing the benefits of social responsibility, reports that disclose the costs and benefits of social responsibility in a quantitative manner, and this is the best type of disclosure in separate reports on the financial statements [33, 52, 66].

The importance of accounting disclosure about the sustainability of companies stems from the fact that it stems from the principle that people are the center of its attention, as it responds to the needs of the current generation without compromising the needs of future generations. A more balanced and just future, which helps in analyzing the economic, political, social, and administrative conditions with a comprehensive vision, that encourages the unification of efforts between the government and private sectors around goals and programs that contribute to meeting the needs of all groups of society, present and future [34, 35].

The beneficiaries of the sustainable development disclosure reports are as follows: Investors: Despite the importance of financial reports for investors in decision-making, they believe that reports should go beyond financial information to include information on the environmental and social performance of the company. Workers: by providing them with important information about services and social sustainability reports, customers and consumers: by providing information to customers about the environmental safety of the product, lenders: the company provides them with their financial and non-financial information needs, government agencies: where they need information about the extent of their contribution to preserving the environment and preventing pollution [36–38, 63–65].

As a result of recent developments in the business environment, the scope of accounting disclosure has expanded to include areas that represent a departure from generally accepted accounting principles, including the following: Money, and improving relations with stakeholders, and the costs are represented in the costs of collecting, operating, reviewing, and disseminating this information, and the costs arising from competitive disadvantages. Secondly, financial reports related to the value of the company: It is represented in the information important to the activity that increases the value of the company, such as human capital, relations with Customers, innovations, research and development, company reputation, and future information on management predictions of basic trends on performance measures and their impact on business [39, 40], in addition to the disclosure of information on the social and environmental responsibility of the company [41, 60–62].

3 Hypotheses Formulation

Among the studies that dealt with big data: is a study [42], whose results indicated that the strategic use of data analytics is expected to contribute to the current dynamic market environment for both researchers and practitioners involved in adopting big data in developing countries, and a study [43], the results of which indicated that accounting information systems are not only supplied with historical information from the various economic transactions carried out by the company.

This goes in line with the results of the study [11] and the study [29], which indicated the importance of investing in big data applications to support the decision-maker and the study [44], whose results indicated that there is no Sufficient knowledge of the importance of big data and how to use it by middle and senior management.

According to [45], the results of which indicated that big data is classified into six axes: risk, security, data visualization, predictive analytics, data management, and data quality, and the study [46] and the study [12], emphasized that the environment of big data is expected to affect accounting by achieving possession of that data, dealing with variable and conflicting data, including it in accounting disclosure, the ability to formulate, store and analyze new performance measures, and the ability to use Such data helps in making predictions, increasing the transparency of financial reports, and increasing the ability of financial analysts to extract, analyze and process such data to help investors obtain accurate information and enhance the follow-up of investment performance.

Concerning sustainability disclosure, many studies [46, 48, 60–65] provided proof of the problem of the study and the scarcity of studies on accounting disclosure on the behaviour of shareholders, especially in the Kingdom of Saudi Arabia, and the study [47–51], indicated that the main reason that drives Social companies to the application of social accounting is to improve reputation, another studies [48, 66] indicated the formation of sustainability accounting development trends, future growth, the importance and nature of sustainability accounting in business, and the study [32], confirmed that banks are moving at an average Slowness in adopting sustainability reporting practices, and that sustainability issues are among the highest priorities of banks, which are directly related to their work. There are differences in the level of disclosure of environmental and social indicators between public and private sector banks.

This is indicated by the study [49] that the level of quality of disclosure of international relations is more important when companies tend to show a higher value relationship with summary accounting information, and the study [50], which indicated that the attitude of stakeholders The use of sustainability information in evaluating the performance of companies is a major reason for increasing the levels of disclosure about sustainability, another study [14, 52] indicated that increasing the level of transparency and disclosure of environmental, social and governance performance positively affects the value of the company, and it also indicated that Increasing disclosure and transparency about sustainability reduces information asymmetry between different stakeholders and reduces agency costs.

It also dealt with a study [51], which emphasized that the voluntary disclosure of sustainability provides information about the sustainable performance of the company with the necessity of disclosing sustainability to strengthen the company's reputation, achieve continuous improvements, and create financial values for the company, and a study [52], which emphasized the importance of corporate sustainability With the need to use scientific models to measure and analyze environmental data, and a study [40, 53–55], which confirmed that this correlation is driven by higher expected growth rates in the cash flows of these companies, which is reflected in the increase in profitability.

After reviewing previous studies and their results, the importance of using big data was demonstrated because of the many benefits that it brings to companies, which could maintain their superiority and competitive position. Most studies also agreed on the importance of adopting new or smart technologies. As it has also been

shown that big data has received a lot of attention from scholars and researchers, due to its advantages and benefits as it helps companies to achieve their objectives and enhance overall performance, the current study tries to investigate the impact of big data on the corporate sustainability disclosure in the digital era, and based on the above discussion, the study hypotheses can be derived as follows.

H1: The infrastructure needed for big data application affects corporate sustainability disclosure improvement.

H2: The role of big data in improving performance affects corporate sustainability disclosure development.

H3: The requirements for applying the use of big data affect corporate sustainability disclosure improvement.

H4: The challenges faced by companies regarding the use of big data affect corporate sustainability disclosure improvement.

H5: the practices of overcoming challenges of big data usage affect corporate sustainability disclosure improvement.

4 Research Methodology

The current study uses the analytical descriptive (quantitative) approach, as it is the appropriate approach for the study, as through it we can describe, analyze and interpret phenomena to reach reliable results in decision-making. This approach also depends on collecting data through questionnaires distributed to the study sample individuals, to test hypotheses and answer the study questions that were developed based on the literature of big data and corporate sustainability disclosure that have been reviewed and analyzed. Accordingly, a study model is built to measure the impact of big data in improving the level of corporate sustainability disclosure in the digital era in listed companies in the Saudi Stock Exchange.

4.1 Research Population and Sample

The study population consists of the listed companies on the Saudi Stock Exchange, which numbered (197) companies categorized into (14) sectors. A sample of (50) companies is chosen, taking into account that the following conditions are met in the selected companies.

- That its annual reports be available.
- Provide accurate and published financial statements throughout the study period.
- To be listed for trading in the Saudi Stock Exchange throughout the study period.

Table 1 Study population and sample and response rate

No	Description
1970	Research population
500	Excluded from the samples
500	Questionnaires sent
388	Questionnaires received
38	Unusable response (incomplete questionnaires)
350	Total useable responses
70%	Response rate

The questionnaires were also distributed to (500) employees of the companies listed on the Saudi Stock Exchange, which were chosen as a sample for the study, as the number of valid questionnaires reached (350), and Table 1 shows that.

4.2 Description of the Study Variables and Measurement

4.2.1 Independent Variables (Big Data)

Big data is the independent variable in the study, which can be measured through an indicator consisting of (5) elements, namely (the infrastructure supporting the application of big data, the role of big data in improving performance, the requirements for applying the use of big data, the challenges facing companies in the use of big data, proposals Overcoming challenges in the use of big data), where this variable is measured by giving (0) a zero score if the company does not have one of the indicators, and giving (1) one if the company has one of the indicators to some extent, and giving (2) Two degrees if the company has one of the indicators, then the indicators are collected and divided by their number to represent the degree of availability of each element of the company's big data.

4.2.2 Dependent Variable (Corporate Sustainability Disclosure)

The accounting disclosure of the sustainability of companies is considered the variable of the study, which can be measured through an indicator consisting of (3) elements, namely (accounting disclosure of environmental standards, accounting disclosure of social standards, and accounting disclosure of economic standards), where this variable is measured by giving (0) zero Score if the company does not have one of the indicators, give (1) one score if the company has one of the indicators to some extent, and give (2) two if the company has one of the indicators, then the indicators are collected and divided by their number to represent the degree The availability of each element, then collecting all the elements and dividing them by

their number to represent the degree of availability of sustainable development in the company.

4.2.3 Control Variables

In this study, several variables were used to isolate the relationship between the independent variable (big data) and the dependent variables (Corporate sustainability disclosure) as follows.

- Size of the company (SIZE): The size of the company will have an impact on the data dealt with within the company, as the larger the size of the company, the greater the volume of data used.
- Age of the company (AGE): The era of the company will have an impact on the accounting disclosure of the sustainability of companies, as the longer the era of the company, the greater the sustainability of the company.
- Sector type (INDUS): The type of sector may affect the volume of data and corporate sustainability disclosure. There are sectors whose nature necessitates the existence of a large volume of data or directly affects the level of corporate sustainability disclosure or the nature of its services that enjoy providing sustainable development to society.

4.2.4 The Study Model

In light of the aim of the study, describing its variables and testing its hypotheses, we were able to come up with an applied model to verify the hypotheses of the study and to identify the role of the independent variable on the dependent variable in light of the isolation of the control variables, as in Fig. 1, as follows:

The data was analyzed using Partial Least Squares Structural Equations Modeling (PLS-SEM), to construct the study variables model. The suitability of the model for the data collected through a set of indicators called conformity quality indicators, which is used to ensure the suitability of the model with the data of the sample used, as well as the impact of the independent variable on the dependent variable. The study is an exploratory study to show the impact of big data (BD) on corporate sustainability disclosure (CSD), To analyze the data statistically and test hypotheses, it is necessary to verify the validity of the data for statistical analysis through the use of several tests, including (confirmative factor analysis (CFA), Model-Data Fit Indication, Discriminant Validity, Convergent Validity, Path Analysis).

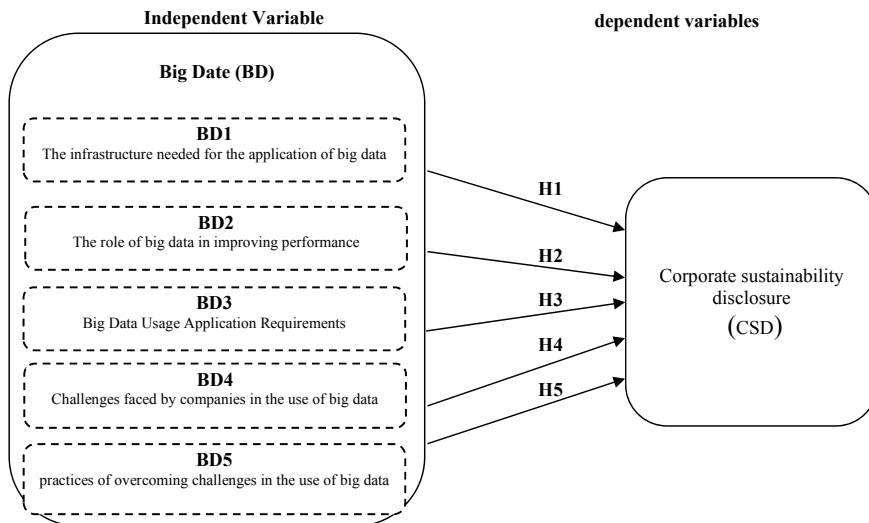


Fig. 1 The study model

5 Results and Interpretation

5.1 Assessment of the Measurement Model

Tables 2 and 3 the first step in Partial Least Squares Structural Equation Modeling (PLS-SEM) involves evaluating the standard model, which is related to examining the validity and reliability of the questionnaires as follows.

To make sure that the element used to represent the factor is actually representative of it, the confirmatory factor analysis (CFA) was also used by calculating the confirmation ratio to represent the available factors in the theoretical framework affected by the predicted factors as influential factors, and it was shown from the results of the confirmatory factor analysis of the sub-constructions of the data questionnaire The large scale (BD) and the Corporate sustainability disclosure (CSD) showed that

Table 2 Relevant indicators of the measurement model

AVE > 0.500	Composite reliability > 0.700	Cronbach’s alpha > 0.700	Construct
0.674	0.854	0.823	BD1
0.580	0.858	0.832	BD2
0.682	0.865	0.829	BD3
0.630	0.867	0.853	BD4
0.628	0.844	0.894	BD5
0.631	0.898	0.871	CSD

Table 3 Square root of the AVEs (Correlation among constructs)

CSD	BD5	BD4	BD3	BD2	BD1	Construct
					0.771	BD1
				0.792	0.702	BD2
			0.873	0.583	0.571	BD3
		0.791	0.482	0.744	0.559	BD4
	0.842	0.532	0.525	0.612	0.693	BD5
0.820	0.701	0.502	0.501	0.589	0.627	CSD

all standard saturation coefficients ranged between (0.729–0.891), which indicates the quality of the saturation coefficients for the questionnaires under study.

To ensure the conformance quality indicators of the measurement model (Model-Data Fit Indication), which are related to the extent to which the theoretical model matches the field data, as all the conformance quality indicators of the measurement model were greater than the required standards, which indicates the quality of the measurement model and its conformity with field data. And that the expressions measure what they were prepared for, and that the measurement structure is appropriate to what we assumed and will lead to acceptable results.

To evaluate discriminant validity and convergent validity, there are two common methods in research. The first method is that the correlation between the sub-constructs of the questionnaire should not be high, as all correlations between the sub-constructs of the measurement model ranged between (0.52–0.76), and this indicates that the correlation between the sub-constructs of the questionnaire is not complete, but it is at an acceptable level. The second method is through the Fornell-Larcker criterion, where the square root of the values of the explained coefficients of variance (AVE) is compared with the matrix of correlations between the underlying variables, and the square root (AVE) of each construct must be It is higher than any correlation with another construct, and it has been shown through the variables correlation matrix that the square root values of the extracted average variance (AVE) are greater than the correlation coefficients between the sub-constructs of the model, which indicates the validity of differentiation for all constructs of the measurement model.

5.2 Assessment of the Structural Model

It appears from Table 4 that the study benefited from the ratio of variance to evaluate the internal structure of the structural model, through the coefficient of determination (R²), where the value of the determination coefficient (R²) was 0.561 for the corporate sustainability disclosure (CSD), as this result showed that the changes that occurred were able to explain (56.1%) of the incident variance, which reflects a mediated level of predictive power. Another test that was performed on the structural model was the predictive relevance of the model using Stone-Geiser’s Q² (iteration

Table 4 Results of the hypothesis testing of the relationship

Decision	P-value	T-value	Path coefficient	Relationship	Hyp. no
Supported	0.030	2.784	0.191	BD1 CSD	H1
Supported	0.000	5.666	0.588	BD2 CSD	H2
Supported	0.000	6.871	0.485	BD3 CSD	H3
Unsupported	0.043	-2.702	-0.612	BD4 CSD	H4
Supported	0.000	4.985	0.387	BD5 CSD	H5

across cross-validation). The Q2 value of the CSD was greater than (0), which means that the model was satisfactorily fit.

Regarding the infrastructure supporting the application of big data (H1), it has a significant positive impact on the corporate sustainability disclosure (CSD) as ($\beta = 0.191$) while ($t = 2.784, p < 0.05$), thus the first hypothesis (H1) is fulfilled).

As for the role of big data in improving performance (H2), it has a significant positive impact on the corporate sustainability disclosure (CSD), as ($\beta = 0.588$) while ($t = 5.666, p < 0.01$), and thus the second hypothesis (H2) is fulfilled).

Likewise, for the requirements of applying the use of big data (H3), it has a significant positive impact on the corporate sustainability disclosure (CSD), as ($\beta = 0.485$) while ($t = 6.871, p < 0.01$), and thus the third hypothesis (H3) is fulfilled.

In addition, regarding the challenges that companies face in using big data (BD4), it has an insignificant impact on the corporate sustainability disclosure (CSD) as ($\beta = -0.612$) while ($t = -2.702, p < 0.05$), and thus is achieved the fourth hypothesis (H4).

Finally, for the practices to overcome the challenges or barriers in big data usage (BD5), it has a significant positive impact on the corporate sustainability disclosure (CSD) as ($\beta = 0.387$) while ($t = 4.985, p < 0.01$), and thus the fifth hypothesis is fulfilled (H5).

6 Discussion and Conclusion

The current study reached several results, the most important of which are:

- The coefficient of determination of the model (R2) was (0.561), which means that (56.1%) of the change that occurs to the dependent variable (Corporate sustainability disclosure CSD) is a result of the change that occurs in the indicators of the independent variable (Big Data BD) in companies listed on the stock market Saudi.
- Providing the infrastructure that supports the application of big data (H1) that works to improve the corporate sustainability disclosure (CSD) in the Saudi Stock Exchange.

- Activating the role of big data in improving performance (H2) works to improve the corporate sustainability disclosure (CSD) in the Saudi stock market.
- Providing requirements for applying the use of big data (H3) that works to improve the corporate sustainability disclosure (CSD) in the Saudi Stock Exchange.
- Reducing the challenges faced by companies in the use of big data (H4) working to improve the corporate sustainability disclosure (CSD) in the Saudi stock market.
- Implementation of proposals to overcome the challenges in the use of big data (H5) working to improve the corporate sustainability disclosure (CSD) in the Saudi stock market.

7 Recommendations

In light of the results of the theoretical study and the results of the applied study, we can suggest the following recommendations.

- Urging officials to use big data technology in the companies listed on the Saudi Stock Exchange because of its many benefits in developing these companies.
- The need to pay attention to all indicators and requirements that can contribute to improving the corporate sustainability disclosure (CSD) in companies listed on the Saudi Stock Exchange because of their national and international economic returns.
- Ensure to follow the implementation of accounting disclosure standards for corporate sustainability (CSD) in companies listed on the Saudi Stock Exchange, to ensure that an appropriate degree of competitiveness is achieved in those companies.
- Emphasizing the use of the applied model proposed by the study because of its applied importance, which reflects positively on the sustainability, competitiveness, and profitability of the companies listed on the Saudi Stock Exchange.
- Preparing, qualifying, and refining the employees of the companies listed on the Saudi Stock Exchange on how to practice the indicators of big data management to ensure achieving a high level of corporate sustainability disclosure (CSD), which is reflected in the achievement of sustainable development.
- Conducting more other studies to study the role of big data (BD) on various other variables, as well as to study the relationship of corporate sustainability disclosure (CSD) with various other variables.

8 Future Research Avenues

There are still research gaps that need to be filled regarding the impacts of big data applications, such as the challenges facing the application of big data and the impact of applying big data on profitability in different economic sectors, different application environments, and different research approaches.

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Fraud Auditing and Forensic Accounting a Review Paper



Sarah Aqeel Abdul-Aziz Khalil Ebrahim and Abdalmuttaleb Al-Sartawi 

Abstract Forensic accounting is considered one of the most important professions in the current era, as it contributes to detecting and limiting financial manipulations. The importance of forensic accounting increases with technological development, as the methods of fraud witness a different nature that requires high technical skills from the forensic accountant and the auditor. It is worth mentioning that forensic accounting cannot be viewed in isolation from the auditing profession, but the auditing profession is linked to the technical opinion of the auditor within the limits permitted by accounting standards, and auditing standards compared to forensic accounting that is not limited with the scope of the accounting standards and auditing standards. The current paper sheds light on the most important differences between forensic accounting and auditing and sheds light on previous studies in the field of forensic accounting from a theoretical point of view.

Keywords Fraud · Auditing · Forensic accounting · Fraud detecting · Accounting profession

1 Introduction

Accounting at the present time is very important for companies especially large companies that need accounting and financial auditing of accounting operations, as accounting is the recording of financial operations and economic events according to a specific system. Accounting is concerned with the business activities of companies [1, 5]. If we look at one aspect, we find that accounting is of great importance when detecting “audit fraud” [2].

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Auditing is as important as accounting. The importance of audit lies in examining the books and records of the company for the data they contain, within the framework of certain accounting principles [3–7, 21]. The economic development in the labor market has led to the spread of auditing in a large and wide manner, which made auditing witness an increasing demand, whether it is internal auditing such as: owners and shareholders, or external auditing such as: banks and tax management [4, 8–11].

This leads us to the conclusion that the larger the organization, the greater our need for auditing, and this is because employees in companies resort to fraud and embezzlement [12, 22, 34]. And the internal auditor may hide some accounting errors that companies make by changing some data and numbers in the financial statements to make the company more profitable, and this is very dangerous, because that may lead to a great loss for business owners, and from here begins the role of forensic accounting, where Forensic accounting plays an important role in detecting any fraud by the auditor by hiding any illegal mistakes of the company [13–15, 23, 25].

2 Literature Review

Forensic accounting has an explanation that shows the reasons for selecting certain types of arguments to detect fraud and fraud in financial and non-financial reports [24]. These reasons and methods depend on the accounting and non-accounting decisions, which the auditor considers [16–19, 27–30]. This interpretation is the most useful in discussions and debates. It is useful for academics and is also useful in the problem-solving process for preparing global financial reports [18, 43, 46].

This theory is discussed in a group of hypotheses for criminal investigation. Does forensic accounting meet social standards as a profession? This is according to the Australian community [11, 19, 26, 44]. Through these three: design, methodology, and approaches, analytical studies of these social criteria for the forensic accounting profession were developed, as interviews with elite forensic accountants were used [20, 36, 59].

Forensic accounting has been recognized in Australia as a profession, as this profession is independent and mandatory to be recognized [5, 9, 21, 22]. Considered to have a significant impact on the professional reality. Many social contributions through solving social problems and providing the necessary knowledge for their roles while carrying out their work. Recently, due to the large number of scams, this has received attention from the media, and that is how to solve this problem [23–26, 35, 39].

Fraud is one of the most important reasons that lead to the increase in financial crises in the public and private sectors. It is certain that fraud has negative economic consequences all over the world. Understanding fraud, the nature of it and the people who carry it out is one of the most important reasons to prevent the spread of fraud at all levels. The responsibilities of auditors and accountants are clear these days

[37, 38]. Recently awareness about accounting, auditing, and technology is become essential to solve problems and conflicts on the level of personal and practical life [27, 28, 47, 52]. People's need for this knowledge led to the emergence of forensic accounting and scrutiny of errors in mathematical operations [29, 53].

This is what led to revealing the relationship between forensic accounting, fraud auditing and criminal accounting. Nowadays lawyers, police, companies, banks, and government representatives are interested in forensic accounting to overcome fraud risk [30–33, 59].

3 Accounting and Forensic Accounting

The difference between forensic accounting and regular accounting is that the former detects fraud by checking accounts and knowing the gaps. Knowledge of the science of auditing leads to benefits for forensic accounting [39–42]. Conversely, knowing the technical aspects of accounting has a positive impact on auditing. There are three main activities of forensic accounting: administrative support, legal support, and expert testimony [34, 43].

It is possible to take advantage of the methods of auditors that they apply to detect fraud methods, and in most developed countries there are those who provide services in the field of forensic accounting and auditing. And in other countries, the authorities may take a special arrangement for this field according to regulations related to criminal accountability within a legal framework [45].

Depending on the previous discussion and after analyzing the previous literature we can categorize the previous studies depending on the main objectives of each study as follow:

4 Defining a Forensic Audit

References [24, 48, 53, 54] defining forensic auditing, as disclosures about operations Fraud and new financial scandals became rife in newspapers and magazines. As a result, the traditional methods of monitoring the financial activities of companies engaged in the accounting profession. At the same time, there is recognition of generally accepted accounting principles. The International Accounting Standards Board and standards recognized in the United States will change practices used to combat corporate wrongdoing that investigators must adapt to the study reached several conclusions. Depending on that the work of forensic audit is important to provide Stakeholders with assurances about the economic risks faced by the company.

5 The Role of Forensic Accountants in Fraud Investigations-Importance of Attorneys and Judges Perceptions

References [15, 31, 36, 52] clarify the importance of qualifying and training the forensic accountant considering the escalation. The study also discussed the importance of understanding the evidence provided by the reports. Accordingly, Forensic checks must be done in specific ways to extract and classify them. The study concluded that the forensic accountant who performs criminal audit work must prepare a clear and understandable reports that are based on audit procedures and investigative skills confirmed and the reports will be used as evidence when needed.

6 Practical Issues: Fraud Detection

Few studies attempt to identify indicators of fraud. References [37, 49, 57, 58] argued that the symptoms of fraud are an indicator of the presence of fraud because there is evidence that is supported by statistics. Usually, the academic research relies on statistics, while some regulators do not rely on this theory, but rather agree that there is a relationship between symptoms of fraud and actual fraud. Moreover, there is complementary evidence that goes beyond statistics, and from this supplementary evidence: interrogations, experts, witnesses, interviews, questionnaires, and others [50, 51]. On the other side the regulators does not believe in the straight-line justification which is built on the cause-and-effect consumptions which means that it is not necessarily to find actual fraud when symptoms of fraud exist.

Another study by [11, 53–56] Identify weaknesses, analytical differences, lifestyles, and unusual behaviors. Some opinions indicate that statistics help to detect fraud, but it is not necessary that the symptoms of fraud mean the existence of actual fraud. References [20, 23, 46] Investigated some symptoms of fraud and did not produce evidence of fraud.

7 Conclusion

The current paper reviewed some previous studies about forensic accounting and auditing to shed light on the importance of forensic accounting in detecting fraud by auditing accounts and detecting accounting errors. The paper mentioned that there are specific methods for detecting fraud using forensic accounting, based on the accounting decisions that the auditor sees. The report concludes that with the development of technology, the chances of exposure to fraud increase, which justify the need for forensic accounting.

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FinTech Education: An Exploratory Study from the Point View of Business Students



Husain Alshraifa and Zakeya Sanad

Abstract In recent years, universities all over the world have begun to develop courses that support financial technology (FinTech) innovation in higher education institutions. When it comes to the developing region, this step is still in the preliminary stage. Therefore, this study investigates the viewpoints, levels of acceptance, and awareness of business students regarding the inclusion of FinTech learning materials in the business academic programs of higher education. A questionnaire was sent targeting undergraduate business students throughout universities in the Kingdom of Bahrain. The findings revealed that most students were not satisfied with the amount of FinTech material in their curriculum and supported including more FinTech learning material in the accounting curriculum. Furthermore, the respondents believed that adding FinTech to their curriculum would help them in their future career. However, the respondents agreed that one of the negative consequences of adopting more Fintech in the business curriculum is that students may become more dependable and less analytical. The study recommends that the FinTech learning material should be added to the business curriculum as there is a significant level of interest and acceptance among undergraduate business students. By highlighting the knowledge gaps and possible adverse consequences of adopting fintech in higher education, this study contributes to the body of literature and offers suggestions for how educators can effectively incorporate fintech into their curriculum.

Keywords Fintech · Higher education · Artificial intelligence · Business students · Bahrain

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1 Introduction

FinTech, also known as Financial Technology, is a hot topic that spans several disciplines and combines finance, technology and innovation management [1–4], FinTech is considered a contemporary approach to working with financial institutions that have significantly improved our lives and provided fresh insight into how the technological revolution is developing [14, 27, 32]. Bahrain has been gradually defining itself as a fintech hub in the Middle East and North Africa region. The Central Bank of Bahrain has supported Bahrain to attract a number of fintech startups and build a thriving ecosystem. One of the biggest and most significant efforts the government has taken to foster fintech in Bahrain is the establishment of Bahrain Fintech Bay, one of the biggest fintech hubs in the Middle East. As part of its goals to become a knowledge-based economy, Bahrain has made significant investments in technology and artificial intelligence over the past 15 years [8].

The Kingdom of Bahrain is a great illustration of how FinTech has replaced using cash, checks, sending money abroad, and most importantly, saving everyone time. Since the majority of Bahrainis now use contactless payment applications given that they are quicker, many financial institutions like the National Bank of Bahrain, ILA, and Benefit Pay are utilizing technology to provide better contactless financial transactions. The COVID-19 pandemic served as a great wake-up call to the importance of fintech in modern society. Early in March 2020, cash was still the main form of payment for most Bahrainis. That quickly changed, though, because of the pandemic, which made people more cautious and forced them to seek out alternatives such as online shopping [5–7, 24]

The use of financial technology during the COVID-19 pandemic would have an impact on the educational system as well. The need to switch from face-to-face classes to virtual ones inspired researchers to look at the implications of fintech in higher education [9, 10, 25]. Hence, this study is expected to provide a thorough overview of how well-equipped the higher education sector in Bahrain is for coping with FinTech innovation from the point of view of business students. Hence, the current study goals are as follows:

- To measure the level of FinTech awareness among undergraduate business students.
- To explore the students' acceptance in including more FinTech material in their curriculum in the future.
- To clarify the advantages and disadvantages of including FinTech learning material in the higher education business curriculum.

The study adds to the body of knowledge by elaborating on the benefits and drawbacks that FinTech presents to the business education sector. The study additionally proposes practical recommendations and policy suggestions to raise the standard of business specialization in higher education in response to the growth of FinTech. The study also advances the body of knowledge and literature on fintech and how business students perceive its effects.

2 Literature Review

We all use fintech daily, but it's crucial that we comprehend how it got started. According to Arner et al. [5], FinTech refers to solutions for finance that can be accomplished through technology. According to Leong and Sung [1], FinTech is an innovative way of interacting with financial institutions that has significantly improved our quality of life and provided fresh insight into how the technological revolution is developing. Paul and Sadath [33] divided FinTech into three stages to explain how it evolved from 1866 to the present. The first phase is known as FinTech 1.0, and it spans the years 1866–1967. Paul and Sadath [33] discovered that earlier technological developments like the steamship, telegraph, and railroads facilitated better financial connections between countries. Although FinTech is frequently regarded as a recent innovation, its roots could be found in 1866, the year that the first transatlantic cable was installed [31].

The second phase, known as FinTech 2.0, goes from 1967 to 2008. Modern automated payment systems and electronic clearing services got their start in 1968 with the UK Interbank Computer Bureau, which was followed by the US Clearing House Interbank system and Fedwire [37]. In the third phase, known as FinTech 3.0 (2008–present), researchers have acknowledged the significance of FinTech following the financial crisis and the shift in retail customers' perceptions of who is qualified to offer financial services. FinTech 3.0 was sparked by the 2008 global financial crisis, though its exact formation is unknown [5, 11–13]. In the third phase of FinTech, technology advanced quickly, and financial service providers changed. Because startups and technology companies can serve customers and businesses more effectively, this phase poses a threat to financial institutions [14, 23, 32].

Professional bodies have emphasized the necessity of integrating technological training into different business fields such as accounting to provide graduates with the skills they need. Different facets of business education have been impacted by the growing Fintech adoption. The way financial transactions are carried out is changing due to FinTech, and this change is having an impact on the business curricula in higher education.

Besides, a study investigated how FinTech was affecting higher education in Indonesia [22]. According to the study, those involved in the accounting education sector view the development of FinTech favorably and have upgraded their course offerings and teaching resources as well as arranged seminars and training sessions for both students and lecturers. According to Ojha [4], the widespread use of technology in India has had a significant impact on a variety of aspects of life, including education. Additionally, the quality of business graduates may increase with the incorporation of FinTech in higher education. Fintech can help instructors of business courses give their students a more interesting and interactive learning experience. This can improve students' comprehension of various business concepts and equip them with useful skills for the labor market today [10, 15–17].

In the GCC, research on the impact of fintech on higher education was conducted in 2020 with the goal of assessing the opportunities and educational initiatives available in universities [25–27]. According to the study, Fintech has the potential to be among the most significant technological advancements, so it is advised that all educated individuals in the GCC think about its significance. Additionally, the connections between educational institutions like schools, colleges, and universities as well as their ties to society can be transformed by blockchain technology. In addition, according to AlZoubi and Al-Dmour [17], the use of Fintech in Accounting education is an essential component of the accounting curriculum in the GCC countries. They also argued that incorporating FinTech into accounting education can give students hands-on experience with financial technology, which is essential in the current accounting profession.

The Kingdom of Bahrain has been positioning itself as a FinTech hub in the Middle East, with the Central Bank of Bahrain actively promoting fintech adoption in the country. The financial sector has been quick to adopt fintech, with accounting firms adopting various fintech tools, including cloud accounting software, robotic process automation, and blockchain technology [8, 18]. As a result, accounting education needs to adapt to the new demands of the industry to produce graduates with the necessary skills to work effectively in a fintech-driven financial landscape [34, 36, 38].

The transformation of teaching and learning methodologies in education has been greatly aided by FinTech [24, 28, 36]. Universities can now provide their students with a more individualized and interesting learning experience because of the use of Fintech tools like mobile apps and online platforms [38]. These tools make it easier to create gamified and interactive learning materials, which improves learning effectiveness and efficiency [3, 21].

Additionally, the development of decentralized financial systems made possible by blockchain technology has opened up new opportunities for financial innovation in the education sector [19, 36].

Fintech has had a significant impact on Bahraini education, but there are still some issues that need to be resolved. The lack of knowledge and comprehension of fintech among educators and students is one such issue. Some institutions may not be able to afford the significant training and investment required to integrate Fintech into the curriculum [16, 30]. Due to the rapid pace of technological change, it might also be difficult to update the curriculum to reflect the most recent developments in FinTech [17, 20]. The advanced technical skills required for the use of Fintech in business education may not be shared by all business students and educators [10, 29]. In addition, the quick pace of Fintech technological advancements necessitates ongoing infrastructure maintenance and updates, which may not be feasible for all institutions [3, 21].

Since the FinTech has affected different sectors internationally, there is a need to explore thoroughly the possible impact of FinTech in higher education from the students' point of view. Hence, this study would provide further explanation regarding the students' perception about the impact of FinTech teaching material in the higher education business curriculum. The study also measures the level of the students'

Table 1 Respondents’ demographic characteristics

Respondents’ characteristics	N = 166	%
Gender	Total = 166	
Male	104	63
Female	62	37
Age	Total = 166	
18–24	106	64
25–34	46	28
35–44	10	6
45 or older	4	2.4

awareness about FinTech. The study also clarifies the advantages and disadvantages of adopting more FinTech learning programs and material in the higher education business courses.

3 Research Methodology

3.1 Survey Instrument and Sample

The research design is based on a quantitative approach that helped the researchers describe the phenomenon under study in detail and identify its key traits. In this study, a questionnaire was used as a data collection tool, and IBM SPSS was used to analyze the data. Students majoring in business at all of the universities in the Kingdom of Bahrain are included in the study’s sample. Additionally, because undergraduate business students were the target population, convenience sampling was used to create the sample. Because of its practicality and feasibility for the research given the time and resource constraints, the convenient sampling technique was chosen. The online surveys were used to gather the data from the chosen sample. To make sure the sample size was representative of the intended target population, the response rate was also evaluated. 166 responses were received and the response rate was 44% (Table 1).

4 Findings and Discussion

Reliability analysis is important for ensuring that a scale accurately measures the construct it intends to measure. In some cases, reliability analysis, specifically Cronbach’s alpha tests, can be useful for evaluating the consistency of multiple-question Likert scale surveys that assess latent variables, which are factors that

are not directly observable in everyday life. The test help researchers to assess the reliability of the survey results and ensure that the survey is measuring what it is intended to measure [35].

Cronbach's alpha is a statistic that shows how closely related a group of test items is when taken collectively [13]. If the survey's items have a high alpha value, there may be a substantial relationship between them. Low alpha scores could be a sign that the test did not have enough questions. Incorporating more pertinent test items might raise alpha. The alpha value is between 0 and 1. The data is not acceptable if the alpha value is less than 0.5, bad if it is between 0.5 and 0.6, and doubtful if it is between 0.6 and 0.7; however, the data is acceptable and suitable for further research if the alpha value is larger than 0.7 [26].

The results of the reliability analysis by testing Cronbach's alpha are shown in the above Table 2. The results indicated that after answering a questionnaire questions, the study has an alpha value of 0.924. However, the alpha value refers to the acceptability of data as the alpha is above 0.7. Moreover, to achieve the research objectives, the descriptive statistics are presented next.

Table 3 shows the descriptive statistics for objective 1, which aims to measure the level of FinTech awareness among undergraduate business students. The table presents the minimum and maximum scores, the mean and standard deviation for two questions that measure confidence and familiarity with FinTech. The average score for both questions is 3.455, indicating a moderate level of FinTech awareness among the students. The standard deviation for both questions is high, indicating a wide range of responses from the students.

Table 4 shows the results of a survey conducted to explore the acceptance of undergraduate business students towards the inclusion of more FinTech material in their curriculum in the future.

The mean scores for all the questions indicate a positive response towards the integration of FinTech in their Accounting coursework. Students believe that the

Table 2 Reliability test—Cronbach Alpha

Cronbach's Alpha	<i>N</i> of Items
0.924	27

Table 3 Results related to objective 1: To measure the level of FinTech awareness among the undergraduate business students

Statements	<i>N</i>	Minimum	Maximum	Mean	Std. deviation
How confident are you in your understanding of what FinTech is?	166	1	5	3.46	1.234
How familiar are you with the different types of FinTech, such as blockchain, mobile payments, and robo-advisors?	166	1	5	3.45	1.296
Average				3.46	

Table 4 Results related to objective 2: To explore the students' acceptance in including more FinTech material in their curriculum in the future

Statements	<i>N</i>	Minimum	Maximum	Mean	Std. deviation
FinTech should be included more in the accounting curriculum in the future	166	1	5	3.98	1.131
I believe that including more FinTech material in the accounting curriculum will enhance my knowledge and understanding of the accounting industry	166	1	5	3.96	1.089
I am comfortable with incorporating FinTech tools and software in my accounting coursework	166	1	5	3.98	1.044
I will use FinTech tools and software in my future accounting profession	166	1	5	3.96	1.141
I believe that knowledge and understanding of FinTech will be beneficial for my future career prospects	166	1	5	4.04	1.047
The inclusion of FinTech in the Accounting curriculum will enhance the overall quality of the education provided by your institution?	166	1	5	4.02	1.056
The inclusion of FinTech in the Accounting curriculum will prepare me for the future demands of the accounting industry	166	1	5	4.03	1.041
I believe that the inclusion of FinTech in the Accounting curriculum will help you stand out among your peers in the job market	166	1	5	4.02	1.081
I believe it is for higher education institutions to keep up with the changing demands of the accounting industry, including the integration of FinTech material in the curriculum	166	1	5	4.02	1.123
I believe that FinTech will play a significant role in the future of the accounting industry	166	1	5	4.16	1.009

inclusion of more FinTech material will enhance their knowledge and understanding of the accounting industry, and they are comfortable with incorporating FinTech tools and software in their coursework.

Furthermore, they believe that knowledge of FinTech will be beneficial for their future career prospects and that the inclusion of FinTech will prepare them for the future demands of the accounting industry. The students also believe that the inclusion of FinTech in the Accounting curriculum will help their institution stand out in the job market and that it is important for higher education institutions to keep up with the changing demands of the accounting industry. Overall, the results suggest that undergraduate business students are receptive to the idea of integrating FinTech material into their accounting curriculum.

Tables 5 and 6 present the results of a study conducted to clarify the advantages and disadvantages of incorporating FinTech in the Accounting curriculum. The average score for each question ranges from 2.92 to 4.09, indicating a general positive sentiment towards the benefits of including FinTech in the curriculum. Respondents strongly agree that adding FinTech will improve their job prospects, make them more competitive in the job market, and prepare them for the future demands of the accounting profession. However, there are also some concerns, with respondents agreeing that the inclusion of FinTech may lead to a decrease in the focus on fundamental accounting principles and concepts and traditional accounting skills such as bookkeeping. Additionally, some respondents believe that adding FinTech may make the curriculum more complex and difficult for some students to understand and lead to a shift in the focus of the curriculum towards technical skills.

The previous section presented general results, in this section, the results are based on the mean difference among the male and female respondents of the study sample.

Table 7 displays the findings from Objective 1, which sought to assess the amount of FinTech knowledge among undergraduate business students. Male and female participants' replies were evaluated to determine their level of confidence and knowledge with FinTech ideas. When asked if they were confident in their comprehension of what FinTech is, both male and female participants reported the same degree of confidence. Males had a mean score of 3.46, while females received a slightly lower score of 3.45. In terms of knowledge with different types of FinTech, both male

Table 5 Results related to objective 3—part A: To clarify the FinTech advantages

Statements	N	Minimum	Maximum	Mean	Std. deviation
How strongly do you agree that adding FinTech in the Accounting curriculum will enhance your understanding of accounting concepts?	166	1	5	3.95	1.091
How strongly do you agree that adding FinTech in the Accounting curriculum will improve your job prospects in the accounting profession?	166	1	5	4.09	1.026
How strongly do you agree that adding FinTech in the Accounting curriculum will make you more competitive in the job market?	166	1	5	4.03	1.081
How strongly do you agree that adding FinTech in the Accounting curriculum will prepare you for the future of the accounting profession?	166	1	5	3.96	1.125
How strongly do you agree that adding FinTech in the Accounting curriculum will improve your critical thinking and problem-solving skills?	166	1	5	3.99	1.093

Table 6 Results related to objective 3—part B: To clarify the FinTech disadvantages

Statements	<i>N</i>	Minimum	Maximum	Mean	Std. deviation
How strongly do you agree that adding FinTech in the Accounting curriculum may lead to a decrease in the focus on fundamental accounting principles and concepts?	166	1	5	2.98	1.399
How strongly do you agree that adding FinTech in the Accounting curriculum may lead to a decrease in the importance of traditional accounting skills such as bookkeeping?	166	1	5	2.92	1.386
How strongly do you agree that adding FinTech in the Accounting curriculum may lead to a reliance on technology that could make accounting students less independent and analytical?	166	1	5	3.06	1.43
How strongly do you agree that adding FinTech in the Accounting curriculum may make the curriculum more complex and difficult for some students to understand?	166	1	5	2.97	1.355
How strongly do you agree that adding FinTech in the Accounting curriculum may lead to a shift in the focus of the curriculum away from practical accounting skills towards technical skills?	166	1	5	3.02	1.39

and female participants had a comparable degree of familiarity. Males had a mean score of 3.43, while females received a slightly higher score of 3.48. The aggregate mean score of 3.46 indicates that members of both genders had a modest level of FinTech awareness. men and females had nearly comparable average scores, with men scoring 3.45 and ladies getting 3.47.

These data imply that, regardless of gender, undergraduate business students have a pretty equal degree of confidence and knowledge with FinTech principles. Although there is still space for development in their comprehension of FinTech, the results show that the participants have a moderate level of awareness.

Table 8 displays the findings from Objective 2, which sought to determine students’ approval of integrating more FinTech content in their accounting curriculum in the future. Male and female participants’ replies were studied to better understand their perspectives on the incorporation of FinTech and its possible advantages.

According to the findings, both male and female participants showed a favorable attitude regarding the inclusion of additional FinTech content in the accounting curriculum. Male participants scored 3.92 on average, suggesting a modest level of agreement. Female participants had a higher mean score of 4.19, indicating a greater willingness to include more FinTech content.

Table 7 Results related to objective 1: To measure the level of FinTech awareness among the undergraduate business students

Statements	Gender	N	Mean	Std. deviation	Std. error mean
How confident are you in your understanding of what FinTech is?	Male	104	3.46	1.277	0.125
	Female	62	3.45	1.169	0.148
How familiar are you with the different types of FinTech, such as blockchain, mobile payments, and robo-advisors?	Male	104	3.43	1.275	0.125
	Female	62	3.48	1.34	0.17
Average			3.46		
Male Average			3.45		
Female Average			3.47		

The findings indicate that both male and female students acknowledge the need of incorporating FinTech into their accounting coursework. They feel that incorporating FinTech will help them have a better grasp of the accounting sector. Participants also showed comfort with adding FinTech tools and software into their courses, demonstrating their willingness to take advantage of technology improvements in the industry.

In addition, both male and female participants believed that understanding and knowledge of FinTech will help their future employment opportunities and equip them for the needs of the accounting sector. They also thought that incorporating FinTech into the curriculum will improve overall educational quality and help students stand out in the job market.

The findings indicate an agreement among the participants, highlighting the need of higher education institutions keeping up with changing accounting industry demands by including FinTech content into the curriculum. Participants noted the major role FinTech is projected to play in the accounting industry's future.

Both male and female participants expressed an interest in integrating more FinTech subject in the accounting curriculum. They identified the potential benefits and advantages it provides in terms of knowledge growth, career opportunities, and accounting profession preparation for the future.

Table 9 summarizes the findings from Objective 3, which sought to highlight the benefits and drawbacks of incorporating FinTech into the accounting curriculum. Male and female participants' replies were evaluated to better understand their perspectives on the impact of FinTech integration.

On average, both male and female participants felt that incorporating FinTech into the accounting curriculum would have a number of benefits. The overall average of all participants was 3.54. Female participants had a higher average score of 3.70, indicating greater agreement, than male participants, who received a score of 3.38.

Table 8 Results related to objective 2: To explore the students' acceptance in including more FinTech material in their curriculum in the future

Statements	Gender	N	Mean	Std. deviation	Std. error mean
FinTech should be included more in the accounting curriculum in the future	Male	104	3.88	1.18	0.116
	Female	62	4.16	1.027	0.13
I believe that including more FinTech material in the accounting curriculum will enhance my knowledge and understanding of the accounting industry	Male	104	3.83	1.136	0.111
	Female	62	4.19	0.972	0.123
I am comfortable with incorporating FinTech tools and software in my accounting coursework	Male	104	3.91	1.034	0.101
	Female	62	4.08	1.06	0.135
I am comfortable with incorporating FinTech tools and software in my accounting coursework	Male	104	3.88	1.172	0.115
	Female	62	4.1	1.082	0.137
I believe that knowledge and understanding of FinTech will be beneficial for my future career prospects	Male	104	3.9	1.066	0.105
	Female	62	4.27	0.978	0.124
The inclusion of FinTech in the accounting curriculum will enhance the overall quality of the education provided by your institution?	Male	104	3.93	1.073	0.105
	Female	62	4.18	1.017	0.129
The inclusion of FinTech in the accounting curriculum will prepare me for the future demands of the accounting industry	Male	104	3.95	1.083	0.106
	Female	62	4.16	0.961	0.122
I believe that the inclusion of FinTech in the accounting curriculum will help you stand out among your peers in the job market	Male	104	3.88	1.185	0.116
	Female	62	4.24	0.843	0.107
I believe it is for higher education institutions to keep up with the changing demands of the accounting industry, including the integration of FinTech material in the curriculum	Male	104	3.96	1.14	0.112
	Female	62	4.13	1.094	0.139
I believe that FinTech will play a significant role in the future of the accounting industry	Male	104	4.05	1.074	0.105
	Female	62	4.34	0.867	0.11
Average			4.05		
Male Average			3.92		
Female Average			4.19		

Table 9 Results related to objective 3: To clarify the FinTech advantages and disadvantages

Statements	Gender	N	Mean	Std. deviation	Std. error mean
How strongly do you agree that adding FinTech in the accounting curriculum will enhance your understanding of accounting concepts?	Male	104	3.86	1.169	0.115
	Female	62	4.1	0.936	0.119
How strongly do you agree that adding FinTech in the accounting curriculum will improve your job prospects in the accounting profession?	Male	104	3.99	1.11	0.109
	Female	62	4.26	0.848	0.108
How strongly do you agree that adding FinTech in the accounting curriculum will make you more competitive in the job market?	Male	104	3.94	1.113	0.109
	Female	62	4.18	1.017	0.129
How strongly do you agree that adding FinTech in the accounting curriculum will prepare you for the future of the accounting profession?	Male	104	3.9	1.178	0.116
	Female	62	4.05	1.031	0.131
How strongly do you agree that adding FinTech in the accounting curriculum will improve your critical thinking and problem-solving skills?	Male	104	3.98	1.149	0.113
	Female	62	4.02	1	0.127
How strongly do you agree that adding FinTech in the accounting curriculum may lead to a decrease in the focus on fundamental accounting principles and concepts?	Male	104	2.82	1.399	0.137
	Female	62	3.26	1.366	0.174
How strongly do you agree that adding FinTech in the accounting curriculum may lead to a decrease in the importance of traditional accounting skills such as bookkeeping?	Male	104	2.69	1.337	0.131
	Female	62	3.29	1.395	0.177

(continued)

Table 9 (continued)

Statements	Gender	N	Mean	Std. deviation	Std. error mean
How strongly do you agree that adding FinTech in the accounting curriculum may lead to a reliance on technology that could make accounting students less independent and analytical?	Male	104	2.86	1.41	0.138
	Female	62	3.4	1.408	0.179
How strongly do you agree that adding FinTech in the accounting curriculum may make the curriculum more complex and difficult for some students to understand?	Male	104	2.87	1.351	0.133
	Female	62	3.15	1.353	0.172
How strongly do you agree that adding FinTech in the accounting curriculum may lead to a shift in the focus of the curriculum away from practical accounting skills towards technical skills?	Male	104	2.88	1.375	0.135
	Female	62	3.24	1.399	0.178
Average			3.54		
Male Average			3.38		
Female Average			3.70		

The potential benefits of incorporating FinTech into the accounting curriculum were highlighted by participants. They agreed that it would increase their comprehension of accounting principles, their employment prospects in the accounting profession, and their competitiveness in the labor market. Furthermore, participants stated that incorporating FinTech will better prepare them for the future of the accounting profession and improve their critical thinking and problem-solving abilities.

Participants were also aware of certain possible drawbacks. They voiced worry that incorporating FinTech into the curriculum will reduce the emphasis on core accounting principles and ideas, as well as the relevance of conventional accounting skills such as bookkeeping. Participants also noted the potential that accounting students' reliance on technology will make them less autonomous and analytical. They were also concerned that the curriculum would grow more complicated and harder for certain students to comprehend, and that there would be a shift away from practical accounting skills and toward technical abilities.

Participants recognized the benefits of incorporating FinTech into the accounting curriculum, but they also noted the possible hurdles and trade-offs that must be evaluated. These findings give important insights into male and female students' perspectives of the influence of FinTech integration in the accounting education setting.

5 Conclusion

FinTech is revolutionizing the financial industry and has become a crucial component of modern-day finance. It offers innovative solutions that enable users to conduct financial transactions in a more efficient, secure, and convenient way. The impact of this technology on accounting education is significant, as it provides students with an opportunity to learn about the latest developments in the industry and enhances their understanding of financial concepts and practices [31].

The objectives of this research were to measure the level of FinTech awareness among undergraduate accounting students, explore students' acceptance in including more FinTech material in their curriculum in the future, and clarify the advantages and disadvantages of FinTech in the Kingdom of Bahrain. To achieve these objectives, a questionnaire was sent to 166 business students through social media. The results of the study showed that there is a significant level of FinTech awareness among accounting students in Bahrain. However, there is a need for more FinTech-related material to be included in the curriculum to further enhance students' knowledge and understanding. Also, the results indicated a positive response from the participants towards including FinTech in the Accounting curriculum. In addition, the participants were not satisfied with the amount of FinTech material covered in their accounting courses, as the average score for this question is the lowest among all questions. Furthermore, the results were indicating a moderate level of confidence and familiarity among the participants regarding FinTech.

The results showed a high level of acceptance among the participants towards including more FinTech material in their accounting curriculum. Also, the participants strongly believe that knowledge and understanding of FinTech will be beneficial for their future career prospects and that the inclusion of FinTech in the Accounting curriculum will prepare them for the future demands of the accounting industry. The results showed a positive response from the participants towards the advantages of including FinTech in the Accounting curriculum. Adding to that, the participants are somewhat concerned that the inclusion of FinTech in the Accounting curriculum may lead to a decrease in the focus on fundamental accounting principles and concepts and the importance of traditional accounting skills such as bookkeeping.

This study highlighted the importance of incorporating FinTech into Accounting education. It provided a roadmap for educators and policymakers to create effective strategies that can help students better prepare for the future of finance. The research also sheds light on the advantages and disadvantages of FinTech, which can guide businesses and organizations to make informed decisions about adopting FinTech solutions.

Based on the results of the study, it is recommended that the impact of FinTech on the field of education, particularly in the accounting curriculum, continue to be investigated by researchers. It is evident from the data that there is a significant level of interest and acceptance among undergraduate business students in including more FinTech material in their coursework.

Furthermore, in the future, the best practices for integrating FinTech into the Accounting curriculum, as well as the potential challenges and limitations that may arise from this integration, could be explored by researchers. The perspectives of accounting educators and industry professionals could also be investigated to gain a more comprehensive understanding of the potential benefits and drawbacks of including FinTech in the Accounting curriculum.

It is also recommended that a research study be conducted to explore the level of knowledge and understanding of FinTech among Accounting educators. This can help to identify any knowledge gaps that may exist and provide insights on how educators can better incorporate FinTech into their teaching. By increasing the knowledge of educators, students can benefit from a more and up-to-date curriculum that prepares them for the changing landscape of the accounting industry. Lastly, as FinTech continues to evolve and expand, it is suggested that researchers regularly revisit and update their findings to ensure that their recommendations remain relevant and useful for educators and students in the field of accounting.

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Metrics-Based Exploration and Assessment of Classification and Association Rule Mining Techniques: A Comprehensive Study



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Abstract Typically, text mining techniques are essential for gleaning insightful information and knowledge from massive amounts of textual data. The effectiveness and performance of significant text mining techniques, text classification and association rule mining are proposed in this paper through a comparative accuracy using different dataset. The traditional algorithms K-nearest Neighbor KNN, Support Vector Machine SVM, and Decision Trees performance were evaluated in terms of accuracy. We evaluated the benefits and drawbacks of various methodologies and emphasize how well they may be applied to actual text mining applications. Following association rule mining, we explored association classification, which combines the two. We contrast two approaches, Classification Based on Association Rule (CBA), Multi-class Association Rule (MCAR) with traditional classification algorithms in terms of accuracy and performance. In the framework of text mining, we also investigated association rule mining methods. Moreover, we evaluated how well association rule mining algorithms identify pertinent patterns from text data. We assessed important metrics, including support, confidence, and specificity, to determine the effectiveness and importance of the identified rules.

Keywords Text mining · Text classification · Association classification · Association rule mining · Evaluation metrics

1 Introduction

Text classification, sometimes referred to as text categorization, involves categorization or labeling texts according to predetermined categories or labels based on their content [1–4]. We can assess the precision, recall, F1-score, and accuracy

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of various text categorization algorithms or techniques in many different ways include conducting comparison studies and surveys [5]. Moreover, we can contrast these methods' scalability and computing effectiveness when used on sizable text datasets.

In general, the association rule mining, as an unsupervised data mining technique, mainly used to identify interesting relationships or associations among items or attributes within a dataset [6–10]. It achieves this by looking for regular item sets, which are amalgamations of items that arise together frequently in the dataset. These frequent item sets aid as the foundation for deriving association rules, which provide insights into the probability of confident items co-occurring. Characteristically, association rule mining is applied in market basket analysis scenarios, where the objective is to reveal relationships between items frequently purchased together. Although association rule mining can be utilized with textual data, its primary focus lies in identifying patterns and associations among items rather than classifying documents into specific categories [11–14].

Table 1 shows the main important differences between AC and association rule mining, where the former involves prediction of a single class attribute, and the latter involves just description of associations between items. A fundamental distinction between AC and association rules is that overfitting prevention is essential in the former, but not in the latter since classification involves using the discovered set of rules for predicting the classes of new data objects. Overfitting often occurs when the discovered rules perform well on the training data and badly on the test data. This can be due to several reasons such as a small amount of training data objects or noise.

In this paper, we explored the effectiveness and performance of different techniques, including text classification, association classification, and association rule mining, furthermore, we briefed about how to interpret and use association rules in text mining applications.

Table 1 The differences between AC and association rules mining

Feature	Text classification	Association classification
Goal	Assign predefined labels to text documents	Discover patterns and relationships among variables
Supervised or unsupervised learning	Supervised	Unsupervised
Labeled training data	Required	Not required
Common algorithms	Naive Bayes, Support Vector Machines (SVM), and deep learning models	Apriori and FP-Growth
Applications	Sentiment analysis, spam detection, topic classification, and language identification	Market basket analysis and recommendation systems

2 Text Classification

There are a variety of Text Classification (TC) approaches used in the fields of data mining and machine learning. Decision Trees [3], Support Vector Machine [4] and Nave Bayes [5] are a few of these methods. The TC techniques in this study will be discussed in the following subsections.

2.1 *K-Nearest Neighbor*

The statistical classification method known as the K-Nearest Neighbor (KNN) [5] algorithm has been thoroughly investigated for prototype detection. When compared to other statistical methods like Bayesian-based networks, it has successfully been used to text categorization (TC) difficulties and showed promising results [11].

The KNN algorithm is a straightforward technique. Finding the K-nearest neighbors among the training documents in a particular scenario with training and testing documents allows for the determination of the test document's category by using the categories of these neighbors [15]. The weights for the categories of the nearby document are determined by the assessment ratings of each neighboring document in relation to the test document. If more than one K-nearest neighbor belongs to the same category, the weights for that category are added up, giving the test document's category a weighted probability score. A ranked list of categories for the test document is created by sorting the scores.

In traditional KNN, the value of K is predetermined. However, if K is too large, it can lead to the domination of larger classes over smaller ones. To address this issue, techniques such as adaptive KNN or instance-based learning methods can be used to dynamically adjust the value of K based on the characteristics of the data. There are other considerations and challenges in KNN, like calculating similarity and distance metrics, dealing with computational complexity, and addressing dimensionality reduction and feature selection. These aspects are important for enhancing the KNN algorithm's practical efficacy and efficiency. KNN is a straightforward but efficient method for classifying texts. It considers the categories of neighboring documents to determine the category of a test document. The choice of K and addressing various challenges play a crucial role in the performance and applicability of the KNN algorithm.

2.2 *Decision Trees*

The C4.5 algorithms [3] utilizes information gain to compute the best attribute for splitting the data. By maximizing information gain, the algorithm aims to create decision trees that effectively classify examples based on their attributes.

In studies conducted by [3] C4.5 and other text classification (TC) methods were applied to different datasets. The findings demonstrated that the C4.5 strategy gave results that were competitive with those of other techniques like K-nearest Neighbor (KNN), Support Vector Machines (SVM), and Rocchio.

In summary, the C4.5 algorithm is a popular decision tree learning method for text classification. It selects the best attribute based on information gain to construct a decision tree that effectively separates training examples according to their class labels. The algorithm has been shown to achieve competitive results when compared to other TC methods like KNN, SVM, and Rocchio.

2.3 Support Vector Machine

Vapnik developed the supervised machine learning method known as the Support Vector Machine (SVM) [15]. It is frequently employed for classification jobs and is based on the idea of structural risk minimization.

SVM develops a hyperplane in linear classification that divides the data into two sets with the greatest possible margin. The hyperplane with the largest margin makes sure that the distances between the points on either side of the hyperplane are equal. Mathematically, SVM learns the sign function $f(x) = \text{sign}(wx + b)$, where w is a weighted vector in n -dimensional space.

SVMs find the hyperplane $y = wx + b$ by separating the n -dimensional space into two half-spaces with the maximum margin. Linear SVMs can be extended to handle non-linear problems by mapping the data into a higher-dimensional space and performing the linear SVM algorithm in that space. This is done using techniques such as the kernel trick [4].

SVM has been successfully applied to text classification tasks and has shown improved accuracy compared to other machine learning techniques such as Naive Bayes, decision trees, and K-nearest Neighbors. SVMs are particularly effective for high-dimensional classification problems.

However, there are two main issues associated with SVM. Firstly, SVM is initially designed for binary classification problems. If a multiple classification problem is given, it needs to be decomposed into multiple binary classification problems using SVM. Secondly, the representation of documents as numerical vectors often leads to a sparse distribution. This means that the training examples frequently contain many zero values, and the inner products of the input vectors can be computationally intensive.

SVM is a powerful supervised machine learning technique used for classification tasks. It creates a hyperplane to separate data points and can handle non-linear problems using kernel functions. SVMs have been successfully applied to text classification and can achieve high accuracy. However, challenges include adapting SVM for multi-class classification and dealing with sparse distributions in the data representation.

3 Association Classification

Data mining's association and classification tasks are combined in association classification (AC) [15]. It includes the building of a categorization model and the generation of association rules. The AC method uses an association rule mining technique to generate rules that adhere to user-specified constraints. Pruning processes are used to limit the number of rules because a lot of them might be developed and are redundant or non-discriminatory.

The remaining rules form a model (classifier) that is used to classify new data. Each classifier may also have a defaulting rule for cases where no other rules apply. Frequent rule items, which satisfy the minimum support threshold, are identified during the association rule mining process [16]. These frequent item sets, consisting of single attribute values, are known as frequent 1-item sets.

Liu proposes one of the earliest algorithms that integrate classification with association principles [17, 18]. It comprises two basic stages: the first stage uses the Apriori algorithm [6] to find common rule items, and the second stage involves creating the classifier. According to experimental findings, this strategy generates rules that are competitive with those produced by well-liked learning techniques like decision trees.

Combining classification and association rule mining has been found to result in efficient and accurate classification systems. According to empirical research, AC can create categorization systems that are more precise than those made using more conventional methods. Additionally, AC generates IF-THEN rules that, in contrast to neural networks and probabilistic techniques, are simple for end users to comprehend and apply [8]. However, most AC algorithms have been evaluated on classic classification benchmarks, and their effectiveness and efficiency on large and complex datasets, such as text classification, are yet to be extensively studied.

In summary, AC integrates association rule mining and classification to create accurate and understandable classification systems. It has shown promise in producing competitive rules and is particularly useful for end-users who prefer comprehensible and controllable models [8, 19]. However, further research is needed to evaluate its effectiveness on large and unstructured datasets, such as text classification.

3.1 *Classification Based on Association Rule (CBA)*

The Classification Based on Association Rule (CBA) [17], can be defined as a method that utilizes association rules for classification tasks. It applies the Apriori algorithm to discover frequent rule items, which are (<attribute value>, class) pairs that exceed a minimum support threshold. These frequent rule items are then used to generate a complete set of Classification Association Rules (CARs) that form the classifier [10, 20].

The candidate generation stage in CBA involves searching for frequent 1-rule items and combining disjoint frequent 1-rule items to create candidate 2-rule items. Iteratively repeating this technique continues until no more frequent rule items can be discovered. A notable distinction is that CBA concentrates on a particular subset of association rules where the right-hand side is limited to the class attribute. CARs are the form's rules $A \rightarrow c_i$, where A is an attribute value and c_i is a possible class.

All generated CARs are ranked during the CBA's classifier development stage, and a subset of rules is then chosen to create the classifier. If a rule correctly applies to at least one training data case, it is added to the classifier, and the covered cases are subtracted from the training data. The cycle repeats until all candidate rules have been applied or all training data cases have been covered. The majority class among any cases that are still unclassified is chosen as the default class.

However, CBA has some limitations. It uses only a single minimum support threshold for rule generation, which may not be suitable for datasets with unbalanced class distribution. Additionally, A combinatorial explosion might occur as a result of the production of many classification rules. Even though such rules may be crucial for accurate categorization in some circumstances, the rule generator might not always be able to produce them.

CBA is a classification method that leverages association rules. It discovers frequent rule items using the Apriori algorithm and generates CARs to build the classifier. However, it has limitations related to the selection of a single minimum support threshold and the potential explosion of rule combinations.

3.2 Multi-Class Classification Based on Association Rule (MCAR)

To preserve rules with high certainty for prediction, the Multi-class Classification based on Association rule (MCAR) method proposed in relies on rule ranking [8]. The two primary phases of MCAR are rule production and classifier construction.

The training dataset is combed through in the rule development stage to find frequently occurring one-rule items. These rule items are combined by MCAR to produce candidate rule items with more qualities. Any rule item that has confidence and support values higher than the user-defined minimums (minconf and minsupp) is formed as a candidate rule [21].

Based on the resulting rules' performance on the training dataset, a classifier is constructed during the classifier building stage. The classifier only keeps rules that cover a specific number of training examples. Real and integer data types are also supported by MCAR. Through dataset scanning, frequent 1-rule items are identified, and their occurrences (rowIds) are indexed in a vertical format array. Additionally, indexed in an array are class labels and their frequency values. Rule items that fall short of the support requirement are eliminated.

By appending disjunct frequent item sets of size $k - 1$ and intersecting their rowIds, MCAR employs a function to locate frequent rule items of size k . The frequency of rule items is counted by intersecting the rowIds of two item sets, which gives a set containing the rowIds where both item sets occur together in the training data. This set, along with the class array, is used to count the support and self-confidence of the new rule item resulting from the intersection [9]. The production function is iteratively increased for each set of frequent item sets produced at iteration K to generate probable frequent rule items at iteration $K + 1$.

Due to the potentially high number of rules created by association classification (AC), choosing an appropriate rule set is crucial. By taking into account the class distribution frequencies in the training data and giving precedence to rules associated with dominant classes, MCAR improves on earlier approaches to rule ranking. The rule ranking in MCAR is based on the cardinality of the rule's antecedent, support, confidence, and the class distribution frequencies [22].

Overall, MCAR addresses multi-class classification using association rules. It introduces a rule ranking scheme that incorporates class distribution frequencies and aims to select rules associated with dominant classes for improved classification performance [23].

4 Rule Discover Classification

This section outlines the two methods Apriori and Frequent Pattern Growth—that are used to discover items using association rules.

4.1 *Apriori*

Agrawal and Srikant devised the Apriori approach to find common item sets in a dataset [6]. It is predicated on the idea of prior familiarity with common item sets. The algorithm does a complete scan of the training data for each iteration in order to create new candidate item sets from the frequent item sets discovered in the previous step.

The Apriori algorithm utilizes the “downward-closure” property, which helps enhance the efficiency of the search process by minimize the size of the candidate item set list at each iteration.

Algorithms like [17] implement the Apriori algorithm for discovering frequent rule items, a step known as candidate generation. These frequent rule items are represented as $\langle \text{attributes, values}, \text{class} \rangle$ and must satisfy a minimum support threshold (minsupp). The frequent rule items are then used to generate a complete set of classification association rules (CARs), which are used to construct the classifier.

Overall, the Apriori algorithm, along with its implementations such as CBA and CAN, plays a crucial role in discovering frequent item sets and association rules, which are essential for classification and pattern mining tasks.

4.2 Frequent Pattern Growth

Frequent Pattern Growth (FP-growth) is an association rule mining approach introduced by [24] as an alternative to Apriori-like techniques. FP-growth aims to address the computational inefficiencies and memory requirements associated with candidate generation in traditional approaches.

The Frequent Pattern Tree (FP-tree), a highly compressed data structure, is created as the transactional database's representation in FP-growth. Each transaction in the FP-tree is represented by a single path, and the length of the path reflects how many frequent items are included in the transaction. This concise form enables effective mining of common item collections.

The FP-growth algorithm only needs to scan the database twice. Frequent item sets and their supporting data are discovered in the first scan, and the FP-tree is built in the second scan. When there are numerous shared items between transactions, the FP-tree captures all frequent item sets that were present in the original database [24, 25].

Using FP-growth, a pattern growth method is used to mine association rules. Frequent patterns that co-occur with the chosen pattern are created and stored in a conditional FP-tree, starting with patterns of length one in the FP-tree. Concatenating the pattern with the results from the conditional FP-tree is the next step in the mining process. FP-growth does not involve the development of candidate rules, unlike [26, 27].

One of the advantages of FP-growth is that it does not require fitting the entire database into main memory, making it suitable for mining large-dimensional databases.

Overall, FP-growth offers an efficient and memory-friendly approach to association rule mining by utilizing the FP-tree data structure and pattern growth technique.

5 UCI Data Set Experimental and Results

In this section, a comparison is made between association classification algorithms and other classification algorithms in terms of classification accuracy. The comparison includes fifteen different UCI datasets [24], and the algorithms tested are RIPPER, C4.5, CBA, and MCAR.

These algorithms were chosen because of their various rule discovery training methods. Divide and conquer is used by C4.5, heuristic-based strategies are used by

RIPPER, and CuA (Classification based on Association rule) algorithms are used by CBA and MCAR.

The purpose of this comparison is to evaluate how association classification algorithms perform compared to traditional classification algorithms. By using different datasets and algorithms with diverse training strategies, a comprehensive assessment can be made regarding the classification accuracy generated by each algorithm.

In this paper, we utilize various classification benchmarks obtained from the UCI data repository, as shown in Table 2. These datasets are diverse in terms of the number of attributes and sizes. The association classification algorithms used in the experiments have specific parameters that need to be set. In this case, the main parameters, MinSupp (minimum support) and MinConf (minimum confidence), were set to 2% and 50% respectively. These parameters determine the minimum threshold for support and confidence that a rule must meet in order to be considered significant.

By applying these classification algorithms to different datasets with varying characteristics and using consistent parameter settings, the experiments aim to provide a fair and comprehensive evaluation of the algorithms' performance. The chosen parameter values ensure a balance between capturing relevant rules and avoiding overfitting.

The predictive accuracies of different algorithms, including CBA, MCAR, C4.5, and RIPPER, were calculated using 15 different UCI datasets and presented in Table 3. The results demonstrate that both CBA and MCAR, which are association-based (CuA) algorithms, consistently outperformed the decision tree (C4.5) and rule induction (RIPPER) classification approaches in terms of classification accuracy.

Table 2 The UCI data sets description

#	Data set	Size	Number of classes
1	Austra	690	2
2	Balance-cale	625	3
3	Breast	699	2
4	Cleve	303	2
5	Glass	214	7
6	Heart-s	294	2
7	Iris	150	3
8	Labor	57	2
9	Led7	3200	10
10	Lymph	148	4
11	Mushroom	8124	2
12	Pima	768	2
13	Primary-tumor	339	23
14	Vote	435	2
15	Wined	178	3
16	Weather	14	2

Table 3 The predictive accuracy of the considered algorithms on UCI data sets

#	Data set	RIPPER	C4.5	CBA	MCAR
1	Austra	85.21	86.41	85.36	86.41
2	Balance-scale	74.56	64.94	68.18	76.96
3	Breast	95.42	94.59	94.68	94.99
4	Cleve	77.55	77.28	83.13	81.84
5	Glass	68.69	77.59	69.86	71.35
6	Heart-s	78.23	79.09	71.2	81.15
7	Iris	94.66	93.67	93.25	92.93
8	Labor	77.19	85.03	94.99	83.50
9	Led7	69.53	73.39	72.39	71.83
10	Lymph	77.02	81.96	74.43	78.10
11	Mushroom	99.90	99.80	98.92	99.60
12	Pima	73.30	77.66	75.49	77.12
13	Vote	88.27	87.84	87.39	88.20
14	Wine	94.38	93.21	98.33	95.73
15	Weather	64.3	71.4	85.0	84.1

Specifically, CBA and MCAR achieved higher accuracy in seven datasets compared to C4.5 and achieved better accuracy in nine datasets compared to RIPPER. However, it should be noted that the traditional classification algorithms (C4.5 and RIPPER) achieved slightly better predictive accuracy than the association-based algorithms (CBA and MCAR) in some datasets.

Overall, the results indicate that the association-based classification algorithms (CBA and MCAR) generally perform well and yield higher accuracy compared to decision tree and rule induction approaches. However, the traditional classification algorithms still show competitive performance in certain datasets.

The describes results of a comparison of the prediction accuracy of MCAR, RIPPER, C4.5, and CBA algorithms across different datasets. The results show that MCAR performed better than RIPPER in ten datasets, while RIPPER performed better in four datasets. Similarly, MCAR performed better than C4.5 in six datasets, while C4.5 performed better in seven datasets. The comparison between CBA and RIPPER showed that CBA performed better in seven datasets, while RIPPER performed better in six datasets. Finally, the comparison between CBA and C4.5 showed that CBA performed better in five datasets, while C4.5 performed better in nine datasets. Overall, the results suggest that the performance of the algorithms varied across different datasets, and there is no single algorithm that is optimal for all classification tasks.

Figure 1 describe the results of a comparison of the prediction accuracy of MCAR, RIPPER, C4.5, and CBA algorithms across different datasets. The results show that MCAR performed better than RIPPER in ten datasets, while RIPPER performed better in four datasets. Similarly, MCAR performed better than C4.5 in six datasets,

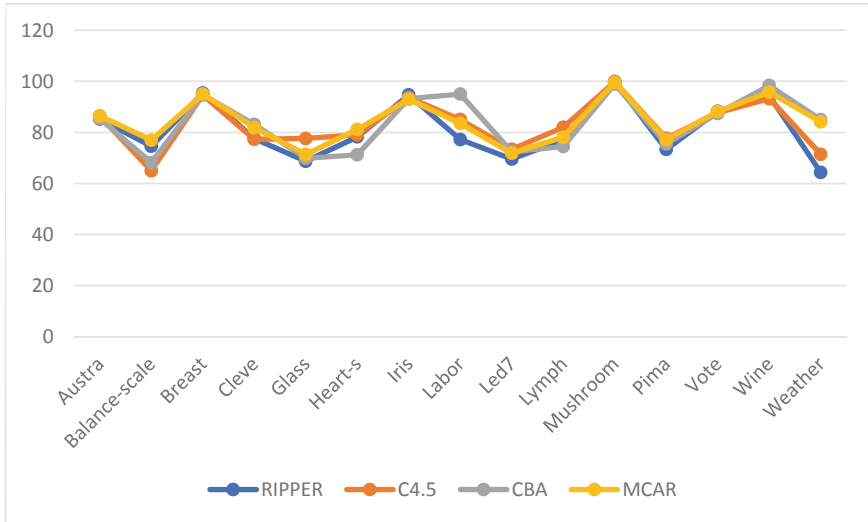


Fig. 1 The predictive accuracy of the considered algorithms on UCI data sets

while C4.5 performed better in seven datasets. The comparison between CBA and RIPPER showed that CBA performed better in seven datasets, while RIPPER performed better in six datasets. Finally, the comparison between CBA and C4.5 showed that CBA performed better in five datasets, while C4.5 performed better in nine datasets [12, 13, 28–33]. Overall, the results suggest that the performance of the algorithms varied across different datasets, and there is no single algorithm that is optimal for all classification tasks. More investigations and evaluation matrices need to be applied over the existing approaches in order to have full comparison between the association rule in data mining [21, 27, 34–38].

6 Conclusion and Future Work

In this paper, a comparative study presented which studied the text classification as well as the association rule mining. As mentioned before, text classification is concerned with categorizing documents and finding the predictive classes based on their content, while association rule mining focuses on discovering associations and patterns among items in a dataset based on the co-occurring regardless of document classification. Both techniques have their own applications and play important roles in analyzing textual data, providing valuable insights and supporting decision-making in different domains. Furthermore, the main differences between text classification and association rule mining is crucial for selecting the appropriate technique based on the specific goals and requirements of techniques with different strengths and applications. The main differences regarding the accuracy are extremely explained in Sect. 5.

Text classification support the process of classifying document or linking any predictable category using the existing contents. It helps in distributing pattern's labels over any text automatically using the features exist in the text using direct or indirect relationships. Mainly, the process of text classification is used for enhancing the process of understanding large repositories of data scattered in different unrelated texts and classes. Where association rule mining has different way of categorizing, in other word, it reveals the relation between similar categories or texts based on discovering the frequent co-occurring of text or items. This helps in commercial business and recently it was utilized for investment prediction. As mentioned before, the text classification and association rule mining has different goals and usage, however, many research were conducted using both of them as predictors approach as well as for text categorizations. Therefore, conducting more research to distinguish the main differences will definitely help in utilizing each of them by using it in the most suitable domain. That means, each environment and domain has different attributes which need different approaches and different processing steps. As a future work, a hybrid model for using both technique in finding the patterns and the prediction process will be utilized and over larger data set.

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Do Green Human Resource Practices Affect Firm's Performance: The Case of the Telecommunication Companies in Bahrain



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Abstract Green human resources management has a most important effect on employees as it reinforces and upsurges their performance. Because of limited but inconsistent findings from previous studies, it is apparent that more studies are needed to examine green human resource practices in organizations. Therefore, it is important to examine how green human resources practices influences business performance in telecommunication companies in Bahrain. Particularly, the study investigates the impacts of green recruitment and selection, green training and development, and green reward and compensation toward the performance of the telecommunication companies working in Bahrain (STC, Batelco and Zain). The data have been collected using a structured questionnaire from 203 employees from the three companies. The findings indicate that the recruitment and selection, training and development, and reward and compensation have a positive and significant influence on firm's performance. This indicates that every positive development and improvement of human resource green competencies will lead to a positive development and improvement in firm's performance.

Keywords Green human resources management · Firm's performance · Bahrain

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1 Introduction

Green human resource management (GHRM) refers to the implementation of environmentally-friendly activities in personnel management. This is crucial in achieving sustainability in business management. In order to focus on the environmental aspect of sustainability, businesses must adopt a culture that prioritizes green practices. This involves changing the values, attitudes, and behaviors of all employees. Implementing green HRM practices is crucial in driving employees to adopt environmentally-friendly behaviors and attitudes, which ultimately contributes to the desired environmental performance [14]. The development and realization of sustainable solutions will be made possible by greater emphasis on novelty to meet significant environmental challenges [9]. As stated by [7], there was a time when environmental teams were largely ignored, but now many huge organizations widely accept them, and as a result, numerous firms are using these green teams to manage change.

GHRM has an important role on employees as it reinforces and increases their performance. Employees are viewed as the firm's human capital; that's why enhancing their knowledge and skills is the most effective way to achieve a firm's success and distinction. Developing employees' skills is a key issue that supports them and prepares them to confront all challenges within the market as well as the workplace [1]. Furthermore, firm leaders are doing their best to enhance performance within all firms. Countless measures of performance have been developed by scholars and experts, such as profitability, maximizing shareholder wealth, sales revenues, and market shares. Leadership plays an undeniable impact in achieving the company's goals and objectives [10].

A bulk of the literature shows mixed results on how GHRM and its practices impact performance. Previous works have shown that the use of HRM practices enhances efficiency, but they have also shown that these techniques have drawbacks on efficiency. Some studies did not find any affiliation, while others indicated an assorted rapport. Participation in organizational change may be affected by GHRM practices, and for that reason, performance may be impacted [9]. Some studies have shown that green human resources management can significantly improve the organization's financial performance. [4, 22, 27]. The vital interceding function of organizational citizenship behavior (OCB) towards the environment lies in its link between corporate social responsibility (CSR) and GHRM practices, as it appears. This implies that OCB towards the environment holds substantial influence over sustainable performance [18].

A methodological challenge that has also contributed to the debate over GHRM activities and performance may be the reason behind the inconsistent findings of these studies as well. Hence, this study contributes to this emerging argument, which argues that there is an association between GHRM activities and firm performance. Due to the limited and inconsistent findings from previous studies, it is apparent that more studies are needed to examine green human resource practices in organizations. Therefore, it is important to examine how green human resources practices influence

business performance in telecommunication companies in Bahrain. This study is significant since the outcomes will add values to the body of knowledge in the field of GHRM practices and telecommunication companies' performance in the Kingdom of Bahrain. Therefore, the current study aims to interrogate the GHRM practices in terms of different practices and test their effect on firm performance.

2 Theoretical Framework, Literature Review and Hypotheses Development

This research looks at the connection between GHRM and firm performance practices from an instrumental perspective. This indicates that the study views GHRM as a tool for assisting in achieving organizational objectives, generally, and financial performance, in particular. In order to investigate this relationship, the conventional Ability–Motivation–Opportunity (AMO) theory given by [5] is applied. This theory states that HRM practices can improve human capital, leading to positive results such as increased productivity, reduced waste, quality, and profitability. The AMO theory suggests that HRM achieves those results by the way of attracting and enhancing talent employees, increasing motivation and commitment through early promotion and improved performance management, and create opportunities for employee autonomy to promote knowledge sharing and problem-solving activities through employee engagement processes [5, 11].

Sustainable HRM promotes environmental sustainability within business organizations through HRM strategies that endorse the utilization of ecological resources within the organization [15]. Using green products and techniques would minimize pollution and deplete natural resources, thereby reducing environmental impact [24]. By ensuring the implementation of GHRM practices, organizations could achieve the financial goals by implementing ecological marketing, as well as protecting the environment from the effects of any negative actions or decisions they take [2].

Environmental sustainability is a priority in organizations. Therefore, integrating environmental aspect into GHRM is paramount [6]. According to Arulrajah et al. [6], a GHRM practices program is the set of practices, strategies, and schemes adopted by a firm to make its employees environmentally friendly in the context of individuals, businesses, and the natural environment. For organizations to achieve effective eco-performance, HRM practices are required to preserve the systems inside the company. GHRM has been the subject of many studies because it enhances managerial operations and competitiveness, as well as encouraging the human capital [25].

Research on the outcomes of organizations has indicated an association between HRM practices and efficiency, flexibility, as well as financial performance. Yet, there has been little attention paid to establishing any connection between these consequences and ecological management initiatives [12]. Karolak et al. [20] said that environmental management should be incorporated into human resource management

practices, largely because it is essential and not merely a desirable concept. In order to successfully manage the environment in an organization, human resources must play a significant role [10]. Organizations' performance of environmental management systems must be supported by human resource practices that facilitate execution [22]. Human resource practices aligned with environmental management objectives can lead to proficient achievement of desired goals or an environmental management expedition within the organization [19]. According to a study by Guerci and Pedrini [16], human resource practices are a major factor in executing green practices and contribute to achieving green goals. Ansari et al. [4] examined how GHRM and eco-innovation affect a company's performance. The outputs show that GHRM has a crucial role in a company's financial performance through eco-innovation. Similarly, Renwick et al. [27] found that GHRM and environmental outcomes can indirectly affect firm's performance.

2.1 Green Recruitment and Selection

Green recruitment involves hiring individuals who understand sustainable processes, environmental systems, and are familiar with words and concepts associated with environmental protection and creating a sustainable atmosphere. Green recruitment ensures that all new employees are familiar with green practices and environmental management systems [8, 21]. It is a paperless recruitment process that uses digital media, such as an online application form, online interviews, or telephonic interviews. These practices reduce environmental degradation rates. According to Sharma and Vashistha [29], an important area of green staffing is hiring eco-friendly employees both internally and externally. This refers to any recruiting actions demonstrating the preference companies have for environmentally friendly candidates, and the green selection focuses on selecting employees committed and knowledgeable about ecological matters who can contribute to an organization's ecological supervision.

Ensuring that the new recruits understand ecological principles and standards can contribute to improving environmental management systems [26]. The previous discussion suggests that GHRM, in general, has a significant impact on firms' performance. However, according to the researchers' knowledge, no studies have discussed the impact of green recruitment and selection practices on the performance of Bahraini telecommunication companies. Accordingly, the above discussion leads us to establish the following research hypothesis:

H1: Green recruitment and selection have a positive and significant influence on the performance of Bahraini telecommunication companies.

2.2 *Green Training and Development*

Training and development practices focus on enhancing employee skills and knowledge. Environmental training also helps to halt the decline in ecological management practices and knowledge [26]. Green training is designed to ascertain that staffs have the insights and attitudes to understand the company's environmental policies, practices, and environmental consciousness [29]. Through green training, employees can learn ways to handle waste, efficiently utilize resources, conserve energy, and reduce environmental damage. They can also participate in solving environmental problems [19]. Khan and Zubair [19] added that identifying the value of green training and development has been done through a multiple case study approach.

Green training and development provide insights pertaining to eco-friendly activities, the green initiatives, waste reduction, and efficient use of energy. Continuously training employees on green principles can foster a green culture. It is important to offer green training and development to stimulate and influence worker behavior in the direction of practicing green practices. A green training program is designed to educate participants about ecological performance, waste reduction, energy efficiency, and participation in green activities to improve the environment. Employee training and development programs should take into account social and environmental aspects, health and safety considerations, and be addressed at both the shop floor and executive level. Newly promoted employees should be provided with green orientation programs as part of their training [21, 29].

According to the researchers' knowledge, limited studies discussed the impact of green training and development practices on the performance of telecommunication companies in Bahrain. Therefore, the researchers have formulated the following hypothesis regarding the relationship between green training and development, and firm performance:

H2: Green training and development have a positive and significant influence on the performance of telecommunication companies in Bahrain.

2.3 *Green Reward and Compensation*

An additional tool to support environmental management activities could be green compensation and rewards, which may encourage companies to make efforts towards sustainability [6]. Green rewards offer incentives for workers who demonstrate a commitment to environmental sustainability [29, 30]. Through rewards, studies have found that they can encourage employees' environmentally friendly behavior and positive attitudes towards the work environment [9, 13, 17]. There are several ways to reward and incentivize green behavior, such as offering incentives for acquiring green skills, providing additional monetary compensation (e.g. premiums, cash),

empowering rewards that are non-monetary based (such as leave and gifts), establishing recognition-based reward systems (such as external roles and daily praise), imposing sanctions (such as criticisms), and offering rewards for positive feedback (such as modular rewards).

As part of the human resources management process, compensation and rewards are key elements. These elements are essential in sustaining an employee’s attention towards the business. Organizations have reward policies in place to attract, retain, and encourage employees to ensure the attainment of objectives, as well as to improve employee loyalty to the organization [9, 10]. The administration of green compensation has an important role in persuading directors and employees of the administration-related climate management [20]. Green rewards and compensation have a crucial role on staff’s satisfaction regarding eco-friendly activities [3]. To the researchers’ knowledge, no studies have discussed the influence of green reward and compensation practices on a firm’s performance. Therefore, the researchers formulate the following hypothesis regarding the association between green reward and compensation and a firm’s performance:

H3: Green reward and compensation have a positive and significant influence on the performance of Bahrain’s telecommunication companies.

Based on aforementioned discussion, a limited efforts exists regarding the relationship between GHRM practices and the performance of telecommunication companies in the Kingdom of Bahrain. Therefore, this research fills this gap in the literature and can help policymakers in Bahraini firms consider GHRM in the future. Figure 1 shows the study’s conceptual model which was developed based on theoretical framework and previous works.

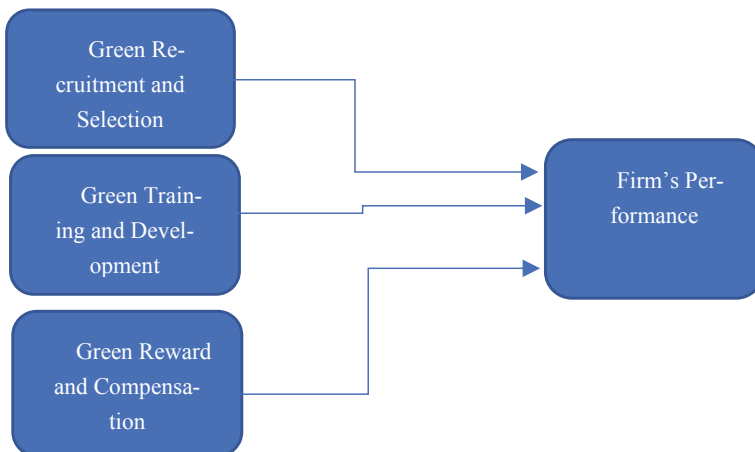


Fig. 1 Study’s model

3 Methodology

3.1 Research Method

The current study aims to examine the impact of GHRM practices on the performance of Bahraini telecommunication companies. To achieve the research objectives, a structured questionnaire has been developed with reference to previous studies on GHRM and was distributed to employees working in the three telecommunication companies in the Kingdom of Bahrain (STC, Batelco, and Zain). After finalizing the procedure of distributing the questionnaire, statistical analyses were applied as seen below.

The study questionnaire includes the following sections: The first section includes the demographic information about the respondents which are: Gender, Age, Educational qualification, and Tenure. The second section includes green human resources practices. This section includes three subsections, namely green recruitment and selection (7 items), green training and development (10 items), green rewards and compensation (7 items). Third section includes employees evaluation of their firm's performance (6 items).

The constructs for all independent variables were adopted from the previous studies and measured on 5-points Likert scale ranged from 1 (strongly disagree) to 5 (strongly agree). The dependent variable (Firm's performance) was measured according to [28] that respondents in each telecommunication company compared their firm's performance to the other two competitors over 6 dimensions including sales growth, revenue growth, and customer satisfaction over the past 3 years. Using 5-point scales ranging from 'much lower' to 'much higher'. An initial copy of the study's instrument was distributed to a number of scholars and experts in the field of HRM to get their feedback regarding the clarity and appropriateness of the survey items. Accordingly, amendments were made to the final version of the survey.

3.2 Sample and Data Collection

The study population comprises of the staffs who are working at the three telecommunication companies in Bahrain (Batelco, Zain, STC). A convenient sampling technique was utilized in this research. A total of 360 questionnaires were distributed with an average of 120 questionnaires in each firm. Next, a total of 210 questionnaires were returned with a response rate of 58.3%. However, only 203 responses were valid for data analysis, while the remaining questionnaires were invalid.

To test whether the data is normally distributed or not, the Kolmogorov–Smirnov test is employed. The results show that the p -value for every construct is more than the significance level of 0.05, which indicates that the normality of distributed data. To examine internal consistency or reliability of dataset, the Cronbach's' alpha is applied. The results indicated that the value of Cronbach's alpha is ranged between

0.756 and 0.824, which is considered an acceptable value. The overall Cronbach's alpha for the entire questionnaire is 0.835. This indicates that the full questionnaire is highly reliable.

4 Results and Discussion

4.1 Demographics Analysis

The current research incorporates four types of demographic variables; gender, age, educational qualification and tenure. The percentage of males and females were 54.7% and 45.3%, respectively. Regarding age, it has been found that the largest age group is group 2 (30–39 years) with 40.4% and group 1 (below 30 years) with 25.6%.

With regard to the educational qualification, the largest group is the bachelor degree holders with 49.8% followed by the master degree holders with 29.1%. Finally, with regard to work experience (Tenure) the dominant group was group 4 (15 years or more) with a percentage of 33%, followed by group 3 (10-less than 15 years) with a percentage of 25.1%.

4.2 Regression Analysis

Table 1 shows the results of the regression analysis on the impact of each of recruitment and selection (R&S), training and development (T&D), and reward and compensation (R&C) on firm performance (FB).

According to the model summary, R-square is 0.963. That is, the three independent variables account for 96.3% of the variation in firm performance. The ANOVA analysis summary as shown in Table 2 reveals The regression analysis is highly significant ($F = 28.057$, $df = (4, 198)$, p -value < 0.0011), which indicates that the study model is acceptable. Table 3 displays the regression coefficient of the three independent factors' influence on the firm's performance. The regression formula uses unstandardized coefficients, with beta values (β) of regression coefficients of

Table 1 Model summary

Model summary					
Model	R	R square	Adjusted R square	Std. error of the estimate	Change statistics
					Sig. F change
1	0.981 ^a	0.963	0.962	0.22641	<0.001

a. Predictors: (Constant), R&S, T&D, and R&C

b. Dependent variable: FP

0.457, 0.165, and 0.224. R&S (recruitment and selection), T&D (training and development), and R&C (rewards and compensation). As a result, the regression model’s formula is as follows:

$$FP = 0.018 + 0.457 R\&S + 0.165T\&D + 0.224 R\&C.$$

The findings support the study hypotheses (H1, H2, H3), indicating that recruiting and selection, training and development, and reward and compensation all have a positive and significant impact on firm performance.

The results are consistent with other studies [8, 21] who state that green choice and staffing are means of procuring, choosing, and executing new recruits who are sensitive to environmental issues. While green recruitment and selection are important, organizations should also focus on conveying their environmental qualities and direction. With regard to green training/development and firm performance, the results are consistent with [15, 23, 29] who are of the view that training helps enhance ordinary management practices and creates a connotative culture delicate to ecological administration. These research conclusions are also in line with [13, 22, 31] who believe that preparing the green leadership of the future through occupation pivots, a training arrangement that emphasizes the ecological administration principles of the subjects examined, were health, energy efficiency, fritter away super vision, and

Table 2 ANOVA results

ANOVA ^a						
Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	262.680	4	65.670	28.057	<0.001 ^b
	Residual	10.150	198	0.051		
	total	272.830	202			

a. Dependent variable: FP

b. Predictors: (Constant), R&S, T&D, and R&C

Table 3 Regression coefficients

Coefficients ^a						
Model		Unstandardized coefficients		Standardized coefficient	T	Sig.
		B	Std. error	Beta		
	(Constant)	0.018	0.044		0.414	0.679
	R&S	0.457	0.043	0.441	10.625	<0.001
	T&D	0.165	0.062	0.161	2.679	0.008
	R&C	0.224	0.044	0.229	5.067	<0.001

a. Dependent variable: FP

reprocessing, the amount of green legislative body in the workforce, and why they leave positions in polluter firms [19, 20, 32].

Finally, the findings regarding the relationship between green reward/compensation and firm performance are consistent with [6, 9, 13, 17, 30] who believe that encouraging employee behavior in an environmental context and their defiance toward the work environment ensure that they will continue at work that positively reflects on the general performance. Therefore, the current findings are relevant and validate the previous research.

5 Conclusions and Recommendations

5.1 Conclusions

Green HR practices have been found to have a significant positive correlation with firm performance. This means that any positive development or improvement in green human resource competencies will result in an associated enhancement in firm performance. The study results revealed a high percentage of employees in three telecommunications companies (Batelco, Zain, and STC) located in the Kingdom of Bahrain who indicated that green recruitment/selection, green training/development, and green reward/compensation are essential factors in improving firm performance. From these findings, it can be concluded that management should have a clear plan for recruiting highly qualified and eco-friendly candidates. This means that having a clear recruitment plan is the most important element of green recruitment and selection practices. Additionally, management should motivate employees to attend courses related to environmental protection practices and the preservation of natural resources. Furthermore, management should provide bonuses and incentives to employees who demonstrate their ability to adopt green practices in order to encourage them to continue working in a manner that positively reflects on the overall performance of the firm.

5.2 Recommendations

5.2.1 Green Recruitment and Selection

According to the study results, it has been found that a high percentage of employees in the three telecommunications companies located in the Kingdom of Bahrain (Batelco, Zain, and STC) indicated that environmental awareness is an essential factor in improving firm performance. It can be concluded that management should have a clear plan to recruit highly qualified and eco-friendly candidates. This means that the availability of a clear plan for recruiting is the most important aspect of

green recruitment and selection practices. Companies should employ green recruitment and selection criteria, and organizations should focus on conveying their environmental values and direction. This can be achieved by reducing waste generated during the recruitment process, such as paper and gasoline used for travel, and implementing paperless recruitment methods that use digital media, such as online application forms, online interviews, or telephonic interviews. These practices can help reduce environmental degradation. Telecommunication companies should ensure that new recruits understand ecological principles and standards that can contribute to improving environmental management systems. Additionally, they should adopt green interviewing procedures, such as distributing interviews in digital formats, using digital job advertisements, minimizing the use of paper during interviews, and asking questions related to the environment. HRM should prioritize Green Recruitment & Selection to hire employees with a sense of social responsibility.

5.2.2 Green Training and Development

According to the study results, the employees of the three telecommunication companies (Batelco, Zain, and STC) in the Kingdom of Bahrain indicated the importance of this factor for their firm performance. This implies the importance of incentivizing employees to attend courses related to environmental protection practices and the preservation of natural resources.

Telecommunication companies should ensure proper ways to handle waste, efficiently utilize resources, conserve energy, and reduce ecological squalor through green training. Employees can also participate in the process of solving environmental problems. Telecommunication companies should recognize the value of green training and progress based on practical policies. Telecommunication companies should prepare the green leadership of the future by providing a training program that teach workers about environmental management principles related to health, energy efficiency, waste management, and recycling. This program should encourage more workers to take up green jobs and help protect the environment while working towards better environmental management.

5.2.3 Green Reward and Compensation

According to the study results, it has been found that the majority of employees in the three telecommunication companies in Bahrain (Batelco, Zain, and STC) indicated that adopting green practices is essential in improving firm performance. It can be concluded that providing bonuses and incentives to employees who demonstrate their ability to adopt environmentally friendly practices can encourage them to continue working, which will have a positive impact on the firm's performance. To this end, telecommunication companies should reward their employees for participating in green activities and encourage them through the addition of both monetary and non-monetary rewards and benefits to the compensation and

reward system. Furthermore, telecommunication companies should link incentives with environmental goals to motivate their staff to work more sustainably. They should also improve employee satisfaction leading to better business results by achieving stability through linking recompense and reimbursement to performance appraisals. In addition, telecommunication companies should review their remuneration schemes as they greatly impact employee performance, and adopt a rewards system to enhance employee commitment and raise their awareness of environmental protection. Finally, telecommunication companies should practice their ability to achieve their natural objectives.

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Data Mining Approaches for Depression Detection on Social Media Twitter Dataset



Yasmeen Walid Abuhasirah

Abstract Nowadays, we live in a world where almost everybody has many problems like discomfort and tensions in their lives, irrespective of age, gender, or caste, due to race, customs, and rituals. Due to such problems, some people are struck by inferiority, others take the pressure, and a few become hopeless and try to destroy themselves. This research will utilize several Data Mining techniques, such as association mining, classification, and regression, with Machine Learning algorithms on social media data to extract a user's mental health state, emphasizing depression. The study focuses on diagnosing depression among cross-cultural social media users using association mining of the Data Mining Association and Machine Learning approaches. The proposed methodology has four significant parts discussed in detail in the methodology section. It is concluded that depression is a common but dangerous mental illness. It is a dysfunctional habit that can strike anyone, regardless of age, gender, and socioeconomic background. There are numerous intelligent strategies to spot depression in online life customers. Machine learning algorithms such as Nave Bayes, LSTM, Decision Tree, Logistic Regression, SVM, and Random Forest are used to classify depressed and non-depressed tweets. The mining technique used in this paper is Association Rule Mining; A priori is the best fit to generate the association rules from the tweets dataset and gives the rules for depressed and undepressed tweets with the best performance. More mining techniques and other algorithms could provide more rules and generalization results.

1 Introduction

A frequent but dangerous human health state known as depression is increasing widely in the world. It is a dysfunctional habit that may affect anybody, regardless of age, gender, and socioeconomic background. The leading cause of disability and suicide is depression, with about 5.0% of adults globally. According to the reports,

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women are affected more than that men globally. Depression spread a major impact on human life, influencing how they perceive themselves and their sleeping and eating patterns. It is the worst condition of a person's mind when they are depressed and loses interest in almost all practical activities; they are also unable to move on from that state. Depression causes are social, biological, and psychological reasons. Other bodily problems are also caused by depression. Self-destruction is the most common cause of mortality among young individuals who are depressed [4] Nonetheless, most persons suffering from depression do not seek treatment from a doctor. In the meantime, social media sites like Twitter, Facebook, and Instagram are rapidly growing and the best data sources to know a depressed person's state. Nowadays, individuals rely on social networking apps to discuss their emotions and feelings. Consequently, the easily available material is helpful for us in analyzing the mental health of such consumers [5].

Recently, there has been a push to use social media data to detect, estimate, and track changes in illness incidence. Because of the pervasiveness of social media, there is a tremendous chance to improve the availability of an extensive volume of data to mental health practitioners and academics, resulting in the best approach with better-equipped in the sector of mental healthcare. Furthermore, infectious negative emotions negatively impact human beings and lead to mental disorders. Depression is the most frequent mental illness, yet it has gone undetected or untreated due to its non-recognition or denial. The beginning of severe depression can be avoided by recognizing its early signs and treating them through appropriate action [6].

The Data Mining techniques [1] such as association mining, classification, and regression, with Machine Learning algorithms on social media data, lead to extracting a user's mental health state with an emphasis on depression [7] Detecting words that indicate negativity in data is one of the most effective methods for detecting depression [8]. Detecting words that indicate negativity in data is one of the most effective methods for detecting depression [8].

Researchers have properly emphasized early detection techniques for depressed and anxious patients. Meanwhile, the CLEF eRisk 2017 workshop [22] was conducted to analyze the early detection of depressed patients. The major challenge was identifying the early risk factors in depressed people. The workshop was conducted using Reddit open-source dataset.

The customer-created content data was also obtained and applied to the techniques to get the values of early risk factors to get the optimum gain. The pilot task informational index covers a customer-made substance made and arranged consecutively. It considers watching the customer's progress and perceiving danger as on schedule as could be permitted. This process gives insight into how the early detection of depression is essential for any human being.

The mental issue is considered a "disorder portrayed by a clinically noteworthy aggravation in a person's discernment, feeling guideline, or conduct that mirrors brokenness in the mental, natural, or formative procedures basic mental working" [23]. As indicated by the Canadian Mental Health Association [23], 20% of Canadians having a place with various socioeconomics have encountered dysfunctional

behaviors during their lifetime, and around 8% of grown-ups have experienced significant melancholy. World Health Organization measurements indicate that about 20% of kids and young people have encountered psychological maladjustments and dysfunctional behaviors at age 14. They are also caused by 23% of passing on the planet because of mental health problems [13]. We utilized the information discharged for the Computational Linguistics and Clinical Psychology [12].

Psychological wellness keeps on being a noticeable plague for the enlightened world. One out of four American residents' experiences and analyzes mental issues at whatever year is assessed. When joined with the 2015 US Census for Residents 18 and more seasoned, these insights make an image of 80 million enduring United States natives. One of every three of these natives who experience the ill effects of a dysfunctional behavior may experience the ill effects of clinical sadness, hence propelling an abundance of concentrates to handle this issue. Proposed devices that gauge the danger of an individual being discouraged can be utilized by doctors, concerned people, and human services offices to help in finding, even perhaps empowering those experiencing gloom to be progressively proactive about recuperating from their emotional wellness [11, 27–29].

Using Data Mining techniques to identify depression would undoubtedly assist social media users in recognizing and forecasting depression risk. Statistical analysis and Data Mining approaches give insights into the data about depression patients [10]. It also encourages social media users to get therapy for depression as soon as possible. Machine Learning methods, such as supervised learning, may evaluate and create a model using social media posts on Twitter or any other social media. Many characteristics, such as users' posts, tweets, responses, post time, emotions, etc., might help diagnose depression. Depression detection is needed timely, and the open-source dataset using social media is helpful for the whole process.

People have worked on depression detection in social media users of specific cultures, races, and countries. Our primary purpose and objective are to trace depression-affected users early to diagnose and control it. All research uses text-based data, but we analyze by using both text and emoji as emoji's play a vital role and express thoughts, vision, and emotions better than textual data. Our main objective is to provide a solution for cross-culture depressed users.

We analyze the scientific research productivity and international collaborations of social media because we do not find any comprehensive study to measure and identify depression among people using social media. Social media data under data mining techniques promotes research and international collaboration among people.

Secondly, we introduce a new way to calculate depression in social media users using textual and emoji data. Our primary purpose is to measure this viral and rapidly developing disease early to control and overcome the suicidal issue. Every second number of users sharing data over the internet, including secrets, emotions, frustration, and exploring ideas, even all events and activities are being recorded over the cloud. Most of the time, we share things over social media which are not being shared with our closest and physical relations. We have to use this data positively and diagnose depression early before it grows to the final stages and takes someone's

life. We use data mining association rules and classification algorithms in machine learning to calculate this.

1.1 The Research Objectives

The following are the objectives of this research study discussed below, and we follow to cover all these mentioned using Data Mining approaches on the social media dataset [9]. Our primary purpose and objective are to trace depression-affected users at an early stage to diagnose and control it. There is no research found on the cross or multi-culture-oriented solution for depressed people. Our main objective is to provide a solution for cross-culture depressed users.

- Research intelligent approaches and their application for depression detection
- Using social media data sets, study depressed users and highlight them from large data
- Choose the best association and classifier to enhance outcomes for a mature system
- To assess the proportional research effort in Data Mining for depression detection
- To evaluate the relative research effort of the depression detection in data mining
- To provide a solution for cross-culture users using Data Mining approaches.

2 Literature Review

The literature review discussed the existing approaches using data mining and machine learning for depression detection. A few of them are discussed in detail to analyze what others did in their approaches and what are the addressed problems.

Shen et al. [24] recommended that depression location is a huge issue for human prosperity. Inferable from social contrasts, recreating the technique to other web-based life stages, for example, Chinese Weibo, in any case, may prompt horrible showing considering deficient accessible named self-announced sorrow information for model preparation. However, this paper discussed an intriguing, testing issue of improving recognition in a specific objective space, for example, Weibo, with sufficient Twitter information as the source space. First, examine the downturn-related element designs crosswise over areas and abridge two significant recognition challenges, specifically isomerism and divergence. DNN-FATC model used that moves the important data crosswise over heterogeneous spaces is proposed. Analyses exhibit improved execution contrasted with existing heterogeneous exchange strategies or preparing straightforwardly in the objective area (over 3.4% improvement in F1, the issue of upgrading gloom identification utilizing internet-based life, and using the dataset from multiple sources. We proposed DNN-FATC algorithm to move the pertinent data crosswise over heterogeneous spaces. Exploratory outcomes checked the adequacy of our technique. Later on, we hope to further improve online locations

by consolidating disconnected investigations and adding to the prosperity of more individuals.

Shen and Rudzicz [26] expressed that depression is a significant supporter of the general worldwide weight of ailments. Customarily, specialists analyze discouraged individuals up close and personal, alluding to clinical sadness criteria. Over 70% of the patients would not counsel specialists at beginning periods of sorrow, which prompts further disintegration of their conditions. [26] proposed that past examinations concerning recognizing psychological instabilities through online networking have predominated distinguishing melancholy through Twitter corpora. This paper discussed the uneasiness issue through close-to-home stories gathered through the mainstream internet-based life site, Reddit. A significant informational collection of run-of-the-mill and nervousness-related posts, and we apply N-gram language displaying, vector embedding, point investigation, and passionate standards to produce includes that precisely characterize presents related to parallel degrees of uneasiness. It accomplishes a precision of 91% with vectors pace word embedding and exactness of 98% when joined with dictionary-based highlights.

Almeida et al. [14] expressed that the frameworks created by the UQAM group and this framework were utilized in Task 2017, CLEF eRisk. The objective was to predict the depression using this approach and give the optimum solution. A few methodologies dependent on administered learning and data recovery techniques were utilized to assess the danger of melancholy for a client, given the substance of its posts on Reddit. The tests demonstrate that joining data recovery and AI methodologies are the best outcomes among the five assessed frameworks. This report depicts the early hazard forecast frameworks submitted. The best framework utilized for further processing and referred to as the eRisk.

Individuals share their sentiments and information on social media right off the bat. [30] proposed a precise sorrow conclusion is a complex long-haul inquiry about the issue. The present discussion situated despondency conclusion between a medicinal specialist and an individual is not exact because of the number of known indications. To find more melancholy indications, our exploration work centers around removing elements identified with sorrow from web-based life, for example, informal organizations and websites. There are two significant points of interest in applying content mining instruments to new sorrow indications extraction.

Recognizable proof of danger for people with schizophrenia is testing when they do not look for treatment. [15] recommended that Individuals who experience the ill effects of schizophrenia include 1% of the United States populace and are multiple times bound to pass on suicide than the general US populace. This work utilized the huge corpus of Twitter pots and AI strategies to distinguish people with schizophrenia. Small scale blogging stage enables clients to impart their contemplations and feelings to the world in short pieces of content. Utilizing highlights from tweets, for example, Emoji use, posting time of day, and word reference terms, we prepared, manufactured, and approved a few AI models. Our help vector machine model accomplished the best execution with 92% accuracy and 71% review on the held-out test set.

Jamil [16] recommended a mechanized framework that can recognize the danger to clients from their open web-based life movement, all the more explicitly, from Twitter. We gathered information from the Bell Let's Talk battle, a wide-coming, multiyear program intended to end the quietness around psychological maladjustment and bolster emotional wellness crosswise over Canada. The objective was to organize a client-level classifier that can in-danger clients that accomplishes a sensible exactness and review. We also prepared a tweet-level classifier that forecasts whether either tweet demonstrates wretchedness.

Yazdavar et al. [17] suggested that with the ascent of web-based life, many individuals are routinely communicating their dispositions, sentiments, and day-by-day battles with psychological wellness issues via web-based networking media stages like Twitter. Dissimilar to conventional observational companion studies directed through polls and self-detailed overviews, we investigate the solid recognition of clinical wretchedness from tweets got subtly.

Leiva and Freire [18] expressed that the measurements introduced by the World Health Organization illuminate that 90% of suicides can be credited to psychological instabilities in high-pay nations. In addition, past investigations presumed that individuals with dysfunctional behaviors would, in general, uncover their state of mind via web-based networking media as a method for help. Subsequently, the real target of this work is the investigation of the messages that the client posts on the web successively through a timeframe and identify at the earliest opportunity if this client is in danger of sorrow.

Sadeque et al. [22] proposed the 2017 CLEF eRisk pilot assignment centers around consequently distinguishing despondency as right on time as conceivable from clients' presents on Reddit. This paper presented the procedures utilized for the University of Arizona group's interest in this early hazard discovery shared assignment. For expectation, we utilized both successive (intermittent neural system) and nonconsecutive (bolster vector machine) models. This model performs fairly on the test information, and the repetitive neural models perform superior to the non-successive help vector machines while utilizing a similar capability. This paper depicted the systems for the University of Arizona entries to the 2017 CLEF eRisk early hazard identification of melancholy pilot task.

Vioules and Moulahi [3] proposed that Suicidal ideation location in informal online communities is a rising exploration zone with significant difficulties. The ongoing examination has demonstrated that the freely accessible data, spread crosswise over web-based life stages, holds important markers for adequately recognizing people with self-destructive goals. The key test of suicide anticipation is understanding and distinguishing the mind-boggling danger factors and cautioning signs that may accelerate the occasion.

Katchapakirin et al. [20] inspected that Depression is one of the main emotional well-being issues. It is a reason for mental handicaps and financial weight to a nation. Around 1.5 of Thailand individuals experience the ill effects of despondency, and its predominance has been growing up quickly. Even though it is a genuine mental issue, not exactly a portion of the individuals who have this emotional issue access emotional wellness administration; it could be a consequence of numerous

components, including needing mindfulness of the malady. One of the arrangements would give a device that downturn could be effectively and early distinguished. It would help individuals know about their excited states and seek assistance from expert administrations.

Orabi et al. [19] suggested that mental ailment location in internet-based life can be viewed as a perplexing errand, mostly because of the convoluted idea of mental issues. This examination zone has begun to develop with the constant increment in the ubiquity of online life stages that have turned into a necessary piece of individuals' lives. This cozy connection between web-based life stages and their clients has made these stages mirror the clients' close-to-home life on numerous levels.

Facebook is the most famous informal community stage in Thailand, and it could be a huge asset in building a downturn identification apparatus. This exploration utilizes Natural Language Processing (NLP) procedures to build up a downturn recognition calculation for the Thai language on Facebook, where individuals use it as an apparatus for imparting insights, sentiments, and life occasions. 35 Facebook clients showed that Facebook practices could foresee a discouragement level. The tests result demonstrate that the utilization of social data on Facebook, both in structured messages and exercises, could anticipate sorrow.

Sadeque [31] suggested that identifying melancholy is a key general well-being challenge, as practically 12% of all handicaps can be ascribed to sorrow. Computational models for sadness location must demonstrate that they would be able to recognize wretchedness and that they can do it early enough for a mediation to be conceivable. Be that as it may, current assessments of sadness identification are poor at estimating model inactivity. Various issues are resolved using this approach, and give the optimum solution with the help of the proposed solution. The Reddit dataset was used to evaluate the proposed system, which gives the best performance.

The analysis of various approaches proves a need to give a solution for the early analysis of depression. A social media dataset can be used for training the proposed model. Table 1 shows the state-of-the-art survey on the previously implemented approaches to depression detection.

2.1 *Table 1: State of the Art Studies Survey*

The following table shows the state-of-the-art survey on the previously implemented approaches to depression detection.

3 Problems and Solution

Social media is where people express their frustration, sentiments, emotions, and despair rather than expressing them with loved ones or near or physical relatives. This real-life problem exists throughout the world, many people have committed

Table 1 Previous implemented approaches to depression detection

Sr. No	Dataset type	Author and references	Methodology/ Classifier	Feature	Publisher	Year	Evaluation measure
1	Twitter, Weibo	(Shen et al. 2018)	DNN-FATC	Emotional Word Count, Punctuation Count, Topic Related Word Count	IJCAI proceedings	2018	Effectiveness
2	Twitter	Shen et al. (2017)	NB, MSNL, WDL and MDL	Emotion words, Emoji and VAD features	IJCAI-17	2017	Performance
3	Reddit	Shen and Rudzicz (2017)	LR,NN,SVM	Anxiety, Negative, Emotional tone, Authentic	Association computation linguistics	2017	Accuracy
4	Reddit	Almeida (2017)	IR,SL and SVM	Occurrence of pronouns	CLEF 2017	2017	Performance
5	Twitter	Ma et al. (2017)	Unsupervised learning approach	Anxiety, stress, suicide, depression, disorder, pain	Springer	2017	Accuracy
6	Twitter	McManus (2015)	Naïve Bayes, SVM, neural network	Number of friends, time of day, time between Tweets, emotics	AMIA	2017	Accuracy, precision, recall
7	Twitter	Jamil (2017)	SVM	Depressed words counts	University of Ottawa	2017	Precision and recall
8	Twitter	Yazdavar (2017)	Lexicon-based semi supervised learning	Lack of interest, feeling down, sleep disorder, suicidal thoughts	IEEE,ACM	2017	Accuracy and precision

(continued)

Table 1 (continued)

Sr. No	Dataset type	Author and references	Methodology/ Classifier	Feature	Publisher	Year	Evaluation measure
9	Reddit	Sadeque (2018)	SVM and NN	Depression lexicon and Meta Map features	CEUR workshop proceedings	2017	Performance
10	Twitter	Orabi (2018)	CNN and RNN	Random trainable, skipgram, and CBOW	AcIWeb.org	2018	ROC, AUC, precision, recall, F measure
11	Twitter	Vioules and Moulahi (2018)	NLP, machine learning	Symptoms, swear, intensifiers, first pronouns	IBM/IEEE	2018	Precision
12	Facebook	Katchapakirin (2018)	NLP	Micro blog, behaviors	IEEE	2018	Accuracy, precision, recall, F measure
13	eRisk	Sadeque (2018)	SVM, Apriori	Words, dep words, dep embed, meta map	ACM	2018	Precision, recall, F1 score

suicide, and some have become abnormal and exhibit anomalies. We should control this at an early stage [2] rather than allowing it to grow and claim anyone’s life. We employ genius Data Mining technologies to detect depression in social media users. This difficulty differs from race to race, with each having its unique sentiments, culture, and expressive style, such as Asian, Arabic, and Chinese, among others. The previous study was conducted for a particular city, nation, and area. The current study is limited to a particular culture and is text-based, without emojis [3]. Existing research is for specific and single cultures and text-based, not using emojis.

4 Research Methodology

This research study focuses on diagnosing depression among cross-cultural social media users using association mining of the Data Mining Association and Machine Learning approaches. Emojis and test data were used for the experimental analysis to train the model. Data Mining Association uses for the rules, and Machine Learning uses for classifying depressed and undepressed. Various works are done on detecting depression in social media users of a particular culture, region, race, and nation. All these studies are conducted using text-based data, but no research is conducted

utilizing emoji data. As a result, we are giving a solution by combining text and emoji datasets. Emojis serve an essential role in expressing sentiments, expressions, ideas, vision, and emotions more effectively than textual material.

People sometimes submit status updates with only emojis and no text representation. As a result, it aids in the comprehension of situations. We give a generic answer for all types of individuals, regardless of ethnicity, culture, or geographic location. We employ advanced data mining approaches such as association mining rules to attain this goal and machine learning.

The proposed system has four major parts discussed in detail below and shown in Fig. 1.

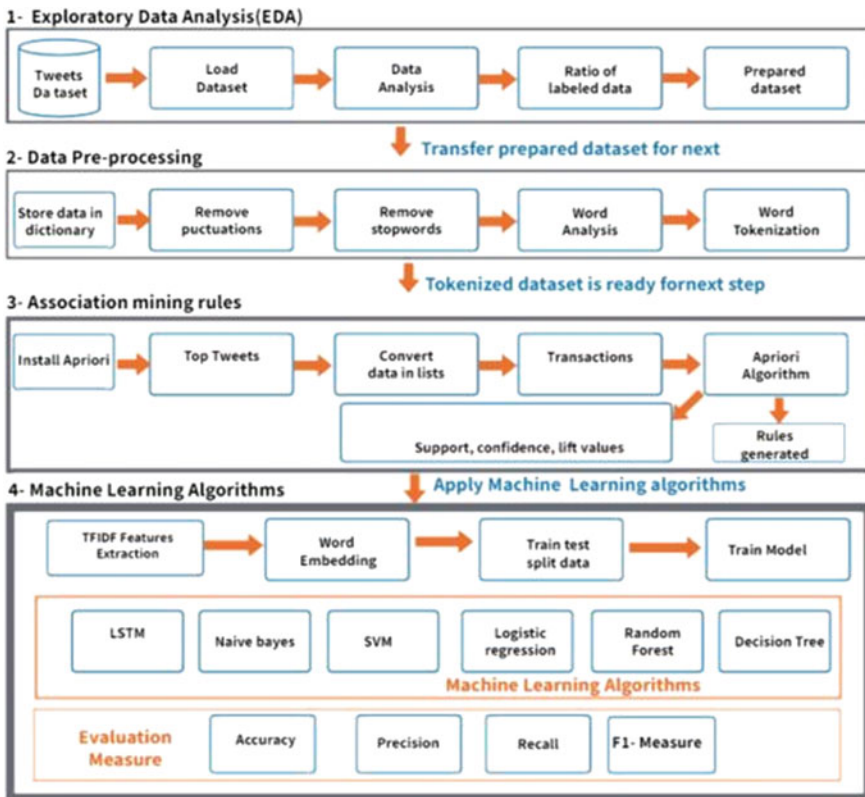


Fig. 1 Proposed model architecture

5 Exploratory Data Analysis (EDA)

The first step in the proposed system is to get the open-source tweets dataset. We obtained the sentiment 140 dataset from open-source Kaggle. This dataset is in a comma-separated value (.csv) that is used for the experiments. It has six fields target, ids, date, flag, user, and text. This dataset contains 1.6 m tweets which are extracted using Twitter API. These tweets were labeled 0 for negative and 4 for positive tweets. After getting the dataset load into the system for analysis, the whole dataset is divided into train and test purposes. We are applying some techniques to show the data insights and prepare for further processing. This dataset is ready to use for the next step.

6 Data Pre-processing

The prepared dataset uses for the pre-processing. Without pre-processing, there are flaws in the dataset which impact the system performance. In the pre-processing, we store the whole dataset in the dictionary for the contraction means to store the special words that impact the processing. After this, we remove the punctuations, stop words, and word analysis and apply tokenization. Punctuations have no value for the processing; also, stop words need to remove, which impacts the performance. Word analysis gives which words have more impact on the complete dataset analysis. All the data convert into several tokens, and we apply approaches to these tokens.

7 Association Mining Rules

This step is for the association mining rules prediction for depression detection from the tweets dataset. First of all, install the Apriori algorithm API to use the association mining rules. Extract the top tweets that significantly impact the actual data, such as those containing depressed, sad, tired, etc. Convert this data into lists to apply the transactions in them. After that, apply the Apriori algorithm to get the rules. The obtained rules are evaluated to get the measures' values, such as confidence, support, and list values for each rule generated from the tweets.

Apriori Algorithm

Apriori is the association mining rules algorithm used for frequent item sets to generate the association rules. Furthermore, this algorithm is workable for databases that have transactions. Apriori algorithm has four steps:

1. Determine the support and confidence in the itemsets and then select the minimum support and confidence.
2. The higher support values are selected than the minimum support values.
3. Find all the rules which have higher confidence values.

4. Rules are sorted using descending order of the list.

8 Machine Learning Algorithms

In the last step, we apply Machine Learning classifiers of depressed and undepressed tweets. There are need to extract the features like TF-IDF statistical features and word embedding. Then split the dataset into train and test to pass the data for model training. We use different classifiers such as LSTM, Naïve Bayes, SVM, Random Forest, logistic regression, and Decision Tree. The detail is given of why we use these algorithms separately.

LSTM Algorithm

For text classification, use the Long Short-Term Memory (LSTM) algorithm because it memorizes the information. It trains multiple words and takes specific words based on the statistics. At that point, LSTM categorizes the words into their respective category. LSTM helps to use multi-string words and easily can identify the word class.

All the other algorithms, such as Naïve Bayes, SVM, Random Forest, Logistic Regression, and Decision Tree, are used for the text data analysis. These algorithms have rules to classify the text data, such as depressed tweets and undepressed tweets. In the end, we apply some evaluation measures to check the proposed system performance where we obtained the values. These values for each evaluation measure the precision, accuracy, f1-measure, and recall used to get the system performance. Accuracy is the measure that depicts the more accurate values in the testing dataset.

9 Results and Analysis

Results are elaborated in this section in detail from the proposed system. Exploratory Data Analysis (EDA) is the step-by-step process that we follow the implement all four mentioned steps in Fig. 1. The process is to classify the depressed vs. undepressed. In the first step of the proposed system, we did explore the data deeply. A few visuals of the data analysis in this step are shown here. The whole dataset is 1.6 M tweets that are labeled by 0 and 4. Figure 2 shows the visuals for a label.

This dataset is very large and requires a high system for the computation and required time. So we randomly took 8000 examples of tweets from the whole dataset and used the depressed dataset labeled as shown in Fig. 3.

We analyze the whole dataset using word cloud and show the more impactful words to show the negativity in the dataset, such as depressing words. The more the font size of the word shows, the more impact in the dataset, as shown in Fig. 4. The words are shown in Fig. 4 such that depression, anxiety, etc. represents the major impact in the system analysis.

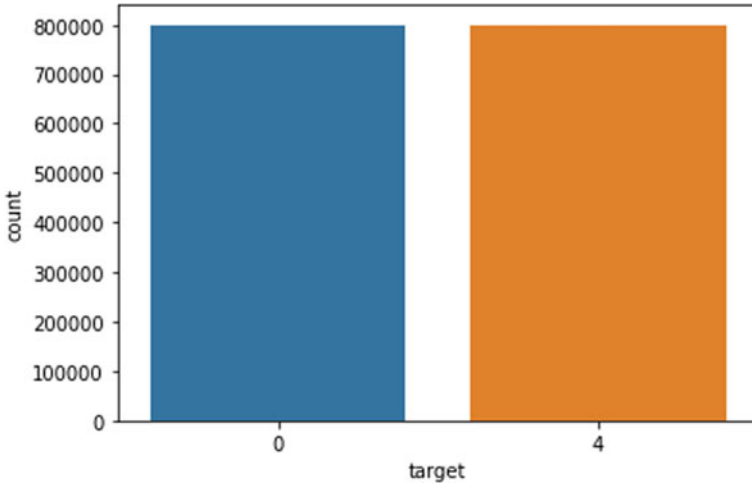


Fig. 2 Sentiment 140 labeled for the distribution of dataset

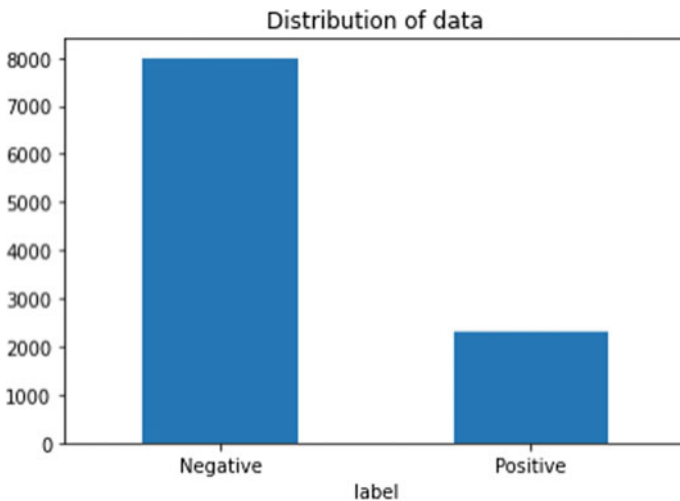


Fig. 3 Sampled labeled data for the positive and negative tweets

To apply the association rule mining, we perform some basic necessary steps on the dataset to prepare for the association rule mining. We applied the Apriori algorithm, so installing the a priori library with all the related backend support was needed. In the association mining rules extraction, we apply the A priori algorithm, where we use a dataset including the emoji of these tweets. The whole dataset is processed in the form of the text, so we translate the emoji's records into text form like depressed, sad, happy, etc. The system we are dealing with is not for the special characters

{happy, chill} => ; {undepressed}

{happy} => ; {undepressed}

{tired, sad} => ; {depressed}

Apriori algorithm has some key terms which need to address like confidence, support, and lift.

Support for the item x in the Apriori algorithm will be the ratio in the number of transactions where x item appears to the total number of transactions. The equation of the support of item x is shown in Eq. (1).

$$\text{Support} = \text{No transactions of depressed} / \text{Total number of transactions.} \quad (1)$$

Confidence ($x = > y$) is the where the likelihood of the item y which may occur in the tweet when the x item or word appears. This works to show the popularity of the x item or word. Equation (2) shows the confidence calculation.

$$\text{Conf}(\{\text{happy, relax}\} => \text{undepressed}) = \frac{\text{Support}(\text{happy, relax, undepressed})}{\text{Support}(\text{happy, relax})} \quad (2)$$

Lift ($x = > y$) is nothing but it is the likelihood of interest of word y appearing in the tweets when the x in it the tweet. Equation (3) shows the lift calculation.

$$\text{Lift}(\{\text{happy, relax}\} => \text{undepressed}) = \frac{\text{Support}(\text{happy, relax, undepressed})}{\text{Support}(\text{happy, relax})} \quad (3)$$

There are three possibilities in the lift such that: if $\text{Lift}(x => y) = 1$ means there will be no correlation between the itemsets. If $\text{Lift}(x => y) > 1$ there will be a positive correlation among the itemsets. If $\text{Lift}(x => y) < 1$ there will be a negative correlation among the itemsets.

After that, we apply some pre-processing for this process and apply the transaction. After applying the association rule mining Apriori algorithm we get the following associations below in Fig. 5. These association results are all the possible outcomes. For instance, we can see the association become {'anxiety', 'unhappy'} in the first transaction. In the second transaction the {'beautiful', 'awesome'} so it proves that the tweets contain these words in their tweet find out the exact words or items in them.

Based on these association results after applying the Apriori algorithm we find out the various rules which help to find the depressed tweets in the dataset. Figure 6 shows the rules generated based on these association results. Also, the parameter values such that support, confidence, and lift are also calculated properly. There are various rules generated on the given dataset and a few of them are shown in Fig. 6. We also analysis these rules and their performance that shown below in a few samples.

```

frozenset({'anxiety', 'unhappy'})
frozenset({'beautiful', 'awesome'})
frozenset({'watch', 'awesome'})
frozenset({'watch', 'beautiful'})
frozenset({'beauty', 'dye hair'})
frozenset({'wish', 'birthday'})
frozenset({'booster', 'juice'})
frozenset({'booster', 'open'})
frozenset({'cause', 'bye'})
frozenset({'right', 'bye'})
frozenset({'weekend', 'bye'})
frozenset({'mom', 'caption'})
frozenset({'caption', 'nothing'})
frozenset({'thinking', 'caption'})
frozenset({'right', 'cause'})
frozenset({'weekend', 'cause'})
frozenset({'caves', 'down'})
frozenset({'caves', 'nightwear'})
frozenset({'caves', 'worst'})
frozenset({'chill', 'smiley'})
frozenset({'confuse', 'depressed'})
frozenset({'confuse', 'silly'})
frozenset({'depressed', 'could ease depression'})
frozenset({'could ease depression', 'stress and anxiety'})
frozenset({'dark', 'depressed'})
frozenset({'dark', 'tired'})
frozenset({'dark', 'unhappy'})

```

Fig. 5 Association results after applying the Apriori algorithm

```

{unhappy} => ; {anger}
{anxiety} => ; {depressed}
{stress, anxiety} => ; {depressed}
{think positive, happy} => ; {undepressed}

```

These are some sample rules which we depicted from the plenty of rules generated in the whole execution. These samples cover the idea of how our proposed system gets the rule to identify the depression detection in the tweets dataset. These rules are generated automatically and based on the dataset nature these rules best fit to give the analysis.

In the end, we apply Machine Learning classifiers that classify the depressed and undepressed tweets. The depressed tweets are labeled 1 and the undepressed labeled 0. The statistical results for using these algorithms are shown in Table 2. The evaluation measures are precision, accuracy, f1-score, and recall.

LSTM shows larger values after evaluation as compared to the other algorithms. The reason is that LSTM stores the information for a long time and during the training

Fig. 6 Association rules generated using the Apriori algorithm

```

=====
Rule: unhappy -> anger
Support: 0.008064516129032258
Confidence: 1.0
Lift: 41.333333333333336
=====
Rule: anxiety -> depressed
Support: 0.04032258064516129
Confidence: 1.0
Lift: 3.1
=====
Rule: anxiety -> serious
Support: 0.024193548387096774
Confidence: 0.6
Lift: 24.8
=====
Rule: anxiety -> unhappy
Support: 0.016129032258064516
Confidence: 0.4
Lift: 16.533333333333335
=====
Rule: beautiful -> awesome
Support: 0.008064516129032258
Confidence: 1.0
Lift: 124.0
=====
    
```

Table 2 Machine learning algorithms evaluations

Algorithm	Accuracy	Precision	Recall	F1-score
Naïve bayes	0.9007	0.91113	0.90077	0.89061
SVM	0.9838	0.98414	0.98389	0.98370
Logistic regression	0.9703	0.97114	0.97036	0.97060
Random forest	0.9552	0.96023	0.95522	0.95627
Decision tree	0.9874	0.98761	0.98744	0.98732
LSTM	0.9994	0.99164	0.99162	0.99163

takes a large number of words to train and store them for processing. The statistical results show the performance of the proposed system.

10 Conclusion

It is concluded that depression is a frequent but dangerous mental health condition. It is a dysfunctional habit that may affect anybody, regardless of age, gender, and socioeconomic environment. Nowadays, we live in a world where almost everybody has many problems like discomfort and tension in their lives, irrespective of age or gender, due to race, customs, rituals, and sins. Due to such problems, some people are struck by inferiority, others take the pressure, and a few become hopeless and try to destroy themselves. It gives a chance to examine informal community information for people's emotions and notions to explore their dispositions and frames of mind when conveying using these online instruments. Computational models for wretchedness recognition must demonstrate that they can identify sorrow and do it early enough for a mediation to be conceivable. There are numerous intelligent strategies utilized for Depression discovery in online life clients. We applied association rule mining using the Apriori algorithm to get the rules. Machine Learning algorithms such as Naïve Bayes, LSTM, Decision Tree, Logistic Regression, SVM, and Random Forest are used to classify depressed and undepressed tweets. Future work should focus on extending more mining techniques, and other algorithms could provide more rules and generalization results.

People have worked on detecting sadness in social media users of a specific culture, race, or nation. All study is done with text-based data; however, we analyze using text and emoji responses. Emojis are vital in expressing thoughts, vision, and emotions more effectively than applying only textual material. Our primary goal is to track down depression-affected users at an early stage. There is no study on cross-cultural or multi-cultural solutions for sad persons. Our primary goal is to give a solution for cross-culturally depressed users using Data Mining and Machine Learning approaches. We analyze the scientific research productivity and international collaborations of social media because we do not find any comprehensive study conducted to measure and identify depression among people using social media. Social media data under data mining techniques promotes research and international collaboration among people. Secondly, we introduce a new way to calculate depression in social media users using textual and emoji data. Our primary purpose is to measure this viral and rapidly developing disease early to control and overcome the suicidal issue.

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Cybersecurity and Forensic Accounting a Literature Review



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Abstract The current paper analyzes previous studies related to criminal accounting. Many of the previous studies consider criminal accountants as an expert who engaged in the investigation related to different financial crimes including cyber ones. The analysis assumes the vital role played by the forensic accountant in protecting data and in preventing a different kind of fraud which includes technological ones.

Keywords Cybersecurity · Accounting · Technologies · Forensic accounting · Crime

1 Introduction

The growing reliance of public and private companies on web technologies and networks for their financial management systems has increased their vulnerability to cyberattacks, which are a risk. The main one that companies must control [1–3]. The objectives of these attacks may be to steal, destroy financial assets, steal intellectual property or other important information relating to companies, their clients or business partners, and to target companies operating in critical infrastructure industries [4–6].

In recent years, enterprises have relied heavily on information technology and communication networks have formed an intermediary in which data flows and information cabinets are inhabited [7, 8].

These networks need protection that safeguards the integrity of their contents and ensures the continuity of their work. and in view of the many threats to the

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integrity of data that flows into networks or data contained in their cupboards and the multiple threats that threaten the stability and security of such networks, such as viruses, malware and attempts to penetrate for the purpose of stealing, sabotaging, modifying and tampering information [9–12].

The importance of around-the-clock protection of the components of physical and software information networks comes by installing protection devices and software in and within local network portals and managing those hardware and software from the security angle and filling gaps first to reduce opportunities for information hackers, competitors, and enemies to be able to hack or steal any data from information networks [5, 13].

Cybersecurity has been relied upon in the field of accounting to maintain financial statements and not manipulate figures that may lead to significant corporate losses [14–17].

2 Literature

According to the findings of [18–21], the mathematical probability of a spam emails incident grows obviously it depends on the individual the scam artist impersonates (i.e., a friend), that whether email means achieving the objective, and if the email consistently y among the top to the victim's task. The paper also presents models developed that used negligible stagnation and artificial neural to distinguish among phishing ingle emails as well as Enron emails [13, 22].

The goal of forensic accounting is to determine the truth of accounting records and the validity of income statement. Forensic accounting is employed to start investigating financial statement preparatory work and trying to report occurrences, including such bank crime [23–25].

In those other words, forensic accounting is a systematic approach to preventing fraud in which financial data as well as quasi details are managed to gather, monitored, studied, and analyzed. The forensic accountant examines economic transactions for substantiation of misconduct, whereas the basic accountant focuses on trying to balance books and record keeping [26–29].

The study's [18] goal was to see if a previous cyberattack affected the effectiveness of cybersecurity risk assessment and research shows reports. The researchers created a study to acquire how AICPA's suggested revelations could indeed impact the preconceptions of non-professional shareholders. Whenever a business does not divulge a previous cyberwar, the researchers discover the t allowed to issue a report without warranty is much more useful. Moreover, issuing a separate cybersecurity guarantee report might increase the company's potential to recruit invest tent opportunities.

The researcher [19] concentrated on information collection all through cybersecurity activities, and the present literature also concentrate on the performing the behavior of cybersecurity analysts, particularly statisticians for whom the forensic

analysis is a crucial feature in their functional activities. Previous research characterized cybersecurity tasks simultaneously, process flows, and perceptual prerequisites. Pertinent studies explain the assessment of cybersecurity from the point of view of special awareness and factors of mass bargaining.

Different organizations visualize the operation of cybersecurity prognosticators differently, thus, capabilities, obligations, preconceptions, and levels of judgement delegated to individuals and groups vary. Numerous organizations' cybersecurity experts are primarily concerned with ensuring compliance (e.g., operating system, software version management, virus protection updates). Individual people in these situations rarely have always had the experience and expertise to respond to a serious catastrophe, and when an incident happens, the facilities of other organizations are required [2, 30–32].

The capability to evaluate and priorities alerts efficiently is essential to these procedures and has been considered. Individuals who work in these environments frequently do not investigate further than the reasonable method of designed to mitigate security flaws, with a more complete study being transmitted to other organizations [33, 34].

Digital cybercrime assessment is also responsible for charge of investigating cyberspace threats including such malware, trying to troll, SQL order attacks, distributed denial-of-service attacks (DDoS), security breaches, and any other type of cyberattack that involves economic or damage to reputation harm. The aim of the digital criminal probe is to preserve, identify, obtain, and record digital information for use in the court system [35–37].

Digital forensic analysis is used to investigate any crime involving the use of electronic devices, whether such devices are used to commit an offence. Having digital forensic capability becomes very important for modern organizations to investigate domestic policy violations and external attacks against their computerized systems [38–41].

The previous research demonstrated that attendees who supplied the much more accurate response to obstacles used much more special purpose computer software [11, 22, 42–45]. It was responded by pointing out that while specialized cybersecurity computer programs might provide major characteristics that would enable users to perform things that wouldn't otherwise be possible, they just weren't adequate per se for the work problem of forensic investigation of information security [8, 46, 47].

The current paper likens the performance and behavior with somewhat experienced analysts. The primary distinction is the application of certain software tools [24, 48]. It ought to be noted that neither of the approaches that rely on behavior generated significant statistical differences [49, 50]. As a result, at a reduced rate of actions (e.g., application software launch, window transition, etc.), specialists and beginners behave the same way [51, 52]. Nevertheless, more experienced experts' advantage more from some development tools and, in specific, more than that from overall software tools. This implies that they may approach the specific task [53, 54].

3 The Importance of Criminal Accounting

The importance of criminal accountability and the reduction of financial and administrative corruption lies in the fact that it supports financial issues in institutions and companies, thereby contributing to the control of all cases of theft, fraud, and fraud, especially in public funds [55–62]. Its importance is as follows:

1. Contribute to the resolution of financial disputes and judicial disputes with damage assessment [55, 59].
2. Enhanced financial control and evaluation of corporate performance [55, 58]
3. Contribute to the creation and presence of external oversight of companies [59, 60].
4. Reveal all instances of fraud and manipulation that may take place in company matters financially [59–61].
5. Preserve customers' and partners' funds in any business or economic activity [56, 57].
6. Companies are helped to help them comply with all laws and laws and regulations [58, 62].

A study [20] describes that lawbreaker financial reporting is viewed as an organization's financial process based on a collection of foundational principles, rules, and guidelines in addition to directions that need to be accompanied to accomplish the objectives and accomplish everything that the institutions generally aspire to. Accounting is also defined as a series of aspects and procedures to be followed; To bring out all the analysis, register and collation of financial data as well as input prices in overall, which problem the company of businesses and businesses of various types [14, 63].

Accounting is a public science that is studied and applied in all scientific and practical respects, as well as accounting science on all processes, which in turn illustrates the causes and methods of economic change, which is very important and necessary for many competent authorities and stakeholders [64–66].

Through accounting and reporting, accounting statements implemented within institutions and companies and submitted at the end of each financial period, managers, competing individuals and investors can make and document their decisions and rely on much of the accounting information provided therein [67, 68].

The study emphasizes three types of corruption fraud: conflict of interest, bribery, and extortion. Research shows that corruption is involved in about a third of scams [69, 70]. In case of conflict-of-interest fraud, the fraudster exercises influence for personal gain that negatively affects the company [71]. The fraudster may not benefit financially but receive an undeclared personal benefit because of the situation [34, 44, 72].

For example, the manager may approve the expenses of an employee who is also a friend to maintain that friendship, even if the expenses are inaccurate. Bribery is when money (or anything else of value) is provided to influence the situation. Extortion is the opposite of bribery and occurs when money is requested (rather

than offered) to secure a certain result [73–76]. Due to fraudulent corporate practices, accounting scandals, the judiciary's business climate, and regulatory measures, accounting is a fast-changing field of accounting [77–79]. Forensic accounting academic achievement wasn't largely represented in financial reporting curricula as considered necessary by the industry [80]. While the study's findings [81] indicated that forensic accounting is extremely beneficial in preventing fraud and lowering Nigeria's banking industry, it also has a positive impact on bank performance. To this end, it is suggested that managers provide a clear description of the ultimate purpose of the financial sector vis-à-vis its strategic vision and that the features, role and responsibilities as well as functional areas of valid auditors and auditors have been properly demarcated, especially in the area of lowering scam in the banking industry [70, 82].

Several suggestions were preferred by [81]; A precise definition of something like the ultimate purpose of the financial sector vis-à-vis the strategic vision that controls what it is and how it works. The position as well as functional areas of valid auditors and auditors, particularly in lowering forgery in the banking sector, must always be specifically articulated.

Make clear respective positions, obligations, and law enforcement agencies as needed to be responsible for efforts in the areas of career development in required to bring out certain actions in the financial sector [83–85]. If all the above suggestions are followed, the Nigerian banking industry will reduce fraud and thus improve its profitability achievement [86].

The study's key conclusions [87] disclosed an important connection among forensic accounting rules and the ability of financial reviewed and approved to detect occurrences of massive corruption. But at the other side, the large percentage of Iraq's audit and finance employees suffer from misconception and details on criminal financial reporting. As a result, [87] proposed incorporating forensic accounting rules into the curriculum content of accounting at Iraqi universities at the main and learning experience via both theoretical and practical lessons. The subject of investigative responsibility and education cannot indeed be emphasized. As a result, one such thing will indeed rise corruption and fraud while also harming the economic growth of the country. Accounting information could be used to prevent or reduce fraud. Finance corruption and fraud are on the rise.

According to the Iraqi study, this is because criminal financial reporting is not part of the education system able to teach at Iraqi universities, such as it is at universities in developed nations. There seem to be presently neither course in lawbreaker financial reporting offered at Iraqi universities, alike postgrad, and bachelors. Besides that, the majority of Iraq's audit team is misinformed about criminal accounting rules. Consequently, it is suggested that criminal financial reporting methods be included in accounting degree curriculum content and training for Iraqi university accounting professionals, in addition to other professionals affiliated with the Iraqi Chartered Accountants Association.

As a result, there are numerous ways of reducing and at least reduce corruption and fraud in the nation. On the other side, a study [88] showed that financial institutions had already faced challenging situations over through the decades due to scams.

Related to regulatory inspection and testing, financial institutions are now under incredibly huge planning to implementation best practices.

Scams in Indian banks had already made the country's financial system precarious and vulnerable. Because of several undiscovered frauds, forensic accountants and auditors are critical and therefore must be dealt with immediately. India's opportunities for accounting professionals had also been increasing in recent years as well as continue to develop. The Reserve Bank of India appointed managerial accounting as well as auditing, but banks seem to be keen to contact fraud examiners investigators and frauds, often reliant on internal audit function.

Leading to excessive fraud, valid accountants are needed. Satyam was one of the conflicting scams in India that contributed to the 2009 financial meltdown [89]. According to [88] banks must figure out how to practice and prepare appropriately competent staff for forensic accounting and evaluate so that trained staff can start investigating large- scale frauds. India's forensic institutions provide exceptional programmers to combat bank fraud. The above discussions are most likely dedicated to bank robberies [90].

In such cases, forensic accounting is a viable method for examining and fraudulent transactions in banks which have been mismanaged [91]. Vibrations in complex banking operations can only be tried to address through to the successful execution of valid financial reporting [3].

4 Conclusion

After analyzing previous studies, criminal accounting is a lease on a specialized area of accounting. The criminal accountant investigates incidents of fraud, bribery, money laundering and embezzlement through analysis of records and financial transactions, tracking of assets, etc. Securities fraud, asset embezzlement, identity theft, compensation disputes, trademark and patent violations are just some of the focus areas for legitimate accountants.

Law enforcement agencies, including intelligence and interior, together with fraud investigation units of major corporations and financial institutions often turn to these highly skilled professionals to help detect and analyze evidence used to solve and prosecute financial crimes.

Several studies have emphasized the need to apply criminal accounting in order to protect data and we have noted this in several previous studies in Iraq, Nigeria and India, They all emphasized the benefits of criminal accounting, and criminal accounting services generally include the application of specialized knowledge and investigative skills of chartered accountants to collect, analyze, evaluate, interpret and report evidence in the courtroom, board or any other legal or administrative place.

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Exploring Business Faculty's Perception About the Usefulness of Chatbots in Higher Education



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Abstract The study aimed to investigate the perceptions of business faculty regarding the usefulness of chatbots in higher education. The study focused on three main factors that would affect the acceptance level of faculty members in using chatbots in higher education including performance expectancy, perceived trust, and social influence. The survey research instrument was distributed to Business faculty internationally. A total of 120 responses were collected and analyzed. Based on the regression results, the study found that the acceptance level of faculty members in using chatbots in higher education is significantly affected by the chatbot performance expectancy, perceived trust, and social influence. The analysis indicated that Business faculty members perceived chatbots as useful tools in higher education. The study recommends that educational institutions should consider implementing chatbot technologies to enhance faculty engagement and support in the business discipline. Providing training programs and workshops to familiarize faculty with the benefits and functionalities of chatbots is essential to address any potential resistance to adopting these technologies. However, it is important to acknowledge the limitations of the study. The study focused specifically on business faculty; therefore, the results may not be fully applicable to other educational contexts or faculty members from different disciplines.

Keywords Chatbot · Business faculty · Higher education · ChatGPT · Artificial intelligence

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1 Introduction

Simulating human conversation, chatbots are computer programs that use artificial intelligence (AI). Their efficiency and personalized services have been largely appreciated by various industries, including education. With the growing interest in the adoption of chatbots in higher education, the Business sector is particularly keen. The usefulness and challenges of incorporating chatbots in higher education will be specifically emphasized in this context [1–3].

Driven by the need to offer students personalized and efficient services, higher education has embraced the adoption of chatbots. One of the ways in which chatbots come in handy is providing students with instant feedback, answering commonly asked questions, and delivering a customized learning experience [5, 6]. They also handle administrative tasks like managing course registration and booking appointments. By integrating with learning management systems (LMS) and other educational technology platforms, they offer a seamless learning journey [9].

In various previous studies, it has been demonstrated that chatbots serve a purpose in higher education. These automated tools are noted for enhancing the engagement of students as well as motivating them to learn [4]. Information and assistance become easily accessible to students via chatbots, and this convenience is key [17, 21]. Students' diverse learning styles and preferences can also be accommodated by chatbots, thereby providing a personalized educational experience [6, 7]. Furthermore, task automation by chatbots plays a major role in relieving the workload of faculty and staff [9].

In higher education, chatbots have potential benefits, but there are also obstacles to be tackled. Among these difficulties is faculty and students' lack of comprehension and awareness of chatbots [4, 16]. In addition, effective design and programming are required for chatbots to deliver precise and pertinent information to students [6, 7]. To guarantee that chatbots mesh well with other systems, it is crucial to assimilate them into pre-existing educational technology platforms [9–11]. It is also imperative to consider moral concerns like safeguarding data and user privacy [8, 10, 18].

Offering personalized and efficient services to students, chatbots have the potential to revolutionize higher education, especially in Business. Their scope of benefit is vast, from administrative tasks' support to prefacing learning experiences with real-time feedback. Ethical considerations, effective design, and programming are among several challenges that need to be addressed for their successful adoption. The lack of awareness and understanding of chatbots among students and faculty is an added challenge that must be overcome. Underpinning all concerns should, therefore, prioritize overcoming said challenges.

Given its ability to improve student learning experiences as well as administrative efficiency, the use of chatbots in higher education has grown increasingly popular in recent years. This popularity may be attributed to the potential of chatbots. However, there hasn't been a lot of study done on how professors feel about the usage of chatbots in higher education yet. The perspectives of Business faculty have a big effect in determining whether chatbots will be adopted and used in Higher Education

[25]. Business faculty play an important part in the formation of the curriculum and the teaching techniques utilized in their degree programs. As a result, the objective of this study is to investigate the perspectives held by Business Faculty about the use of chatbots in the context of higher education.

The outcomes of this research contribute to the current literature on the application of chatbots in higher education and will give insights into the perspectives of Business professors regarding the usefulness of chatbots in Higher education. The findings of this research may be used to inform the development and deployment of chatbots in Higher education, which in turn can assist Business degree programs in better meeting the demands of their student body.

The importance of this research comes in its attempt to identify and fill a gap in the existing research on the importance of chatbots in higher education. Despite various research studies in the field of artificial intelligence (AI) in the business industry, the purpose of this study is to examine the Business Faculty's perspective on chatbots in Higher Education. This study intends to examine the level of their positive or negative response by studying the factors that determine the usefulness of chatbots in higher education, consequently measuring the Business faculty's perception on the usage of such technology. The study's findings can help educational policymakers and stakeholders in making informed decisions concerning the use of chatbots in higher education.

Hence, this research aims to identify factors that influence the usefulness of Chatbots in higher education by exploring the business faculty's perception. The following are the research questions:

1. What impact does Performance Expectancy have on acceptance level of chatbot usage on business higher education faculty?
2. What is the effect of Perceived trust on acceptance level of chatbot usage on business higher education faculty?
3. What impact does the social influence have on acceptance level of chatbot usage on business higher education faculty?

2 Literature Review

According to [5] study, it has been suggested that the recently launched AI chatbot, ChatGPT, could immensely benefit in finance research. This article addressed benefits of using ChatGPT to generate ideas and identify data using the empirical approach. Besides, the study highlighted the drawbacks of literature synthesis, determination and implementation of testing frameworks. One of the paper's key findings is that the amount of private data and researcher field of expertise input effects the output quality. Furthermore, the assistance of chatbots can be useful for researchers who already have a solid basis in their field of study and have access to pertinent data. The importance of using ethical implications in AI technology are also highlighted in this research. In addition, issues related to data privacy, bias, and transparency are crucial when using AI bots like ChatGPT. The study's findings indicate a necessity for additional research

to corroborate the results in other contexts and fields. Additionally, responsible and transparent use of these tools is crucial.

According to the findings of the study [20], AI-based Chatbots can aid Malaysian Higher Education Institutions (HEIs) by offering virtual student services assistance. The article focuses on the elements that determine chatbot adoption effectiveness, with the UTAUT2 model serving as the reference IS theory. It also underlined the significance of designing user-friendly and visually appealing chatbots. The importance of perceived trust, interaction, design, ethics, performance expectancy, and frequent usage of chatbot apps was one of the study's important results. These insights can be used to inform productivity and marketing initiatives for better serving students. A survey technique and a two-stage analytical procedure (SEM-ANN) were used to assess the study model and investigate the research hypothesis. The study's findings also laid the groundwork for future studies on chatbot adoption in higher education. Overall, this article added to the expanding collection of articles on AI-based chatbot adoption in non-HEI contexts.

With regards to perceived benefits and limitations of chatbots in higher education, [12] performed a survey to investigate the perceived advantages and disadvantages of chatbots in higher education. Chatbots are computer programs that understand and reply to user inputs using natural language processing. They have been used in higher education as virtual assistants, customized learning assistance, and student help and interaction instruments [12]. The study involved 137 university students, and the findings revealed that chatbots are effective for giving quick and simple access to information, addressing inquiries outside business hours, and enhancing student participation [12]. Students, on the other hand, were concerned about the absence of human connection and the possibility that chatbots may deliver erroneous or irrelevant information.

The results correspond with earlier research that has explored the advantages and disadvantages of chatbots in higher education. Sandu and Gide [23], for instance, examined chatbot programs and assessment studies in higher education and discovered that while chatbots can enhance student engagement, satisfaction, and learning outcomes, they additionally demand careful design and implementation to guarantee effectiveness and user-friendliness. Kooli [10] performed a randomized controlled study of a chatbot meant to promote student learning and discovered that the chatbot enhanced educational results for some but not all students.

On the other hand, some studies discussed the challenges of Chatbots for Accounting Professionals. For instance, [3] investigated the use and problems of chatbots in the context of accounting professionals in their study. The paper emphasized the usage of ChatGPT, a language model similar to the one I'm using to communicate with you. Chatbots may help users with activities like data input, analysis, and reporting, as well as give real-time information and assistance. These advantages have also been noticed in other industries, including healthcare, where chatbots can assist experts minimize their burden by answering typical patient concerns [13].

Nevertheless, [3] mentioned several difficulties with the implementation of chatbots in accounting. These challenges included the need for careful design and implementation to ensure accuracy and user-friendliness, the potential for chatbots to

make errors or provide incomplete information, and concerns about data privacy and security. These challenges have been identified in other fields as well.

The article concluded by presenting a case study of ChatGPT's application in accounting, which demonstrated the potential usefulness of chatbots for tasks such as financial statement analysis and fraud detection [3]. However, the author also noted that further research is needed to explore the effectiveness of chatbots in accounting and to address the challenges associated with their use.

Tsvitanidou and Ioannou [24] conducted a study aimed to explore the potential of chatbot integration in educational contexts. The study employed semi-structured online interviews with professors and students from a Cypriot institution. Additionally, the research study that involved analyzing information obtained from interviews to identify the diverse needs and expectations of higher education users regarding chatbots as a supporting technology. Through thematic analysis, the study revealed that users require chatbots to support content delivery, formative evaluation, qualitative feedback, research task processing, and social bonding. Hence, the research provided compelling evidence of chatbots' potential to meet the diverse technological and instructional needs of higher education users. The study recommended that chatbot developers prioritize incorporating key platform elements such as flexibility, personalization, and user-friendliness when creating chatbots. By doing so, chatbots can provide optimized levels of support and enhance the overall quality of the higher education experience for users [14, 15]. These findings underscore the critical importance of creating next-generation chatbots that are not only technically advanced but also user-centric and able to adapt to the changing needs of higher education users.

Also, [1] conducted research to examine the potential benefits of using chatbots to gather data from university students. The major goal of the study was to compare the usefulness and efficiency of chatbots as a data gathering method to traditional survey approaches. Abbas et al. [1] conducted a comprehensive assessment of data collected from a representative sample of university students in Oman using a mixed methods research design. The main purpose of the study was to evaluate the quality and quantity of university questionnaire responses received via chatbots. According to the study, chatbots have proved to be an effective tool for data collection in university surveys. The results showed that chatbot-assisted surveys resulted in significantly higher response rates. This indicates that individuals find the technology to be more interactive and engaging compared to traditional survey techniques.

According to [1], chatbots have customizable features, can provide personalized responses, and produce quicker survey results, making them a beneficial instrument for gathering data. Compared to conventional survey methods, respondents feel more comfortable expressing their opinions to chatbots, representing a significant advantage afforded by this technology. This article concluded that Chatbots represent an effective approach for administering university surveys. The utilization of chatbots allows for the collection of data in an economical and efficient manner, contributing to the enhancement of teaching and delivery techniques within academic institutions [1].

Chocarro et al. [4] utilized the Technology Acceptance Model (TAM) to investigate the perceptions of teachers regarding chatbots in the classroom. The study aimed

to determine how social language, bot proactiveness, and user characteristics affected instructors' adoption of chatbots in education. The research employed a questionnaire survey of 214 Spanish teachers who provided their impressions of chatbots in education and received a rating for their responses. The findings suggested that social language and the robot's initiative are important factors influencing teachers' perceptions of chatbots. In addition, the lecturers' previous experience with new technologies and the ease of use of chatbots played a crucial role in shaping their views. Chocarroet al. [4] also found a strong correlation between teachers' perceptions of chatbots and their intentions to use chatbots in the classroom. The study by [4] examined factors influencing teachers' adoption of chatbots in the classroom. According to the results, chatbots could prove to be useful educational tools, provided they have active functions and appropriate social language. The study highlighted the importance of considering teachers' prior experience with the technology and ease of use when considering the use of chatbots in education.

Furthermore, [19] conducted a study about the student perspective on information acquisition using chatbots at universities. Now more than ever, chatbots find use in a wide variety of contexts. The authors asserted that there is a new form of human-computer interface based on natural language, and they are particularly useful for issues that arise in the workplace, such as customer service and information gathering. However, there has been a dearth of research into the use of chatbots in educational institutions, even though they could be immensely helpful in a variety of contexts. Therefore, researchers used a questionnaire to collect data from 166 students at a German university, representing a wide range of majors and levels of education. Their goal was to conduct a comprehensive study of (1) what it takes to build a chatbot, and (2) what kinds of questions and topics chatbots should be able to answer. The findings of the researchers also showed that many college students are open to interacting with chatbots, suggesting that they are well-suited to the educational setting.

Moreover, [2] looked into what factors might affect chatbots' popularity among college students and how they might be implemented in higher education institutions. In this research, researchers applied the UTAUT2 (Unified Theory of Acceptance and Use of Technology) to the classroom setting. Brunel University London's 431 undergraduate and master's level computer science students participated in a quantitative survey. Partial Least Squares Structural Equation Modeling (PLS-SEM) in SmartPLS3 was used to examine the data. The research showed that students' behavioral intention (BI) to use chatbot technology was most strongly predicted by their performance expectancy, effort expectancy, and habit.

Pérez et al. [22] looked into the use of chatbots in the education system. The authors' research is centered on the evolution and current applications of chatbots in the field of education, where they serve as either service assistants or educational agents. The study findings suggested scenarios in which a chatbot can help with learning in a setting analogous to that of a human instructor, while also investigating additional options and methods for rating chatbot quality. Based on the above-mentioned studies, the research hypotheses are as follows:

H₁: There is a significant relationship between Performance Expectancy and Acceptance level of chatbot usage to business higher education faculty.

H₂: There is a significant relationship between Perceived Trust and Acceptance level of chatbot usage to business higher education faculty.

H₃: There is a significant relationship between Social Influence and Acceptance level of chatbot usage to business higher education faculty.

3 Methodology

The fundamental goal of this study is to examine how elements such academics’, trust, social influence, and performance expectations affect the acceptability level of the adoption of chatbots in Business Higher Educations (Fig. 1).

A quantitative approach for this research is applied and a survey was created to collect information from the business faculty internationally. 22 Closed-ended questions using Likert scale were included in the questionnaire. SPSS version 26.0 was utilized for data analysis. 120 responses were obtained to better provide a comprehensive understanding of the data gathered.

3.1 Demographics and General Information

Table 1 shows the demographic information of our study. The majority of the respondents were males with 54.8%; nonetheless, 45.2% were females. Furthermore, the majority of the respondents with the academic position were lecturers with 38.7%,

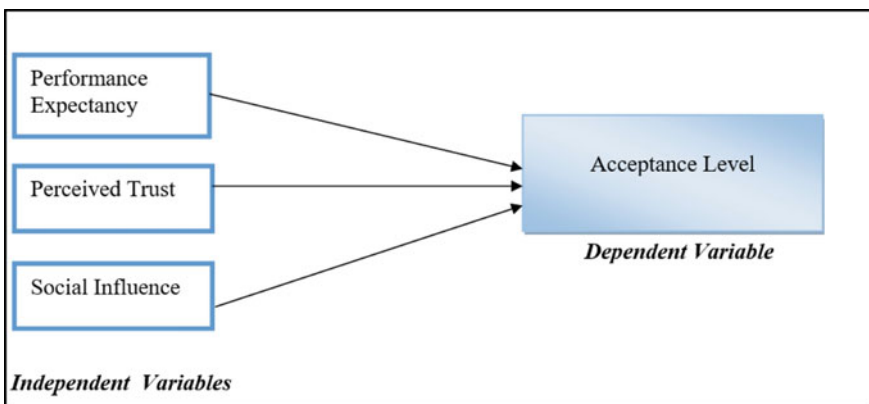


Fig. 1 Research conceptual model

Table 1 Demographics information

Variable	Group	Frequency	%
Gender	Male	68	54.8
	Female	56	45.2
Academic position	Professor	23	18.5
	Associate professor	23	18.5
	Assistant professor	29	23.4
	Lecturer	48	38.7
	Bahraini	76	61.3
Nationality	Non-Bahraini	48	38.7
	1–5	24	19.4
	5–10	43	34.7
Years of experience	10–15	37	29.8
	15+	20	16.1

followed by assistant professors with 23.4%, and ending with equal weight between associate professor and professor positions with 18.5%.

3.2 Performance Expectancy

Table 2 shows the summary statistics for a survey conducted on a set of statements that aims to measure the impact between performance expectancy and acceptance levels. The table shows the statements, number of responses (N), minimum and maximum number, mean, and standard deviation. The mean results value is 4.756 which suggests that, on average, the participants' responses are closer to the higher end of the scale (5) rather than the lower end (1). This indicates a generally positive sentiment or agreement towards the statement among the respondents. The standard deviation with values ranging from 0.46 to 0.549, it suggests that many responses are clustered closely around the mean and consistent, with relatively little deviation. This indicates a higher level of agreement or consensus among the participants regarding their ratings or opinions on the performance expectancy statements.

3.3 Perceived Trust

Table 3 shows the summary statistics for a survey conducted on a set of statements that aims to measure the impact between perceived trust and acceptance levels. The mean results value is 4.748 which suggests that, on average, the participants' responses are closer to the higher end of the scale (5) rather than the lower end (1). This indicates a generally positive sentiment or agreement towards the statement among

Table 2 Results related to H₁: relationship between performance expectancy and acceptance level

Statements	N	Minimum	Maximum	Mean	Std dev.
I find chatbots useful in my daily campus life	120	1	5	4.75	0.523
Using a chatbot increases my chances of achieving academic-related information that is important to me	120	1	5	4.725	0.549
Using a chatbot increases my productivity in academic difficulties	120	1	5	4.75	0.506
Overall, I would find a chatbot to be advantageous for my campus lifestyle	120	1	5	4.8	0.460
Average				4.756	

Table 3 Results related to H₂: relationship between perceived trust and acceptance level

Statements	N	Minimum	Maximum	Mean	Std dev.
I will encourage the students to use the chatbot if I feel that the content is trustworthy	120	1	5	4.742	0.572
I will encourage the students to use the chatbot if I feel that the chatbot provides reliable information	120	1	5	4.775	0.476
I will encourage the students to use the chatbot if I feel that the chatbot meets my expectations	120	1	5	4.758	0.485
I will encourage the students to use the chatbot if I feel that the chatbot is secure	120	1	5	4.717	0.522
Average				4.748	

the respondents. The standard deviation with values ranging from 0.476 to 0.572, it suggests that many responses are clustered closely around the mean and consistent, with relatively little deviation. This indicates a higher level of agreement or consensus among the participants regarding their ratings or opinions on the perceived trust statements.

3.4 Social Influence

Table 4 shows the summary statistics for a survey conducted on a set of statements that aims to measure the impact between social influence and acceptance levels. The mean results value is 4.725 which suggests that, on average, the participants’ responses are closer to the higher end of the scale (5) rather than the lower end (1). This indicates a generally positive sentiment or agreement towards the statement among the respondents. The standard deviation with values ranging from 0.510 to 0.585, it suggests that most responses are clustered closely around the mean and

Table 4 Results related to H3: relationship between social influence and acceptance level

Statements	N	Minimum	Maximum	Mean	Std dev.
People who are important in my specialization think that I should use a chatbot	120	1	5	4.692	0.531
People who influence my behavior think that I should use a chatbot	120	1	5	4.742	0.527
People whose opinions I value prefer that I use a chatbot	120	1	5	4.742	0.526
A colleague’s suggestion and recommendation will affect my decision to use a chatbot	120	1	5	4.742	0.510
I would use a chatbot because a proportion of my colleagues use a chatbot in their teaching	120	1	5	4.708	0.585
Average				4.725	

Table 5 Cronbach’s alpha

Variable	Cronbach alpha
Trust levels	0.845
Performance expectancy	0.897
Social influence	0.916
Acceptance level	0.888

consistent, with relatively little deviation. This indicates a higher level of agreement or consensus among the participants regarding their ratings or opinions on the social influence statements.

3.5 Data Reliability

For data reliability, researchers used Cronbach’s Alpha test. Based on [8], values from 0.90 and above are for excellent reliability. Values between 0.70 and 0.90 are for high reliability. Values between 0.50 and 0.70 are for moderate reliability. Finally, values from 0.50 and below are for low reliability.

It can be concluded from Table 5 that trust level, performance expectancy, and acceptance level have high reliability, while social influence has excellent reliability.

3.6 ANOVA Test

An analysis of variance (ANOVA) test was performed to determine if the predictor factors had a significant effect on the independent variables of interest. The model

Table 6 ANOVA test results

	df	SS	MS	F	Significance F
Regression	3	7.793484172	2.59782806	32.2291094	0.000
Residual	116	9.350182495	0.08060502		
Total	119	17.14366667			

Table 7 Regression statistics

Multiple R	0.67423916
R square	0.45459844
Adjusted R square	0.44049323
Standard error	0.28391023
Observations	120

appears to be statistically significant because the F value is less than 0.01, as shown in Table 6. This means that the dependent variable, namely acceptance level of chatbot usage to business higher education faculty, can be accurately predicted by the three independent variables, namely, trust level, performance expectancy, and social influence.

3.7 *R Squared*

Table 7 shows the regression statistics. It can be concluded that only 45.5% and 44.1% of the independent variables (trust level, performance expectancy, and social influence) can explain the dependent variable (acceptance level of chatbot usage to business higher education faculty).

3.8 *Hypothesis Testing*

The outcomes of the regression statistics for all independent variables are shown in Table 8. All hypotheses are accepted because their respective P values are smaller than 0.05.

Table 8 Hypothesis testing

Code	Coefficient	T Stat.	P value	Result
H1	0.370	4.313	0.000	Accepted
H2	0.337	3.930	0.000	Accepted
H3	-0.067	-0.847	0.000	Accepted

4 Conclusion

The study aimed to investigate the perceptions of business faculty regarding the usefulness of chatbots in higher education. The independent variables considered were performance expectancy, perceived trust, and social influence, while the dependent variable was the acceptance level of chatbot usage among business higher education faculty. A total of 120 responses were collected and analyzed.

The study found significant relationships between the independent variables (performance expectancy, perceived trust, and social influence) and the acceptance level of chatbot usage among business faculty. The analysis indicated that business faculty members perceived chatbots as useful tools in higher education.

Based on the findings of the study, which indicate significant relationships between performance expectancy, perceived trust, social influence, and the acceptance level of chatbot usage among business higher education faculty, it is recommended that educational institutions consider implementing chatbot technologies to enhance faculty engagement and support. Chatbots have the potential to improve the overall educational experience by providing timely and accurate information, facilitating communication, and offering personalized assistance to faculty members.

Furthermore, institutions should invest in training programs and workshops to familiarize business faculty with the benefits and functionalities of chatbots. This will help address any potential concerns or resistance towards adopting new technologies and maximize the potential benefits of chatbot usage in higher education settings.

The main limitation for this study was the sample size. Although the study included 120 responses, it is important to acknowledge that the sample size may limit the generalizability of the findings. To enhance the study's validity, future research could aim for a larger and more diverse sample, including participants from different institutions and disciplines.

Furthermore, the study has had contextual limitations: The study focused specifically on business faculty, which may restrict the generalizability of the results to other educational contexts or faculty members from different disciplines. Future studies could explore the perceptions of chatbot usage across various educational settings to provide a broader understanding of its effectiveness and acceptance.

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Electronic Fraud in the Age of Technology



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Abstract The current paper focuses on the need of educating society about electronic fraud which will reduce the cost spent for investigating the fraud and recovering from its financial and economic impact on society. As a result, the paper recommends considering cybersecurity and the basic rules for investigating fraud to be part of universities' and schools' curriculums.

Keywords Electronic commerce · Fraud · Auditing · Digital era · Forensic accounting

1 Introduction

Fraud it means deception the offender obtains from others unlawfully a benefit or advantage Fraud through smart electronic devices has become a serious crime, which has increased recently with the advancement of technology, as smart devices are available to everyone and to different groups of society of different ages, such as children, adolescents, and adults alike, and this is due to the ease of acquiring these modern devices, as their prices vary between Low-priced devices and expensive devices, but in the end they serve the same purpose [1–6].

Where different and strange phenomena appeared to us that fall under electronic fraud, where we communicate randomly with all the devices in order to deceive their owners by deluding them, for example, by winning sums of money from a bank or winning gifts from a commercial store, and the aim is to lure the victims to obtain their confidential information Which enables them to steal their money and hack their bank accounts, or offer them various types of prohibited drugs, such as drugs

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at low prices, targeting teenagers to get involved in methods that do not benefit the person himself or society [7–15].

The seriousness of this crime lies in human corruption, which is the basis of society and its renaissance in its various categories, where children and adolescents are at an insufficient age to be aware of the distinction between things that are in their interest or not, as it is easy to lure them and influence them, which leads to the deviation of their ways to ways that do not benefit them. In view of the great importance of this issue in preserving the structure of society and the large spread of this type of crime, the causes of which are due to the technological development witnessed by the world, there was an urgent need to increase the awareness of members of society and to stipulate strict laws for this type of crime. The importance of the study shows the extent of the seriousness of crimes arising from Internet fraud and modern technology, which is still increasing, as the victims of this crime are not confined to a specific group but have become targeting most of society in its various categories, whether from natural individuals of different ages, including children, adolescents and adults, and legal individuals such as companies and banks [16–23].

As it has become important to address this type of crime, some countries left this crime to the general rules of the crime of fraud and did not organize a special text for it, which raised legal problems before jurisprudence and the judiciary [24–27].

2 Literature Review

According to Bahraini law the Fraud can be defined as Seizing movable money or a document owned by others by deceiving them and forcing them to hand them over to other people using fraudulent methods with the aim of owning and possessing them. Moreover, the online fraud can be considered as the use of a service or program from the Internet to reach potential victims and carry out various fraud operations on them like using e-mail—websites—chat rooms. Furthermore, the Electronic fraud/phishing summarized as a form of exploitation, deception, and illegal electronic attacks committed by electronic criminals in order to entrap individuals to steal, extort, or for other purposes, and the penetration process usually takes place when individuals visit websites, chat rooms, online stores, blogs, or smart applications. During this stage, the victim is ambushed in order to catch and trap him, after which the criminal achieves his intention and goal that he wants illegally by attacking people's data and customer accounts [28–33].

Electronic fraud can be characterized by the ability to reach many people without actual meetings which known as online scammer, the fraudster can practice fraud wherever he is using his modern technical devices, whether he is near the victim or very far, and the risk rate in this crime is very low compared to fraud practiced on the ground and compared to other crimes [34–38].

Usually, we have many types of the online fraud in electronic devices, in the most modern electronic devices, the Internet is used, where electronic fraud is done by using various Internet services such as e-mail service, the web, chat rooms and other services that are constantly renewed and appear in new images [39–46]. Fraud takes various forms according to the diversity of Internet services and the more modern means and services develop new pictures appear to us, and among the most prominent pictures of fraud:

1. **Impersonation and Identity:** [4, 35, 47, 48]

Where the fraudster impersonates a person who may be influential in society and is important, or he may target the identity of one of the victim's acquaintances, as he communicates with the victim based on the impersonation of others and asks them for help with sums of money or personal data to be able to steal their money and hack their accounts [49].

2. **Email Scams:** [36, 50–52]

A method of electronic fraud in which the fraudster masters the extent of his ability to manipulate the victim and convince him of the authenticity of the message, as fake and misleading emails or SMS text messages are sent for the purpose of deceiving the victim and obtaining personal information from him, sums of money or credit card number where the temptation is the victim by winning a prize or winning an amount of money from a bank and other deceptions[53].

3. **Winning a Prize:** [54–57]

According to this type of fraud, the fraudster deceives the victim with a specific message that he has won a prize in a competition or contest he has never participated in, or by shopping in one of the large stores in the market that most people frequent, where he asks the victim to pay a fee Certain to release the prize as insurance, freight or tax and thus the scammer earns money[58].

4. **Online Auction Fraud:** [59–62]

It is well known that there are official public auctions that take place in the presence of the place and the inspection of the product, but with the development of technology and the availability of the Internet, electronic auctions appeared to us through social media through live broadcasts, as there is a high rate of fraud and fraud in this type of auctions, as the buyer cannot preview the product Before purchasing it, the product may be replaced with another other than the one he saw, and the product may not reach him at all, as it is required to pay money through an electronic means, in order to deserve to buy the product, but the person may lose his money and the product does not reach him and he cannot recover his money[25, 63, 64].

5 **Unknown Numbers and WhatsApp Messages:** [35, 49, 65, 66]

Where calls are made by unknown numbers, or a message is sent in the WhatsApp application that misleads the victim that he won a prize, whether a prize from the bank or a voucher and other prizes, and personal information is requested from

the victims, as the fraudster can penetrate their bank accounts and withdraw large sums of money from them, but it is not limited to that, but there are messages on WhatsApp selling contraband, as teenagers become easy prey for this type of fraud, motivated by experience and reckless decision-making [67, 68].

5. **Fraud Selling Counterfeit Medicines and Cosmetics:** [56, 69, 70]

Recently, there have been accounts on social media that sell medicines and beauty products at a cheaper price than pharmacies and trusted commercial places, as they mislead individuals that their products are original and at a low price, but it is quite the opposite, as medicines are not manufactured according to the medical specifications of the medicine, which negatively affects health. The buyer, as well as for cosmetics that negatively affect the buyer, which may cause him a rash and eye infections and other matters for not observing medical materials in manufacturing.

The users can protect their selves by learn the correct use of the social media and the Internet, the can educate themselves to not enter unsafe sites, enhance the security procedures for the electronic systems of the institutions and companies to reduce the expected cyber-attacks that result in the theft of information and data from individuals, not following the fake online stores that lead to loss of money, and to be aware about the digital currency fraud, which is one of the most prevalent types of fraud in the past few years and is considered one of the clean types of fraud in which the individual often cannot recover his money from the fraudster [5, 39, 71–74].

3 Conclusion

Educating members of society in different age groups of children through educating them in schools from the kindergarten level and adolescents as well as through lectures in schools that aim to educate them to prevent falling into the trap of these crimes [47, 51, 60, 75, 76]. Students must be prepared to deal with these transactions after they finish school stage, as well as adults by highlighting the role of visual media through targeted and educational videos and via radio and television, as well as written advertising such as spreading awareness through road advertisements and articles in daily local newspapers. The trap of these crimes, as well as urging countries to legislate a particular text that criminalizes this type of crime and not to leave it to the general rules and increase the punishment to achieve general deterrence for individuals, and it is also the responsibility of companies and banks to educate their customers in dealings and warn them not to respond to suspicious messages.

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The Level of Students' Satisfaction with Their Academic Performance in e-learning Through Learning Platforms



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Abstract This study aims to explore the degree of student satisfaction concerning their academic performance within e-learning platforms. To achieve this, a comprehensive survey of 16 carefully structured questions was disseminated among 100 undergraduate students at Al-Zarqa University. The results indicated a modest level of satisfaction among students regarding their academic achievement within these digital learning environments. Given these findings, this research underscores the critical necessity for further in-depth studies to determine the comprehensive scope of student satisfaction associated with online learning platforms. This study also highlights the pressing need for higher education institutions to innovate and refine these e-learning platforms actively. Such efforts are intended to bolster enhanced learning experiences and ultimately contribute to improved academic outcomes in online educational contexts.

Keywords Satisfaction · e-learning platforms · Academic performance

1 Introduction

Learning and education are the basis for the development, survival, and advancement of nations throughout the ages, and the success of the educational and learning process is reflected in the progress of nations and the building and advancement of

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societies. Accordingly, there has become an urgent need for development in education, and keeping pace with the change taking place in the informatics era in which we live today, as a result of several successive and rapid technological developments, such as the development of computers, smart devices, communications, and various applications whose effect has positively affected all areas of life in general, and education in private [1].

In an attempt to keep pace with this change, technology-based e-learning has emerged, which is one of the most important modern trends in the education and learning system that keeps pace with these developments. It is also a kind of modern technical revolution in teaching methods, which abounds with the latest technology in terms of hardware and software in the education process; [1–5].

Attar and Kansara [6] defined e-learning as a mechanism of learning and teaching that relies on providing knowledge to students and achieving interaction between students and teachers on several electronic media such as the Internet, satellites, and CDs, to facilitate the learning and teaching process. One of the advantages of this type of education is the opportunity for self-learning for students anywhere, by providing distance courses, and this is what makes this type of advanced education a tool for widespread use [7–9].

E-learning manifests in two distinctive styles: synchronous and asynchronous. In synchronous e-learning, direct interaction between the teacher and students is prevalent. The teacher presents the educational material directly, allowing students to engage in dialogue, pose queries, and receive immediate responses from the teacher. Contrarily, asynchronous e-learning is characterized by indirect interaction, primarily facilitated through study materials and learning resources provided by the teacher on the educational platform [10]. In this self-guided model, students can access the platform at their convenience and learn at their own pace without real-time interaction with the teacher. In response to these methods, Blended Learning (BL), or hybrid learning, has emerged as a progressive approach. It amalgamates the strengths of both online and traditional learning, intending to provide learners with a more engaging and cooperative learning experience [11–13].

The advantages of e-learning are identified as follows [14]:

- Students can continue their education regardless of time and place.
- Contribute to equal opportunities and provide education to all students.
- Through it, interactive lessons can be created that provide students with many advantages, such as; Instant feedback, sharing and discussing ideas, and get instant evaluation and assessment.

Ghada [15] added that one of the advantages of e-learning is that it allows all workers to complete their university studies easily and achieves fun, excitement, and flexibility in learning, and allows teachers to show creativity and art in presenting and designing scientific material, and it also strengthens the relationship between teachers and students, and students among themselves.

Through e-learning, students can use many computer programs and technical means that help achieve educational goals. This is because it possesses capabilities that create an interactive environment in education that attracts students' attention, arouses their interest, and encourages them to carry out scientific activities and required tasks and achieve educational and learning goals [1, 16].

At present, the spread of e-learning in all its synchronous and asynchronous forms has increased, due to the previous events represented in the outbreak of the Coronavirus pandemic, and the subsequent decisions of closing educational institutions in different countries of the world, including Jordan, which resulted in the discontinuation of millions of students from going to schools and universities. Countries of the world, including Jordan, resorted to directing to amending educational policies and plans and moving to e-learning in all its forms to maintain the progress of the educational process.

Accordingly, some courses continued to be offered to students through the e-learning platforms in educational institutions in Jordan, such as universities and others, and it became associated with traditional education due to its advantages and the benefits it brought to students. Zarqa University (ZU) in Jordan has also relied on the Microsoft Teams application and Moodle as platforms for student education, as Moodle is a free digital platform that integrates with other platforms to allow follow-up of student learning and direct their learning, design, and correct electronic tests, and provide techniques for communication and interaction between students and teachers, so it is considered an integrated educational environment. It includes the inclusion of various downloadable lectures and files [9].

Al-Enezi [17] refers to the distinctive characteristics of the Microsoft Teams platform in education, as this interactive platform allows the ability to send an instant message, go to a video call, share the screen with students, collaborate by sharing conversations and files, and group communication with a team via video or calls. And it allows the display of applications such as PowerPoint, and allows learners to work collectively and share files, in addition to the ease of communication through communication networks, and this type of learning provides terms of techniques such as verbal and text conversation, and communication with learners in their places and thus increases the opportunities for bonding between students and teachers and helps create new environments for collective thinking and problem-solving [18–21].

The success factors of the virtual classes provided by these platforms are represented in the factors and requirements of the educational process: such as; Choosing appropriate content, activities, assessment methods, technological factors, and requirements: such as; The availability of devices, equipment, and the appropriate electronic environment, in addition to the factor of self-efficacy and its relationship to distance education among students and the achievement of teaching goals, which is represented in the vital interaction in education, managing the educational situation well, and facilitating the learning process [22].

Satisfaction with the academic performance of students expresses whether their goals and expectations from e-learning through learning platforms will be achieved or not. Academic performance is also considered a criterion by which a decision can be made regarding educational program effectiveness and the extent of interaction

with it. The factors affecting the academic performance of students are determined by cognitive factors related to the individual, such as interaction, intelligence, information processing method, and motivational factors; Such as internal motivations and external stimuli for learning, and a combination of emotional and behavioral factors such as academic engagement that are closely related to improving the overall academic performance of students [7].

2 Research Problem

E-learning has witnessed in recent years a lot of developments at the global and local levels, and it has transformed from just an idea in the imagination of educators into a practical reality that plays a key role in achieving human development and the development of the educational process in many countries of the world [7, 23]. The development of e-learning came in different forms and shapes, by employing the means of communication and modern media, which made the process of teaching and learning easy and accessible to all.

Given the importance of the student in the educational process and the importance of his involvement and acceptance of the idea of using e-learning platforms, it constitutes an interactive environment for him, that replaces face-to-face learning and gives a picture that matches direct learning in terms of achieving educational goals, an urgent need arose to ensure the ability of these platforms to achieve students' knowledge outputs, mental abilities, and various skills.

2.1 Research Questions

The research attempts to answer the following main question:

What is the level of satisfaction of students regarding their academic performance in electronic learning through learning platforms?

2.2 Research Objectives

This research aims to:

Know the level of satisfaction of students with their academic performance in electronic learning through learning platforms.

3 Study Terminology

3.1 Satisfaction

E-learning platform. An interactive system linked to the teaching–learning process. This system relies on the existence of a digital electronic environment that presents courses and activities to students through electronic networks and smart devices [16, 24].

The researchers define it procedurally as an integrated educational platform provided by (ZU) to its students, through which students acquire several skills and knowledge by employing technology sync synchronously or asynchronously in the Microsoft Teams platform and Moodle.

Performance. The term performance is applied to the ability to do something, especially if it requires skill or the implementation of part of a work or activity in a specific way.

Academic performance. Al-Tabal [5] defines it as the knowledge gained as a result of teaching, and it is measured through achievement tests that aim to measure previous learning in scholastic areas such as reading and writing. Academic performance is a measure of students' abilities; which expresses what students have learned during the educational process. It also assumes the student's ability to respond to educational stimuli.

It is defined procedurally as the total score obtained by students on the academic performance scale specially prepared for this purpose.

4 Previous Studies

The aim of the [4] study was to measure the degree of satisfaction of Kuwait University students with the experience of distance learning during the COVID-19 pandemic from their perspective. The study sample consisted of (2035) participants, and the study tool was a questionnaire, informal personal interviews, and focus group discussions to collect data. The results indicated that the degree of students' satisfaction with distance learning came at a moderate level in all study indicators.

Chtouh [20] conducted a study aimed at identifying the reality of the uses and problems of dealing with the Moodle platform among students of the Department of Arabic Language and Literature at M'sila University, and the results showed that the majority of students (80%) of them use the moodle platform, and this indicates the spread of e-learning at M'sila University, The study also revealed that there are some problems facing the university student, which it is hoped will be solved through recommendations and proposals.

Miqdadi [8] aimed to reveal the perceptions of secondary school students in public schools in Jordan about the use of distance education in light of the Corona crisis and its developments. The results of the study showed that there is a significant positive

effect of the use of distance education in light of the Corona crisis, and there are no differences in the estimates of respondents on average performance as a whole according to the gender variable.

As conducted by [25], a study aimed to identify the possible factors that affect students' academic performance and satisfaction with online learning platforms. The sample included 243 higher education students who use learning platforms. The results showed that students' backgrounds, experiences, collaboration, interactions, and independence had a positive impact on their satisfaction. Additionally, students were able to engage in processes of recall, analysis, and understanding, which enhanced their academic achievement.

Al-Bitar [18] conducted a study aimed at identifying the effectiveness of using distance education in developing academic achievement, and the attitude towards distance education in the educational technology course for general diploma students at the Education Faculty at Assiut University. The results showed the effectiveness of using distance education in developing academic achievement and the trend towards distance education.

Umek et al. [26] aimed to study the introduction of the integrated learning system using Moodle as part of the teaching process and its impact on the academic performance of students in the Faculty of Administration at the University of Ljubljana, Slovenia. The study was conducted on two groups of students, one of which was taught using the conventional face-to-face method, while the other group had Moodle integrated into their lectures. The results revealed a significant improvement in the academic performance of the students, where the average grades increased after the introduction of the Moodle platform.

By reviewing previous studies related to the subject of the research, it became clear that there are studies that dealt with distance education and its impact on students' learning, achievement, and attitudes. However, most of the studies dealt with distance learning and e-learning during the Corona pandemic period specifically, and the current research is one of the researches that examine the issue of learning through the learning platforms offered in the education sector now after the end of the pandemic and the return of the education sector and all sectors to normal, and the continuity of learning through the platforms in some courses.

5 Method and Procedures

5.1 Research Methodology

The research followed the quantitative approach due to its suitability to its subject and objectives. The research sought to identify the level of students' satisfaction with their academic performance in electronic learning through learning platforms.

5.2 Research Community

The research community consisted of all (ZU) students who study (completely electronic) courses, for which 30% of the total courses of the study plan are allocated.

5.3 Research Sample

A total of (100) male and female undergraduate students from Zarqa University were randomly selected for the first semester of the academic year 2022/2023. It is worth noting that (95) students responded to the study.

5.4 Research Tool

To assess the level of student satisfaction with their academic performance in e-learning via learning management systems, the researcher developed a questionnaire consisting of (25) items. The initial form of the questionnaire was based on a review of educational literature related to student's opinions and perceptions of e-learning.

5.5 Validity of the Scale

The scale was presented to a group of (13) expert reviewers to ensure the face validity of the tool and its suitability for the research purposes and goals. The reviewers examined the language clarity, and meaning, and suggested adding, replacing, or deleting items as necessary. The recommended modifications were implemented, which resulted in the final version of the scale consisting of (16) items after (9) items were removed due to overlapping content with other items.

5.6 The Stability of the Questionnaire

The questionnaire stability was confirmed by the test and re-test method, by applying it to (30) male and female students from the research community, from outside the sample, with a two-week interval between the first and second application, then the Pearson correlation coefficient was calculated between the sample responses in both applications. Where the value of the correlation coefficient was (0.83), which means that the tool has a high degree of stability for its application. The stability of the internal consistency was also calculated using the Cronbach alpha equation on the

Table 1 The statistical standard used to judge the arithmetic mean (Mean) values

High	Medium	Low	Mean
3.67–5	2.34–3.66	1–2.33	

previous survey sample, and its value was (0.93), and this value was considered a good indicator of the stability of the tool for this research.

To measure the opinions of the respondents, the following statistical criterion was used (Table 1).

6 Research Results and Discussion

What is the level of student satisfaction with their academic performance in e-learning through learning platforms? To answer the research question means and standard deviations were calculated to determine the level of student satisfaction with their academic performance in e-learning through learning platforms. The results are shown in the following Table 2.

It can be observed from Table 2 that the level of student satisfaction with their academic performance in online learning through learning platforms (with an overall average value of (2.895)) indicates that the level of student satisfaction is moderate.

The paragraph (I feel satisfied with my results in the courses I studied through e-learning platforms) got the highest (Mean) with (a 4.2) value with a high score. This might be due to that e-learning platforms provide many technologies, means, and resources that help the student to choose between them according to his needs, tendencies, and ability to learn. Learning through learning platforms provides a rich, flexible, and dynamic learning environment that helps the student to learn effectively and in the time that suits him, in addition to that the platforms provide the student with the opportunity to repeat, train, and constantly review the scientific material presented, and this, in turn, enhances the information among students and achieves learning outcomes in the best way.

The teachers also provide educational content with activities that attract the student, including texts and illustrations, allowing him to learn according to his ability freely and without restrictions, which contributed to the development of positive attitudes towards learning in general, and the development of the knowledge aspect related to the content. The learning platform (Microsoft Teams) provides an opportunity to immediate feedback to the learners, which prompted them to identify their weaknesses and thus inquire and communicate with teachers first to enhance explanation and clarification. The results of this research are consistent with the study of [21], which found the effectiveness of interactive e-learning platforms in developing internet use skills and reducing cognitive burden and confirmed that e-learning platforms increase academic achievement.

Table 2 (Means) and (SDs) of the level of student satisfaction with their academic performance in e-learning through learning platforms

Rank	Item	(Mean)	(SD)	Degree
1	I feel satisfied with my results in the courses I took through e-learning platforms	4.2	0.2	High
2	Learning through the platform helped me effectively achieve the objectives and learning outcomes of the lesson	4.1	0.01	High
3	The platform helped me understand the scientific material clearly	3.9	0.015	High
4	My performance and achievement in periodic tests and exams through the platform are better	3.75	0.01	High
5	Learning through the e-learning platform gave me the skill of critical thinking	3.64	0.03	Medium
6	Learning through the e-learning platform developed my self-thinking skills	3.43	0.01	Medium
7	Learning through the platform has given me the skill of collaborative learning with colleagues	3.25	0.14	Medium
8	Learning through the platform increased my motivation and enthusiasm for learning	3.1	0.02	Low
9	Learning through the platform increased my confidence in my ability to learn	2.89	0.002	Low
10	Learning through the platform gave me the ability to analyze information	2.67	0.01	Low
11	The e-learning platform helped me commit to submitting my homework on time	2.44	0.01	Low
12	Test questions and exams are answered through the platform honestly and credibly without anyone's help	2.1	0.01	Low
13	Learning through the platform demonstrated my abilities and potential	1.9	0.14	Low
14	The platform increased my positive attitude toward education	1.76	0.03	Low
16	The e-learning platform allowed me to allow media and draw information from its sources	1.65	0.03	Low
17	Learning through the platform has developed my skill in searching for and investigating information	1.54	0.2	Low
The general (Mean)		2.895	0.07	High

The paragraph (Learning through the platform has developed my skill of searching and investigating information) got the lowest (Mean) and value (1.54) a low score. This may be due to the effort made by the teacher in helping students to learn through electronic learning platforms, thus presenting the scientific material in more than one template, and presenting the scientific material at length and detail, so that the student reaches the stage of sufficiency with the presented material without the effort of searching for other sources of information to clarify ideas and meanings. This result is consistent with the study of [14, 18] (Kanan et al. 2020), all of which indicated

the positive impact of distance education and e-learning on increasing achievement and improving performance.

7 Recommendations

Based on this study, following recommendations are proposed:

- There is a need to work on developing educational platforms that align with the needs and expectations of students in all educational sectors and institutions.
- There is a necessity of conducting more studies to determine the level of student satisfaction with learning through online learning platforms, to develop these platforms by higher education institutions.

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International Accounting Standards Technique: Need of Related Party Disclosures (IAS 24)



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Abstract The purpose of this study is to review the International Accounting Standard (IAS 24) “Related Party Disclosures”. The theoretical literature review helps to understand the need of Related Party Disclosures. “A review method was chosen to explore the “IAS 24. Related Party Disclosures are needed to improve the quality of disclosures as well as the role in providing the necessary information to all related parties”. This study should be relevant to accounting setter institutions considering jurisdictions in Related Party Disclosures.

Keywords International accounting standards · Related party disclosures · IAS 24

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1 Introduction

International Financial Reporting Standards (IFRS) has been issued by International Accounting Standards Board (IASB). There are 41 accounting standards issued by IASB [8]. IAS 24 (Related Party Disclosures) are one of the accounting standards issued by International Accounting Standards Committee (IASC) in 1984 [8]. This standard argued about various issues identified with nine measurements, which incorporate (General necessities, communications with control relationship parent, transactions with mutual control, “transactions with affiliates, relations with associates, dealings with joint venture, contacts with management personnel, trades with government related entities, understanding IAS 24) [1, 7].

The standard of IAS 24 is known as the standard of Related Party Disclosures towards more effective income statements and balance sheets that have been affected by the existence of different transactions such as commitments, outstanding balances and others [12, 13].

IAS 24 is one of the important International Accounting Standards that provide vital information and data regarding entity’s outstanding balances and different transactions related with several parties involved. This standard is related with different individuals and their respective disclosures such as directors’ compensation and outstanding balances [9, 10]. The IAS 24 has been applied on key personnel of the entity that have control, significant influence on the management of the entity. The IAS 24 has been also applied on entities such as subsidiaries, parents, fellow subsidiaries, joint ventures, entities with significant influence, and employment benefit plans [8].

The goal of IAS 24 is to safeguard that an entity’s financial statements contain the revelations required to notice the attention to the prospect that its “financial position and profit or loss may have been influenced by the presence of related parties and by dealings and outstanding balances with such parties”.

“Transaction between entities that are considered related parties must be adequately disclosed in financial statements. Such disclosures have been a common feature of financial reporting, and the most accounting standards-setting bodies have imposed similar mandates [5]”.

“The review technique of IAS 24 are extends to further emphasis on international accounting studies by several scholars [2, 4, 5, 13–16], in order to address the issue of the ninth dimensions of the IAS 24, which include (General requirements, transactions with control relationship parent, transactions with joint control, transactions with subsidiaries, transactions with associates, transactions with joint venture, transactions with management personnel, “transactions with government related entities”, understanding IAS 24).

2 Literature Review

International accounting standard 24 [8] initially came out in 1984 to elaborate the problems caused by related party transactions (RPTs). It became effective for the very first time on January 1st of 1986. It defines the role of RPTs and restricts the misuse or fraudulent use of the RPTs [8]. IFRS [8] states that the transactions held between the company and its subsidiaries, officers, owners, affiliates directors or other entities controlled and owned by the officer, or their family members of that company will be defined as related party transactions [8]. It also considers the acquisitions of assets and sales of assets, sales of services, sales of goods, loan guarantees, cash payments, and other transactions with the related parties as RPTs. The purpose of the accounting standards that govern how to present the RPTs, is to reflect the change occurred in the financial position due to the related parties' transactions [6]. The early stage of the IAS 24 development was the.

Exposure Draft E25 issued by IASC in March 1983, it started working on January 1st of 1986 and was adopted by IASB in 2001 and 2009 [8]. The most updated edition being on January 2011, which further simplified the description of RPTs and gave temporary exceptional cases about "government related entities [8]".

There are other and more extensive related parties of the reporting entity include [17]:

- Got a separate of full control of or joint control above %50 of the reporting entity.
- Can influence the %20 to %50 over the reporting entity.
- Being an important management member in reporting entity or its parent entity or the other related party.
- Having the same participation in the same group as that of reporting entity.
- Being an associated subsidiary of reporting entity May be a joint venture of reporting entity.
- Has as after employment benefit plans for its employees or the related parties.
- Is co controlled or separately controlled by related person of reporting or the related entity.

However, the two parties will not be considered as related parties if they have a mutual joint venture or having same important management members or key member who can influence the other entity IAS 24.11 the accounting standards for RPTs [8] are to strengthen the market regulations of capital market and procedure of approvals on RPTs and developed plans for providing guidelines of best practices of RPTs [11]. The related party transactions are considered as the mostly used as opportunistically and hence caused a business failure. In countries where the business transactions are likely to be more susceptible in concern of corruption the periodic disclosure is more acceptable in comparison with the countries with strong law enforcement of shareholders rights and protection of these rights and having control over the corruption, have a transparent RPTs disclosure instead of earlier discussed [4].

There is an amendment which tells that any entity which is providing the management services or "management personnel to the reporting entity (or to parent of

reporting entity)” will be known as a related entity. According to this amendment it may be required that the expenses made on these management personnel and the personnel services given by a separate entity of management should be disclosed separately. However, this amendment also clarifies that it is not necessary to report the compensation payable or paid from the management to the employees or to the directors of the company according to the limits set in the [3, 8].

The reporting entity must disclose name of its parent whether there are transactions between subsidiaries and its parent or not. if it doesn’t apply on it then it should mention the name of final authority of control which can produce the financial statements for general public uses also “the name of the next senior authority or parent that can also do so should also be mentioned for sure [8]”.

In general, a common feature of business activities and the commerce is that the “transactions with joint ventures, subsidiaries and associates” are involved including the transaction of management personnel is known as the related party relationships. It can be so much “effective on the financial performance and the financial position of the company” because of fact that related party have a strong influence over transaction with a separate entity. Many concerns were raised regarding the cost and benefit implication of huge disclosure about the transaction which are very improbable to have influenced by the related entity relationship in the situation [14].

IASB released an updated exposure drafts in December 2008 to propose the amendment in the IAS 24 regarding the relationship with the state. The main purpose the amendments were to simplify the requirement of disclosure which is applied to those entities which are jointly controlled significantly affected by state or controlled according to [3] (Fig. 1).

The proposed structure is designed based on the literature review.

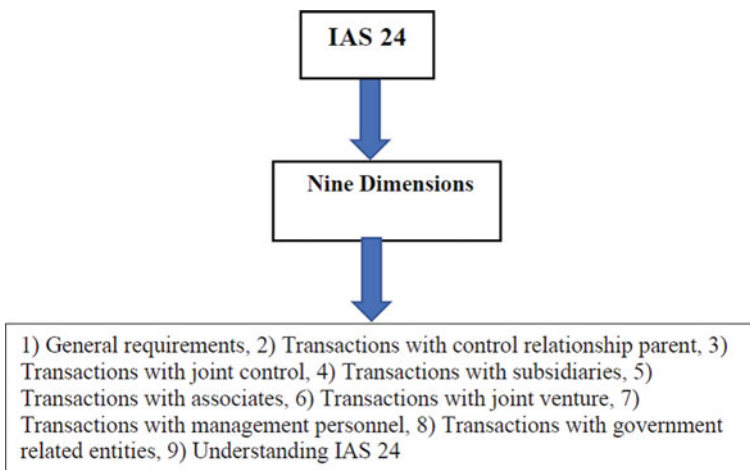
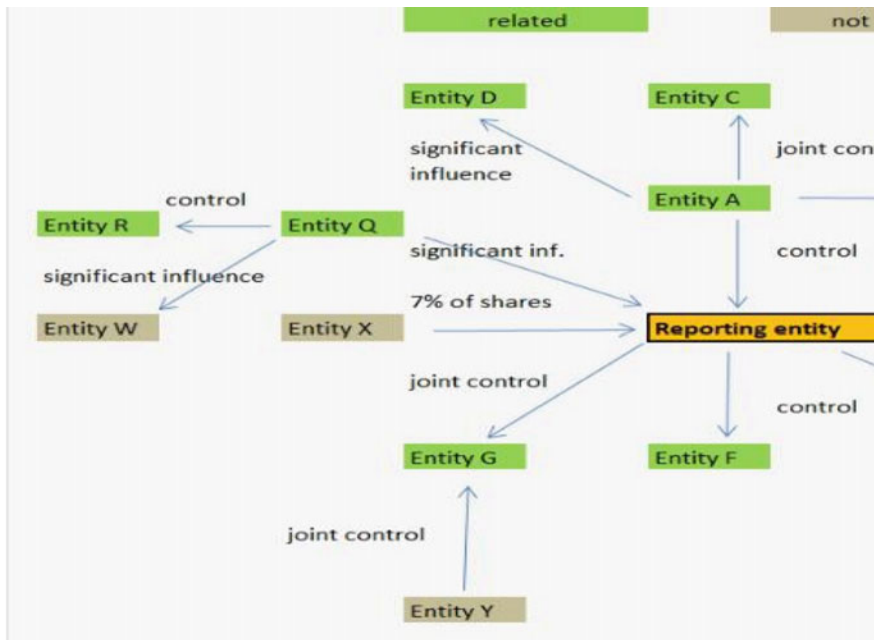


Fig. 1 Developed by authors. *Source* Authors

The reason of the “disclosures required by IAS 24” is to draw attention to the probability that the entity’s financial statements may have been influenced by the presence of “related parties and by transactions and outstanding balances with such parties”.

“The reporting company is the individual that is preparing its financial statements”. In the definition of the concept associated party, an associate includes affiliates of the associate and a joint venture” includes subsidiaries of the joint venture. A related party transaction represents a transfer of resources, services, or obligations between a reporting entity and a related party, regardless of whether a price is charged.

Related party web based on capital relationships



Example: parties related through other entities Source: iFRS community.com

3 Findings and Recommendation

“IFRS Accounting Trends & Techniques gives a close aspect at the revelation practices of global bodies that have previously started the implementation of IFRS”.

Entities should follow globally accepted accounting technique IAS 24 for “related-party disclosure” to safeguard quality financial reporting. The entities should enlarge

their focus on “disclosure of related-party” to fulfill the need of different stakeholders and other related parties. Regulatory authorities have to be active in safeguarding the related-party disclosure for retaining the worth financial reporting by entity.

4 Conclusion

The scope of this standard is to understand the related party’s disclosures, transactions, outstanding balances, any special commitments related to the entity. The disclosure contains the short-range and post employee benefit, termination, share based paybacks and other any long-term significant profitable dealings. “The related party transactions as described in the IAS 24 standard” should be implemented across the organization in which all executive members of the company such as key management personnel should be declared their liabilities and all other short- or long-term benefits that they have been utilized from the company’s assets. In this regard, the IAS 24 standard should be implemented, and related party transactions must be presented in financial statements in order to enhance the reliability of assets and performance in the market.

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The Impact of Applying the Elements of Administrative Creativity in Improving the Quality of Services in the Ministry of Education Center: A Case Study



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Abstract The primary objective of this research is to explore the impact of incorporating administrative creativity elements on service quality enhancement, focusing on employees at the Central Jordanian Ministry of Education. The investigation is structured around two distinct variables: the independent and dependent variables. The independent variable represents administrative creativity, gauged through four key aspects: fluency, flexibility, risk-taking, and analytical ability. Conversely, the dependent variable's service quality is evaluated through five parameters: reliability, responsiveness, tangibility, safety, and empathy. Data for the study was collected through a comprehensive 48-item questionnaire designed meticulously to measure the variables. The study sample comprised 255 male and female employees working within the public administration sector. A descriptive analytical approach was adopted for the research, utilizing a variety of statistical tests performed via the SPSS software. The findings revealed a series of insightful results. Most notably, combined administrative creativity dimensions—fluency, flexibility, risk-taking, and analytical ability—had a significant statistical effect on the service quality within the Jordanian Ministry of Education. However, not all dimensions of administrative creativity had an equal effect. The results indicated that flexibility did not significantly influence service quality. In contrast, the analytical ability dimension held the

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greatest explanatory power over service quality. The study, therefore, recommends enhancing the Ministry's administrative flexibility. This could be achieved through open dialogues with employees, actively listening to their perspectives, and implementing feasible and ministry-aligned ideas—even if they challenge the existing administrative views. It also suggests the administration should remain highly flexible with its procedures and plans, continuously evaluating them, and not hesitate to change these processes when superior alternatives become apparent.

Keywords Administrative creativity · Service quality · Ministry of education · Jordan

1 Introduction

In the current era, organizations are experiencing an accelerated pace of change unprecedented in history. This transformation is fueled by a multitude of factors, such as evolving technology, socio-political shifts, economic changes, and the advent of globalization, open markets, heightened competition, and constrained resources. Amidst this changing landscape, public sector organizations undergo profound structural shifts across all operational facets.

The necessity for these shifts stems from the imperative to adapt and thrive amidst change, focusing on prioritizing customer needs and satisfaction, which is now a central metric for institutional success. In fact, the survival and prosperity of any institution are directly tied to customer satisfaction with its services [1–3].

Service quality has emerged as a critical competitive strategy across governmental and private organizations. This new focus has transformed organizations into competitive entities within a relatively free and open marketplace [4–6]. Today's customers are spoiled for choice and often consider service quality a fundamental selection criterion. This necessitates that organizations' departments grasp customer needs effectively to enhance satisfaction and foster loyalty—an essential tool to remain competitive in the customer-centric modern market [7].

As rapid changes continue to define the operational landscape, traditional management practices still need to be improved for improving institutional performance and enhancing service provision. Institutions across various sectors, including education, require greater creativity to adapt to globalization and rapid technological advances. The focus is on increasing efficiency and effectiveness through advanced, flexible administrative practices and a clear vision for the future.

It is of paramount importance to harness administrative creativity to enhance service quality by formulating efficient and effective strategies. This necessitates that organizational leaders and decision-makers commit significant time to envision future scenarios. Adopting such an approach will equip them to surmount the

myriad challenges and problems that contemporary employees confront in organizations and to devise suitable solutions [8]. Creativity is an indispensable ingredient in achieving excellence and superiority across many diverse fields. Its definition, however, fluctuates depending on its contextual usage. In certain institutions, creativity is intrinsically tied to talent [9]. Therefore, the thinking process, a quintessentially human activity, demands concerted and distinguished efforts from various parties for nurturing and learning [10].

1.1 Study Problem and Questions

Education constitutes the core of prevailing educational systems in many countries worldwide. This importance is underscored by numerous considerations, notably the development plans and varied programs that rely on a skilled workforce with high learning capacity, efficiency, and creativity [11]. Both individual and institutional productivity can be enhanced when creativity is encouraged throughout the organization.

Jordanian state institutions, which fundamentally revolve around service provision, require effective management of their knowledge assets to offer superior quality services. These entities need to bolster their efforts and fully utilize and develop their resources, aiming to elevate the service quality within the Ministry of Education. An observation by the researchers indicated a deficiency in applying administrative creativity within Jordanian educational institutions. The pressure to provide high-quality services to meet beneficiary satisfaction and expectations is escalating in the era of globalization and competitive global mergers [12].

Given these considerations, the study's problem can be encapsulated in the primary question: What is the impact of incorporating elements of administrative creativity on the quality-of-service enhancement within the Jordanian Ministry of Education?

1.2 Objectives of the Study

1. Explaining the concept of administrative creativity, improving the quality of services, and presenting different points of view regarding these two concepts.
2. Clarifying the most critical dimensions of the elements of administrative creativity and their role in improving the quality and dimensions of services.
3. Knowing the level of improving the quality of services in the center of the Jordanian Ministry of Education.
4. To identify the impact of the dimensions of the elements of administrative creativity in improving the quality of services in the center of the Jordanian Ministry of Education.

1.3 The Proposed Study Model

In order to fulfill the study’s objectives and offer suitable recommendations within the framework of understanding the statistical significance of the independent variable’s impact on the dependent variable, the researchers constructed a theoretical model. This model aimed to elucidate the influence of the independent variable—administrative creativity—on the dependent variable—service quality. It was postulated that the relationship between these variables was unidirectional, as depicted in the following illustration. Figure 1 presents this model for the study.

The researcher drew from various studies to prepare the source material: For the independent variable, references were made to [13–17]. For the dependent variable, the following studies were used [7, 18–20].

Study Hypotheses

Based on the study problem and questions, the study hypotheses can be formulated as follows:

H0: There is no statistically significant impact at the level of significance ($0.05 \geq \alpha$) for the elements of administrative creativity in terms of its dimensions (fluency, flexibility, risk, ability to analyze) in improving the quality of services in terms of its dimensions (reliability, responsiveness, tangibility, safety, and empathy) at the Jordanian Ministry of Education Center, the following sub-hypotheses are derived from it:

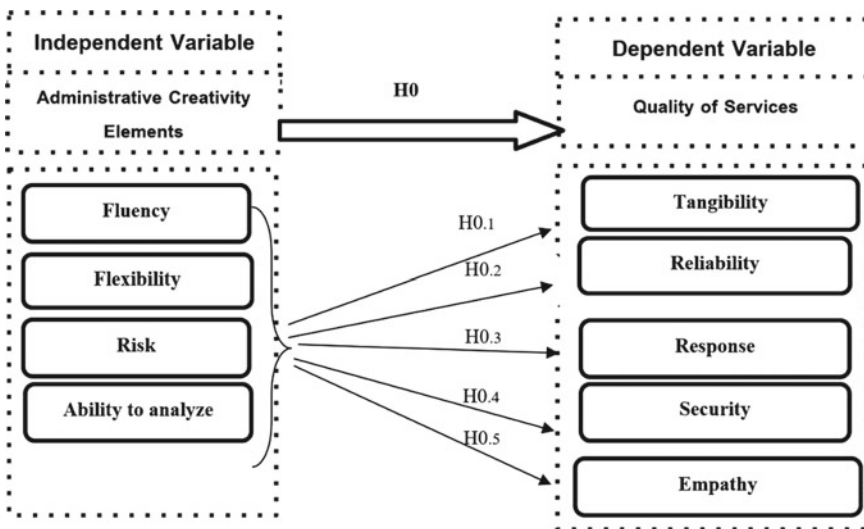


Fig. 1 The proposed study model

H01: There is no statistically significant impact at the level of significance ($0.05 \geq \alpha$) for the elements of administrative creativity in terms of its dimensions (fluency, flexibility, risk, ability to analyze) in (reliability) in the center of the Jordanian Ministry of Education.

H02: There is no statistically significant impact at the level of significance ($0.05 \geq \alpha$) on the elements of administrative creativity in terms of its dimensions (fluency, flexibility, risk-taking, ability to analyze) in (response) at the Jordanian Ministry of Education Center.

H03: There is no statistically significant impact at the level of significance ($0.05 \geq \alpha$) for the elements of administrative creativity in terms of its dimensions (fluency, flexibility, risk, ability to analyze) in (tangibility) in the center of the Jordanian Ministry of Education.

H04: There is no statistically significant impact at the level of significance ($0.05 \geq \alpha$) for the elements of administrative creativity in terms of its dimensions (fluency, flexibility, risk-taking, ability to analyze) in (AI-Aman) in the center of the Jordanian Ministry of Education.

2 Literature Review

2.1 *The Concept of Administrative Creativity*

Administrative creativity is a multifaceted concept with varying definitions proposed by different scholars. According to [1], it refers to “the ability to gather or disseminate information in a way that fosters the development of innovative ideas, responding to perceived needs and opportunities within an organization.”

Abdullah Abdul Khaleq Al [5] interprets it as a uniquely individual process in which a person encounters situations, deeply engages with them, and reacts in a way distinct from others. This reaction often leads to the creation of new products, services, technologies, tools, or administrative processes.

Others have defined it as the inception of something new, a transformative shift within an organization geared towards development, or a capability requiring specific cognitive skills and not easily accessible to all [3]. Despite the diversity in definitions, a common thread understands administrative creativity as unusual or unconventional.

Another perspective, provided by [14], defines administrative creativity as a suite of mental abilities that allow institutional managers to adapt to their environment, solve problems, and respond to various situations in unique, innovative ways. This definition emphasizes the novelty and originality characterizing such responses.

Further, [15] view administrative creativity as the capacity to conceive novel and potentially valuable ideas, solutions, products, services, or work methods. This capacity is based on an individual’s exceptional problem-solving skills, intellectual

proWess, knowledge, the presence of an enabling environment, competent leadership, and interactive work relationships that foster innovative ideation.

Lastly, [21] describe it as the employee developing personal creative skills to devise novel administrative methods, find innovative solutions to an administrative problem, or form new perceptions to address that problem. This process relies on a deliberate analysis and structured creative endeavor connected to sensory perception grounded in logical analysis, testing, experimentation, and evaluation.

2.2 The Importance of Administrative Creativity

Administrative creativity, a prevalent topic in business administration literature, is recognized for its unique characteristics and organizational variables that set one organization apart. Its understanding involves various factors, including the creative individual's personal attributes and cognitive abilities. It is considered essential in driving economic and social development, particularly in developing countries where innovation is necessary [22, 23].

According to [15], administrative creativity is crucial in enhancing organizational effectiveness by improving coordination, internal control, and the structural framework. Additionally, it supports creative processes vital for an organization's continuity and efficient resolution of challenges [24, 25]. It also encourages positive transformations within an organization's structure and operations and aids in its adaptation and interaction with surrounding environmental variables [5].

Komelina et al. [26] note that the impact of administrative creativity is evident in productivity enhancement, performance improvement of the organization and its staff, and the introduction of innovative systems, regulations, procedures, and work methods. Such creative administration contributes to developing programs and services beyond the organization's primary activities, improving the quality of products and services delivered to beneficiaries [27].

2.3 The Concept of Quality of Services

Fotouh [28] delineates the quality of services as the degree to which a service's actual performance aligns with a customer's expectations. It is a combination of features and characteristics that aptly satisfy a customer's needs, leading to satisfaction or dissatisfaction on the customer's end. Service quality is often perceived as the aptness of a service to cater to customer needs or expectations.

According to [29, 30] service quality can be defined as a measure of how well a service aligns with a customer's expectations. Providing excellent service equates to matching the customer's anticipated standards. Furthermore, [14] suggests that service quality means the organization successfully designs and delivers the service right from the outset, continually improves its performance, and concurrently

achieves customer satisfaction. The organization can enjoy a competitive edge over similar service providers in this context.

Taha et al. [31] define it as the ability of a product or service to fulfill consumer needs, representing the discrepancy between customers' expectations of perceived service and the actual service. Bouaka et al. [7] suggest that service quality fluctuates based on the sophistication level of the service provided to individuals versus their expectations, emphasizing that service quality is a fundamental requirement to satisfy and retain customers.

Abdalmalik and Yasser Saleh Mahfouz [18] perceive service quality as a skill for attracting customers and interacting with them to achieve market excellence and leadership. Hamza and Boutmani [6] further add that service quality encompasses delivering services to individuals and facilitating their provision via technical means and social media platforms. This facilitates interaction with individuals and fulfills obligations towards them without discrimination while maintaining strict confidentiality of the services provided [32].

2.4 The Importance of Quality of Services

Service quality is critical to organizations aiming for growth and stability, as it plays a pivotal role in enhancing performance and adapting to contemporary changes [33, 34]. This is especially pertinent in-service organizations where, according to [20], customers and employees jointly strive to deliver services of the highest caliber. Exceptional service quality and performance distinguish competitive organizations, often characterized by robust information systems, adept staff, and distinctive customer service skills [16, 35].

Kaddah [13] highlights that service quality significantly contributes to profit generation, fostering customer satisfaction and helping to achieve organizational objectives. While planning can be employed in product production, it's the dynamic interaction between customers and employees in service sectors that creates and delivers top-notch service. Taha et al. [31] further underscore that, particularly in this age of technological and information revolutions, service quality is a potent tool for driving ongoing service delivery improvement, retaining existing customers, attracting new ones, and sustaining organizational competitiveness.

3 Methodology

The methodology outlines the statistical techniques, processes, and tools employed by the researcher to gather and interpret data, accomplish the study's objectives, and address the research questions. While there exists a broad range of scientific methodologies utilized by scholars, the descriptive analytical method, adopted by the researcher in this study, is among the most prevalent.

To align with the study's objectives, questions, and hypotheses, the researchers leveraged an array of statistical tests executed via the SPSS (Statistical Package for the Social Sciences) program for data analysis.

3.1 Study Population and Sample

The scope of this study encompassed the employees stationed at the central office of the Ministry of Education, totaling 255 individuals of diverse genders. The study sample represented a wide array of ranks and job designations, thus encapsulating all levels of the workforce within the ministry.

3.2 Data Collection

In the process of data collection, the researchers drew upon secondary sources. These included the annual reports published by the sample banks during the study period (2017–2021) to obtain essential data. Further information was sourced from references, periodicals, bulletins, and financial and accounting reports relevant to the study topic.

Considering the study population of 255 employees, the minor sample size representative of the community, as per [15] table, ought to be no less than 155 individuals. The researchers used the comprehensive sampling method to target the entire population by distributing questionnaires. Out of the distributed questionnaires, responses were received from 180 individuals, accounting for 71% of the total distributed questionnaires. Out of the 255 questionnaires circulated among the population, 75 were not recovered by the researchers.

3.3 Study Tool

The research instrument, or the method researchers use to collect data from the sample, plays a pivotal role in the study. In this instance, a questionnaire was utilized to gather primary data. This tool was thoughtfully designed with phrases and sections that aligned with the nature of the study and its variables. Data was collated through the responses given by the respondents to these statements.

The questionnaire was sectioned into three parts: Part One: Captured demographic and functional data. Part Two: Explored the independent variable, namely administrative creativity. This was gauged through 23 items. Part Three: Focused on the dependent variable, the quality of services, measured using 25 items.

3.4 Stability

Stability refers to the extent to which the performance yields consistent results upon repeated applications. Any instrument that fails to provide stable readings raises doubts about the validity of its data. Numerous methods exist to gauge stability, with internal consistency being one of the most crucial.

Table 1 demonstrates that Cronbach’s alpha values for all study variables exceed (0.7). This suggests that the study’s findings are reliably consistent and provide a reasonable basis for interpretation and analysis [3, 36].

Table 2 demonstrates that the tolerance values for all dimensions associated with the independent variable exceed 0.1. Concurrently, all variance inflation factor (VIF) values are below 5 [33]. These findings indicate the absence of multicollinearity within the data set (Tables 3 and 4).

Table 1 Results of the internal consistency analysis of the questionnaire through Cronbach alpha coefficient

No	Variables	The number of Items	Cronbach alpha coefficient
1	Fluency	6	0.871
2	Flexibility	6	0.861
3	Risk	5	0.828
4	The ability to analyze	6	0.878
5	Tangibility	5	0.860
6	Reliability	5	0.839
7	response	5	0.860
8	Safety	5	0.837
9	Empathy	5	0.866
	Overall performance	48	0.971

Table 2 Variance inflation factor (VIF Tolerance)

Variables	(VIF)	Tolerance
Fluency	0.2750	3.641
Flexibility	0.2320	4.311
Risk	0.3510	2.845
The ability to analyze	0.3240	3.090

Table 3 Arithmetic means and relative importance of the dimensions of the administrative creativity variable

No	Item	Arithmetic mean	Relative importance
1	Fluency	Medium	3.50
4	Flexibility	Medium	3.40
3	Risk	Medium	3.44
2	The ability to analyze	Medium	3.49
	Administrative creativity	Medium	3.46

Table 4 Arithmetic means and relative importance of the dimensions of the service quality variable

No	Item	Arithmetic mean	Relative importance
3	Tangibility	Medium	3.42
2	Reliability	Medium	3.47
4	Response	Medium	3.38
1	Safety	Medium	3.64
5	Empathy	Medium	3.34
	Quality of services	Medium	3.45

4 Results

The study deployed a multiple regression analysis to test the principal hypothesis and its derivative sub-hypotheses. The examination yielded the following insightful outcomes:

4.1 *Impact of Administrative Creativity Elements on Quality of Services*

The dimensions of administrative creativity (fluency, flexibility, risk-taking, and analytical ability) demonstrated a statistically significant effect on the quality of services in the Jordanian Ministry of Education center. The findings indicate that administrative creativity substantially influences service quality and is instrumental in its enhancement. Furthermore, the data reveals a robust, positive correlation between the facets of administrative creativity and service quality. This suggests that by fostering administrative creativity, the Ministry of Education could see an appreciable improvement in its service quality.

4.2 Impact of Administrative Creativity Elements on Reliability

The aggregated dimensions of administrative creativity were found to exert a statistically significant influence on reliability, an essential facet of service quality. The findings underscore the role of administrative creativity in bolstering reliability within the Ministry of Education.

4.3 Impact of Administrative Creativity Elements on Responsiveness

Our study also revealed that specific dimensions of administrative creativity, particularly the leadership dimension, impact the responsiveness within the Jordanian Ministry of Education. The evidence suggests that effective implementation of administrative creativity dimensions can enhance responsiveness.

4.4 Impact of Administrative Creativity Elements on Tangibility

The analysis found a statistically significant impact of administrative creativity on tangibility, an essential aspect of service quality. However, it is important to note that this influence is chiefly attributed to the fluency and analytical ability dimensions, while flexibility and risk-taking appeared to have negligible effects on tangibility.

4.5 Impact of Administrative Creativity Elements on Security

A significant effect was noted of the combined dimensions of administrative creativity on security within the Jordanian Ministry of Education. These results highlight the pivotal role of administrative creativity in fostering a sense of security within the institution.

4.6 Impact of Administrative Creativity Elements on Empathy

Finally, a substantial effect was observed of the combined dimensions of administrative creativity on empathy, an important component of service quality. The study

thereby underscores the significance of administrative creativity in fostering a more empathetic environment within the Ministry of Education.

5 Conclusion

Drawing from the results of our multiple regression analysis, our study concludes that the dimensions of administrative creativity, namely fluency, flexibility, risk-taking, and analytical ability, significantly influence various facets of service quality in the Jordanian Ministry of Education center.

The findings underscore administrative creativity as a critical driver for enhancing service quality, reliability, responsiveness, tangibility, security, and empathy within the Ministry. This implies that fostering an environment that promotes these dimensions could substantially improve the overall functioning of the Ministry of Education.

However, our study also highlights that the impact of different creative dimensions varies across service quality facets. For instance, while fluency and analytical ability substantially influence tangibility, the same cannot be said for flexibility and risk-taking.

Given these findings, the Jordanian Ministry of Education should consider developing targeted strategies to cultivate and promote administrative creativity. Such initiatives could enhance the overall service quality, contributing to the Ministry's efficiency, reliability, and effectiveness. It is crucial, however, to implement these strategies with a nuanced understanding of which dimensions of creativity exert the most influence on particular aspects of service quality.

In conclusion, nurturing an atmosphere of administrative creativity within educational institutions can enhance service quality, thereby contributing to the overall effectiveness and reputation of such institutions. Future research could further explore the specific mechanisms through which each dimension of creativity impacts different aspects of service quality, paving the way for more detailed and effective policy recommendations.

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Utilizing Deep Learning Models (RNN, LSTM, CNN-LSTM, and Bi-LSTM) for Arabic Text Classification



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Abstract With the increase in the number of Internet users, the amount of data has increased dramatically. Millions of texts are written daily in most fields, whether cultural, scientific, political, health, or others, through websites, social media, and academic or news institutions. This data has become an essential source for providing additional services. One of these services is the classification of texts into previously defined categories according to the information they contain. Texts in the Arabic language are still considered a great challenge to carry out the task of classifying them, unlike other languages, such as English, French and many other languages. In this research paper, four models of deep learning techniques (RNN, LSTM, CNN-LSTM, and Bi-LSTM) were built to classify texts in the Arabic language, and the models were tested on a data set consisting of news articles and classified based on the content of the article. The highest accuracy result (94.02) was obtained by the (Bi-LSTM) model.

Keywords Classification · Deep learning · LSTM · Arabic text · RNN · CNN-LSTM · Bi-LSTM

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1 Introduction

In today's fast-paced, technologically driven world, we are ceaselessly inundated with innovations rapidly transforming the educational landscape. These burgeoning technologies are playing an influential role, not just in reshaping education as a whole but specifically in revolutionizing the field of language teaching [16]. According to the arrangement of languages, the Arabic language is considered the fourth language in the world, and the number of Arabic speakers is more than 420 million speakers, and more than 150 million Internet users. Also, the Arabic language is considered the second most difficult language in the world. The diacritics of the Arabic language is one of the reasons for its complexity, in addition to the fact that the Arabic language is written from right to left, unlike other languages, and it is characterized by the multiplicity of meanings for one word in it [1]. The Arabic language does not have an uppercase letter and a lowercase letter like the English language. The diacritical symbols used in this language are the ones that increase its complexity. The diacritics ("Fatha, Damma, Kasra, Sukoon, Tanween, Shadda") change the meaning of the word and can be used on all letters [2]. The text can be classified according to the meaning of the words (content), and it can be classified into one category or many categories for a group of texts (based on the contents of the text). This can be applied to all languages [1]. Many research, applications, algorithms, artificial intelligence techniques, and models that have been worked on in classifying texts of the English language and other languages have achieved a great success rate, and their results are excellent in the accuracy of classification. The texts of the Arabic language, and the classification process for the Arabic text is still facing difficulties because the structure of words in the Arabic language has complexity and difference in meaning, and one word may have more than one meaning [3]. For example, the word "سلم" is a word of three letters only, but it has several meanings based on the diacritical marks. It may come in the form of a past tense, meaning "greet," and it may come in the form of another past verb, meaning "save," and another past verb, meaning "to deliver," and it can come as a noun. "Peace" means the opposite of war, and a noun can come in the sense of "stairs", and this is a simple example of one word. There are words that are used as prepositions and in other meanings that are used as nouns or verbs. Also, most of the texts of the Arabic language are written electronically without diacritical marks. All these reasons add to the complexity of the language and thus increase the complexity of the classification of the Arabic text. The pre-processing techniques that the researchers used in classifying the texts of the English language is to reduce the randomness of the data, choose good features, and shorten the processing and classification time [4]. The feature space has multiple dimensions and has a poor estimated accuracy rate. This is one of the biggest classification accuracy problems. When extracting features from a text document, not all properties represent the semantics of the document, and many of them do not affect the significance of the content. As a result, effectively selecting distinct words is an essential process in text classification. This process involves a number of steps, including feature extraction, feature selection, and feature weighting. All the features

that can be extracted from the document are extracted using feature extraction, the most important features are selected using feature selection, and the last step is feature weighting, which assigns a value to each word to indicate how important it is for that feature [5]. The texts of the Arabic language need to conduct more pre-treatments than the needs of other languages, due to their complex diacritics and structure [6]. Many words and letters that are used repeatedly, such as prepositions, demonstrative nouns, and pronouns, all of this greatly affects the meaning of the sentence, the research involves the development of deep learning models such as RNN, LSTM, CNN-LSTM, and Bi-LSTM for classifying Arabic news texts into different categories. The models are tested on a dataset specific to various topics, and their accuracy in text classification is evaluated. Additionally, the data is pre-processed, and experiments are conducted to compare the models' performance before and after pre-processing. The study also includes a review of related literature to support the research idea.

2 Related Work

Many researchers worked on finding and improving methods of classifying the Arabic text using artificial intelligence techniques. Some researchers focused on building and developing classification models, while some researchers focused on methods of pre-processing the data. Here are some of the previous factors that focused on classifying the Arabic text in various ways.

In [7]. The authors of these articles used Rocchio's classifier, neural networks, K-nearest neighbors, support vector machines, Naive Bayesian, C4.5, and neural networks in a number of experiments. The Arab Trials Dataset was used in these investigations. Experiments in that study were conducted using a smaller data set. They used (term frequency-inverse document frequency) techniques to adjust the weights, and through tests it was found that their results were good. In [8] is conducting another study on classification of Arabic text. The authors suggested employing Deep Belief Networks and Markov Clustering Unsupervised Learning (DBN). They carried out their tests in three stages. Pre-processing was the initial step, which involved taking out conjunctions and punctuation and using each word's base form. The clustering step came next, and fuzzy C-means and Markov clustering were used. They trained the suggested model using DBN in the final step. The suggested technique was evaluated using two datasets: the Saudi Press Agency dataset, which had 6,000 cases, and the Al-Jazeera dataset, which contained 10,000 instances. The findings had an accuracy of 91.2%, a recall of 90.9%, and an F1 measure of 91.02%. The authors of [5] used convolutional neural networks to enhance the categorization of Arabic text (CNN). There were four steps in the suggested procedure. To eliminate stop words, tidy up the text of other characters and numerals, and identify word stems, the writers first preprocessed the text. Then, they represented the text using the Bag of Words approach. Then, as a dimension reduction technique, they used Term Frequency-Inverse Document Frequency (TF-IDF) to identify the most crucial terms. They trained the CNN model last. The 111,728 items in the dataset, which

was divided into five groups, were taken from several Moroccan newspapers by the authors for this study. The accuracy rating for the findings was 92.94%. The authors in [9] have developed a deep Arabic text classification model that is a completely new framework for Arabic text classification based on N-gram word embedding and multi-Kernel CNN. The purpose was to use the word embedding approach to improve the representation of words in the Arabic language. The scientists used 15 public data sets and conducted a comparative study using well-known machine and deep learning algorithms to confirm their findings. The classification accuracy exceeded the standard results with a high score of 97.58%. In a different study [10], CNN and GA were used to improve weight start for crack identification in pictures. The initialization of the chromosomes' values, which ranged from 0 to 255, and the choice of the bias values, which fell between 128 and 128. In the training phase, the weights' starting values were taken from the chromosome to generate an output picture. The fitness value of that chromosome was determined by comparing this output image to the original image. With a 1% mutation rate, the fittest chromosomes were chosen using the roulette selection approach. Additionally, a random value between 0 and the length of the chromosome is chosen as the crossover point. The fracture detection accuracy using the suggested method was 92.3% over 100 pictures. The authors of [11] used a large Arabic text dataset and deep learning to show how stemming approaches might affect classification accuracy. In order to do this, they used seven Deep Learning approaches (CNN, CNN-LSTM (Long Short Memory), Bidirectional LSTM, CNN-GRU (Gated Recurrent Units), Bidirectional GRU, Attention-based GRU, and Attention-based LSTM) coupled with eleven stemming methods based on stem and root. They made use of the word embedding technique. They employed cross validation with 10 folds and two sizable datasets (Arabic News Texts (ANT v1.1) and Saudi Press Agency (SPA)). The outcomes demonstrated that stem-based stemming techniques are marginally superior to root-based stemming strategies. To cope with Arabic text categorization, the authors advised using the bidirectional and attention learning principles. For Attention-based GRU combined with stem-based technique, the F measure was 97.96%. Additionally, they recommended using a stem-based technique in conjunction with a skip-gram representation when dealing with a small-sized vector, although CBOW (Bag-Of-Word) can be employed when dealing with a large-dimensional vector. The authors of [12] used DL to classify multiclass, single-label Arabic phrases. They combined the word embedding layer with convolutional neural networks (CNN). The AraVec Arabic word2vec model was utilized in the word embedding layer to capture word float point vector similarity. CNN employed hyper-parameters such padding, the layer count, the filter count, and the filter size stride. As a preprocessing stage, they used tokenization, word indices, and pad sequences [13]. Three convolutional layers plus a sequential stack embedded layer make up the model. There are 1500 of the most popular terms in the dataset. They said that their strategy produced very accurate outcomes for the NLP tasks. In [14] a study of the categorization of Arabic text using the K closest neighbor (KNN) and support vector networks as two machine learning methods (SVM). By gathering news items for the training and testing phases, they create their own corpus. They showed that these algorithms produce the best outcomes, although the SVM method

performed better for prediction. In [15–19] A multi-label Arabic dataset was gathered from the CNN Arabic news portal 10,997 papers made up the dataset, which was divided into six categories: “economics,” “Middle East,” “world,” “sports,” “science and technology,” and “other.” The kNN, Random Forest, and Decision trees single-label learning algorithms were combined with the BR transformation in the authors’ experiment. kNN and Random Forest were surpassed by Decision trees, according to the trial data. The authors of [8] Describe the use of the Nave Bayes classifier with the Tasleel technique, for the purpose of classifying documents written in Arabic, the authors developed a set of 300 papers divided into 10 types in order to validate the proposed approach. The compiled collection consists of many journal articles from various newspaper websites on the internet. The experimental analysis showed the success of the proposed classifier in terms of error rate, retrieval, and accuracy measures, achieving a classification accuracy of 62.23%.

3 Deep Learning

Deep learning is a part of machine learning, basically a multi-layered NN (neural network). Those NNs aim to mimic human brain activities, although with limited ability, enabling it to learn from huge quantities of information. Whilst the single-layer NN might remain to produce reasonable predictions, further layers may assist refine and optimize the accuracy.

3.1 *Recurrent Neural Networks (RNNs)*

A kind of deep neural network works with sequential data or time series. Those methods are usually utilized for, ordinal or temporal problems such as translating, voice recognition, Natural Language Processing, and image captioning, and they’re employed in useful applications including voice commands, Google Translate and Siri. To learn, RNNs require training data. These are characterized by their memory, allowing them to alter present output and input by using information from prior inputs. Although traditional neural networks assume that outputs and inputs are unrelated to one another, the output of RNN is dependent on the previous elements’ sequence. Whilst upcoming events could be helpful in determining a series’ output, unidirectional, RNNs cannot compensate for them in their forecasts (Fig. 1).

3.2 *Long-Short-Term Memory (LSTM)*

LSTM blocks or units are types of RNN topology. RNNs structure includes long short-term memory (LSTM) blocks or modules. RNNs are designed to use specific

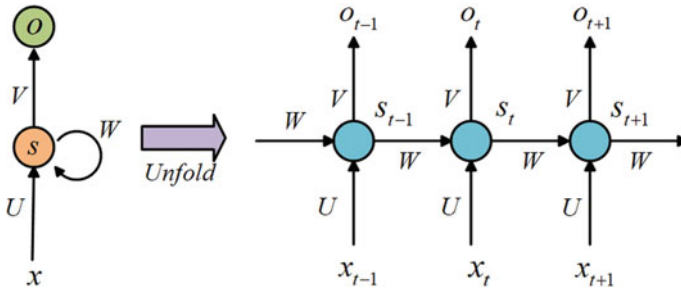


Fig. 1 Recurrent neural networks architecture

forms of artificial memory operations that really can assist those AI applications in better mimicking human reasoning. RNN utilizes LSTM blocks for providing context on how the software receives input and generates output. LSTM blocks are complicated units with numerous components including activation functions, weighted inputs, inputs of the previous layer, and final outputs.

The unit is known as LSTM block since the software uses a structure based on short-term memory operations to generate long-term memory. Those systems are frequently employed in NLP, for example. Generally, LSTM is a well-known and widely used idea in developing RNNs (Fig. 2).

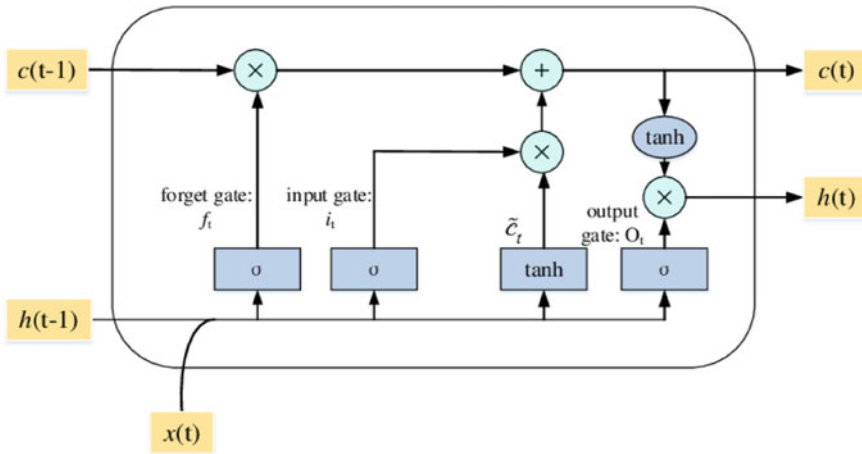


Fig. 2 Long-short-term memory architecture

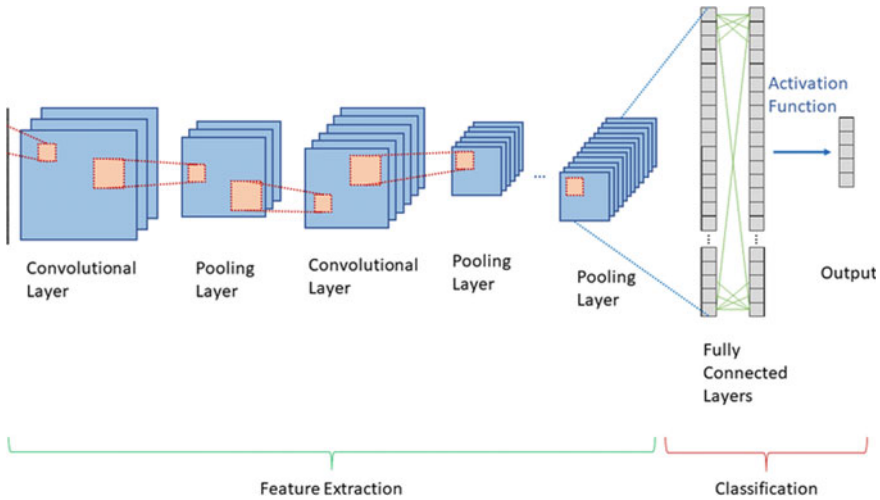


Fig. 3 Convolutional neural network architecture

3.3 Convolutional Neural Networks (CNNs)

CNNs are special versions of ANNs (artificial neural networks), use convolution rather than ordinary matrix multiplication in (at least) one of their layers. They are employed in image processing and recognition and are specifically built for processing pixel data. CNN includes input, hidden, and output layers. Any intermediary layers in a feed-forward NN are referred to as hidden since its input and output are veiled via the final convolution and the activation function. These hidden layers of a CNN include convolutional layers. Usually, this contains a layer that executes the dot product of the convolution kernel as well as the input matrix of the layer (Fig. 3).

3.4 CNN-LSMT Integration

CNN-LSTM model integrates Convolutional Neural Network layers for extracting features on data input with Long-Short-Term Memory to enable sequence predictions. CNN-LSTM was created to solve prediction issues of visual time series and to generate text descriptions of image sequences (Fig. 4).

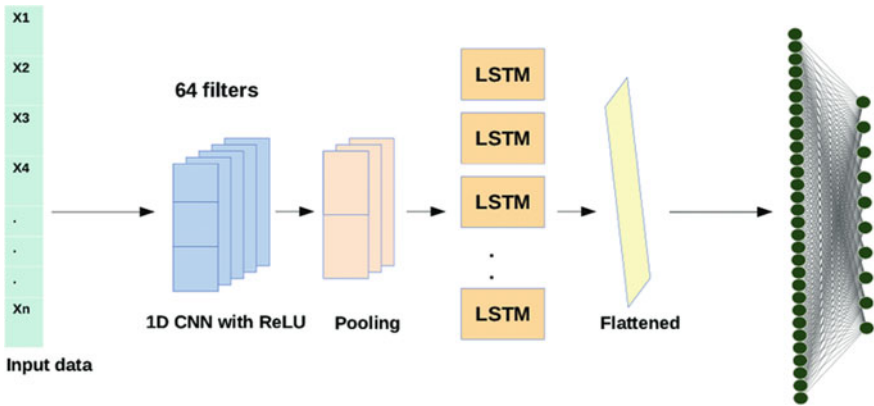


Fig. 4 CNN-LSTM architecture

3.5 Bidirectional Long-Short Term Memory (BiLSTM)

BiLSTM is a sequential processing method that includes two Long-Short-Term memory, the first able to take input in the forward direction and the second in the other (backward direction). Bidirectional Long-Short-Term Memory significantly enhances the network’s available information, optimizing the context for the algorithms (for example: being aware of the words that simultaneously precede and follow a word in a specific sentence) (Fig. 5).

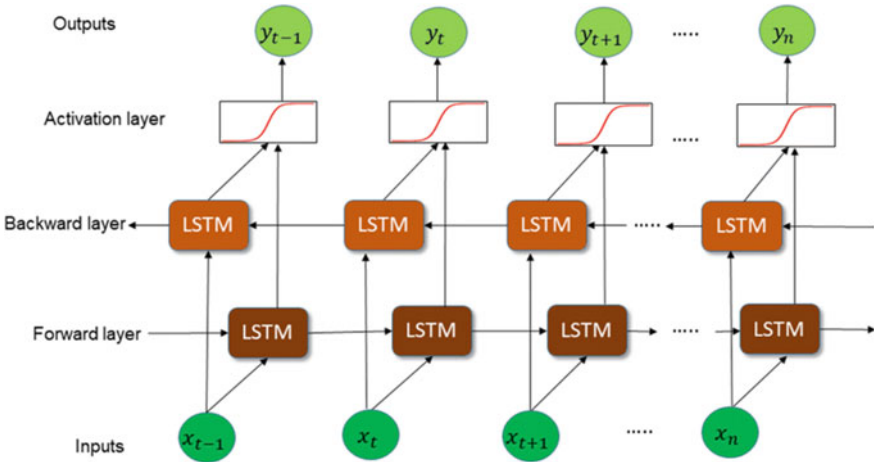


Fig. 5 Bi-LSTM architecture

4 Dataset

The dataset that was worked on was collected from several data sets of previous works specialized in the classification of Arabic text, which is available on the website (www.kaggle.com). The texts were collected, and their categories unified, the current dataset comprises over 16,200 texts that have been categorized into six distinct categories.

5 Methodology

5.1 Data Collection

As previously stated in the “Data set” section, data was gathered from various prior studies based on their respective categories. The dataset, which contains over 16,200 entries, has been classified into six distinct categories.

5.2 Preprocessing of Data

To preprocess the data, several steps were taken to clean it. This involved removing digits, punctuations, stop words, emojis, diacritics, and emoticons. Specifically, a “stop-word” list for the Arabic language was utilized to eliminate commonly repeated words in Arabic sentences, such as “من” (from), “الى” (to), “في” (in), “حتى” (until), “لكن” (but), “بعد” (after), and “ليس” (not). The objective was to ensure that these words did not impact the remaining words used in the dataset.

5.3 Features Extraction

In this section, a specific function from the TensorFlow library was employed for features extraction. This function allows the selection of a maximum number of features to extract, such as 5000 words. Consequently, it focuses on the most frequently occurring 5000 words in the dataset while disregarding the remaining ones. The choice of this number depends on the size of the data or the length of the texts being processed.

5.4 Padding

After features extraction, the documents' lengths vary. To address this, padding was applied to ensure uniform document length by adding sparse elements.

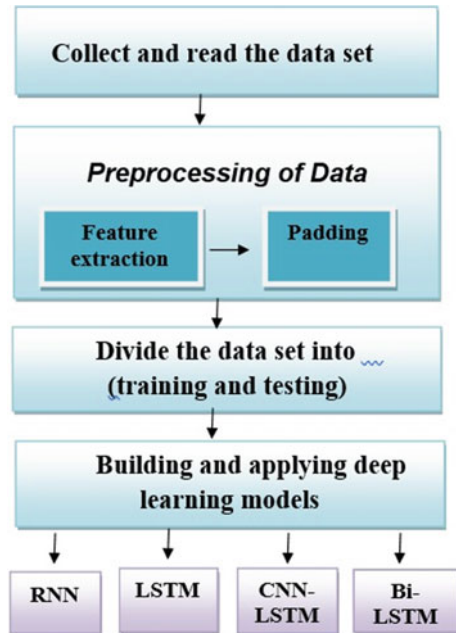
- Pad_sequences 'Pre': add zeros to the begging of the array till its length becomes as determined.
- Pad_sequences 'Post': add zeros to the end of the array till its length becomes as determined.

5.5 Embedding

The Embedding layer allows us to map words into dense vectors as inputs, the common first layer.

In Fig. 6 a graphic represents our work steps.

Fig. 6 A graphic represents our work steps



6 Experiments

Once the models were constructed, various parameters were utilized for each model. The optimal values for these parameters, resulting in the highest accuracy and completion time for the classification process, are presented in Table 1. and they were applied to all models before data processing with minor modifications to some parameters on other models. In Table 2, the same parameter values that were chosen and then applied to the models after data pre-processing are shown. The classification accuracy percentage and the time spent by each of them are also shown. The emphasis was placed on modifying specific parameters, including maximum features, padding type, embedded vector length, number of neurons, number of layers, epochs, batch size, LSTM neurons, recurrent dropout, test rate, number of filters, filter length, and activation function, as a result, the highest accuracy was achieved in both cases (before and after processing). Interestingly, we observed that pre-processing had minimal impact. However, a substantial difference in accuracy results was noted when altering the padding type from “post.” to “pre” when increasing the sentence length, except for the (Bi-LSTM) model, which gives the same results because this model takes information in both directions. There was no significant effect when choosing the length of the short sentence. We also noticed a difference in the accuracy results when changing the number of neurons and the number of layers, Furthermore, alterations in the accuracy results were observed when adjusting the number of neurons and layers. Additionally, it was noticed that increasing parameter values led to longer implementation times. Notably, significant differences were observed when modifying the value of recurrent dropout, with improved results obtained by reducing its value. Consequently, the focus was narrowed down to identifying the parameter values that yielded the highest accuracy in the initial RNN model. These identified parameters were then tested on the remaining models to evaluate their performance.

Table 3 displays the highest accuracy results achieved and the corresponding processing time for each model. Notably, the Bi-LSTM model yielded the highest accuracy of 94.02%. This can be attributed to its ability to process data from both directions, which aligns well with the right-to-left nature of the Arabic language. It’s important to mention that this accuracy was obtained prior to pre-processing the data, as depicted in Fig. 7. During pre-processing, certain words, such as stop-words, were removed, which could potentially impact the contextual understanding of the sentence. Thus, the inclusion of stop-words may not always be necessary or yield the best results. Figure 8 show cases the outcome after applying the pre-processing step.

Table 1 Best parameters before preprocessing

Parameters	RNN	LSTM	CNN-LSTM	Bi-LSTM
Max features	60,000	60,000	60,000	60,000
Max len	40	40	40	54
Embedding vector len	100	100	120	120
Padding type	pre	pre	pre	Post
Batch size	50	100	120	200
RNN neurons	40	–	–	–
LSMT neurons	–	160	80	60
Layer 1 neurons	80	–	–	–
Total Epochs	5	8	7	8
Recurrent dropout	0.1	0.1	0.01	0.15
Number of filters	–	–	60	–
Filter length	–	–	6	–
Accuracy	90.40	93.24	93.32	94.72
Process time (seconds)	234	482	476	839

Table 2 Best parameters after preprocessing

Parameters	RNN	LSTM	CNN-LSTM	Bi-LSTM
Max features	60,000	60,000	60,000	60,000
Max len	40	40	40	54
Embedding vector len	100	100	120	120
Padding type	pre	pre	pre	Post
Batch size	50	100	120	200
RNN neurons	40	–	–	–
LSMT neurons	–	160	80	60
Layer 1 neurons	80	–	–	–
Total Epochs	5	8	7	8
Recurrent dropout	0.1	0.1	0.01	0.15
Number of filters	–	–	60	–
Filter length	–	–	6	–
Accuracy	90.56	93.13	93.61	93.71
Process time (seconds)	296	1225	507	496

Table 3 Highest accuracy results for each model

Model type	Accuracy			
	Before processing	Time	After processing	Time
RNN	90.13	234	90.56	296
LSTM	93.24	482	93.13	1225
CNN-LSTM	93.32	476	93.61	507
Bi-LSTM	94.72	839	93.71	496

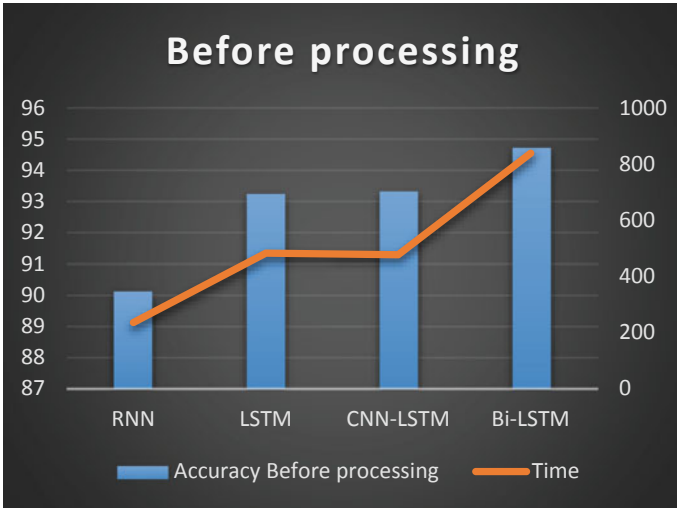


Fig. 7 Obtained accuracy before processing

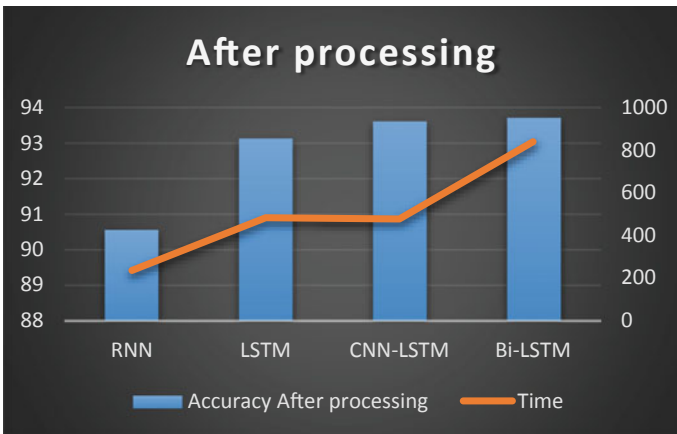


Fig. 8 Obtained accuracy after processing

7 Conclusion

This paper discussed the exponential growth of Internet data due to the increasing number of users and highlighted the significance of the Arabic language and its user base. The importance of text classification was also emphasized, noting the abundance of classification methods available for English and other languages, particularly those utilizing artificial intelligence techniques. However, these methods are not as suitable for Arabic text due to certain reasons, which were mentioned. The study focused on implementing deep learning techniques such as RNN, LSTM, CNN-LSTM, and Bi-LSTM for classifying Arabic text using a specific dataset. The results obtained were relatively satisfactory, and attempts were made to preprocess the data, although the impact on the results was found to be comparable to when no preprocessing was performed. Future research aims to leverage pre-trained models that specialize in natural language processing.

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Forensic Accounting and Big Data a Literature Paper



Dana Kayed and Abdalmuttaleb Al-Sartawi 

Abstract Big data becomes essential to each sector because it will provide decision-makers with very important and critical information. Analyzing big data will lead to understanding the patterns of the work and will help the forensic accountant in deducting any expected fraud. The current paper reviewed previous literature related to big data and the challenges that can be faced by a forensic accountant. Depending on the literature, they reviewed the paper and concluded that it is important for a forensic accountant to have knowledge about big data and know how to use different software to analyze it.

Keywords Forensic accounting · Big data · Auditing · Accounting · Cybersecurity

1 Introduction

Today, big data is not only a major factor in the business world; it has spread to almost all sectors, and it is being used in new ways in a variety of fields daily [1–3]. Libraries collect, organize, preserve, and retrieve intellectual production with the information and data it contains [4, 5]. If data are the foundational elements of the information structure [6–9]. To accomplish the goals of libraries, which are to enable and facilitate access to information for individuals who are looking for it, we as librarians should take use of this data and use it [10–12].

However, this role is no longer a preferential role and a favor from libraries to their societies, but has become an existing necessity and unavoidable competition, especially with the needs of the current generation of users and the high ceiling of

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their expectations of library services, as well as the development of competition from the web and websites that make information and its sources available to the user, and social networks and the opportunities they provided to benefit [13–16]. This may result in libraries pulling the rug out from under their feet, in whole or in part, after sitting on it for decades [17]. As a result, we as librarians must develop, follow, and keep pace with the existing development in societal information needs, opportunities, and threats that would shift researchers. Destination from the library to where the web and its environment are [18–23].

2 Forensic Accounting

2.1 *The Concept of Forensic Accounting*

The field of forensic accounting, also referred to as judicial accounting, investigative accounting, or simply forensic accounting, has developed into one that looks beyond numbers when dealing with reality [24–26]. It employs the law and investigative skills to be present in the courts; it employs the science and skills of accounting and auditing to detect financial damages and report them for use in legal investigations; and it employs the science and skills of accounting and auditing to detect non-financial damages [27, 28].

Forensic accounting is the science of applying knowledge in the fields of accounting, finance, taxation, auditing, analysis, investigation, inquiry, examination, and testing of criminal law issues to achieve honesty, through which the criminal accountant can present his opinion as an expert [29–33]. According to the American Institute of Certified Public Accountants, forensic accounting is the use of specialized knowledge in the areas of accounting, computer auditing, finance, quantitative methods, portions of the law, research, and investigative skills to gather, assess, and report on fixed evidence [34–36].

- **Services for conducting investigations:** These could lead to testimony in court.
- **Legal services:** which depend on the accountant’s position as an expert, consultant, or in another relevant job.

According to Bhasin, forensic accounting is the science that deals with the application of knowledge from the fields of accounting, finance, taxation, and auditing for the analysis, investigation, inquiry, examination, and testing of criminal law and legal philosophy issues in an effort to reach the objectivity that will allow the accountant to offer his opinion as an expert [37].

2.2 The Importance of a Forensic Accountant

Forensic accounting services may be required by all individuals, institutes, business organizations, and courts through the collection of financial evidence that is used in the courts to settle disputes, support or refute claims for losses, and seek justice for fraud perpetrators for breach of trust and trust [8, 38, 39].

The significance of forensic accounting is also emphasized by the fact that it meets the needs of the judiciary, investors, lenders, and others by lowering the rate of financial crimes, supporting criminal cases, and lowering the frequency of fraud and financial fraud [17, 22, 40].

The capacity of forensic accounting to identify and investigate financial fraud and other financial crimes is crucial because financial fraud is a real threat in today's complicated corporate world and can have far-reaching effects on both businesses and individuals [21, 41]. To shield companies and customers from the negative financial and legal repercussions of such crimes, forensic accountants play a critical role in the detection and investigation of financial fraud [42–46]. Forensic accounting is vital because it offers essential assistance for judicial actions involving financial issues. In court situations, forensic accountants may be called upon to testify as an expert, and their evaluation and interpretation of financial data can be crucial in establishing the facts of the case and influencing the result [47, 48].

3 Big Data

3.1 The Importance of Big Data

The value of data comes from its abundance, which also coincides with the superior ability to handle it and employ it in value-added areas [49–51]. This necessitates the development of its infrastructure of computers and cutting-edge information and communication technology, in addition to continuous improvement in all methods of data governance from data privacy and security and protecting it from penetration, with a meaningful investment in the human skills dealing with it and required to handle it [52–56].

The so-called data industry, which includes data in all stages of dealing with it from collection, organization, preservation, security, analysis, issuance, publication, and marketing, is growing in an unprecedented fashion to meet the ever-increasing data revolution [57–59]. The data revolution has also benefited many people, and businesses and government organizations alike heavily rely on data for planning, developing enabling policies, streamlining processes, and providing prompt access to its beneficiaries [5, 27, 60].

Big data analysis also discloses the criminal, commercial, behavioral, or functional tendencies of the data owners, making it a very valuable product in the context of the knowledge-based economy. Finally, knowing that the US White House has

committed more than \$ 200 million in big data projects would suffice to comprehend the significance of big data in general [61–63].

3.2 Characteristics of Big Data

3.2.1 Volume

Every day since 2012, humans have stored more than petabytes (one trillion billion) of data, and studies show that 90% of the data available today was created in the last two years [60, 62–67].

Big data is typically characterized as data that, regardless of indication of size, cannot be stored or analyzed by conventional technology and software; nevertheless, in this case, the size is perceived in comparison to ordinary data. The amount of data being considered, its value and potential, and whether or not it qualifies as big data are all determined by its size [6, 68–70].

There is no single specific value that distinguishes big data from small data, but the term “big data” is typically applied to data sets that are so large that traditional data processing techniques cannot be used to work on or store them. Traditional software can handle data sets of megabytes and kilobytes, while big data tools can handle data sets of terabytes and petabytes in size [10, 71].

However, new technologies have significantly contributed to many solutions to the need to store larger data sets [54]. As with cloud storage, it is important to mention sharing projects or the so-called “Consortium” to solve the problems of storing and retrieving large data sets through the solutions provided by hundreds or thousands of computers and servers linked together [58, 72–74].

3.2.2 Velocity

It discusses the astounding rate at which data is generated and processed to meet user demands. It can also be understood by imagining the speed with which messages and posts are created and uploaded on social media sites. Millions of people use e-commerce sites, blogs, and social networks, which generate continuous real-time data streams that businesses can use to gauge consumer sentiment. The challenge here is determining how to respond to the flood of information at the appropriate time, as everyone wants to access data at the appropriate time [2, 17, 75].

3.2.3 Variety

Numerous types of data are included in big data sets, including tweets, Facebook chats, text messages, status updates or videos shared with friends, comments on a particular product or post, weather indicators and news, emails, photos, forum posts,

videos, audio recordings, architectural and engineering drawings and designs, information designs and mind maps, infographics, and many more [59, 60, 62–67, 69–76, 76–79]. Every day, more and more tools for data entry are being added, including smartphones, geolocators, space sensors, traffic data, and information inputs for students, employees, and workers worldwide. This makes enormous data sets more challenging to process and maintain using a single database management tool or by conventional approaches since they contain informational overlapping images [49, 80, 81].

The data can be divided into three categories: semi-structured or structured data, which is a combination of the two, and structured or unstructured data, which makes up much of the data [46, 78, 82].

3.2.4 Value

Which is associated with smart data and refers to values deduced from the most accurate big data available. Big data analysis was initially only used by large institutions and governments due to the high costs associated with doing so. However, as technology advanced and hardware and software became more readily available and affordable, big data analysis began to be used by a variety of commercial enterprises, academic institutions, and other organizations, which helped to focus these activities on lowering costs, improving their products, and enhancing support [66].

4 The Relationship Between Forensic Accounting and Big Data

In the contemporary world, forensic accounting and big data are two professions that are progressively interacting. Forensic accountants are employing cutting-edge analytical tools and techniques to filter through enormous volumes of data to detect financial crimes and other fraudulent acts as the amount of data generated by businesses and individuals continues to expand tremendously [31, 34, 83].

The capacity to analyze vast amounts of financial data swiftly and effectively to spot trends and abnormalities that can point to fraudulent activity is one of the numerous advantages of using big data in forensic accounting. This has made it easier for forensic accountants to identify intricate financial schemes and unearth hidden assets, enabling them to strengthen their arguments and support legal actions [61].

The use of predictive analytics is one of the main ways that forensic accountants use big data. To find trends and patterns in financial data that can be indicative of fraudulent conduct, statistical models and algorithms are used. Predictive analytics can be used, for instance, by forensic accountants to spot odd trends in a company's financial operations, such a rapid rise in the volume of tiny transactions or the movement of money to accounts overseas [3, 54].

The use of data mining tools is another way forensic accountants make use of large data. To find hidden links and patterns that might not be obvious from a cursory study of the data, this involves utilizing specialist tools to analyze massive datasets. Data mining can be used, for instance, by a forensic accountant to find links between parties implicated in a financial crime, for as by locating shared bank accounts or financial transactions [70].

Forensic accountants employ a variety of big data technologies and approaches to aid their investigations in addition to predictive analytics and data mining. For instance, they might employ natural language processing to examine a sizable volume of unstructured text data, such emails or bank records, to find terms and phrases that could be indicative of fraud. In order to find links between people or organizations implicated in a financial crime, such as close friends or colleagues, they may also employ social network analysis [77, 84].

5 Conclusion

Big data analytics has demonstrated its significance in the audit process. With its existence, the auditor can audit all customer data without any exceptions, whereas previously, the auditor had to adopt samples in the audit process and gather proof and cues related to those samples appropriately. This increased the time and effort needed in the audit process and increased the cost because it required larger storage rules to save data if all data had been audited.

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Agriculture Insurance: A Panacea for the Development of the Agriculture Sector in India



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Abstract In many emerging nations, agriculture remains the industry that is most crucial. Agriculture financing will contribute to feeding 9 billion people by 2050 by facilitating the expansion of food value chains and enabling underprivileged farmers to increase their income. Global food demand is projected to increase by 70% by 2050, necessitating annual investments of at least \$80 billion [1]. To eradicate hunger, achieve food security, and promote sustainable agriculture are the three objectives of the second sustainable development goal (SDG2). Agricultural insurance is a useful safeguard for achieving SDG2. For agriculture to be viable, farmers must be shielded from natural disasters and given credit eligibility for the upcoming season. The study examines the sector of agriculture insurance in India's present policy initiatives. In the current study, a content analysis technique is used to assess and analyse the viewpoints on development and performance analysis of India's current agricultural insurance programmes. The researchers also suggested a plan to boost the effectiveness of the agriculture insurance programme. To improve the insurance programme and carry out the sustainable agriculture mission, governments and development organisations must take a more active part in collaboration with commercial reinsurers, technology providers, input suppliers, and financial institutions.

Keywords Agriculture insurance · PMFBY · Sustainable development goal · Sustainable agriculture

1 Introduction

Agriculture is a significant economic sector in many developing nations and provides rural households with income and food security. In addition to taking into account the country's food requirements, the agricultural sector greatly increases overall

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exports. It provides the essential raw materials needed by many agro-based enterprises. Protecting farmers from agriculture's unpredictability has always been a focus of agricultural policy. According to the National Agriculture Policy (NAP) 2000, despite economic and technological advancements, farmers' livelihoods continue to be unstable due to natural calamities and market fluctuations. The significance of this fluctuation is shown by accounts of farmer suicides in many areas of the country during drought years. One strategy utilised in India to protect farmers from agricultural uncertainty is crop insurance.

The Pradhan Mantri Fasal Bima Yojana (PMFBY) is a ground-breaking initiative seeks to stabilise agronomists' incomes and boost them to espouse cutting-edge farming practises in the event that any of the advised crops fail. The proposal recognises that crop insurance needs technological improvements to increase its efficacy, transparency, and farmer-friendliness.

2 Review of Literature

India has the largest crop insurance programme in the world, covering 25 million farmers. Nevertheless, 95 million farmer households have been denied coverage due to design defects, most notably those associated with delays in claims settlement [2]. A risk management approach, agriculture insurance is difficult for the majority of Indian farmers to get. The Indian government presented a brand-new agricultural programme every ten years, but each program's crop insurance was inconsistent and ineffective due to operational faults. Jain [3] asserting that there has been a misconception that agriculture and crop insurance are unable to generate revenue or increase output. But it can surely help both get better. Due to several constraints and inherent limitations, the insurance sector cannot swiftly grow in rural areas. However, there is a essential for greater insurance to cover farm assets, the lives and health of rural populations, as well as some specific risks that have an influence on crop and livestock output. The private sector might effectively provide this insurance provided several significant limitations on commercial insurers were relaxed [4].

3 Objectives of the Study

- To look into possible policy changes in relation to India's agriculture insurance programmes.
- To evaluate how well India's current agricultural insurance programmes are working.
- To design a model employing content analysis to enhance the performance of agriculture insurance.

4 Methodology for Review

The content analysis method is currently being used to examine published materials on India’s agricultural insurance. A systematic exploration of the Scopus and Web of Science archives was performed by means of the keywords “Agriculture Industry,” “PMFBY,” and “crop insurance in India” to discover any works that were still accessible. Secondary literature that is pertinent to the search phrase and is available through electronic resources.

5 Results & Discussions

See Fig. 1.

5.1 Present Significance of Agriculture Insurance in India

Two important agriculture insurance programmes, PMFBY and RWBCIS, are now in use in India. On 18th Feb 2018, the government officially embraced these

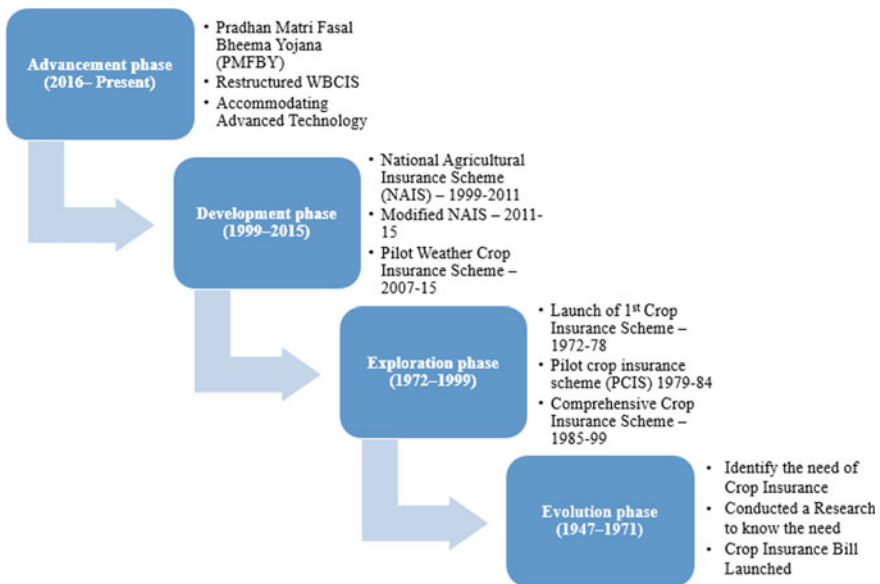


Fig. 1 Phases of agriculture insurance in India

programmes as a PPP approach, giving it significant control over the insurance service's business model, the amount of the subsidy, and the scope of the coverage.

Assessment of the current agriculture insurance program's performance.

Agriculture insurance programmes have been running in India since 2016 under the Pradhan Mantri Fasal Bima Yojana (PMFBY) and Restructured Weather Based Crop Insurance Scheme RWBCIS.

An innovative government programme in India called the Pradhan Mantri Fasal Bima Yojana (PMFBY) attempts to stabilise farmers' earnings and encourage them to adopt modern farming techniques. For the effective implementation of the PMFBY, a number of technological possibilities have been presented, including IT/ICTs, cell-phones, digital photography, new statistical methodology, and modelling approaches. The broad use of these technologies in crop insurance programmes across the different agroecological regions of the country, however, requires more proof [5].

Tables 1, 2, 3, and 4 display enrollment information, farmer coverage, and statistics on reported and settled claims for the entire state from 2018 to 2022. Although there is space for improvement in terms of adoption among the intended stakeholders, PMFBY has proven successful in several states. Knowledge from this article may help this important step for farmworkers' welfare become more generally embraced. The efficacy and acceptance of the plan can be increased by cooperative federalism, which entails aiming for greater engagement from the states, districts, and village-level authorities.

Table 1 Enrolment data from 2018–2022 (Kharif season)

Year	2018	2019	2020	2021	2022
<i>Season: Kharif</i>					
States/UTs	22	20	19	19	19
Districts	475	463	391	404	383
Insurance units	1,47,836	1,56,520	1,27,553	1,21,733	1,27,127

(Source <https://pmfby.gov.in/adminStatistics/dashboardF>)

Table 2 Enrolment data from 2018–2022 (Rabi season)

Year	2018	2019	2020	2021	2022
<i>Season: Rabi</i>					
States/UTs	21	19	18	19	17
Districts	486	445	389	410	408
Insurance units	1,35,020	1,26,843	1,12,539	1,14,591	1,12,639

(Source <https://pmfby.gov.in/adminStatistics/dashboard>)

Table 3 Farmers coverage data from 2018–2022

<i>Coverage (Kharif)</i>					
	2018	2019	2020	2021	2022
Farmers	2,16,63,395	2,00,50,883	1,68,70,111	1,50,95,028	1,53,81,333
<i>Coverage (Rabi)</i>					
Farmers	1,46,85,273	96,60,447	1,00,07,688	98,09,987	81,54,403

(Source <https://pmfby.gov.in/adminStatistics/dashboard>)

PMFBY lacks insufficient state backing, an ineffective subsidy mechanism, a cumbersome claim processing system, and an uneven benefit distribution. Crop insurance shouldn't be influenced by politics, and if PMFBY is quick, varied, and verifiable [6], crop insurance will help farmers more than insurers, administrators, and politicians.

All loanee farmers were subject to mandatory provisions under PMFBY's supply-side push policy, however the programme was made optional in 2020. The demand side issues with crop insurance are disregarded by the PMFBY idea. Due to the difficulty of the application process, unjustified claim reimbursement postponements, and administrative inefficiencies—lack of technological adoption in PMFBY plan administration—farmers are discouraged from applying for crop insurance. Due to the inconsistency of the administrators and insurers of the PMFBY programme as well as a lack of political commitment, farmers lack faith and trust. It was required to look into PMFBY's performance at various stages as a result. It was also necessary to examine how well various units implemented PMFBY in order to make improvements (Fig. 2).

Despite the country's constant introduction of new plans, agriculture insurance has not seen much use. Thus, expanding crop insurance coverage would result in a substantial increase in governmental spending. It seems unlikely that the programme will be expanded in the future to include and help more farmers unless it is properly modified to make it feasible. This calls for additional government initiatives to create appropriate procedures and offer financial support for crop insurance. Insurance services for rural areas should be presented in a way that is clear and concise. The general insurance market is particularly appealing to the private sector for investment. This capability may be used to enable numerous general insurance companies to provide coverage for some targets. This objective might be equated to agriculture's GDP contribution. Running an agriculture insurance scheme and completing other development initiatives successfully both depend on effective governance. Operations for development suffer from poor management. It is possible to implement and administer a variety of crop insurance-based programmes with improved control.

Table 4 PMFBY & RWBCIS Combined—State-wise business statistics as on 31.08.2021

PMFBY & RWBCIS Combined—State wise business statistics as on 31.08.2021			
State/UT name	Reported claims	Paid claims	Farmer applications benefitted (Lakh)
A & N Islands	0	—	—
Andhra Pradesh	1,259.01	1,254.03	13.533
Assam	17.27	—	—
Bihar	—	—	—
Chhattisgarh	1,314.60	1,296.59	15.025
Goa	0.01	0.01	0.001
Gujarat	354.89	111.67	0.927
Haryana	932.26	927.45	5.552
Himachal Pradesh	64.6	58.01	1.505
Jammu & Kashmir	—	—	—
Jharkhand	25.46	—	—
Karnataka	1,357.79	1,215.35	6.869
Kerala	85.9	85.9	0.457
Madhya Pradesh	5,905.48	5,811.75	30.546
Maharashtra	6,755.92	6,747.05	87.895
Manipur	1.14	1.14	0.032
Meghalaya	0.18	0.18	0.005
Odisha	1,177.91	1,139.48	12.078
Puducherry	7.16	—	—
Rajasthan	4,920.44	4,920.31	25.574
Sikkim	—	—	—
Tamil Nadu	1,090.13	1,056.84	13.213
Telangana	402.28	—	—
Tripura	0.81	0.8	0.077
Uttar Pradesh	1,116.75	1,092.74	9.343
Uttarakhand	103.18	103.17	0.949
West Bengal	—	—	—
Grand total	26,893	25,822	223.6

(Source <https://pmfby.gov.in/adminStatistics/dashboard>)

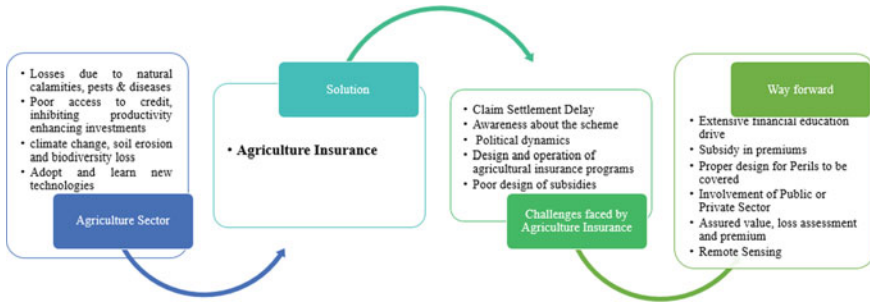


Fig. 2 Model representing improving the efficiency of agriculture insurance

6 Conclusion

In many emerging countries, agriculture is still the most major industry. Agriculture financing will contribute to the feeding of 9 billion people by 2050 by facilitating the expansion of food value chains and enabling poor farmers to increase their wealth. Global food demand is projected to increase by 70% by 2050, necessitating annual investments of at least \$80 billion [1]. However, the agriculture industry was badly influenced by different uncertainties. These dangers not only put the stability and security of the world’s food supply in jeopardy, but they also have the potential to ruin livelihoods, disrupt value networks, and even threaten macroeconomic stability.

Agricultural insurance is a useful defense against these dangers. By shifting climate risk to the private sector, it reduces the budget volatility of expenditures connected to agriculture, increases budgetary interplanetary during disbelief times, and encourages the expansion of the agriculture segment, which has the potential to create jobs. Additionally, there may be less chance for financial fraud and corruption [7]. However, in order for farm insurance to grow and become sustainable, there must be government involvement due to market imperfections and information asymmetries [8, 9]. A major and ambitious programme called PMFBY was created to safeguard farmers’ steady income in the event of agricultural unpredictability. It is one of the most important experiments ever carried out since it may aid millions of small, poor farmers.

A useful risk management tool, the RWBCIS provides greater protection at affordable premium charges [10]. Due to the challenges of weather data-related issues, RWBCIS was not successfully implemented. To address these issues, a modern scientific method for creating high-resolution secondary data was created, and the current design of WBCIS Products was modified in accordance with sound agronomic principles [11]. The maturing of the agricultural insurance system is a complex and varied dynamic that, depending on the time, may display progressive, regressive, or stationary features. It is governed by a set of standards and benchmarks, which have the power to alter its components, subsystems, and structure. To grow and promote our agriculture industry, the federal and state governments must work together.

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The Impacts of COVID-19 on the Jordanian Economy: Evidence from the Middle East



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Abstract The main objective of this study is to investigate the effects of COVID-19 on a developing nation, namely Jordan. The study conducted an extensive examination of the effects of COVID-19 on the country's gross domestic product, inflation, unemployment, poverty, and the stock market through the adoption of a desk research study method, with data collected from government websites, international websites, online statistics, international and locally published reports, as well as from previous studies. Based on the findings, the crisis of the COVID-19 pandemic has brought about significant economic and financial changes in Jordan. It negatively affected the gross domestic product, and employment in the country, triggered panic buying, discrepancies in domestic production and distribution, and import restrictions, resulting in inflationary economic pressure that was compounded by headline inflation. Additionally, the COVID-19 pandemic has significantly impacted the Amman Stock Exchange as well as the macroeconomic aspects; based on the findings, poverty in the country may be worsened by the pandemic, which represents a novel challenge in light of the type and quality of life in Jordan. Hence, the government of Jordan has been using measures through varying strategies for short-term adaptation and long-run survival. Correspondingly, this study has several implications for policymakers who are concerned with building a robust economy in the face of the pandemic. To the best of the authors' knowledge, this is a pioneering work

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that examines the impacts of COVID-19 on the economy of Jordan, thus, providing an enriching insight into the awareness of COVID-19 impacts on the economic development of Jordan.

Keywords COVID-19 · Jordanian economy · Jordan · Amman stock exchange

1 Introduction

The World Health Organization (WHO) declared the emergence of the COVID-19 outbreak in Central China in late December 2019, after which it proceeded to spread to 216 countries, resulting in 400 million cases and 5.7 million deaths globally as of 1st February 2022 [1]. Due to the extensive and ongoing COVID-19 pandemic transmission worldwide, considerable challenges have arisen in the healthcare and economies of different countries [2]. Additionally, the COVID-19 pandemic has been proven to be the worst humanitarian crisis since World War II and the economic crisis since the 1930s Great Depression [3, 4]. Moreover, there has been a significant impact of the pandemic on the global value chains (GVCs), the network of domestic production, trade, and services, which eventually affects the whole growth of the nation. COVID-19 has triggered an economic crisis that is distinct from prior crises [5], considering the scope and magnitude of the adverse effects on demand and supply, leading to growth degradation that is compounded by economic restrictions [6].

In the context of Jordan, the Jordanian economy would face the likelihood of losses because of the pandemic, as the output gap is approximated to be 3.5% lower than the real potential [7]. Along with this is the pandemic's major impact on the stock market indices' performance around the globe. Accordingly, [8] has argued that the stock market fluctuations have stemmed from the investors' concerns and their pessimistic outlook on the future, whereby the pandemic has incurred market losses. Notably, the pandemic's contagion effect on the global stock markets has been experienced in every country, including Jordan's Amman Stock Exchange (ASE), whereby regulated markets for trading securities have been affected by COVID-19. Such losses have worsened since the financial crisis in 2008 and the Arab Spring in 2011 [9–12].

Correspondingly, many studies have delved into the coronavirus literature to improve general insights into the effects of COVID-19 on the different aspects of the economy in developed literature [13–19]. However, few studies have focused on the coronavirus literature in developing markets; they focus mainly on the specific sector such as tourism and sports [19, 20], the mining sector [21], the healthcare sector [22], the oil sector [14], and sustainable energy transitions [23]. In Jordan, most studies have focused on the effects of COVID-19 on small and medium-sized enterprises [24–26]. Thus, this study derives its motivation from studies that have focused on the impact of COVID-19 on the economy of Jordan [27, 28]. To address this issue, the study aims to fill the gap by examining the COVID-19 effects on the economy of Jordan during the COVID-19 period. Consequently, the gaps highlight

the necessity to answer the main research question, “What is the extent of the impact of COVID-19 on the Jordanian economy?”. Along this line, the study is motivated to examine the effects of COVID-19 on the Jordanian economy as it is essential to understand the economic outcomes of the outbreak and the subsequent shutdown, considering information on the topic plays a key role in decision-making processes such as the economic policies of Jordan during the COVID-19 period. The current situation offers the researchers an opportunity to study the influence of COVID-19 on the economy of Jordan.

This research will add to the literature in the following ways, first, the study’s findings are expected to contribute to understanding the COVID-19 effects on the economy of Jordan and pave the way towards extending the literature in different ways, the first of which is the exploration of the effects of COVID-19 on the economy and stock market of a Middle Eastern country, specifically that of Jordan. Second, the researchers contribute to the exponentially growing literature on the effects of COVID-19 on economic activity [13, 29] and financial markets [30–32]. Third, the current paper extends previous empirical studies on COVID-19 effects on the economy of Jordan [27, 33]. Fourth, this study is a guideline for future studies concerning COVID-19 on the economy of Jordan, boosting studies in the area. Finally, the study also has implications for policymakers, financial regulators, and economic experts in Jordan to enhance economic recovery during the crisis as well as provide a deep insight for authorities to formulate agendas for enhancing the confidence of investors and attract local and foreign investment to Jordan.

Accordingly, the remaining parts of the paper have the following parts and contents: Section two contains a brief background on COVID-19 and Section three provides an overview of Jordan. This is followed by literature that is related to the topic, the study’s adopted research methodology, and the effects of COVID-19 on the economy of Jordan. The last two sections present the related policies that are adopted by the Jordanian government and the ASE to contain COVID-19, the suggested policies for the government, and the conclusion, respectively.

2 COVID-19 Brief Background

The ultimate comparison between COVID-19 and prior pandemics, such as the Asian highly Pathogenic Avian Influenza (H5N1), Severe Acute Respiratory Syndrome (SARS), Swine Flu, Middle East Respiratory Syndrome (MERS), and Ebola (see Fig. 1), is too premature to be determined. Nevertheless, COVID-19 is considered to be the third major outbreak of a novel coronavirus in the twenty-first century, after SARS (2003) and MERS (2012) [35]. More importantly, COVID-19 which was first reported in Wuhan in December 2019 was only declared to be a pandemic in March 2020.

Following the declaration of the COVID-19 pandemic, a few months later 100,000 COVID-19 cases were reported around the globe, and in March the number of cases had doubled [1], an increase that occurred in the face of the adoption of several

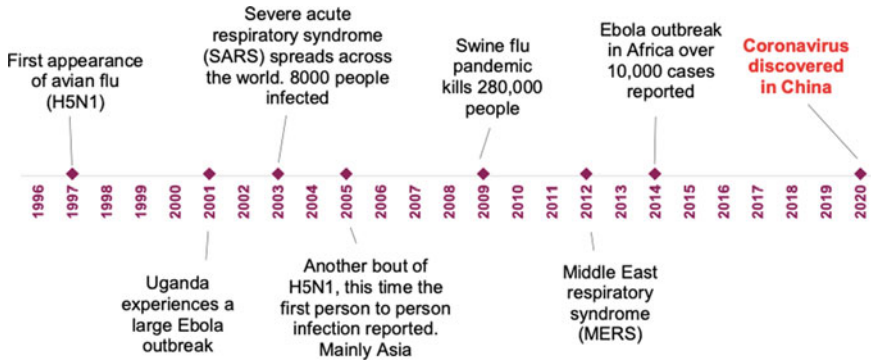


Fig. 1 Pandemics in modern history. *Source* World Health Organization [1]

measures, including social distancing (physical distancing), telework, shutdowns of schools and universities, cities quarantine, sports event cancellations, festivals, and other public gatherings.

Furthermore, the pandemic has led to a heightened number of deaths and has led to a decrease in economic, financial markets, and social activities worldwide. Notably, the adverse effects have been minimized by the ICT advances, enabling people to work from home and sustain economic activity and connectivity among people [35–40].

3 Jordan Overview

Jordan is a country that is characterized by a low-resource base, with a GDP per capita that is ranked 110th among the countries in the world [7]. Such a low ranking is reflective of the unequal distribution of the economy in Jordan among the citizens and the influx of refugees into the country. This is evident by the data showing that 15.7% of the population and 78% of the Syrian population in the country live under the poverty line even prior to the COVID-19 pandemic [41]. Moreover, there is little economic leeway to deal with the pandemic in a country where public debt is equaled to 92.4% of the GDP of the country as of 2019 [41]. The economy of Jordan was also unprepared for the closing of borders, and thus, there have been significant incurred losses [42].

3.1 Jordan's Covid-19 Outbreak

Jordan, similar to other countries, is on unfamiliar ground when it comes to the pandemic challenges. The government realized the pandemic's critical health challenge earlier on and had adopted measures; the first confirmed case in the country was reported on the 2nd of March 2020, from a male youth returning from his trip to Italy [27]. By the end of May 2020, Jordan had reported 7881 cases of COVID-19 and by February 14, 2022, the country's Covid-19 cases had reached 1.47 million, with an accompanying 13,508 reported fatalities [43].

3.2 Healthcare System Response in Jordan

Healthcare capacity in Jordan has been a considerable challenge in the country [44]. According to WHO's ranking, Jordan's healthcare system is one of the worst-prepared during the pandemic, with Jordanian hospitals having 1.4 beds per 1000 population members (constituting around half of the world average) [42].

Similar to other countries, Jordan has been currently reporting a high number of COVID-19 cases, which has urged the government to implement martial law, which has led to a national curfew on the 21st of March, 2020. Following the first reported COVID-19 case in Jordan (see Fig. 2), extensive contact tracing was implemented with contact screening and mandatory hospital admission of laboratory-confirmed patients. This was conducted along with a nightly curfew and a strict country lockdown sealing the country's borders on the 21st of March, 2020. The country passed a Royal Decree passing the National Defense Law implementation. Such measures were adopted at the initial pandemic stages, reducing the spread of the virus and its effect on public health [44].

4 Literature Review

During the pandemic, the rising challenges and the effects on the economy have to be understood to assist risk management and policymakers in decision-making, which in turn would stabilize and develop a robust economy and the well-being of the citizens. However, because of limited research on the topic of pandemic's impact on the global economy, a comparison can be made to the natural disasters in the past that had affected the financial systems of the world.

Along this line of study, [46] have developed a theoretical model to investigate the banking sector stability in the joint Malaria-AIDS prevalence. The study showed the banking sector had collapsed and the eventual increase in the pandemic occurred. Also, according to [47], the approximated national losses in the national U.S. economy may arise in case of an influenza-related pandemic outbreak. The

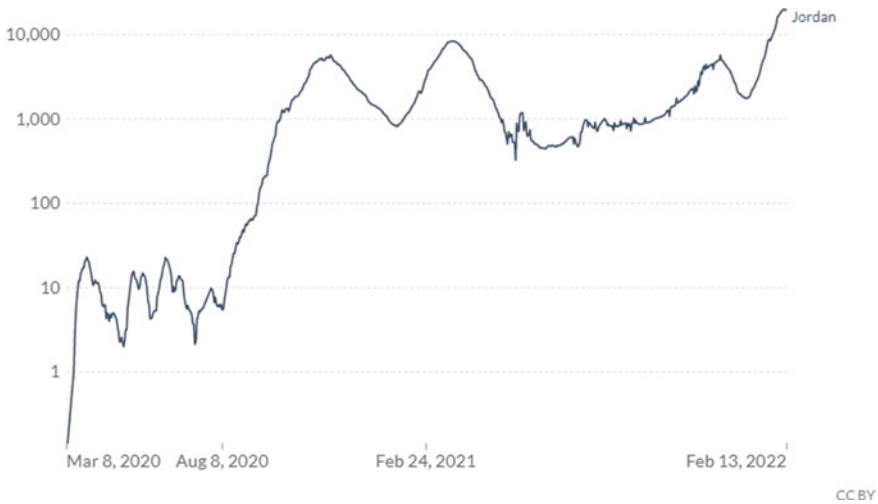


Fig. 2 Daily cases graph. *Source* Johns Hopkins University[45]

study encompassed several fatalities from the pandemic and estimated the expected number of related deaths to be 720,000 annually whereby the annual losses incurred reached \$500 million. Added to this, [48] looked into the possible impact of COVID-19 mortality and economic activity through the comparison of the pandemic to the Great Influenza Pandemic (1918–1920). A parallel evaluation of the economic GDP declines heightened consumption, and fatalities, decreased realized real returns on stocks, and short-term government bills brought on by the Great Influenza Pandemic, to the Covid-19 to obtain lessons. The study reached the conclusion that the present COVID-19 situation that brought on a decline in stock prices, high stock-prices volatility, mitigated rates of interest, and real economic activity contractions are common outcomes calling for timely and effective responses. The COVID-19 pandemic has impacted the financial markets of countries and led to a crucial risk level, causing a huge magnitude of losses among investors in a short period of time [31].

Moreover, the aggregate and firm level stock returns during the real-time pandemic were the topic that was explored in the USA; [19] study has indicated that changes in the COVID-19 trajectory infections are useful in predicting real-time US stock returns and that unexpected doubling of projected infections can predict a next-day aggregate U.S. market value decrease of 4–11%, which indicates the possibility of rebounding equity markets even in the pandemic period. In a related study, the frequency of the influenza pandemic's effects on the South African insurance industry was the direction taken by [49]. Based on their study's conclusion, the South African economy would incur R1.1billion claims from a mild pandemic and R55 billion claims from a severe one. In Saudi Arabia, [50] examined the way SMEs tackle the required changes in their market survival strategy during the COVID-19 pandemic. The conclusion showed that the Saudi government has demonstrated efforts and

appropriated stimulus packages to maintain employment among SMEs. Many of the enterprises were satisfied with what the government gave as proclaimed by the Saudi government.

The above review of the literature shows that many of the undertaken studies are linked to the pandemic and that their examined determinants have commonalities, albeit their adopted methodologies that are varied, and only a few have concentrated on the effect of the pandemic on the countries' economies. Evidence shows that past studies have not tackled this study's topic scope and thus, keeping this into consideration, the authors proceeded to examine the effects of COVID-19 on the economy of Jordan.

5 Methodology

This study adopted the methodology of [51–54]. Accordingly, the study mainly included a number of statistics obtained from a review of reports published by international agencies (i.e., the World Bank, the World Health Organization, the Organization for Economic Cooperation and Development, and the International Monetary Fund) and Jordanian agencies (e.g., government websites, local documents, and local newspaper). In addition, the study has employed keywords that are relevant to the topic by focusing on a review of prior studies, determining economic key indicators such as GDP, inflation, unemployment, poverty, the ASE market, the COVID-19 outbreak, and the Jordanian economy. Therefore, following the identification of the needed documents, the authors reviewed their contents to determine what to include and exclude based on their relevance to the study.

6 Discussion of Results

Globally, communities, businesses and organizations have experienced the impact of the COVID-19 pandemic, which eventually affected the financial markets. To compound the chaos further, governments' response and lockdowns have disrupted the activities of the economy, reducing goods production, implementing quarantines and self-isolation policies, which in turn have led to decreased demand, consumption, and use of services and products. On the 1st of February 2022, 400 million confirmed cases were reported on a global level, with 5.7 million fatalities based on WHO publications. Consequently, COVID-19 has led to an international economic downturn because of adopted measures causing a depression that is akin to that of the 1930s. The causes behind the two crises may differ, with the recovery of the current one expected to be quicker than that of the past albeit uncertainties abound as to how long the recession brought on by the current pandemic will last and the aftermath in the medium-term. These uncertainties include how businesses will rebound from the

lockdown and the possibility of the secondary waves that would force governments to implement new lockdown measures.

However, there have been several outlooks of the global economy constituting for the COVID-19 effects on the GDP, with the International Monetary Fund [IMF], World Bank, and OECD expecting global GDP to contract in 2020 by 3.0–7.5% and an increase in the global GDP in 2021 by 2.8–5.8% [4, 7]. Based on the forecast report of the IMF, half a billion people could face poverty because of the pandemic while the International Food Policy Research Institute (IFPRI) estimated a contraction of the economy in 2021 that would result in people, approximately 140 million, to live in poverty, resulting in increased food insecurity level in many countries worldwide [55, 56].

In sum, the COVID-19 has damaged countries' economies, and this is particularly true for emerging economies around the world, with the effects of the pandemic experienced more in small open economies, like that of Jordan in different ways. First, this may influence economic sentiment and mitigate both investments and consumption levels. Second, the restrictions imposed by the government have minimized economic activities. Third, international trade and financial markets have been affected, as a result of which global developments have digressed. Additionally, the pandemic has affected public finances to a long-term extent, hand in hand with the increase in public indebtedness. The primary effects originate from decreased economic activity, minimized tax incomes, and measures that aim to compensate for losses to the economy and those directed towards stimulating the economy to its rebound path. Due to the importance of foreign trade and the well-contained pandemic, it can be argued that international trade and financial markets' effects will take over the domestic pandemic and the actions of the Jordanian government. The question thus arises as to how the pandemic could affect the economy of Jordan. In this work, the extended literature on the COVID-19 pandemic economic effects and the analysis of such impacts on the economy of Jordan are delved into.

6.1 GDP

Jordan is a country blessed with a low resource base, ranking 110 in the world based on GDP per capita [42]. Such a low ranking may be attributed to the country's unequally distributed economy, with economic activities slowing down in 2020. Figure 3 from the Department of Statistics [57] shows that supply growth has been led by the service sector, with nominal contributions from the industrial and agricultural sectors. The economic growth of Jordan has experienced the negative effects of the pandemic, with GDP decreasing to -1.5% by the end of 2020. The real GDP showed an increase of 2.7% in 2021, subject to the recovery in the post-pandemic global economy [57]. The forecast of GDP growth in Jordan is expected to be 2.8% in 2022, but over the medium-term, growth is expected to remain low if Jordan's structural issues and economic challenges are not quickly and extensively addressed. Major challenges

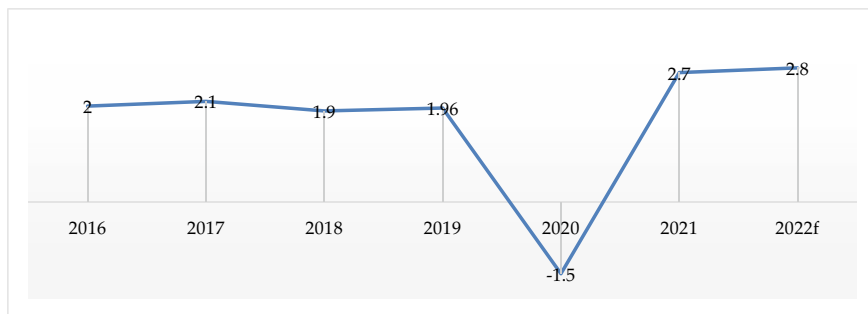


Fig. 3 GDP growth percentage. *Source* Department of Statistics [57]. *Notes* f = forecast

and issues to the future outlook include a long economic decline in activities because of the imposed lockdowns on the domestic level.

6.2 Inflation

Goods and services prices are affected by internal and external shocks, and with the extensive proliferation of COVID-19 throughout the world, the general level of prices is expected to increase all over the globe, which would contribute to inflated economic pressure [58]. This holds true for Jordan, which was taken by surprise by the pandemic, and left unprepared to face the ensuing global economic chaos. Also, in comparison to other industrialized nations, the economy of Jordan is highly sensitive, with over 87% of the caloric intake and 93% of the energy consumption of the country dependent on imports, the same case holds for clothing, automotive, and electronics. Thus, the current economic situation in Jordan has added to the inflation occurrence in many ways; the immediate of which is the panic buying among consumers, in expectation of the lockdowns in the country. Panic buying has developed a huge excess market demand, which has not been stabilized by the market mechanism. Figure 4 shows an increase in inflation from 0.40% in 2020, to 1.35% in 2021, with only a 1.5 expected increase in 2022 during implemented monetary policies and the slow COVID-19 brought on demands.

6.3 Unemployment

The report issued by the International Labor Organization describes the COVID-19 pandemic as the worst global crisis following the one brought on by World War II. With half of the globe under lockdown, a loss of 195 million full-time jobs equating to 6.7% of global working hours are lost [3]. The economy of Jordan appears to be

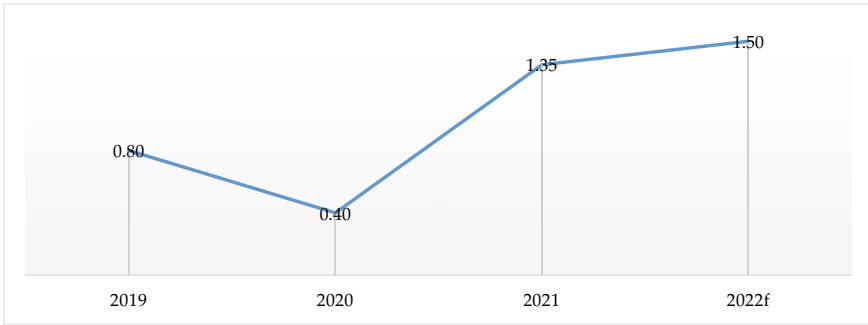


Fig. 4 Inflation rate percentage. *Source* Department of Statistics [57]. *Notes* f = forecast

in low-growth equilibrium with a weak labor market and high structural unemployment. Based on the Department of Statistics [57] report, the pandemic has adversely affected an already weak job market, with the rate of unemployment reaching 24.7% in the 2020 fourth quarter. According to the Jordan Economic Forum [59], the unemployment rate is expected to reach 24.8% in the final 2021 quarter and thus, based on these forecasts, it is expected that the rate of unemployment in the country will reach 25.3% in 2022 because of the effect of the pandemic, driving local and international lockdowns to mitigate supply and demand. Nevertheless, the annual jobs provided by the economy of Jordan, a number from 30–40 thousand in comparison to the demand for jobs that reach 100,000 every year. Figure 5 indicates that in the past years, the unemployment rate in Jordan has shown a dramatic increase from 2015 up until 2021, with losses expected to continue in the following year (2022). Still another issue that may influence the unemployment rate is the crowding-out effect of undocumented migrants, whereby the country depends on migrant workers from Syria, Southeast Asia, and Egypt [60], the majority of whom are working in agriculture, textiles, domestic work, and construction. Most of such workers are undocumented, estimated by the Labor Ministry to be several hundred thousand.

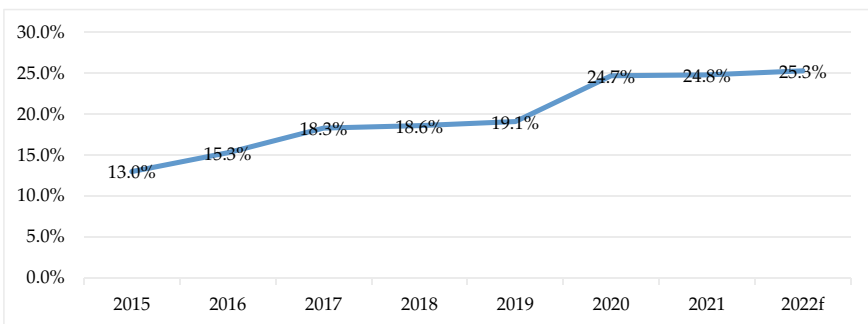


Fig. 5 The unemployment rate. *Source* Department of Statistics [57]. *Notes* f = forecast

6.4 Poverty

The current COVID-19 pandemic has transformed quickly from a health crisis to a global economic one with recessions forecasted by several international agencies by 2021, because of which, extreme poverty will arise all over the globe [4]. The virus has permeated all the countries in the world leading to the mobilization of billions of dollars to support enterprises, their workers, and families [61]. In the EU and the US, large-scale support packages have been launched and International financial and development institutions declared their inclination to support developing nations with limited financial resources to address and contain the COVID-19 pandemic and the ongoing effects of the same on the economy.

According to related literature [58, 62], in the worst-case scenario, a contraction of 20% is expected, with poor people (people living under the poverty line) expected to increase by half a billion. Based on the additional number of poor people throughout the regions, the majority of the world's poor will be comprised of the Middle East, East Asia, South Asia, and Sub-Saharan African regions. More specifically, the poverty rate in Jordan's citizen-population is expected to increase to reach 38%.

Furthermore, the social protection level needed for the complete offset of income losses among poor households has the likelihood to be prohibitive, particularly as government revenues have fallen due to a lack of economic activities. Hence, the opening of the economy at a gradual pace would be critical for steering clear of permanent job losses and an increasingly poor population throughout the country. The economy re-opening and related support from the government to the sectors may also pave the way for new opportunities for a sustainable transformation of the economy. On the other hand, economic depression would ensure, with skyrocketing unemployment rates and massive life losses, with millions driven to live under the poverty line.

6.5 ASE Market

Mobilization of capital and provision of secondary markets to investors and financial institutions through buying and selling securities have played a major role in stock markets [9, 63, 64, 72]. A liquid stock market arises when large transactions are conducted with negligible effects on the securities prices. The COVID-19 pandemic has brought about the collapse of the stock markets in March 2020, leading to most stock indices registering their highest one-day falls, and major companies experiencing over 80% of their share prices falling within a mere few days [65].

It appears that the pandemic has the likelihood of causing bankruptcy among major brands in many industries with lockdowns imposed and consumers following the stay-at-home measures [66]. This is reflected by the enormous financial pressure that is experienced by major U.S. firms such as Sears, Neiman Marcus, JC

Penny, Hertz, and J. Crew. This is also reflected in the travel industry when in 2020, 80% of hotel rooms have remained empty, airlines cut their workforce by 90%, and tourist destinations remained stagnant and unprofitable [66]. Moreover, public activities including expos, conferences, sporting events, and large gatherings, including cultural galleries, and museums have remained closed and empty. Lastly, major car, truck, and electronic industries have also remained closed.

In effect, the COVID-19 pandemic has led to global financial unrest, with stock markets collapsing in most of the developing nations [11, 58, 64]. This held true for the Amman Stock Exchange in Jordan whose first half of 2020 had only reached 416 million (JD) in volume, lower than that of the previous year (668 million); several Jordanian firms are faced with bankruptcy.

6.5.1 ASE Price Index Weighted

A dramatic decrease in the ASE price index weighted was experienced in the COVID-19 pandemic, with a notable 1657 points as of 26th November 2020, in comparison to 1808 points in the previous year. It can therefore be stated that the economy of Jordan has been significantly affected by the pandemic [67]. Prior to the pandemic, the Jordanian economy had already experienced adverse effects from the global financial crisis and the Arab Spring, and it appears that the COVID-19 pandemic has added to the shock, making it impossible for the Jordanian stock market to recover.

6.5.2 Market Capitalization of ASE

Based on the statistics in Fig. 6, the market capitalization on each Jordanian major exchange was at JD15.5 billion in 2019, falling to JD12.9 billion in 2020, with a continued decrease to JD1.4 billion in 2021. It is thus understandable that with every strike of the COVID-19 pandemic, the market shrinks with uncertainties and risks, leading to crashing world markets- the extent of which that has not been experienced since the Global Financial Crisis of 2008, as such the Jordanian market is not an exception. Thus, the Dow global market sank by 6%, indicating the highest drop since March 2020 and the S&P500 experienced a decline of 3.5% in June 2020 [68]. Essentially, the pandemic sentiments have been unleashed upon foreign and domestic investors and have been reflected in the stock market. It is expected that following the pandemic, business and economic normalcy will ensue, after which the stock market will rebound.

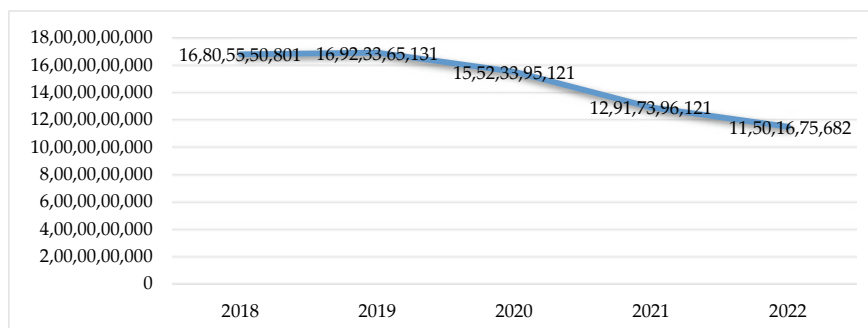


Fig. 6 Market capitalization of ASE (JD Billion). *Source:* ASE website [67]

7 The Economy Recovery Policies in Jordan During the Covid-19 Pandemic

Globally, the pandemic has brought overwhelming economic consequences for every country. The entire society is affected, leading to dramatic changes in businesses and the behavior of consumers [66]. Great progress has been made in Jordan for economic reformation, but remaining challenges have yet to be settled. The ongoing impacts of COVID-19, along with the regional conflicts and the influx of Syrian refugees into Jordan, are the current challenges that the country is facing [4, 71]. This has urged the government to implement several measures to boost the economy and mitigate the effects of the pandemic on businesses and their employees, which include the following:

1. The government has appropriated two major funds to help enterprises face risks—the first is managed by the government, which is gathered from entities and individuals' donations, while the other is managed by business leaders and is referred to as Himmat Watan Fund (Nation's Efforts) that is gathered from the private sector donations. Additionally, the Central Bank of Jordan established a fund for struggling SMEs to request soft loans or low-interest loans from the Jordan Loan Guarantee Corporation (loan guarantor). SMEs that address the loans are not allowed to let go of employees during the loan duration [62, 78, 79].
2. In March 2020, the International Monetary Fund's Executive Board approved an initiative of a \$1.3 billion Extended Fund Facility to minimize the virus's effects on the struggling sectors and individuals in the economy [69].
3. From 3rd March 2020 onwards, the Central Bank of Jordan dropped interest rates by 0.5 points (from 4–3.5%), and from 16th March 2020 onwards, by 1 point (from 3.5–2.5%), enabling the rescheduling of loans by banks particularly among virus-ridden sectors at no cost till the end of 2020 [70]. The cash reserve requirement was also reduced for banks by 2% (7–5%) for the release of additional liquidity amounting to JD550 million.

4. The government of Jordan has delayed the collection of sales tax from the local sectors and enterprises, particularly for those who are dealing with food supply and healthcare until the goods are sold, as opposed to upon contract signing [73–77].
5. Other daily works have not been halted by ASE with emergency plans still ongoing for remote work prior to the closing and equipping the technical infrastructure that is required for launching such works. In addition, ASE departments have been mandated to follow steps for ongoing remote work and have been updated with the relevant plans and strategies, in terms of the market developments and the trends in the local and international arena [80–84].

8 Suggested Policies for the Jordanian Government (What Can the Jordanian Government Do?)

Like governments all over the world, the government of Jordan has proclaimed several measures for the prevention of total collapse. While the government has been adopting measures to mitigate the damage that has been wrought by COVID-19, they are not sufficient solutions [85–89]. Hence, the following guidelines are suggested to further minimize the negative effects of the pandemic on the economy of Jordan in the form of in-exhaustive measures that would stimulate economic growth:

1. Revival of consumption can be brought about through tax cuts on businesses and goods. In addition, income-tax reductions raise the disposable income of employees, thus encouraging them to spend.
2. Due to the seemingly insurmountable magnitude of the COVID-19 effects, the measures to contain it by the Jordanian government have formed a vulnerable macroeconomic situation, and with the decrease in tax revenue that is related to the lockdown, the government of Jordan needs to mobilize additional resources or search for other sources to restore and maximize the revenues to address the pandemic.
3. Encourage investment in modern infrastructure, research and development (R & D), as well as assistance for small and medium-sized enterprises (SMEs) (e.g., direct loans; loan guarantees). The aim is to maintain competitiveness and provide a new basis for development while also taking advantage of the downturn to start working on numerous long-term goals, such as lowering unemployment, increasing GDP, and growing investment.
4. Cutting interest rates makes borrowing cheaper and increases the disposable income of companies and households, leading to higher spending. In addition, the government should increase healthcare services and testing facilities for COVID-19.

9 Conclusion

This work presented an enriching insight into promoting awareness of the effects of COVID-19 on the economy of Jordan with statistical figures and theoretical underpinnings. The study made use of indicators of the economy, including GDP, inflation, unemployment, poverty, the ASE Index, and market capitalization in the ASE Market. Based on the findings, COVID-19 has had and is still having a significant effect on the economy of Jordan. Thus, for the economy of the country to recover, economic policies need to be adopted at the national level. The government should plan for the long and short-term in addressing and resolving the crisis.”. Thereby, this study recommends that policymakers conduct clear debates concerning alternatives, provide instances of creative solutions to respond to the pandemic, and transition to a sustainable, resilient, and equitable future economy. It is suggested that the government promotes a positive environment for both local and foreign investments to reboot the growth of the economy, and policies should be adopted that direct towards the economic activities of businesses for economic revival. Consequently, the government of Jordan should carry out extensive planning for enhancing the economy by enabling businesses to operate more efficiently so that the adverse impact of the pandemic on the long-term economy of the country is mitigated, along with the level of employment and income losses, and eventually, poverty.

Despite the contributions of this study and its findings, it has its limitations, the first of which is the fact that it is just a preliminary study, which requires a follow-up examination at varying levels of oversight of the impact of the pandemic, on the economy of Jordan. Another limitation relates to the major determinants of the economy of Jordan; thus, it is suggested that future studies focus on specific economic sectors such as the industrial and service sectors in Jordan. They may also focus their concentration on the direct effect of COVID-19 on the Jordanian enterprises’ performance. Finally, studies can delve into the effects of COVID-19 on other developing countries’ stock markets and provide a global picture of the aggregate results.

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Innovation and Creativity an Important Ingredient in the Future Growth and Sustainability of SMEs



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Abstract SMEs are the lifeblood that is essential to any country or nation. SMEs throughout the world add to a country's GDP, stimulate a country's economy, and contribute to its prosperity and future sustainability. The importance of SMEs can never be undervalued by a country's government and leadership as they form the backbone in providing a steady stream of employment to many people in the community. However, like all evolving environments, SMEs' is part of a complex macro-environment that is dynamic and constantly changing. SMEs must keep abreast of the changes in technology to grow and remain sustainable. In times of the COVID-19 pandemic, an important lesson for SMEs is that they needed to move to digital platforms to be sustainable. Since, information technology improved psychological empowerment as well as organizational performance, this can assist organizations in increasing psychological well-being among employees while also increasing organizational efficiency, allowing them to achieve greater levels of success in their respective fields of endeavor. The results of this study corroborated previous research that has pointed to the potential benefits of digital transformation in terms of enhancing organizational outcomes. In contrast, innovation possibilities failed to have any effect on the performance of the companies in question in the study. A plausible cause might be the kind, nature, and sector of the inquiry, which would urge that further tests be performed before the findings can be generalized. Notably, in Bahrain's SMEs, innovation prospects were found to be promising in terms of organizational performance and psychological empowerment of workers, among other things.

Keywords Innovation · Organizational performance · Psychological empowerment · SMEs

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1 Introduction

1.1 Research Gaps

There are gaps in the adaption of technology by SME's in Bahrain. Another gap in the study is that SME owners have challenges adapting innovation and creativity to their business. This can lead to poor growth in the business. Possible business failure can also occur if SMEs are not up to date with new technology and provide creative and innovative ways to service their customers and clients.

1.2 Research Design

The study follows a quantitative approach where a survey was conducted. A closed-ended questionnaire was used to collect information from Bahrain SME owners on how they adapt innovation and creativity into their business by embracing the new technology. The questionnaire was developed using a 5-Point Likert scale. The population of the study were SME owners in Bahrain. The researchers used convenient sampling. The sample was chosen from 50 SMEs's registered in the Department of Industry, Commerce, and Tourism. Data from the study was analysed, and descriptive and inferential statistics will be put forward and discussed in this paper. In the study the average variance, composite reliability scores, and loading of the items that measured reliability and validity will also be included in the discussion of results.

1.3 Literature Review and Hypotheses Development

SME's in Bahrain has an important role to play in the continued sustainability of the country's economic wellbeing and success. For SMEs to keep abreast of technological changes and remain viable and lucrative in an industry, they must digitally transform their business operations. This in turn contributes favorably to their overall efficiencies thus improving SME performance. [5, 25] argues that due to globalization and the quickly evolving technical environment, the fourth industrial revolution has made the business environment more complex. Owners of SMEs must always stay up to date with changes in the technical environment. For SMEs to thrive, expand and survive in in the raging era of technology entrepreneurs must concentrate on creativity and innovation to stay competitive in their relevant business sectors. Digitization of SMEs can become their tool in maintaining their competitive advantage in the industry within which they operate. Westerman et al. [38] posit that successful digital transformation entails altering businesses so as to take advantages of digital technologies and in due course attain a competitive edge. To improve performance SME's need to adopt technology that can increase their overall efficiencies

and improve their profits margins. Aligning their strategies towards catering to their customers' needs is imperative. Since customers engage in online shopping especially during the COVID-19 pandemic meant small businesses needed to adopt technologies into their business operations. Dobbelstein and Naidoo [13] argues that because the fear of contracting the virus while shopping, is a major worry among millennials, it is necessary for marketers to make available additional online shopping options in the techno-savvy market segment. SME's need to therefore provide their customers in Bahrain with online shopping options. This would develop a new market segment (online shoppers) and maintain the profit margins during the pandemic. Zwingina and Opusunju [42] argue that SME performance measures have been defined in terms of sales level financial, production, and market indicators. If technology is used to enhance these areas, the SME's performance will also be improved.

Based on the aforementioned discussion, we formulated Hypothesis 1.

H1: There is a positive relationship between information technology use and organizational performance in SMEs

Entrepreneurial actions are linked to an entrepreneurial spirit that is related to a determination to achieve business goals, acceptance of knowledge acquisition and effective learning, exploration of growth opportunities, and willingness to take risks to affect business competitiveness [4]. If SME owners and managers want to improve knowledge management practices and innovation activities in their firms, they should focus on supporting staff training, creating suitable working conditions, and building a supportive corporate culture [7].

Innovation techniques have a significant positive impact on SME success. Idea generation supports both formal and informal processes of innovation. Both internal and external SME barriers are a source of ideas. The culture of a SME makes it easier to invest in innovative concepts. For instance, SMEs with formal innovation processes exhibit a higher risk-taking mindset than SMEs with informal innovation processes [42]. The capacity of SMEs to generate new products and manage new business processes that add value will also determine how quickly they adopt innovation [3–5]. The concept of Innovative Work Behaviour (IWB) entails the use of alternative methods of reasoning, a constant search for improvements, the pursuit of novel methods for carrying out tasks, the exploration of novel technologies, the application of various work strategies and methods, and the provision of resources to enable the realization of new ideas [40]. Traditional business models are being replaced with flexible business models that are knowledge-based, quick to adapt, and able to react in real time to customer preferences. When the effects of Industry 4.0 on the business world are examined, it is noted that manufacturing and manufacturing processes become more practical, the supply chain is better, the cost of infrastructure and energy is lower, less human resource is needed, qualified manpower is more abundant, and income and profit levels are increased [35]. According to [7, 8] in order for knowledge management to have an impact on the performance of small and medium-sized enterprises (SMEs), it is necessary for innovation to act as an intermediary factor. Knowledge management consists of various components, including strategies and policies, knowledge acquisition, organizational culture, and

employee training [3, 37]. It has been discovered that strategies and policies, knowledge acquisition, and organizational culture have an influence on innovation, while training does not directly affect innovation. [23] posit that for SMEs to be sustainable and successful they need to have a good social network. These can be in connection with networks that have been established outside of the firm such as research institutions, government agencies, competitors, suppliers, customers, and any other potential organization.

After considering the aforementioned discussion, Hypothesis 2 was formulated.

H2: There is a positive relationship between innovation atmosphere and organizational performance in SMEs

In terms of product, process, organizational, administrative, managerial system, as well as marketing innovation, innovation has been categorized [42]. SMEs frequently carry out marketing innovations by creating and putting into practice improved approaches for product, price, and promotion [1]. Thus, incorporating client needs and ideas into the innovation process is essential for successful innovation [7]. SMEs are prepared to take part in cutting-edge activities that advance their technology. According to [39], SMEs also work to construct control mechanisms in a participatory manner and engage in the creation of open and successful innovation strategies. Online software, according to [20] can make creating billing and payment papers simple. As posited by [6, 7], inventory is the periodic and ongoing observation of inventories with the goal of determining average selling and buying prices. In order to assure that goods will be available, it also provides information about the stock of popular items. Social media has become a popular way to communicate with clients and get their input right away. For instance, SMEs strongly favour the use of WhatsApp and, to a lesser extent, Twitter and Facebook in the food industry, notably the restaurant business [29]. According to the studies of [42], innovation affects the performance of SME. Product development promotes strategic marketing. Furthermore, the adoption of cutting-edge marketing technologies can influence SME performance [14]. Networking setup and capabilities are introduced by [30]. According to their definition, networking capacity is the capacity to access resources within a network by means of relationships. They went on to say that these talents also include the ability to coordinate tasks, maintain connections, understand partners, communicate internally, and form new partnerships. However, they define network configuration as the kind of connections made by the ties between the players. These typically include networking with business partners and customers. Further suggestions regarding the impact of network configuration and capabilities on creativity and how network capability affects SME performance were given by [30]. According to [28] argues that previous research have looked at technologies on the whole and have discovered a number of elements that affect an organization's decision to embrace information and communications technologies (ICTs). These factors can be grouped into the following: organizational characteristics (such as the size and nature of the firm), historical performance, concerns regarding privacy and security (such as uncertainties about internet security as well as legal issues), resistance to change, financial limitation, exorbitant nature of computers and network, shortage

of qualified workers, limited understanding of necessary technology, limitations in infrastructure, marketing challenges, competition, locating trustworthy technology management consultants and suppliers, establishing guidelines for suitable hardware and software, as well as the adoption of ICT and e-commerce through support programs for digital transformation.

On the basis of the aforementioned discussion, we constructed Hypothesis 3.

H3: There is a positive relationship between innovation opportunities and organizational performance in SMEs

Digital transformation can play an instrumental role in harnessing several strengths among employees. [38] posit that successful digital transformation is about changing businesses to leverage digital technologies and ultimately attaining competitive outcomes. We assert that the availability of technological tools and resources to focus on innovation can help boost the employees' cognitive resourcefulness, thus predicting psychological empowerment. The authors argue that such prospects would help businesses to enable their employees to experience the freedom to be creative and innovative which would lead to harnessing their beliefs about being empowered individuals. Though not much has been investigated in this regard, a few scholarly traces can be noted. First, following the findings of [15] findings, we assert that providing robust information technology use, innovation platforms, and innovation opportunities can serve as prospects for employee empowerment which can nourish their psychological resources. Second, in their recent study, [21] also underlined that an innovative organizational climate can boost employees' psychological empowerment, which further aids to promising outcomes. Innovation entities have been reported instrumental in improving employees' work behaviors which ultimately results in harnessing organizational performance outcomes. Thus, we hypothesize that information technology use, innovation atmosphere, and innovation opportunities will be positively related to employees' psychological empowerment. Hence, we test the following:

H4: There is a positive relationship between information technology use and psychological empowerment

H5: There is a positive relationship between innovation atmosphere and psychological empowerment

H6: There is a positive relationship between innovation opportunities and psychological empowerment

Scholars have indicated how psychological empowerment can benefit organizational performance prospects [9]. Individual psychological wellbeing can harness a sense of commitment and dedication towards the work and organization [27], thus boosting organizational performance. Accordingly, scholars have also argued that harnessing psychological empowerment can help employees show a greater level of organizational citizenship behavior [3], which can be referred to as a significant contributor towards enhancing the results of an organization. In parallel, a prominent study has

also indicated how psychological empowerment can result in performance consequences ([2]. Thus we assert that psychological empowerment will play an instrumental role in enabling employees to boost their contribution towards organizational performance. Therefore we tested the following.

H7: There is a positive relationship between psychological empowerment and organizational performance in SMEs

There are many drivers of innovation. The improvement of innovative capabilities in SMEs and ultimately performance is influenced by the internal business environment [1, 5, 6]. If staff within the SME are driven by physiological empowerment, then this will have a positive bearing on the innovative atmosphere generated within the firm. This ripple effect will further drive excellent returns in organization performance.

Past studies established that psychological empowerment plays an important role in nourishing employees' innovative work behavior [1–6, 24]. Employees will experience a sense of meaning if they believe their work is vital, which will motivate them to take initiative and be more creative at work [9]. When highly competent individuals in SMEs are confident in their knowledge and abilities to come up with ideas and put those ideas into practice at work. They take more time to pinpoint and come up with solutions to problems [19]. Self-determination is important to employees within SME's. Perceived autonomy grants employees increased chances to explore and test their fresh ideas and is positively related to innovative behavior [33, 42].

On the basis of discussion above, we came up with the following.

H8: Psychological empowerment mediates the relationship between innovation atmosphere and organizational performance in SMEs

From a definition given by the European Commission (EC), Industry 4.0 consists of several emerging and innovative technologies (EC, 2015).

The utilization of ICT enables the digitization of information and the integration of systems throughout all stages of product creation and usage, encompassing logistics, supply, and internal and external company operations.

Intelligent systems leverage ICTs to effectively control or monitor mechanisms. These systems may incorporate embedded sensors, intelligent robots capable of self-configuration to accommodate specific product requirements, or 3D printing devices.

Internetworking, encompassing wireless and internet technologies, facilitate the interconnection of machines, work products, systems, and individuals. This connectivity extends to the manufacturing plant as well as suppliers and distributors.

The application of simulation, modeling, and virtualization plays a pivotal role in product design and the creation of manufacturing processes.

Analysis and exploitation of big data occur either directly on the factory floor, or through cloud computing resources (such as database, analytics, artificial intelligence, networking, amongst others).

Digital assistance systems such as intelligent aid systems, augmented reality tools (intended to enhance the both the real and virtual world), and robots, are developed to support the cognitive abilities of staffs.

Within the SME, if staff is driven by high levels of physiological empowerment then this will filter through positively in them taking active initiatives in innovation opportunities that can improve the firm's organizational performance. Psychological empowerment is a motivational concept that consists of four scopes (meaning, self-determination, competence, and impact) about individual orientation [33]. Employees with similar value as their organization, are likely to intensify their involvement in the job and augment their innovative behavior [32]. Recently, "meaning" was well-thought out to be the standard of work on the basis of the interpretation of a person about a job [21]. It is how a person perceives his job to important [18]. On the basis of the aforementioned, we hypothesized the following:

H9: Psychological empowerment mediates the relationship innovation opportunities and organizational performance in SMEs

Nambisan et al. [26] argue that digital technologies have fundamentally reshaped business processes, products, and services, as well as inter-firm relationships, greatly reducing the difficulty and costs of resource shifting. The following are ways in which SME's can be digitally transformed:

1. To identify who will be responsible for what, the management must request a data-based digital transformation. SMEs with requirements and needs analysis are able to create quantifiable goals with clarity. The management can examine the issues around digitalization, the potential contributions of new technology, and potential new business models. After that, they can provide training and benchmarking to assist SMEs.
2. In order to digitally transform operations, small and medium-sized enterprises (SMEs) must embrace a culture of learning. This entails having skilled employees, providing training for current staff, identifying necessary abilities and skills, and addressing any skill gaps. It is also important to consider hiring individuals with digital expertise, such as IT specialists and socioeconomic support professionals.
3. SMEs should develop a clear roadmap detailing their business objectives to aid in digital transformation. These objectives should be founded on the digital transformation process, and span a range of factors including time, money, space, and quality. They involve tasks like creating a new digital strategy for SMEs, examining the current business model, figuring out what customers want, assessing digital capabilities and expectations, setting goals, building competencies, compiling best practices for digital transformation, looking into different options for using information technology and digital business models, assessing progress, creating a digital value network, and getting customer feedback.
4. Raising awareness about digital technology and fostering a supportive atmosphere It can also assist in establishing obvious communications between entrepreneurs and IT specialists as regards expectations and deliverables so as to avoid dishonesty [23].

5. Seeking guidance from experts in SME support, innovation labs, and research institutions for successful digital transformation, would be of tremendous benefits to SMEs.
6. Governments and stakeholders like Trade Associations and Chambers should support SMEs in their digital transformation, aiding in requirements analysis and accessing assistance [6].

If staff in SMEs are easily adapting to new technology usage within the firm's business processes, then psychological empowerment amongst these staff will be high and can positively impact the firm's overall success and business performance. According to empirical research, competency positively correlates with a number of employment outcomes, such as job involvement [11], creative performance [41] etc. Numerous employment outcomes have been studied in relation to self-determination. According to research, work satisfaction, organizational commitment, and innovative performance [31, 33], have been discovered to be favorably correlated with job performance [34]. Impact, then, refers to a person's perception of their ability to shape professional outcomes. Research in this area has discovered a favorable correlation between impact and other outcomes.

On the basis of the aforementioned discussion, we assumed the following.

H10: Psychological empowerment mediates the relationship between information technology use and organizational performance in SMEs

2 Methodology

Structural equation modelling using Smart PLS 3.0 was deployed for the purpose data analysis. PLS-SEM has gained much appreciation due to its strong predictive nature. Therein, two step approach was deployed.

Assessment of Measurement Model

For the assessment of the measurement model, the algorithm was applied through Smart PLS3. In the assessment of the measurement model, current research assessed the reliability and validity of the research construct. For reliability and validity assessment, current research checked for average variance, composite reliability scores, and loading of the items. [16] stated that validity is achieved when there are composite reliability scores of 0.70 and above. Convergent validity can be achieved when AVE is 0.50 and above [10] and item loading is 0.50 and above. Table 1 represents current research results about loading, composite reliability, and average variance extract. Results stated in Table 1 show that current research has achieved sufficient reliability and validity.

Table 1 Assessment of reliability and validity

Construct	Loading	CR
<i>AVE</i>		
Information technology use	0.923	0.750
ITU1	0.809	
ITU2	0.899	
ITU3	0.863	
ITU4	0.889	
Innovation atmosphere	0.965	0.824
IA1	0.934	
IA2	0.942	
IA3	0.944	
IA4	0.936	
IA5	0.904	
IA6	0.774	
Innovation opportunities	0.919	0.739
IO1	0.808	
IO2	0.910	
IO3	0.890	
IO4	0.826	
	0.896	0.553
OP1	0.677	
OP2	0.684	
OP3	0.745	
OP4	0.792	
OP5	0.760	
OP6	0.781	
OP7	0.761	
Psychological empowerment	0.892	0.547
PE1	0.523	
PE2	0.684	
PE3	0.699	
PE4	0.834	
PE5	0.789	
PE6	0.813	
PE7	0.786	

Table 2 represents the square root of AVE which is used to assess the discriminant validity in the research. The square root of the AVE approach is known as [16] criteria to assess discriminant validity. Results depicted in Table 2 show that current research shows an adequate level of discriminant validity in the model.

Besides the square root of AVE, current research also checked HTMT inference recommended in [17]. Recommended range of HTMT is as below HTMT0.85 or HTMT0.90. In the results of the current study, all HTMT values were within the threshold of HTMT0.9. Results regarding HTMT values are presented in Table 3.

Variance in endogenous variables has also been assessed in current research. Variance in endogenous variables was assessed by checking R2 values. Results regarding R2 are presented in Table 4. The current study found 69% variance in organizational performance, and 66.4% variance in psychological empowerment was observed due to predictor variables.

Besides variance, the effect of each independent variable on the dependent variable was also checked in current research through effect size f2. [12] recommended the effect size values effect size of 0.02 is known as low, 0.15 treated as medium, and 0.35 known as strong. Results regarding effect size are stated in Table 5. The highest

Table 2 Square root of AVE

	ITU	IA	IO	OP	PE
IT use	0.866				
Innovation atmosphere	0.568	0.908			
Innovation opportunity	0.609	0.518	0.860		
Organization performance	0.663	0.533	0.791	0.744	
Psychological empowerment	0.697	0.640	0.761	0.707	0.740

All bold values show square root of Ave

Table 3 HTMT criteria

	ITU	IA	IO	OP	PE
IT use	= =				
Innovation atm	0.613	= =			
Innovation opp	0.689	0.562	= =		
Organization perf	0.750	0.584	0.887	= =	
Psychological emp	0.793	0.703	0.814	0.795	= =

Table 4 R-Square values R2

Construct	R2	Adjusted R2
Organizational performance	0.690	0.684
Psychological empowerment	0.664	0.659

(0.423) effect was shown from innovation opportunity on organizational performance and the low effect (0.003) was shown from innovation atmosphere (Fig. 1).

Assessment of Structural Model

Current research also assessed the structural model through bootstrapping in which path co-efficient and testing of hypothesis were assessed. Out of 10 hypotheses, six direct and one indirect hypothesis were accepted. One direct and 2 indirect hypotheses were found insignificant and were rejected.

The hypothesis proposed between information technology (ITU) use and organizational performance was measured and the current study found ($\beta = 0.207$, t value 3.587, p-value 0.000) based on the current research findings hypothesis was showing positive significant results so, therefore, the hypothesis was accepted. Similarly, the

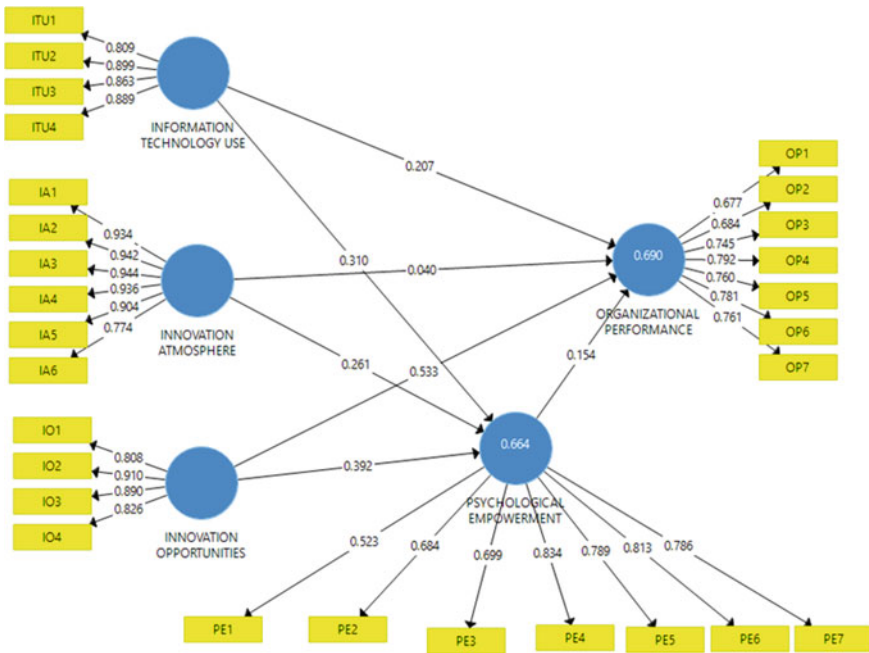


Fig. 1 Measurement model (PLS-Algorithm).Sample

Table 5 Effect size (f2)

Construct	OP	PE	Effect
ITU	0.065	0.155	Low on OP, medium on PE
IA	0.003	0.128	Low on OP, medium on PE
IO	0.423	0.268	Strong on OP, medium on PE
PE	0.026	—	Low

hypothesis between ITU and psychological empowerment also found positive significant results ($\beta = 0.310$, t value 5.342, p -value 0.000) based on findings hypothesis was accepted. While the hypothesis between innovation atmosphere (IA) and organizational performance was found insignificant ($\beta = 0.040$, t value 0.775 p -value 0.438) so hypothesis between IA and OP was rejected. Apart from this, hypothesis between innovation opportunity (IO) and OP ($\beta = 0.533$, t value 9.881, p -value 0.000), IO and psychological empowerment (PE) ($\beta = 0.392$, t value 6.799, p -value 0.000), PE and OP ($\beta = 0.154$, t value 2.079 p -value 0.038) were found positive significant and were accepted. Moreover, results of structural model assessment regarding hypothesis testing are mentioned in Table 6 and Fig. 2.

Assessment of structural model during indirect hypothesis testing (mediation) found positive significant results of mediation by psychological empowerment between information technology use and organizational performance ($\beta = 0.048$, t value 1.989, p -value 0.047) hence hypothesis ITU-PE-OP was accepted, psychological empowerment insignificantly mediated the relationship between innovation atmosphere and organizational performance ($\beta= 0.040$, t value 1.939, p -value 0.053) hypothesis was rejected due to higher p -value than the threshold. Similarly, psychological empowerment was also proved as an insignificant mediator between the relationship of innovation opportunity and organizational performance ($\beta = 0.061$, t value 1.878, p -value 0.060) based on insignificant results in hypothesis IO-PE-OP was rejected.

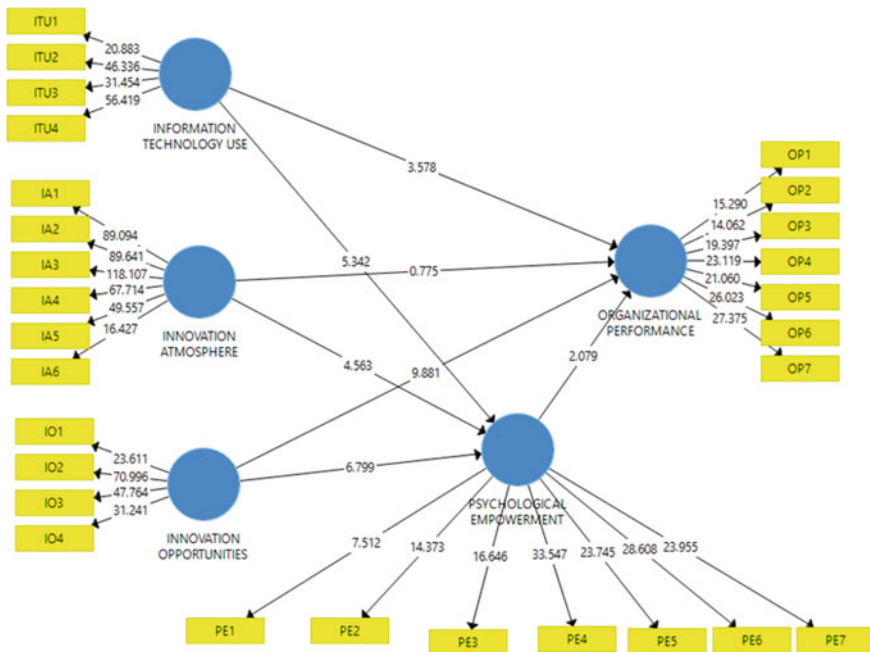


Fig. 2 Structural model (Bootstrapping)

Table 6 Assessment of structural model

Path	Beta	SD	T value	P value	Decision
ITU-OP	0.207	0.058	3.587	0.000	Accepted
IA-OP	0.040	0.052	0.775	0.438	Rejected
IO-OP	0.533	0.054	9.881	0.000	Accepted
IA-PE	0.261	0.057	4.563	0.000	Accepted
ITU-PE	0.310	0.058	5.342	0.000	Accepted
IO-PE	0.392	0.058	6.799	0.000	Accepted
PE-OP	0.154	0.074	2.079	0.038	Accepted
ITU-PE-OP	0.048	0.024	1.989	0.047	Accepted
IA-PE-OP	0.040	0.021	1.939	0.053	Rejected
IO-PE-OP	0.061	0.032	1.878	0.060	Rejected

3 Discussion

The study has attempted to address several empirical gaps by exploring how the information technology use, innovation atmosphere, innovation opportunities, psychological empowerment, and organizational performance interact in a mediated model in SMEs. Information technology positively enhanced psychological empowerment as well as organizational performance thus indicating that the use of information technology can help organizations to bring more psychological well-being among employees and also help bring more efficiency in the organizations to further their performance. The findings support prior studies [38], which indicated digital transformation’s benefit in improving organizational outcomes. In comparison innovation opportunities failed to pose any influence on organizational performance. A plausible reason could be the type, nature, and sector of the investigation thus, suggesting further tests before generalization of the results. Notably, innovation opportunities were seemed to be promising in organizational performance and employees’ psychological empowerment in the SMEs in Bahrain. This indicates that SMEs providing employees with innovation opportunities help them to enrich their psychological self and the way they work to predict organizational performance. The findings confirm that innovation influences SME performance [42].

About mediation, psychological empowerment mediated the relationship between information technology use and organizational performance. This indicates that employees who were provided with resources about information technology use were able to enhance their psychological empowerment that enabled them to bring better performance prospects to boost organizational performance. Furthermore, employee psychological empowerment also worked effectively in predicting organizational performance which confirms the assertions of [36]. Surprisingly, contrary to our assertions, psychological empowerment did not mediate the association of innovation atmosphere and innovation opportunities with organizational performance.

Implications for Theory and Practice

“Innovation” and “Entrepreneurship” are often used interchangeably in today’s global community. It’s common for people to assume they mean the same thing, but it would be a terrible mistake. Even though they have a familiar concept, innovation is a fresh idea or solution using one’s creativity, thanks to technological advances, components can now do things they couldn’t do previously. Every society relies on innovation, and those who excel at it have the potential to be enormously wealthy. Both notions are necessary for the survival and growth of small and medium-sized businesses (SMEs).

Risk-taking, visionary, and a limited tolerance for bureaucracy are all essential for small businesses. Financial, personal, or professional risk-taking is common in small businesses. While SMEs are more inclined to take business risks, innovators are more likely to take risks that challenge an idea. A creative thinker can bring together unrelated problems or concepts from several fields through effective connections. SMEs and innovators are both necessary for a company to remain competitive. Even if entrepreneurs know what choices need to be made, innovative thinkers know precisely how to put those choices into action to achieve a particular goal.

On the other hand, SMEs use innovation to bring their goals and ideas to life. Thanks to this societal innovation, people can now do things they couldn’t before. Small and medium-sized enterprises (SMEs) seize possibilities to profit from innovation. They create enterprises and advocate for the advancement of technology. Outstanding SMEs make more money than great inventors, and this is because progress is dependent on SMEs.

If our young people are enterprising and take chances, we want them to have a healthy sense of their worth grounded in reality. In other cases, however, this isn’t always the case, which can have highly adverse psychological effects on children and adolescents. A lack of entrepreneurialism and innovation in these companies may result from being an SME trainer, but simply being a wage earner when you’ve never been a business owner. No matter what, being an entrepreneur is not the same as being an inventor. They would probably make better decisions and be more successful at starting a business by adhering to this idea. Even though less attractive.

Limitations and Scope for Future Studies

The innovation process, which includes processes like idea generation, concept development, and idea execution, is the effect an organization’s operational process has on its capacity for innovation. The employees of an organization majorly implement this innovation process. When given autonomy and power, employees are seen to operate more creatively because they are allowed to invent in their own workplace. However, this is viewed as a significant limiting factor in an organization because the level of freedom will have a significant impact on the person and they may require support rather than individual independence and loneliness. In comparison to a small firm, there is little to no monitoring and observation of every individual in a huge organization. Large firms are able to give their employees freedom and personal space because they have the resources and ability to take risks, but this is not achievable in

small organizations. Smaller businesses strive to reduce costs as much as they can, therefore occasionally offer support and assistance. Therefore, it is the management style's guidance, support and leadership to ensure that the operational process is fruitful and whether the employees are integrating the innovation process. Proper implementation of a good guidance system will help prevent such a factor limiting the resourcefulness or innovative ability of an organization besides, organizational structure and organizational culture. An organization's degree of functionality and formality mainly depends on its structure. The structure in either way affects the processes' working, thinking and channels. The type as well as the nature of the work are frequently dictated by the organizational structure. It has been observed that an employee working alone can only make a little contribution to an organization's innovation process, whereas an employee team may gather and manage the organization's whole innovation process. The concept of organizational structure, when discussed in relation to innovation, refers to the components of the structure that influence or modify the level of innovativeness within an organization. It goes beyond the simple arrangement of company departments. The effectiveness of these teams largely depends on the organization's culture and management style, which can potentially restrict the organization's ability to innovate. The organizational culture represents the way in which it affects a company's inclination and capacity to innovate and create. Consequently, in larger organizations, the structure and culture are designed to facilitate activities and projects carried out by large groups and teams. Due to the abundance of resources, larger organizations divide their employees into different groups, whereas smaller organizations typically have one team working on a single project at a time due to limited resources and staff. In contrast, larger organizations undertake multiple activities simultaneously, with teams constantly managing, discussing, and regulating these activities. To overcome this limitation, organizations can foster a culture of collaboration and teamwork to prevent a slowdown in the innovation process.

Additional issues with technology and knowledge management It is well recognized that technology indirectly has a significant impact on employees through knowledge management. ICT is viewed as the general mechanism of information transfer. Technology aids in the collection of knowledge and the creation of a repository, allowing or preventing employees from accessing it. The ability to use these tools or resources is what encourages or inhibits innovation. Lack of appropriate technical tools, a lack of experience, etc. all negatively impact the innovation process. Small and medium-sized businesses have limited resources and try to make the most of what they have, whereas large organizations have ample IT assistance and produce vast amounts of knowledge and resources. The technology resources in larger organizations. Resources like virtual reality, artificial intelligence, and group work software have a significant impact on an organization's capacity for innovation. Therefore, having the technology available, managing it properly, and having the knowledge of it all assist prevent any delays in the creation process. Environmental barriers are similar. The external and internal environments are crucial barriers in any kind of organization. Because negativity and unpleasant interactions will sap managers'

energy and the organization's interaction, preventing it from concentrating on innovative ideas, the good communications and feedback from an organization's external environment helps with the innovation process.

Additionally, there are roadblocks that prevent innovation, such as governmental structures, laws, and suppliers. Similar to small and medium sized organizations, huge organizations are far more affected by external influences. Large organizations have a lot of regulations and restrictions that must always be followed, which slows down the innovation process. Large organizations are so preoccupied with adhering to external requirements that they are unable to concentrate inwardly on the unimportant flashes of originality and innovation. In smaller organizations, there is ample space for creative thinking, whereas in large organizations like Apple, they have established coordinated systems and resources due to their significant revenue and employee support. This enables them to have the freedom to pursue creativity and innovative ideas. Therefore, it is crucial for organizations to create an integrated structure that ensures the creative process is not hindered by the organization's size and scale.

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The Mediating Effect of the Organizational Commitment on the Association Between Employees' Empowerment and the Quality of Municipal Services in Jordan



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Abstract This study investigates the impact of employee empowerment on the quality of municipal services by testing the effect of organizational commitment as a possible mediator variable. A questionnaire was used to collect data from the study sample, which consisted of 304 employees who occupy managerial and supervisory positions in great municipalities in Jordan. The study revealed a positive, statistically significant effect of empowering employees to raise the quality of municipal services. According to the study's findings, decision-making participation had the highest impact on service quality improvement, followed by training, motivation, and teamwork quality; delegation came in last. Moreover, results indicated that organizational commitment partially mediates the relationship between employee empowerment and the quality of municipal services.

Keywords Empowerment · Service quality · Mediation analysis · Organizational commitment · Municipalities

1 Introduction

In modern organizations, a focus on human resources is one of the most successful organizational initiatives. Because of the critical nature of this aspect, it acts as the cornerstone of all public and private organizations. These organizations place a premium on developing and educating human resources, developing their competencies, providing adequate authority, involving people in decision-making, and fostering trust between employees and management. This is intended to promote organizational efficiency and effectiveness, as well as individual and institutional performance, which will eventually improve the quality of services offered to

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customers. Numerous studies have shown decisively that empowerment promotes the most effective use of human resources and high performance, strengthens the value and meaning of work for employees, increases employee motivation, and enhances employees' feeling of responsibility. Perhaps the most significant advantages of embracing the idea and practice of empowerment are an increase in productivity, a decrease in turnover, an increase in the quality of goods and services, and a competitive advantage [1, 2].

Municipalities have been entrusted with additional responsibilities and powers that formerly mainly belonged to the central government, and they have developed into a pillar of economic, social, and political growth in several countries. However, several studies undertaken in the local government context indicated a significant deficiency in the quality of municipal services in Jordan across a range of sectors, including health, hygiene, roads, parks, and urban planning [3]. These factors led to people's discontent and disappointment, which may have contributed to their reluctance to support those localities [4, 5].

Organizational commitment has gained considerable attention in psychology and human resource management, intending to reach high performance through employee commitment [6]. Organizational commitment instills a strong feeling of responsibility for the business and motivates employees to continue engaged, increase productivity, and demonstrate service-oriented behaviors and organizational commitment and the quality of municipal services. However, if such studies are limited to the public sector, they are almost non-existent in municipalities. Many municipalities tend to approach empowerment with caution and mistrust, believing that it will deprive the administration of its authority and ability to manage, owing to a lack of awareness of the significant contribution of empowerment in improving performance and service quality [7–9]. As a result, this study attempts to fill this void by shedding light on the impact of empowerment on the quality of municipal services by properly understanding the model of the Relationship between the empowerment and the quality of municipal services in the context of an organization commitment as an intermediating variable. This paper complements the efforts of the Royal Committee to Modernize the Political System, which concluded its work in late October 2021, and strengthens recommended legislation linked to the development of local government, including municipalities [10–12]. This research contributes theoretically and practically to elucidating the notion of empowerment and its benefits; moreover, it assists the decision maker in executing the study's recommendations. The study's primary goal is to identify the effect of employee empowerment on the quality of municipal services and the effect of perceived organizational commitment on the Relationship between empowerment and service quality [2–14]. Numerous Western scholars have highlighted staff empowerment as a primary strategy for administrative reform and development. Arab studies are rather restricted in this regard since they do not analyze the Relationship between empowerment and its impact.

2 Literature Review and Hypotheses Development

2.1 *Employees' Empowerment and Quality of Municipal Services*

Scholars have defined the term "employee empowerment" in a variety of ways. Majority of them agree that empowerment entails delegating specific task-related behaviors to employees. Employee empowerment is concerned with establishing trust, motivating employees, and involving them in decision-making [10]. According to [11], empowerment focuses on establishing trust, motivation, and decision-making participation. Empowerment is a new organizational method and set of skills aimed at enabling individuals to carry out corporate operations independently and without direct management interference [12]. Additionally, empowerment means equipping employees with the tools and work environment thinking. Rather than that, it frees the individual from overbearing control and restrictive instructions and develops trust between necessary for professional and efficient performance [15]. Empowerment is a fluid strategy that is not predicated on rigid rules that stifle innovation and independent the employee and top management [2–15]. Among the most widely accepted definitions of empowerment is that it is a collection of factors and conditions that enable employees to be given increased authority to make decisions and share authority with senior management by fostering mutual trust between them, thereby improving organizational performance [2]. Numerous scholars have demonstrated that a properly employed empowerment idea helps to an organization's effectiveness in accomplishing its vision and objectives [14]. Additionally, empowerment boosts employees' understanding of their organizations' goals and demands, as well as their feeling of self-control to do their jobs to the utmost [15].

Tamneh et al. [17] stressed the empowered individual's self-efficacy and internal drive for effectively and skillfully performing duties without management scrutiny. Furthermore, the empowered person is totally confident in his or her competence and believes in his or her ability to innovate and perform well on his or her own [18]. There are numerous perspectives on the dimensions of empowerment, depending on the researcher's perspective on the concept, but this study chose a set of dimensions that encompassed the primary aspects of employee empowerment, as represented by delegation of authority, training, employee motivation, work teams, and participation in decision-making [5–22]. Aws et al. [21] defined service quality as a measure of how well the service level delivered matches customer expectations. Taamneh Mohammad et al. [2] indicated that hospitals can improve customer satisfaction and loyalty through efficient operations, employee engagement, and service quality. Al-Okaily et al. [22] indicated that service quality is customers decision based on their realistic experience with the product/service, measured by customer requests.

The term “service quality” refers to the extent to which the level of service delivered matches consumer expectations [23]. Lee [2] assert that firms may boost customer satisfaction and loyalty by concentrating on operational effectiveness, employee engagement, and service quality. According to [22], the quality of service is decided by the customer’s actual experience with the product/service, as measured by client needs.

Municipalities offer critical services, the majority of which cannot be delayed, which necessitates the availability of authority. However, there is no unanimity on the characteristics and antecedents of citizen-perceived service quality. As a result, there is no agreement on the optimal method for determining and measuring service quality [24, 18]. Parasuraman et al. devised a SERVQUAL technique for determining service quality satisfaction and authorization for personnel to provide these services in a timely way. Additionally, municipal services must be of high quality, consistent with residents’ expectations and the promises made by mayors and elected officials alike [25, 26]. The quality of services in local government sector has been the subject of numerous studies because this matter is important for the sustainability of municipal sector.

SERVQUAL is a concept that is based on an investigation of the gap between customer expectations and perceived service quality. According to various academics, there were five aspects of service quality: (1) Tangibles: quality of materials, equipment, and personnel appearance; (2) Reliability: capacity to provide the expected service consistently and precisely; (3) Responsiveness: desire to assist clients and give timely service. (4) Assurance: Employees’ knowledge and civility, as well as their capacity to inspire trust and confidence; and (5) empathy: The firm’s caring, customized attention to its customers [24–26, 28]. Numerous scholars have claimed that one of the most critical aspects affecting job performance and service quality is employees’ ability and willingness to work. As a result, organizations strive to boost performance by creating an adequate work environment and empowering their staff, ensuring that they deliver high-quality services [29, 30, 32–35].

Numerous applied research has examined the link between empowerment and service quality. The study revealed a statistically significant correlation between employee empowerment and municipal service quality. [36, 37]. Likewise, [38] highlighted the need of delegating, motivating, and training staff to improve the quality of municipal services. In this regard, a study conducted by [39] on a sample of three municipalities in the Emirate of Abu Dhabi revealed that employee engagement in decision-making has a beneficial influence on the quality of municipal services. To ascertain the influence of empowerment strategies on the quality of services in the insurance industry, [1] performed research on the effect of empowerment on the quality of services in insurance businesses, which found that empowerment plays a beneficial role in service quality. Al-Okaily et al. [30] stressed the critical nature of developing and disseminating a quality culture to enhance the quality of bank’s services. The study revealed that administrative empowerment has an influence on the bank’s service quality. Based on the above we propose the following hypothesis:

H1: *Employee empowerment positively affects the quality of municipal services.*

The following sub-hypotheses may be developed for this main hypothesis based on the empowerment components outlined above:

H1.1. *Authority delegation positively affects the quality of municipal services.*

H1.2. *Training positively affects the quality of municipal services.*

H1.3. *Participation in decision-making positively affects the quality of municipal services.*

H1.4. *Motivation positively affects the quality of municipal services.*

H1.5. *Teamwork positively affects the quality of municipal services.*

2.2 Mediation Role of Organizational Commitment

O'Reilly defined organizational commitment in [37] as a person's psychological connection to his organization, which reflects the extent to which people absorb or accept the organization's features or ideas. Employee empowerment is crucial for firms seeking to increase earnings, improve customer service, and maintain labor stability [40]. Many scholars agree that there are three major types of commitment: (1) effectiveness commitment, which occurs when an employee desires to be a part of the organization and that desire emerges from inside the employee; (2) continuation commitment, which occurs when employees feel a need to be a part of the organization; and (3) normative commitment, which occurs when employees understand that organization members should be part of the organization [37]. Within this conceptual framework and according to [37], there are three characteristics that have a significant impact on determining an individual's organizational commitment: a strong belief in accepting goals, a willingness to put forth the maximum effort for the benefit of the organization, and a desire to stay in the organization.

According to [6], organizational commitment has received considerable interest in the fields of psychology and human resource management. They claimed that to attain high performance, an employee's commitment, loyalty, and conviction to the organization's values must be shown, which favorably affects his work performance. In terms of the importance of organizational commitment, several scholars have indicated that it inspires a strong feeling of duty in the person, which results in increased performance and satisfaction. Additional advantages of employee commitment include higher productivity and demonstrating service-oriented behaviors that contribute to service quality [9]. Organizational commitment in all three dimensions (emotional, continuous, and normative) has been shown to have a negative effect on the intention to leave work and to play a significant role in reducing negative phenomena, increasing motivation for achievement, and maintaining high-quality services for organizations [6]. Bany Mohammed et al. [41] research in the

banking sector shown a clear and significant influence of organizational commitment on increasing the quality of banking service in Jordanian commercial banks. Numerous research have proven a favorable correlation between the affective element of commitment and the quality of service [32, 33, 42–44, 46]. In contrast to previous research, Brown et al. [6], discovered that affective commitment had no discernible influence on service quality. Although committed employees are believed to work harder for a firm than those who are not committed [45], research has yielded mixed results with regard to the Relationship between organizational commitment and performance. Some researchers have established a positive relationship between the two [24, 44], some see no relationship at all [5], while some have surprisingly even established a negative relationship [6]. There are hardly any studies in the literature which investigate the Relationship of the continuance and normative commitment of employees with service quality.

Indeed, numerous studies have discovered positive associations between organizational commitment and employee behaviors such as increased effort expended on tasks, increased employee retention, improved work attendance, increased desire to engage in organizational citizenship behaviour, and improved service delivery quality [42]. After conducting a review of the administrative literature pertinent to this study's topic, the researchers discovered a dearth of research in the municipal sector. However, the administrative logic surrounding the role of organizational commitment as a mediator between empowerment and service quality variables led the researchers to confidently develop the following hypothesis:

***H2:** Organizational commitment mediates the effect of employee empowerment on municipal service quality.*

3 Methodology

The proposed hypotheses were tested quantitatively. This technique enables statistical validation of the conceptual model and its variables. A questionnaire was developed to elicit data from respondents and ascertain their impressions of real employee empowerment, service quality, and organizational commitment in Jordan's major municipalities. Four components comprised the questionnaire. The first segment discussed demographic characteristics such as gender, age, educational achievement, tenure, and job title. The second section covered the respondent's perceptions of employee empowerment in five dimensions (five items each), making a total of 25 items, all of which were adopted from various studies in this field [5, 18, 26, 43]. The third section covered the service quality delivered by major municipalities in Jordan measured according to their five dimensions: tangibility (4 items), reliability (5 items), responsiveness (4 items), assurance (4 items), & empathy (4 items). The fourth section covered organizational commitment, measured according to three dimensions: normative, continuous, and affective with a total of 12 items (4 items for each dimension), all of which were adopted from study conducted by [44].

The research population is made up entirely of personnel in Jordan's main municipalities who occupy leadership and supervisory positions such as (director, deputy/assistant director, department head, division head, and head of office) in Irbid, Mafraq, Ajloun, and Jerash.

This set of employees was chosen because they are the most qualified to evaluate the availability of research variables in municipalities. Therefore, the study population, which also serves as the research sample, is anticipated to be about 555 individuals. According to [45], the optimum sample size for this population is 300 respondents, or 55% of the population. However, our sample included 555 people, all of whom are directors, deputy directors, or department heads. We chose a convenience sample of participants based on their accessibility and availability. 555 questionnaires were circulated; 330 questionnaires were retrieved; and after removing invalid questions, a total of 304 questionnaires were available for further assessment.

The data was examined, formatted, and arranged using SPSS software. Demographic variables have been subjected to frequency testing. The standard deviation and mean for all items were determined using descriptive statistics. The Cronbach's coefficient alpha was utilized to determine the tool's internal consistency's stability. Additionally, the AMOS software was utilized to investigate the structural equation models. Additionally, this tool was utilized to do proper statistical analyses to answer questions and test hypotheses. While simple regression analysis was used to test the first main hypothesis and its five branches, path analysis utilizing the AMOS program was used to test the second main hypothesis.

The descriptive statistics for the demographic factors are shown in Table 1. According to the table, over 78% of our participants were male, and 39% have a bachelor's degree. Additionally, the table indicates that 62.1% of participants are under the age of 39, indicating that most respondents would be classified as young professionals. Additionally, about 65.2% of participants had less than fifteen years of experience, while participants with more than fifteen years of professional experience account for just 34.9% of the sample. Finally, the table indicates that almost half (52.3%) of respondents hold the post of head of department.

The mean and standard deviation are shown in Table 2 as descriptive statistics for the underlying variables. The correlation matrix is shown in the Table 3. According to Table 2, participants stated that their organizations perform well in terms of employee empowerment and achieve high levels of service quality across the board.

4 Results and Discussion

To assess the validity of the first hypothesis, we performed regression analysis to determine the effect of employee empowerment on the quality of municipal services. The following table summarizes the outcome.

As shown in Table 4, the regression coefficient is 0.862, which is statistically significant because it is less than (0.5); this indicates that the employee empowerment variable can account for a 74.2% change in the quality of municipal services, and

Table 1 The demographical descriptive statistics, (Note N = 403)

Variable name	Category	Frequency	Percent
Gender	Male	237	78.0
	Female	67	22.0
Age	Less than 30 years	84	27.6
	30-less than 40 years	105	34.5
	40-less than 50 years	115	37.8
Education	Diploma	42	13.8
	Bachelor's	119	39.1
	Graduate	143	47.0
No. of years of services	Less than 5 years	28	9.2
	5-less than 10 years	75	24.7
	10-less than 15 years	95	31.3
	15 years and above	106	34.9
Job title	Director	43	14.2
	Deputy Director	43	14.2
	Head of Department	218	71.6

Table 2 The descriptive statistics of the underlining variables

Grade rank	Dimension	Mean	SD	Evaluation degree
1	Delegation	4.33	0.598	High
2	Teamwork	4.22	0.693	High
3	Participation	4.20	0.826	High
4	Training	4.10	0.845	High
5	Motivation	4.05	0.956	High
Employees' empowerment		4.18	0.695	High
1	Empathy	4.30	0.665	High
2	Tangibility	4.29	0.718	High
3	Assurance	4.20	0.756	High
4	Reliability	4.19	0.694	High
5	Responsiveness	4.18	0.763	High
Overall service quality		4.23	0.656	High

the correlation coefficient is 0.862, indicating that there is a positive relationship between employee empowerment and municipal service quality. As a result, the initial principal hypothesis was accepted and verified. This finding is consistent with the findings of [39, 32] which suggested that service quality is dependent on employee empowerment, as empowered employees can provide higher-quality services. It is worth noting that the employee who is empowered by his or her organization improves

Table 3 The correlation matrix

Variables	1	2	3	4	5	6	7	8	9	10
Delegation (1)	1									
Teamwork (2)	0.825**	1								
Training (3)	0.749**	0.909**	1							
Motivation (4)	0.700**	0.894**	0.907**	1						
Participation (5)	0.784**	0.885**	0.86**	0.991**	1					
Tangibility (6)	0.703**	0.780**	0.731**	0.810**	0.635**	1				
Reliability (7)	0.689**	0.638**	0.640**	0.722**	0.627**	0.650**	1			
Responsiveness (8)	0.677**	0.640**	0.630**	0.618**	0.713**	0.633**	0.710**	1		
Assurance (9)	0.650**	0.630**	0.611**	0.623**	0.610**	0.605**	0.722**	0.712**	1	
Empathy (10)	0.655**	0.640**	0.612**	0.590**	0.622**	0.619**	0.690**	0.615**	0.619**	1

Table 4 Regression analysis of the impact of dimensions of employees’ empowerment on service quality

Variable	R	R2	Non-standard parameter		T value	F value	Sig.
			B	Standard error			
Empowerment	0.0862	0.0742	0.0813	0.028	29.499	870.196	0.000

Table 5 Impact of empowerment dimensions on the quality of municipal services based on regression analysis

Empowerment of variable	R	R2	Non-standard parameter		T value	F value	Sig.
			B	Standard error			
Delegation	0.619	0.384	0.680	0.050	13.708	187.913	0.000
Training	0.808	0.653	0.627	0.026	23.842	568.429	0.000
Participation in Decision making	0.814	0.663	0.647	0.027	24.376	594.197	0.000
Motivation	0.794	0.630	0.544	0.024	22.675	514.159	0.000
Teamwork	0.737	0.543	0.698	0.037	18.956	359.345	0.000

his or her ability to carry out his or her obligations and tasks effectively in terms of size, accuracy, speed, and quality.

The study examined each dimension of employee empowerment in depth to determine its impact on the quality of municipal services and to determine which dimension was most relevant. As shown in Table 5, the study discovered a favorable effect of employee empowerment on service quality across all dimensions, which corresponded to the findings of another study [39]. According to the study’s findings, decision-making participation had the highest impact on service quality improvement, followed by training, motivation, and teamwork quality; delegation came in last.

To test the second hypothesis, “Organizational commitment mediates the relationship between employee empowerment and municipal service quality,” path analysis in conjunction with AMOS software was utilized, as shown in Table 6 and Fig. 1.

According to Table 6, the computed value of Chi2 is (0.000), which is statistically significant at the (α0.01) level. The Goodness of Fit Index (GFI) obtained a

Table 6 The results of the path analysis of organizational commitment as a mediator variable between empowerment and quality of service

Chi2	GFI	CFI	Sig.	Direct effects		Indirect effects	Path	T	Sig.
0.000	1.000	1.000	0.000	EE-EC	0.827	0.856	First	25.610	0.000
				EE-SQ	0.477		Second	29.499	0.000
				EC-SQ	0.464		Third	29.201	0.000

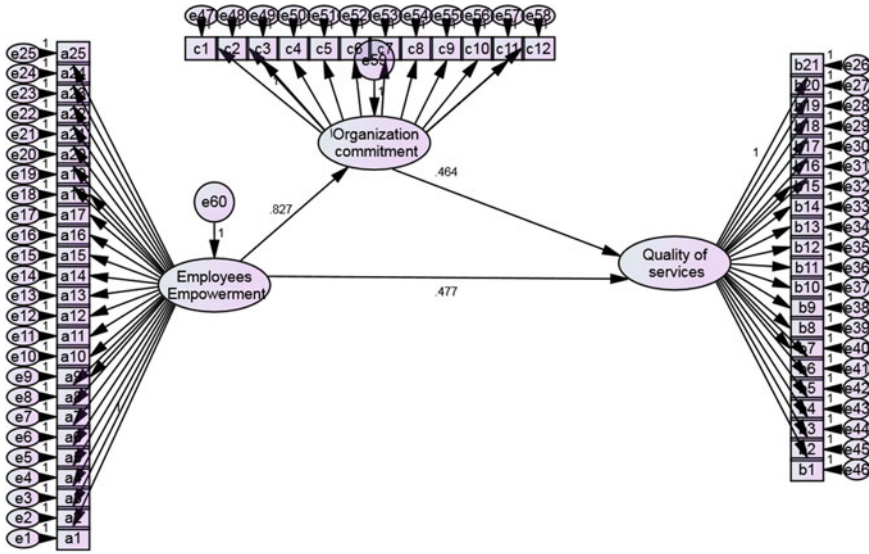


Fig. 1 Path analysis of organizational commitment as a mediating variable

value of (1.000), indicating a degree of complete fit; also, the comparative Fit index reached a value of (1.000). Additionally, the table demonstrates that when organizational commitment is included as a moderating variable in the Relationship between employee empowerment and municipal service quality, the direct impact of service quality (first path) is increased to 0.827 while remaining statistically significant at the level ($\alpha < 0.01$). Employee empowerment had a direct influence on the quality of municipal services (second path) of 0.477, which is statistically significant. The direct effect of organizational commitment on the quality of municipal service (third path) was 0.464, which is statistically significant. Thus, the conditions required for a mediating effect have been met [33, 34]. As a result of the foregoing, it can be inferred that organizational commitment has a statistically significant effect as a mediating variable in the link between employee empowerment and municipal service quality by partial mediation. As a result, the hypothesis that organizational commitment mediates the association between empowerment and municipal service quality may be accepted.

5 Research Implications

Municipalities are essential to attain a range of administrative, political, economic, social, and development goals, which can only be done with human resources equipped with the necessary knowledge, skills, and authority [42]. Based on the findings of this study, which indicate that employee empowerment improves the

quality of municipal services, it is recommended to municipal administrations and decision makers in all local government units in Jordan to continue empowering their employees through delegation and training, as well as providing opportunities for participation in decision-making. In this regard, it is recommended that the Ministry of Local Administration establish a training institute dedicated to the education and development of local government employees. Researchers believe that policymakers should seek to improve the salaries and wages of municipal employees and to make them comparable to those of their peers in other public sector organizations to sustain municipal employees' organizational commitment. While it is true that the study's findings indicated a high level of organizational commitment on the part of employees, we must keep in mind that the study's sample included individuals in leadership positions and those earning relatively high incomes. The study advises that individuals in leadership and supervisory roles look out for their subordinates and address their needs and aspirations through the use of incentive, encouragement, and delegation techniques. The researchers argue that by developing the meanings of role models and excellent morals, municipal mayors create an opportunity for employees to emulate them. This approach is the most effective method for changing and transforming employees' attitudes about job quality, productivity, and a sustained commitment to high performance.

6 Limitations and Future Research

In general, this study will contribute to the existing of knowledge by proposing and constructing a framework for the Relationship between employee empowerment and municipal service quality. Additionally, this framework contributes to a theoretical understanding of the role and impact of organizational commitment in the relationship between employee empowerment and municipal service quality. According to this cognitive framework, researchers will get an understanding of the concepts and components of the study variables, which will aid them in developing additional variables or applying them to a different context. The current study demonstrated that employee empowerment has a beneficial effect on municipal service quality; additionally, the mediating variable is critical in explaining the Relationship between employee empowerment and municipal service quality. No research is without limitations. The study, however, is limited to First category (Great) municipalities. As such, researchers are invited to duplicate the study on Jordan's second and third tier municipalities to make the findings more generalizable. The researchers recommend that future research use other mediating variables such as level of satisfaction or job affiliation.

The researcher neglected to specify the demographic features of the sample of studies, knowing that they are important variables for this study. The paper examined the level of job satisfaction for males and females (gender effect) of faculty members. The result of the study showed that there are no differences between males and

females. However, the small size of the study population and its sample makes the issue of generalizing gender discrimination difficult. The researcher used simple statistical tools, but they are suitable for the study.

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The Importance and Trends of Digital Economy During COVID 19 Crisis: UAE Case



Myriam Aloulou 

Abstract The digital economy is a key driver of economic development that has profoundly altered the public's way of life. Technology has played an important role in our well-being, and it is likely to present more opportunities in the future, particularly during the COVID-19 pandemic. As the "Internet of Things," artificial intelligence (AI), virtual reality, blockchain, self-driving cars, and other technologies advance, the digital economy will become more important. It offers some advantages like information through reviews, forums that help making decision about goods and services, security through online payment and global presence since the product or service is available anytime and anywhere. The goal of this study is to showcase the importance, challenges and trends of digital economy and its impact on the economic development and employment during Covid19 crisis in the UAE. The study also explores how innovations can improve people's quality of life around the globe and how technology and digitalization can be used to create prosperous smart economies in the post-pandemic period.

Keywords Digital economy · Covid 19 · Technology · Economic growth

1 Introduction

The digital economy incorporates the economic value generated by modern digital technology [1]. Kirton, identifies the new information and communication technology (ICT) as the primary driver of economic structure optimization [2]. In addition to signaling the beginning of the fourth industrial revolution, the digital economy will be the primary driver of future national development [3, 4].

Digital information technology, such as the Internet, cloud computing, big data, block-chain, and artificial intelligence, was the driver for the digital economy. For example, the rise of mobile Internet allowed people all over the world to buy and

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provide at the same time goods and services, promoting social [5]. Today's key sources and stores of value are information, data, and technology. With one of the highest FTTH (fibre to the house) penetration rates in the world (95.7% of homes), the UAE has already laid the groundwork for the digital economy. In terms of launching and constructing 5G networks, the UAE came in first among Arab nations and third overall, according to "The Connectivity Index" [6].

To digitally revolutionize vertical industries, boost efficiency, and create new opportunities, the UAE has embraced 5G. The original 5G-powered applications have been brought to regional sectors, new 5G ecosystems have been established [7]. Furthermore, during the COVID-19 pandemic (from 2020 till 2022), the digital economy was very beneficial: The Internet has enabled home-confined employees to work from home and students were able to attend classes through online education platforms. QR codes and big data have enabled governments to determine the itineraries of infected people [8].

Pradhan et al., 2019; stated that the digital economy has also delivered the beginning of the fourth industrial revolution 4.0 and become the main future development path of countries in the world [9].

The UAE Digital Economy Strategy announced in April 2022 that the country aims to double the contribution of the digital economy to its GDP from 9.7 to 19.4% within the next decade.

The UAE leads the rest of the globe in the digital economy thanks to its forward-thinking planning and policies. Additionally, it offers creative business solutions that have been successfully implemented and are fruitful results of these tactics. These businesses offer a solution for our post-pandemic environment since they are durable and long-lasting.

2 Impact of Digital Economy on Employment

Contemporary organizations are seeking competent employees who possess exceptional technical training and can adjust to dynamic circumstances [10]. The European Commission and the Organization for Economic Co-operation and Development have highlighted the crucial importance of developing the right skills to get the most benefit from digital economy [11]. Companies must develop employees' direction and staff to cope with technological revolution [12]. Also, several reports show how getting the right digital skills can lead to job opportunities, how workers can prepare for the digital transformation by doing certain things to learn or improve their digital skills [13, 14].

Through the development and deployment of digital technology, the workforce became well-trained, more high-tech and manufacturing focused. Further studies demonstrate that enhancing industrial structure and human capital stock has a positive impact on the digital economy's growth and the employment structure [15].

3 Why Digital Economy is Important?

During COVID 19 era from 2020 till 2022, Digital Technology has demonstrated its strengths: it enabled mitigation of the economic impact by enabling firms to interact with customers digitally, ensured the continuity of the operations using remote working arrangements, and resolved logistical obstacles brought on by disruptions occurred to global supply chains. In the post-pandemic period, digital technology will continue to play a crucial role in enhancing the competitiveness and resilience of enterprises around the world. Governments should provide regulatory, financial, and advising support for firms, particularly MSMEs (micro, small, and medium-sized enterprises) that still lack digital competence, to speed up the efforts related to economy digitalization. This may entail assisting businesses with advice and grants towards digitalization [16].

3.1 Economic Recovery from COVID-19 Depends on Digital Transformation

During the time after the pandemic in UAE, digital technologies will continue playing a key role in making businesses more competitive and resilient. To speed up digital transformation, governments can offer more regulatory, financial, and consulting help to companies, especially micro, small, and medium-sized businesses (MSMEs) that don't have digital skills. This can include giving digitalization grants and advice to companies, as well as making it easier for people to get to high-speed Internet and broadband infrastructure.

3.2 E-Commerce Will Increase MSMEs' Access to International Markets

The pandemic has had a big effect on how people act and has led to more online sales around the world. This is a big chance for MSMEs because they can now deal internationally at much lower costs than they could before. But there are some things that keep companies from using e-commerce. Most of the time, regulations and costs stand in the way of MSMEs.

Some of these are high costs for moving goods across borders, strict buyer protection laws in foreign countries, and high customs duties on online foreign trades. Governments can help MSMEs deal with these problems in several ways, such as by giving grants for e-commerce and exports and giving training on foreign laws.

4 Challenges of Computing Digital Economy

Since the popularity of digital products and services rises and new digital intermediary platforms emerge, the quality of many crucial economic indicators might decrease if statistical organizations fail to address these challenges.

The first one is aggregate expenditure, which means people can buy videos, music, fashion, and electronics online from anywhere in the world. This has major effects on the Consumer Price Index, foreign trade, and household spending.

Second, people buy more and produce more. Most governments limited production to real estate and agriculture. In the transportation services, food and lodging, and cultural and entertainment industries, households are key producers (e.g., Uber drivers, Airbnb hosts, and YouTubers). Household output growth affects economic and labor market measurement.

Third, Amazon, Airbnb, eBay, and Uber have emerged from the digital economy. These digital platforms provide financial services that must be classified and reported in our national accounts and new business models are becoming prevalent and dominating particularly the concept of “Industry 4.0” [17] (Fig. 1).

Fourth, the digital economy is forcing accountants to develop methodologies on how to define and measure intellectual property. There are still doubt that most companies today are capturing sales data, but the databases and the investment made in generating these Sales are not being adequately captured.

Fifth, the digital economy is altering the payment methods for goods and services since it brings changes in money. The emergence and growth of cryptocurrencies,

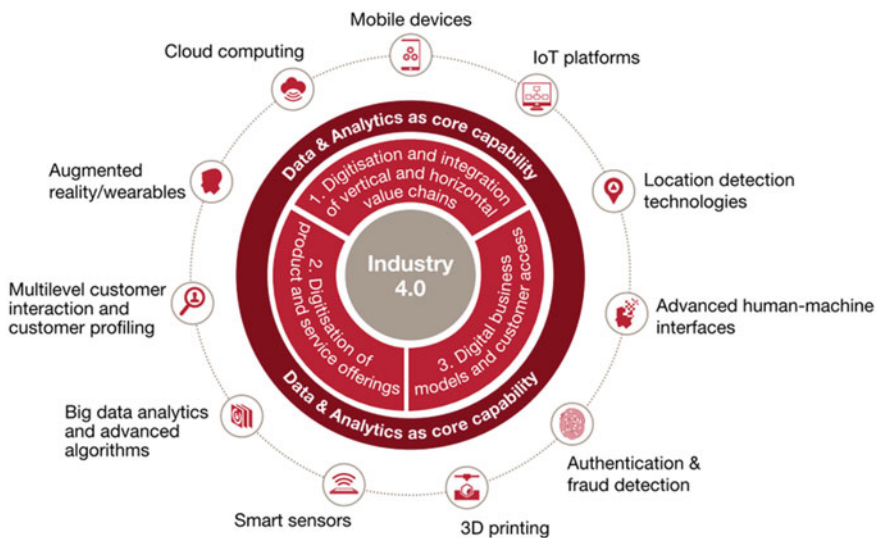


Fig. 1 Industry 4.0 framework and contributing digital technologies [18]

stable coins, and Central Bank Digital Currencies (CBDC) raise numerous regulatory and security concerns and will result in a major transformation of financial industry.

As the economy digitalizes, additional information from the households and digital intermediary platforms (such e-commerce platforms) will need to be considered building reliable economic data to be used in the statistical system.

5 Major Trends in the Digital Economy

5.1 The Importance of Internet in Times of Crisis

Connectivity plays a crucial role. Many citizens must attempt to sustain productivity while engaging in social isolation during the COVID-19 health emergency. Due to teleworking and confinement measures, demand for broadband communication services has increased.

The UAE already has the best foundation for the digital economy success: It has one of the world’s deepest FTTH (fiber to the home) penetration rates, reaching 95.7% of homes across the UAE. Between November 2021 and November 2022, the internet exchange point production remains constant at 2 in UAE and the domestic bandwidth production increases by 13% from 251 to 284 G (Fig. 2).

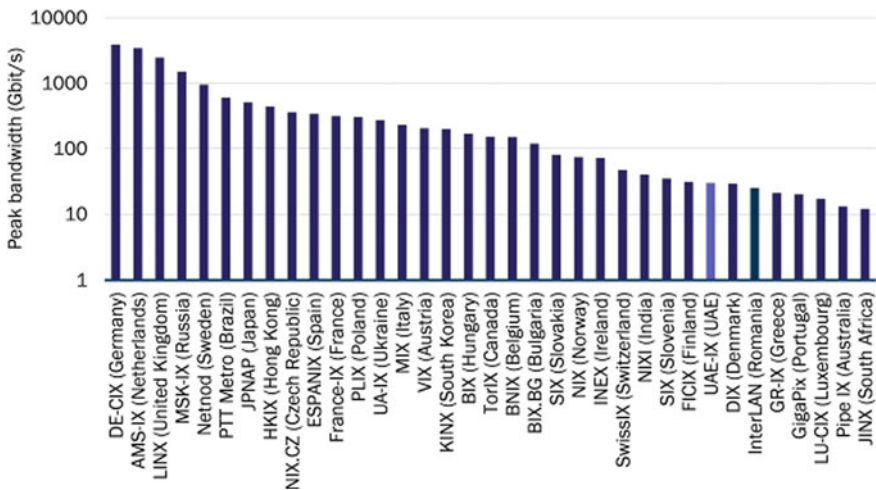


Fig. 2 Ranking by size of some of the largest IXPs (excluding those in North America) [19]. *Note* This chart excludes IXPs from the USA, and only shows those exchanges which publish traffic data on their website

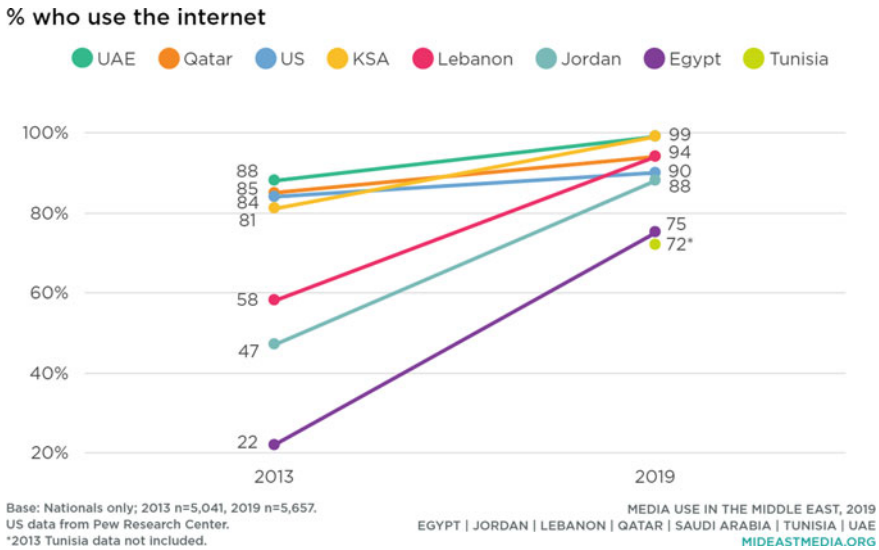


Fig. 3 % who use the internet [22]

5.2 Gaps in Technology and Internet Usage Remain

Even if Internet coverage is reaching saturation in some countries, gaps persist both between countries and between different groups/regions within countries. There are still discrepancies between men and women, people with different levels of income, people of different ages, people of different educational attainment, and between those living in rural or urban areas [20]. These gaps were especially noticeable during times of crisis (COVID-19 pandemic), they affected how different groups were able to continue to work or were able to maintain contact with the world outside their homes. While younger generations are more likely to use the Internet, older generations still have time to catch up [21].

Some Arab countries have seen internet penetration rates of 90% or more since 2013. The United Arab Emirates (UAE) has the highest rate of internet penetration comparing to Egypt (53% points), Jordan (41% points), Lebanon (36% points), and Tunisia (27% points) (Fig. 3).

5.3 Managing Increasing Digital Threats

The COVID-19 pandemic has expedited the worldwide transition towards digital online economy. It increased the importance of safeguarding users' data and digital content against viruses, cyber-attacks, and fraud. Building users' and merchants' confidence in the safety and security of online spaces is essential to the success of this

transition. Although the regularity of cyber-attacks differs by country, the necessity of keeping networks secure is growing everywhere. This is especially true during times of crisis, when people’s access to the internet for work and communication is vital to the survival of many industries.

The percentage of websites with critical flaws has decreased during the past five years (Fig. 4).

The market for cyber security in the UAE is projected to expand rapidly over the next few years. The rising prevalence of cyber risks in businesses is a key factor boosting growth in the UAE cyber security industry. The market is predicting growth because of the rising importance of securing sensitive information from viruses and ransomware.

Moreover, innovations in technology, such as the next-generation security solutions and the integrated security solutions, and the merge of new technologies such the Artificial intelligence AI and the Internet of Things IoT.

According to Emirates news agency (WAM) report: The UAE moved in the 2020 Global Cybersecurity Index 33 places to fifth. This was mainly thanks to the increase

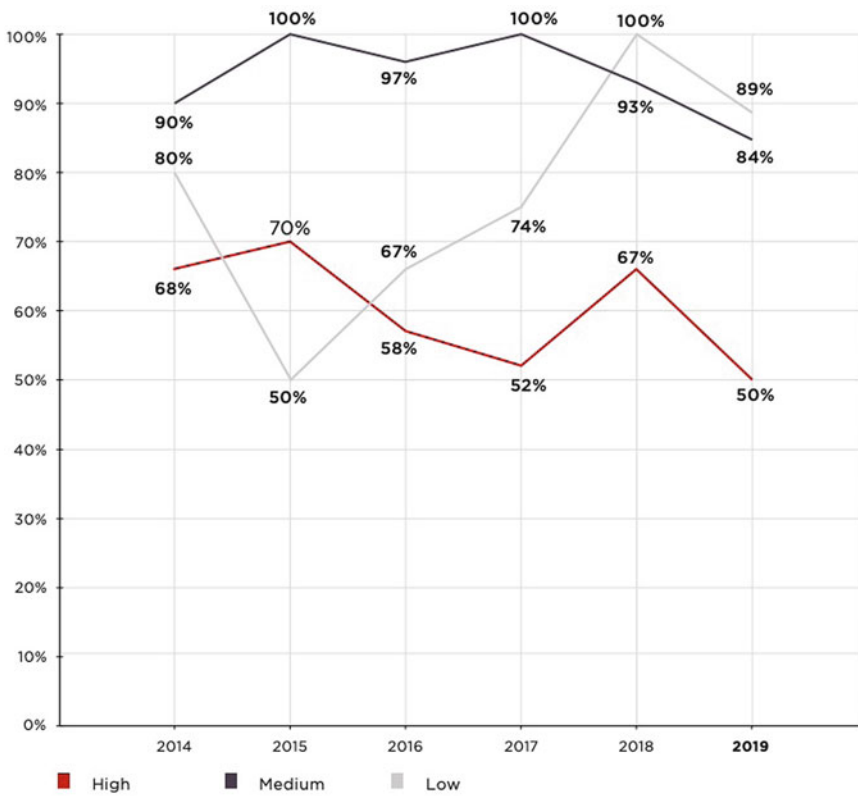


Fig. 4 Websites by vulnerability severity [23]



Fig. 5 UAE cyber security market size by region [24]

of awareness towards the importance of cyber security. This Index is published by the International Telecommunication Union (ITU) which is an internet and telecoms agency belonging to the United Nations. It ranks 193 countries based on their commitment towards cybersecurity. The performance of each single country is measured in five categories: legal, technical, organizational, capacity building, and cooperation (Fig. 5).

6 Indicators for Measuring Key Aspects of the Digital Economy

The Digital Economy presented indicators organized into three “themes” that addressed the most important parts of the Digital Economy: Empowering Society, Infrastructure, Technology Adoption, and Innovation.

6.1 Infrastructure

This theme focuses on physical, service, and security infrastructure indicators that support the Digital Economy. It examines mobile and fixed network access, the growth of the next generation access (NGA) network, the dynamics of household as well as business adoption, the infrastructure for the IoT (Internet of things) and the secure server infrastructure. Infrastructure development is a key factor in how easy

it is for people and businesses to get access to and use technology. Because of this, it needs to be carefully measured to create the best conditions for investing in both real and intangible assets.

6.2 Empowering Society

In a relatively brief period, the use of digital technologies has improved the livelihoods and well-being of people in addition to its economic impact. Digital technologies allow more people than ever to access government services and encourage civic participation [25].

Listed below are indicators that demonstrate how the Digital Economy is altering the lives of people, their access to and use of digital technologies, and their capacity to realize their maximum potential. It includes indicators on Internet usage, such as online interactions with the government, as well as indicators on the gender disparity in Digital Economy participation [26].

6.3 Innovation and Technology Adoption

The digital transformation has the potential to drive the economic growth and social prosperity through enhanced productivity, broader access to markets, and more diverse product offerings. As a result, keeping tabs on the spread of innovative and potentially disruptive technology is a good idea [27]. Policymaking in related fields, including skill development, benefits from this as well.

7 Conclusion

This paper discussed different parts of the digital economy, as well as how they have changed over time. The digital economy revolves around the IT/ICT sector. We distinguish broader deployment of digital technologies in existing businesses, viewing them as part of the broader “digitalized economy.” Measuring the digital economy is complicated by poor data quality, indeterminate boundaries, pricing related issues, and the invisibility of a substantial amount of digital activity. According to this definition, the digital economy accounts for about 3% of worldwide employment and 5% of global GDP. There is a large gap between countries in terms of the possibilities, challenges, and best-practice interventions needed to fully achieve the digital economy’s potential to bring about significant development outcomes.

Digital services provided by the UAE government have varying degrees of quality between emirates and cities. However, there are three main opportunities for improvement: designing services around user needs; developing open-data led services in

partnership with the private sector; and creating comprehensive “one-stop shop” portals that incorporate all core services in a single site and app.

The diversification of the UAE economy and the nature of accessible jobs will be profoundly affected by the proliferation of digital services, from e-commerce apps to government portals. Employees with digital and CS skills will become increasingly valuable. This would help the government increase efficiency and public satisfaction while also allowing the private sector to sell digital services across the region. The United Arab Emirates has the resources and political will to seize the opportunity presented by the rise of the digital economy.



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Enhancing the Security of Sensitive Data in Cloud Using Enhanced Cryptographic Scheme



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Abstract Cloud computing is powerful evolving on-demand computer system resources technology, As the technologies are increasing day by day the problems associated with them would also increase. Cloud security is one of the major concerns in today. Cloud is useful for the storage of data and need not be managed by the direct users or owner of the data. Data are not be saved in the physical device of the user but in a third-party cloud storage. The major issue with cloud computing is the lack of trust on the security. The purpose of study is to enhance and ensure the security of sensitive data in cloud using enhanced encryption scheme. In this paper, cryptography is proposed as a method of protecting sensitive data by various tools and techniques. The cryptography algorithm used in the proposed methodology are AES, SAL, Blowfish and CSL algorithms and a through a comparative analysis the most effective and secured algorithm is suggested. In proposed methodology information transmitted with confidentially, without any breach or any alteration in data, information is transferred in secured way that only the authorized person is able to process or receive the data.

Keywords Cloud computing · Encryption · Block cipher · Cyber security · Cryptography

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1 Introduction

Cloud Computing this word was first given by professor John McCarthy in 1961, at that time it was viewed just as a small thing like telephone. Later it was realized that it was not just like a telephone system it is greater than that what people have thought at that time. A huge transformation to business & IT, data storage, services and its computing power can be used to provide third party uses and can be made available to all the business and customers [1]. It is present at the core of all the important technologies like Internet of Things (IoT), automation, Machine learning, Big data, Mobile Internet. As the technologies are increasing day by day the problems associated with them would also increase. Security is one of the major concerns in today generation. There are advantages as well as disadvantages associated with the use of Cloud. The Foremost concern with Cloud Computing is Privacy, where the data is stored to another party it privacy is the major concern today [2, 3]. Let's assume for the moment that we have stuff in the cloud that someone could access. Concerns include law enforcement's easy access to data on organization servers. Data can be stolen even if the supplier is protecting it. Second, hackers can steal your data without your knowledge. They can simply sell our data to competitors and blackmail victims into exchanging cryptocurrency to decrypt encrypted information. Finally, bot attackers use botnets for DDOS attacks. DDOS blackmail is rising in some nations. DDOS assaults are the biggest cloud safety risk. DDOS attacks overload system resources with fake traffic. DDOS attacks block network traffic to end users. DDOS attacks are hard to stop because attacker requests look like user requests [4].

Cryptography is the most powerful tool for securing information. This scheme improves the information is transmitted with confidentially, without any breach or any altered should happen. In this method the information is transferred in secured way that only the authorized person is able to process or receive the data. Symmetric key cryptography (also known as secret key cryptography) and asymmetric encryption are the two main types of cryptography [2, 5]. To encrypt and decode data, secret key employs a single key. Two keys are used in symmetric encryption. Encryption is performed using the first key, the public key, and decryption is performed using the public key. In Symmetric, the key size and length are often lower, but in Asymmetric, they are typically greater. Asymmetric deals with nontrivial mathematical computations, modular arithmetic functions, and large numbers, whereas symmetric deals with XOR, OR, NOT, and so on. Algorithms based on symmetric is 100 times faster than asymmetric and also provide confidentiality and Integrity. So, based on time complexity and space complexity we have different types of algorithm like AES, RSA, Blowfish, CSL based on different parameter [5–8]. The RSA algorithm is the based-on public-key cryptosystem. The Advanced Encryption Standard (AES) is also a symmetric block cipher, government want to protect information so they use different hardware and software. Blowfish is another symmetric block cipher with a configurable length key starting at 32 bits and operates on 64 bits [5, 6].

Hybrid clouds are two or more clouds consisting of (private and public). They typically remain distinctive organizations, but are joined together and provide the

value of several models of implementation. In Hybrid cloud, we can leverage benefits of third-party cloud provider in either partially or fully manner. Hybrid cloud increases the cloud computing flexibility. In this we can use public cloud along with private cloud. When the demands of businesses fluctuate then the ability to seamlessly scale them on premises infrastructure to handle any overflow that do not allow both third-party data centers have access to all their data [9]. For simple and non-sensitive computational functions, companies achieve the simplicity and computing ability of the public cloud. The data can be easily accessed from any point and from place and can be deployed on it.

2 Literature Review

The authors proposed an RSA as the solution. In RSA algorithm the there are steps of key generation, encryption and decryption. This is a secure communication as the private keys are only known by the individuals but the public key is circulated. The public key can only be decrypted by the private key of the same individual. Hence only the intended receiver can decrypt the file, hence keeping the communication confidential. The drawbacks are also discussed as there are flaws in the RSA encryption. The RSA algorithm has the drawback of having a fake public key which can cause issues while decrypting the message. The generation of key can be very complex and the security is not very high. If anyone who gets to know the private key of the sender or the receiver can open message speed is also problem in the RSA algorithm. The research paper outline limited control granted to the users over their data builds an anxiety that it is not secure and it can be accessed and modified by an external attacker [1]. To ensure the integrity of the data, the user can resort to a Third-Party Auditor (TPA) for an auditing. But to keep the data confidential for the TPA the paper proposes two encryption methods, MD5 and AES [10]. This provides the benefit that the TPA can audit the data without knowing the contents of the data and preserving data privacy. They can act as an intermediary between the user and the cloud provider. The data can be stored in multiple cloud to increase the availability. The proposed system is efficient in minimizing the time taken by AES algorithm to encrypt the data and transferring it from the client to the CSP using MD5 algorithm. The drawback of the system is the time taken to encrypt the file, upload, key generation increases with the increase in the file size. The rate of false positive and false negative is lower than the existing system but has the possibility of raising a false alarm in modified and unmodified file. This paper used the concept of multi-cloud for the purpose of security. This provides a web service level agreement framework, SLA monitoring and enforcement in SOA [11–17].

Sensitive data and key applications demand more security. This study uses RSA and Magic Square Algorithm to protect data-in-transit to and from cloud providers. The suggested system encrypts data and only the owner has the key, ensuring data secrecy. Encryption secures and preserves cloud data. RSA + magic square is secure. Encryption and decryption speed up and secure file transmission. However, this

model requires a lot of memory for a tiny amount of data. This model just encrypts text [15, 16]. The authors have a combined algorithm is used coma RSA encryption algorithm is used for protecting the data from any breach by secured communication and encryption and decryption and For digital signatures and to protect data from unauthorized access, the MD5 algorithm is used [17–19]. The hybrid approach is better than any other cypher method yet it lacks in throughput because when the data increases the time taken for encryption also increases [5, 20].

The author suggested several cryptographic methods to improve cloud data security and reliability, as well as comparisons of these methods depending on different criteria. Cryptography algorithms encode text, audio, images, and videos to ensure confidentiality, integrity, and availability [21, 22]. RSA, Digital Signature, Diffie Hellman, AES, and DES cryptographic algorithms and authentication methods solve cloud computing security challenges [5, 23]. To protect privacy, security, trust, and government surveillance, there are important standards to follow. High-security symmetric and asymmetric cryptography with key exchange is utilised [1, 24]. Kerberos authentication is used to protect data exchange and storage via trusted third parties [24–26]. The TDES requires less space having three keys of 56 bits and it is used effectively to safeguard data against various attacks. Analyzing these cryptographic algorithms, it is concluded that TDES is strong and better technique of encrypting personal data instead of acquiring larger space than DES [19–23]. A new algorithm has been proposed to maintain security within the cloud by providing integrity to the users' identities and within this algorithm, RC5 and AES symmetric algorithms have been applied together to enhance high level of security, complexity of cipher text against the attackers and the speed of computing process. It also eliminates the problems found in the encryption process. This algorithm that found to be the best among others by adding other encryption techniques, includes three stages: Key expansion, Data encryption and Data decryption [27, 28]. The author proposed SAL algorithm which uses 64-bit blocks with a 64-bit to 128-bit key size. SAL is based on a small compact s-box embedded with composite filed arithmetic (CFA) technology to decrease hardware consumption on field-programmable gate array (FPGA) boards. It accepts 64-bit plaintext input as well as a 64-bit plaintext key size [8, 26].

3 Proposed Methodology

Cryptography is a method of protecting sensitive data by various tools and techniques. It provides confidentiality as a basic security service to keep sensitive information hidden from unauthorized users and maintains privacy using various algorithms which will be discussed later in the paper. Components of cryptosystem are as follows.

1. Plain text: Initial mode of data to be secured during transmission and storage.
2. Cipher text: After encryption, cipher text is generated which is an unreadable form of plaintext.
3. Encryption Algorithm: It is a mathematical process of converting plaintext to cipher text.
4. Decryption Algorithm: The reverse operation of the encryption algorithm is done, transforming cipher text to plaintext.
5. Secret Key: a secret shared between sender and receiver.

In the area of cloud protection, the Encryption Algorithm plays a significant role. In the cloud world, several algorithms are available for use in protecting user data. Hybrid Encryption Scheme is an approach for transmitting data securely over the internet. This is done by encrypting the data into cipher text when the sender sends some data and then it is decrypted back to plain text at the receiver's end. The hybrid encryption scheme consists of four phases.

First of all, initial original or plain text is converted into cipher text by mono alphabetic substitution. In this method to produce cipher text using encryption methods like Caesar Cipher, each time a plaintext symbol appears, it is replaced by a cipher text symbol. For such a cipher, the key is a correspondence table or a feature from which the correspondence is determined. It used set replacement over the message as a whole.

In the second phase, transposition is used for conversion into cipher text. It takes the converted cipher text in the previous step and reverses the order of the letters or shifted according to a standard scheme, such that the text of the cipher represents a plain text permutation. can be keyless as well as keyed. The third phase of the scheme is focused on compression of data. This is done by breaking down the text into blocks of two characters and then each block is encoded with a single character through computation. In the fourth phase, the character encoded is then replaced by a value using mathematical encryption functions and its ASCII Value (Fig. 1).

The proposed algorithm is a one-of-a-kind Feistel structure that combines the F and H functions to form the Round Function. It enables to make cryptographic implementation easier. The structure basically takes Plain Text as the input. The input is broken down into blocks of 64 bit and then it splits into 32 bits each. Further 14 rounds are performed on the 32bit block to be converted into 64-bit cipher text. The Feistel structure of the algorithm consists of matrices of substitution boxes and for each cycle of the Feistel network, there are 18 32-bit P-arrays utilized for key expansion. The Key is used as an input to the F function, and the output of the F function is used as an input to the H function, which rapidly generates the output. The encryption and decryption algorithm are given below:

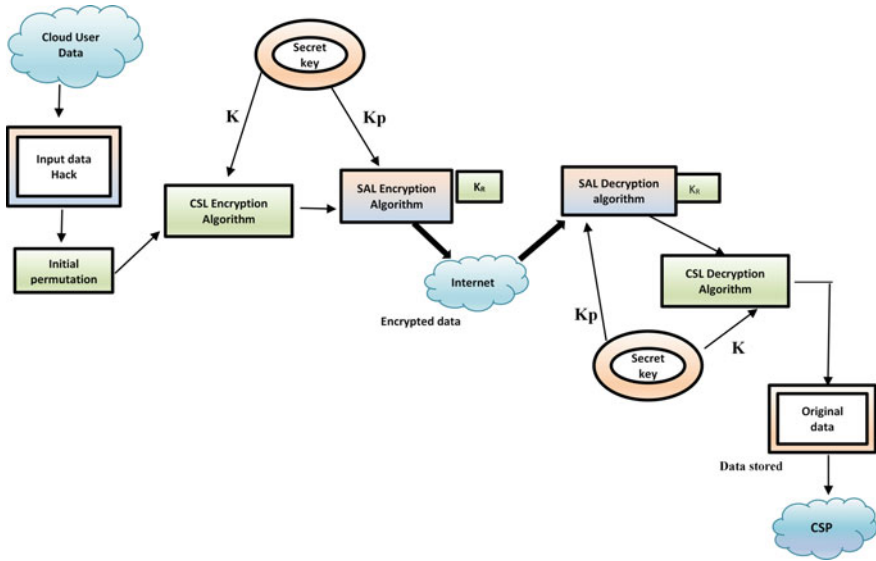


Fig. 1 Proposed system for securing information

CSL Encryption Algorithm

The input if 64-bit (X) Plaintext.

Divide X into two 32-bits splits: XL, XR.

For i = 1 to 14:

$$XL = XL \text{ XOR } P[i].$$

$$XR = XR \text{ XOR } (P[i] \text{ XOR } F[i]).$$

$$XL = XL \text{ XOR } H(XR).$$

Switch XL and XR.

End for.

Switch XL and XR (undo the last swap).

$$XL = XL \text{ XOR } P [15]$$

$$XR = XR \text{ XOR } P [16]$$

Switch XL and XR.

$$XL = XL \text{ XOR } P [17]$$

$$XR = XR \text{ XOR } P [18]$$

Re-combine XL and XR.

Finally, 64bit cipher Text is generated.

CSL Decryption Algorithm:

The input if 64-bit (X) Plaintext.

Divide X into two 32-bits splits: XL, XR.

$$XL = XL \text{ XOR } P \text{ [18]}$$

$$XR = XR \text{ XOR } P \text{ [17]}$$

Switch XL and XR.

$$XL = XL \text{ XOR } P \text{ [16]}$$

$$XR = XR \text{ XOR } P \text{ [15]}$$

For i = 14 to 1:

$$XR = XR \text{ XOR } H(XL).$$

$$XL = XL \text{ XOR } (P[i] \text{ XOR } F[XR]).$$

$$XR = XR \text{ XOR } P[i].$$

Switch XL and XR (undo the last swap) End for.

Re-combine XL and XR. Finally, 64bit original Plain Text is generated.

The SAL is a lightweight cipher of 64-bit block that operates on Feistel context that takes input as the plaintext of 64-bit and key size for 64-bit ciphertext to be produced. By increasing the number of rounds of the Feistel SAL network, the key size may be increased from 64 to 128 bits. SAL's structure of Feistel works for 14 rounds and S-box with composite field arithmetic is used at the same time. A function that is superimposed with a special new feature. The function of Inverter H. Different mathematical processes, such as permutation and replacement, the XOR process, key manipulation, and the role of an inverter, are included in each Feistel round of functions. The additional two 32-bit keys are used as a primary network towards the conclusion of the Feistel 14 round, so that the more complicated ciphertext created SAL. There are four levels to the lightweight encryption algorithm: Initialization Layer, P-box layer, S-box layer, and Feistel structure. For encryption schemes we have proposed SAL algorithm which provides more security to the application. When data is transfer using this application, it uses more than one algorithm to encrypt input files given by a mobile application. While practically doing and noting the time taken by all the algorithms to encrypt the input files ranging from 500 kb to 1 MB, we found SAL is a lightweight 64-bit block cipher that operates on Feistel. It is a feasible and standard algorithm to protect data from being compromised. Hence, we can make use of SAL algorithm to encrypt files before transmitting it over internet.

Cryptographic techniques are easier to be implemented on SAL algorithm consisting of F function and H function. SAL decryption algorithm is a reverse engineering process that takes input as a cipher text [8]. It processes the cipher text and create original plain text of data given to mobile application. We have practically noted the time taken to decrypt the cipher text by algorithms like AES, Blowfish, CSL and SAL conclude that SAL took less time to decrypt the files to get the information. It reduces the chance of information being modified or interrupted at the time of transferring, maintaining the data security. Considering this SAL algorithm is a better option.

4 Results and Findings

The data is obtained after giving the input to mobile application which is designed for encryption and decryption for different algorithms. We have taken input is 6 different files of type types (i.e. txt, jpg, png, doc, pdf, mp3) of different file size as shown in Table 1. ranging from (500KB to 1MB). For each input file we have noted time taken to encrypt and decrypt the respective file in Millisecond (ms). It has been observed that time taken to decrypt is less then then time taken to encrypt.

Blowfish is symmetric key block cipher, above data is obtained after giving the input to mobile application which is designed for encryption and decryption for different algorithms. We have taken input is 6 different files of type types (i.e. txt, jpg, png, doc, pdf, mp3) of different file size as shown in Table 1. ranging from (500KB to 1MB). For each input file we have noted time taken to encrypt and decrypt the respective file in Millisecond (ms). It has been observed that time taken to decrypt is less then then time taken to encrypt.

CSL is hybrid encryption and decryption method as it uses more than one algorithm to encrypt and decrypt which provides more security while transmitting data, above data is obtained after giving the input to mobile application which is designed for encryption and decryption for different algorithms. We have taken input is 6 different files of type types (i.e. txt, jpg, png, doc, pdf, mp3) of different file size as shown in Table 2. ranging from (500 KB to 1 MB). For each input file we have noted

Table 1 Execution time (Blowfish Cryptosystem)

SN	File name	File type	File size (KB)	Time taken to encrypt (ms)	Time taken to decrypt (ms)
1	sample_txt	.txt	170.0576	647.79	481.427
2	sample_jpg	.jpg	542.1689	1740.233	1533.312
3	sample_png	.png	500.582	1620.03	1412.739
4	sample_doc	.doc	1013	3253.106	2865.567
5	sample_pdf	.pdf	1017.731	3234.821	2859.43
6	sample_mp3	.mp3	746.2656	2387.886	2111.88

Table 2 Execution time (CSL cryptosystem)

SN	File Name	File type	File size (KB)	Time taken to encrypt (ms)	Time taken to decrypt (ms)
1	sample_txt	.txt	170.0576	1140.69	980.8125
2	sample_jpg	.jpg	542.1689	1138.47	1056.5101
3	sample_png	.png	500.582	1107.4	1029.832
4	sample_doc	.doc	1013	1180.39	1131.7053
5	sample_pdf	.pdf	1017.731	1238.98	1116.8694
6	sample_mp3	.mp3	746.2656	1143.03	1068.637

Table 3 Comparative analysis of various cryptographic algorithm (Encryption file size)

SN	File name	File type	File size (KB)	AES	Blowfish	CSL	SAL
1	sample_txt	.txt	170.0576	1341.98	647.79	1140.69	939.39
2	sample_jpg	.jpg	542.1689	1339.37	1740.233	1138.47	937.56
3	sample_png	.png	500.582	1302.82	1620.03	1107.4	911.97
4	sample_doc	.doc	1013	1388.69	3253.106	1180.39	972.08
5	sample_pdf	.pdf	1017.731	1457.62	3234.821	1238.98	1020.33
6	sample_mp3	.mp3	746.2656	1344.73	2387.886	1143.03	941.31

Table 4 Comparative analysis of various cryptographic algorithm (Decryption file size)

SN	File name	File type	File size (KB)	AES	Blowfish	CSL	SAL
1	sample_txt	.txt	170.0576	1153.89	481.42	980.81	865.42
2	sample_jpg	.jpg	542.1689	1242.95	1533.31	1056.51	932.21
3	sample_png	.png	500.582	1211.56	1412.73	1029.83	908.67
4	sample_doc	.doc	1013	1331.41	2865.56	1131.70	998.56
5	sample_pdf	.pdf	1017.731	1313.96	2859.43	1116.86	985.47
6	sample_mp3	.mp3	746.2656	1257.22	2111.88	1068.63	942.91

time taken to encrypt and decrypt the respective file in Millisecond (ms). It has been observed that time taken to decrypt is less then then time taken to encrypt. Similarly, Tables 3 and 4 shows comparative analysis of various cryptographic algorithm with execution time for encryption and decryption respectively.






The above data is obtained after giving the input to mobile application which is designed for encryption and decryption for different algorithms (AES, Blowfish, CSL and SAL) We have taken input is 6 different files of type types (i.e. txt, jpg, png, doc, pdf, mp3) of different file size as shown in Table 1 ranging from (500 KB to 1 MB). For each input file we have noted time taken to decrypt the respective file in Millisecond (ms). From above table of decryption, we can say that for sample.txt file of file size 170.0576 KB blowfish took less time 481.427 ms and after SAL took 865.42275 ms and CSL took 980.8125 ms to decrypt. When tried to decrypt image file (i.e. sample_jpg.jpg) of size 542.1689 KB, SAL took less time i.e. 908.67525 ms as compared to AES and Blowfish. Similarly, for image of png type and size of 500.582 KB SAL took less time 998.5635 ms. While decrypting sample_doc of size 1013 KB here also SAL took less time 985.473 ms as compared to AES and Blowfish. Similarly, for sample_pdf and sample_mp3 files of 1017.731 KB and 746.2656 KB again SAL took less time 985.473 ms and 942.915 ms over AES and Blowfish. From above observation we can clearly say that to decrypt data SAL algorithm would be better choice as it takes less time and as it uses more than one algorithm which increases the security.

The below data shown in Table 5 is obtained after giving the input to mobile application which is designed for encryption and decryption for different algorithms (AES, Blowfish, SAL and CSL) We have taken input is 5 different image files of type different dimension and of 300 dpi and of different file size as shown below. ranging from (500 KB to 800 KB). For each input file we have noted time taken to encrypt the respective file in Millisecond (MS). From above table of encryption, we can say time taken to encrypt image files SAL takes less time as compared to AES, CSL and Blowfish. From above observation we can clearly say that to encrypt data SAL algorithm would be better choice as it takes less time and its uses more than one algorithm which increases the security, before transferring files over any internet medium we can use SAL algorithm to encrypt files.

5 Conclusion

Enhancing the security of sensitive data in cloud has been trending research topic different encryption & decryption algorithm are used to protect data in cloud we are us using enhanced encryption scheme to secure data in cloud. The study analyzed the time taken for different algorithms to decrypt and encrypt files of different types and sizes in a mobile application. The results showed that the SAL algorithm took less time compared to AES, Blowfish, and CSL algorithms for both encryption and decryption, making it a better choice for enhancing security when transferring files over the internet medium.

Table 5 Encryption of images using various cryptographic algorithms

Image	Dimension in pixel	Resolution (dpi)	File size (KB)	AES	Blowfish	SAL	CSL
	1400 × 1400	300	794.99	1332.42	2529.50	999.32	1132.56
	3000 × 3000	300	678.37	1357.69	2192.35	1018.27	1154.04
	3000 × 3000	300	700.44	1354.38	2218.50	1015.78	1151.22
	3000 × 3000	300	550.7197	1321.05	1793.771	990.78	1122.89
	3000 × 3000	300	729.77	1341.96	2325.35	1006.47	1140.67

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Female Influencers: Examining Bahraini Social Media's Portrayal of Female Subjectivity



Layla Faisal Alhalwachi

Abstract The study explores the representation of female subjectivity on social media, highlighting the significant impact that these women's images have on the gendered narratives and discourses that saturate the public sphere. The study focuses on the patterns of femininity portrayed by female influencers and the relationships they could form with their followers. It emphasizes how these popular personalities embody post-feminism's core values of self-realization, independence, and empowerment after introducing the notion of post-feminism's sensitivity. Finally, it depicted two of Bahrain's most well-known social media influencers, Rubi Rahim, and Manal, are examined, emphasizing how well they can serve as examples of successful female digital businesses. The goal of the analysis is to demonstrate how these media personae offer an ambivalent representation of female subjectivity because, on the one hand, they highlight women's capacity to assert themselves as ambitious, competently. They treat women as autonomous, free-choice subjects (as postfeminist culture dictates), but they also use the drive for female self-fulfillment for marketing purposes, turning it into a self-branding instrument.

Keywords Gender · Social media · Patterns of femininity · Female influencers · Feminism · Followers · Kingdom of Bahrain

1 Introduction

The epidemic brought on by the Covid-19 virus's spread has significantly impacted the social, economic, and cultural landscape in a rapidly changing environment. Altering social dynamics, resulting in significant changes to how participants define their identities as well as how they interact and build meaningful social bonds. In some respects, the lockdown period has made the overlap between physical and

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online space—which distinguishes modern society and blurs the lines between the two dimensions—even more obvious.

The movement of people in such an environment is being noted for a long time by sociologists and communication academics, who are investigating models that seamlessly combine the activities carried out in the two domains who are testing interaction models that seamlessly combine the activities carried out in the two domains.

Social players employ sociability behaviours that bind the in-person and online dimensions together, building networks of relationships based on emotional similarity, since they are driven by a logic that values the continuity of the communicative experience over the division of identities, networks, or communication patterns [1], they are motivated by a logic that prioritises these concepts.

Reference [2] noted how the dynamics of self-presentation and impression management are carried out by social actors, who interact through networks that bring together commonly distinct audiences, when she called attention to the progressive “context collapse” linked to the growth of social media a few years ago. Due to the emergence of such mechanisms, academics are paying more attention to how people connect online to better understand the dynamics of social bonding as well as the function those digital platforms play in the creation of fresh collective imaginations. The relationship between the examination of these occurrences and the gender-related reflections is evident. Studies, as media remain a reservoir of societal models and representations that women must deal with daily the relationship between the examination of these occurrences and the gender-related reflections is evident. studies, as media remain a reservoir of societal models and representations that women must deal with daily [3].

Reference [4] noted, there is currently a significant emphasis in public discourse on the contradictory nature of gender constructions, it seems necessary to simultaneously question how the interactions between media and gender produce new forms of subjectivity, imaginaries, and models of action. According to this viewpoint, the dedication to the development of various female identities must reconcile with the representations of women offered by the communication system, prompting researchers in the fields of gender and feminist media studies to look into both the advantages and dangers of this connection.

The rapid use of social media and digital media in general has further complicated this situation by increasing both the number of potential role models and the surveillance technologies that people, particularly women, must contend with. In a recent article, [5] citing the findings of a survey of more than 200 young people between the ages of 18 and 30, highlighted how the interviewees expressed the difficulty of constantly having to live up to the normative models communicated by social media, while also emphasizing their prescriptiveness about social roles. Young women in particular gripe about being constantly observed by others, a perception heightened by the features of cell phones as well as the platforms themselves, the sense of.

In fact, this process forces the girls to constantly work on themselves, their eating habits, and their bodies to fit the social media image they present with the expectations of others, whether it be their peer group, or the followers dispersed throughout the

many platforms. However, as we will see in more detail in the paragraphs that follow, this pursuit of excellence is coupled with a strong desire for authenticity, putting women in what [6] refer to as a gendered double bind. Not having to be either too real or insufficiently real.

The emergence of new female subjectivities in such a media environment must also contend with the rise in popularity of social media influencers—online celebrities who can gather a substantial following across a range of digital channels, personal blogs, Instagram, Tik Tok, or YouTube, for instance.

According to [7] the gendered narratives and discourses that are common in these communities develop or duplicate standards and patterns of femininity that young women must deal with, frequently feeling inadequate or wrong.

Considering these factors, the study seeks to investigate how female subjectivity is created and reproduced on social media. To understand how the gendered narratives and imaginaries put out by the most well-known female influencers in the country are constructed between the online and offline worlds, it analyses the peculiarities of the Italian setting. According to this viewpoint, the first section of the essay will concentrate on the characteristics that define, in contemporary society, the media representation of female identity, and the second section will analyse the role of female influencers to highlight the qualities of the relationships they are able to forge with their female audience both online and in person.

With an investigation of two of the most well-known social media influencers in The Kingdom of Bahrain, Rubi Rahim and Manal, the article's last portion will examine the pattern of female subjectivity that these celebrities represent. We will try to comprehend how these very different persons' personal and professional histories might serve as an illustration of the creation of the type of postmodern (and neoliberal) femininity at the heart of gender studies reflection by doing reflection on them.

2 Media Gender Stereotypes from the Past and Present

Since the 1990s, [8] notes, gender issues have taken up more and more space in the mediated public sphere and popular culture, but they are often addressed in a simplistic and frequently trivial manner. Instead of highlighting its ability to shed light on the complex power relations defining contemporary society, mainstream media representations of feminism (and femininity) have begun to emphasize its stylish, glamorous, and hip character.

In the discipline of gender studies, the study of femininity has been linked to diverse political, social, and cultural interpretations of postmodernity, reflecting some of its ideals and, in some cases, ideological inclinations. Many analyses have shown this to be the case. [4, 8, 9] and for example, have discussed the complex ramifications of the postfeminist model of femininity, emphasizing how in media outlets like newspapers, magazines, television, and the internet, the tropes of freedom, choice, and realized equality have taken the place of the conventional feminist political and linguistic repertoire.

The aspect of the postfeminist approach that is most frequently criticised is the emphasis on women as unique individuals and their ensuing detachment from communities and social groups, which renders public feminist thinking ineffective as a critique of inequalities and traditional patriarchal power structures. The social image of women as it is presented in the media has been influenced by choice feminism, as defined by [10]. This philosophy emphasises the freedom of individuals to construct their own biographical paths in full autonomy, reducing the role of any type of structural or cultural conditioning.

The term “neoliberal feminism” was used by [11] to refer to a countercultural movement that places all the burden for managing one’s own affairs on women. “I started to term this version of feminism neoliberal feminism, since it disavows the socio-economic and cultural forces affecting our lives,” says the author, erasing all allusions to collectively, social justice, and injustice from feminist discourse. According to [12], “this feminism also helps to spawn a new feminist subject, one who assumes complete responsibility for her own well-being and self-care.

In fact, this type of market-driven feminism, which has, unsurprisingly, found a lot of room in the media landscape, focuses on the mechanisms for individual empowerment and encourages women to put themselves first in order to achieve the coveted balance between personal/affective life and professional success⁵. Such a “having it all” model [13] exemplifies for young women the desire to pursue a career without sacrificing either their femininity or their desire to have children by fusing the ideal yet unattainable union of the successful worker and the model of the perfect mother/homemaker. According to this strategy, women can achieve their goals by working hard and planning their days well. This form of market-driven feminism, which is unsurprising, has found a lot of room in.

The media environment places a strong emphasis on personal empowerment strategies, which encourages women to put themselves first to strike the long-desired balance between success in their personal/affective lives and their careers. Such a “having it all” model [13] exemplifies for young women the desire to pursue a career without sacrificing either their femininity or their desire to have children by fusing the ideal yet unattainable union of the successful worker and the model of the perfect mother/homemaker. This viewpoint contends that women can achieve their goals by working hard and planning their days perfectly.

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However, the possibility of this gender illusion becoming widely diffused, especially through media, advertising, and the internet presenting an idealized view of womanhood that symbolically seeks to bring together (post)feminism and femininity, while also perpetuating unrealistic feminine norms and stereotypes.

Social media, particularly on the internet, feeds similar gender norms by portraying idealized, frequently unrepresentative pictures of women. The use of dissimulative techniques by female influencers to project an image of accomplished and successful women tends to give a misleading representation of female subjectivity, as will be seen later; The pursuit of the ideal trifecta is still very much alive on Instagram, as [7] point out. If, on the one hand, the rise in women's presence in social media culture has made many feminisms claims more well-known (sometimes turning them into trending hashtags⁷), On the other side, it has muddied the urge to challenge gendered power structures and the patriarchal structure of society and partially emptied them of their political substance. Popular feminism, which is currently a media trend⁸ [14], is well aligned with neoliberal values of self-improvement, ambition, and female entrepreneurship on the one hand, and on the other hand, while also emphasizing individual responsibility and choice, much like post feminism. In fact, the larger social process that forces people to deal with gender issues appears to have an impact on it as well. By presenting a view of female subjectivity that is strong but free of the most contentious aspects, particularly in respect to.

The production of a gender imaginary that is somewhat depoliticized, as opposed to the gendered power relations ingrained in social structures, is facilitated by mainstream media and digital platforms. This image is one of a strong, adaptable woman who also chooses the consumption sphere as the location for the exercise of her agency.

In fact, the idea of "Girl Power" has found a home in the neoliberal media system, or a representation of femininity that emphasizes her self-affirming and empowering qualities while at the same time softening her desire to reform gendered power structures in society. As girls are told that power and gender equality have already been achieved, the depoliticized versions of Girl Power offered by the dominant media institutions create barriers to their active citizenship and political engagement. "By presenting a world with no need for social change, this use of the Girls Power discourse fails to provide girls with tools to understand and challenge situations where they expel [15]. It is obvious how such a strategy results in a difficult form of female subjectivity.

Moreover, she is ambitious without being confrontational, reinforcing the stereotype that places the "happy feminist" at the epicentre of popular feminism, the exact

opposite of the “feminist killjoy” [16] who, in the eyes of the public, embodied the second wave of feminism in the 1970s.

However, from our perspective, it would be incorrect to attribute the female presence on social media to a single model because digital platforms host a variety of representations and gender models; the influencer universe itself is undoubtedly differentiated¹⁰, allowing users to experience various forms of recognition and belonging through them.

3 Influencers on Social Media and Developing a Close Relationship Among Female Viewers

The ability of users to create unique and creative material utilizing tools that allow them to narrate their everyday lives or ideas in the first person has risen hand in hand with the important position of social media in the communication ecosystem. In this setting, the social media influencer has emerged as a persona capable of transferring the renown that was initially gained on digital platforms into an offline realm. Internet users who “acquire a relatively large following on blogs and social media through the textual and visual narration of their lives and lifestyles, engage with their following in digital and physical spaces, and monetize their following” are what [17] refers to as these individuals Not having to be either too real or insufficiently real.

In such a media environment, the creation of new female subjectivities must also contend with the rising prominence of social media influencers—online stars who can amass a sizable following across a variety of digital platforms, such as personal blogs, Instagram, Tik Tok, or YouTube. The gendered narratives and discourses that are prevalent in these communities generate or replicate ideals and patterns of femininity, which young women must contend with, frequently feeling inadequate or wrong, as [7] illustrated.

In the past few years, their communication strategy tries to reduce the cognitive and emotional barrier between consumers, therefore they select a purposefully straightforward and casual expressive approach [18]; as they become well-known, the communicative relationship alters, and the followers’ distance tends to increase. The ability of influencers to engage users through the sharing of their own personal experiences, blurring the line between the public and private spheres, and thereby fostering the triggering of an identification mechanism is what initially makes them popular [19]. However, some of them later develop the characteristics of true mainstream celebrities, able to occupy the centre of the media scene and turn the notoriety gained through likes into a real-world following [20].

This is the example of Rubi Rahim, one of the most well-known fashion influencers in the Gulf region, who began her career while in college by uploading daily images of her outfits on a blog and, as we shall see in more detail in the following paragraph, has amassed nearly 30 million Instagram followers who adore her famous lifestyle.

It's essential for influencers to be able to develop a close bond with their audience [21], for example, by posting content that makes people instantly recognize themselves or that can evoke aspirational dynamics. In fact, the foundation of these actors' great performances is their capacity to come across as trustworthy partners to an engaged audience, with whom they can forge a bond based on trust and showy authenticity.

Influencers must look commercially reliable yet transparent, adopting consumption decisions congruent with their own image and lifestyle, and declare themselves as powerful advertising testimonials [22].

Focusing the investigation on the female audience and its relationship with female influencers, it becomes clear how the emotional tie between followers and influencers, who also utilize the account of their daily lives to create this bond, is precisely one of familiarity and intimacy. Given that celebrities are viewed as genuine and honest, revealing personal information in this setting fosters a unique relationship based on trust. While it is true that disclosing information and personal experiences is used to foster an intimacy with audiences [23], it is also obvious that this perceived intimacy does not equate to accessibility or emulation¹³, as many of these glamorous individuals lead lives that are objectively very dissimilar from those of most internet users.

But what we want to emphasize here is how these female characters also help to create a collective female imaginary by giving the audience who watches them a personal interpretation of what it means to be a woman today. Influencers are involved in a persistent identity project that swings back and forth between the online and offline worlds. They do this by designing and projecting their self-assured, emancipated view of women in the online world onto digital platforms.

Even though the media's successful femininity models are rather diverse, scholars like [12, 24] stigmatize the feminist sensibility that is prevalent in the mediascape (and on social media) by calling it celebrity feminism or even glossy feminism. They view the media system as a key cultural site for the re/production of normative, limited and limiting gender and sexual identities and re/production of dominant, heteronormative [24]. These critics view celebrity feminism as a trend that influences many people but lacks any true political commitment.

Famous females, Hollywood actors, and well-known public figures to take a position on specific gender problems or to formally identify as feminists¹⁵. Reference [7] assert that while feminism has finally gained acceptance in the public eye, it has also evolved into an unanticipated source of social capital, or, as they put it, a "trend" as opposed to a genuine political and intellectual position. This viewpoint alludes to nebulous feminist ideas seem less like a sincere declaration of devotion and more like a calculated move to improve one's public image.

The Instagram profile is accurate. The most well-known female influence in the world reproduces a female subjectivity that is confident, aggressive, and self-aware, but lacks the desire to challenge hegemonic power systems that has long been associated with female activism since the 1970s. social media is flooded with pictures of ambitious women who are pursuing their professional ambitions without sacrificing a fulfilling personal and emotional life. These women inspire us with their messages of

confidence, feminism, and self-worth without ever focusing on the structural issues that continue to underlie gender inequality.

In 2017, a psychological understanding of femininity and a social paradigm that holds each woman accountable are in play. Patriarchal culture masks the limitations of a social framework still lacking in gender equality with the psychological language of empowerment, choice, and self-responsibility, encouraging her to seek for greater self-confidence by suggesting individual solutions to structural difficulties. The emphasis is instead placed on women self-regulating and locating the “solutions” to their problems within a newly upgraded form of confident subjectivity, as the scholars state: “The confidence culture exculpates social, economic, and political forces for their role in producing and maintaining inequality.

As a result, it rejects political criticism and throws the idea that the personal is political on its head. It works by placing the blame and responsibility for all obstacles and challenges on women themselves, despite its apparent warm and affirmative approach to women to ‘lean in’ and believe in themselves [25].

The Instagram accounts of these celebrities also stand out for the almost complete absence of any mention of a collective subject or collective political action. Instead, the most explicit claims, which primarily centre on the idea of self-empowerment, refer to an individual dimension and are decried as individual struggles for one’s own affirmation of one’s freedom of choice. The general perception is that this generation of influencers does not deeply perceive the existence of a collective horizon of meaning, continuing instead to pursue a simplified gender discourse, which is based on individualism and personal agency, apart from the campaigns against sexual harassment and rape culture, which began to spread virally as hashtags on social media.

In this way, the formation of the female subject, as it is portrayed particularly on social media, seems to be influenced by personal rather than structural or systemic difficulties, neglecting or at the very least downplaying the importance of gender politics in the public discourse. In this regard, it is crucial to emphasize that social media platforms are anything but neutral and that their affordances are changing the norms and circumstances of social interaction [26]. As a result, many users are changing the ways in which they present their online identities.

As [27] note, many female Instagram users consciously avoid addressing feminist issues that do not fit the platform’s interaction order and even refrain from expressing political viewpoints that might cause audience members to react negatively. The development of influencers’ Instagram profiles is far from unrelated to these dynamics, particularly regarding the representation of their feminine and feminist subjectivity.

Although unique, these young influencers’ social media personas portray strong subjectivity and feminine figures who assert the right to use their own agentic capacity, positioning them as role models for millions of followers. However, according to some feminist scholars, these occurrences are mostly limited to one area of life—consumption—as if in today’s culture, female agency can only coexist with consumer agency.

According to this viewpoint, [28] notes how consumer culture has gradually replaced traditional social institutions like family and education in the process of producing and reproducing the category of girl as a particular type of subjectivity. In addition, according to the scholar, the sprinkling of selective, even parent-friendly, feminist values present in consumer culture is likely to conceal the gendered power relations inscribed in that culture [28].

This theory holds that girls' social power and purchasing capacity are correlated, which restricts their ability to act outside of the realm of consumerism. While [29] provides a more in-depth analysis of the relationship between female agency and particular consumption experiences, we will only highlight how the freedom provided by the diverse consumption patterns challenges normative femininity and enables girls to defy gender stereotypes here. We will specifically discuss the meaning young women attribute to their decision to tattoo their bodies. A strong means of communication, an instrument for expressing one's subjectivity or proclaiming one's freedom, can be found in the way one dresses or the type of music one listens to.

Influencers openly promote new female patterns in their capacity as cultural producers, while also exploiting consumer decisions to reclaim their agency and prominence in the public sphere. The active and creative role of consumers can be highlighted if we define consumer agency, as [30] did, as the capacity to alter and play with meanings. This places consumers at the nexus of the production and consuming dimensions¹⁹.

In addition, consumer agency plays a significant role in identity-expressive purchases, as noted by [33] making embodied consumption practices a tool for creating one's own ideal gendered identity as well.

4 Consumer Decisions Are Ultimately Just One Form of Self-expression and Personal Freedom

Focusing the investigation on the female audience and its relationship with female influencers, it becomes clear how the emotional tie between followers and influencers, who also utilize the account of their daily lives to create this bond, is precisely one of familiarity and intimacy. Given that celebrities are viewed as genuine and honest, revealing personal information in this setting fosters a unique relationship based on trust. While it is true that disclosing information and personal experiences is used to foster an intimacy with audiences [23], it is also obvious that this perceived intimacy does not equate to accessibility or emulation¹³, as many of these glamorous individuals lead lives that are objectively very dissimilar from those of most internet users.

But what we want to emphasize here is how these female characters also help to create a collective female imaginary by giving the audience who watches them a personal interpretation of what it means to be a woman today. Influencers are involved in a persistent identity project that swings back and forth between the

online and offline worlds. They do this by designing and projecting their self-assured, emancipated view of women in the online world onto digital platforms.

Even though the media's successful femininity models are rather diverse, scholars [14, 24] stigmatize the feminist sensibility that is prevalent in the mediascape (and on social media) by calling it celebrity feminism or even glossy feminism. They view the media system as a key cultural site for the re/production of dominant, heteronormative, and normative gender and sexual identities [24]. These critics view celebrity feminism as a trend that influences many people but lacks any true political commitment.

Famous females, Hollywood actors, and well-known public figures to take a position on specific gender problems or to formally identify as feminists [7] assert that while feminism has finally gained acceptance in the public eye, it has also evolved into an unanticipated source of social capital, or, as they put it, a "trend" as opposed to a genuine political and intellectual position. This viewpoint alludes to nebulous feminist ideas seem less like a sincere declaration of devotion and more like a calculated move to improve one's public image.

The Instagram profile is accurate. The most well-known female influence in the world reproduces a confident, combative, and self-aware female subjectivity, but without the drive to oppose hegemonic power structures that has been traditionally linked with female activism since the 1970s. social media flooded with pictures of ambitious women who are pursuing their professional ambitions without sacrificing a fulfilling personal and emotional life. These women inspire us with their messages of confidence, feminism, and self-worth without ever focusing on the structural issues that continue to underlie gender inequality. In 2017, a psychological understanding of femininity and a social paradigm that holds each woman accountable are in play.

Patriarchal culture masks the limitations of a social framework still lacking in gender equality with the psychological language of empowerment, choice, and self-responsibility, encouraging her to seek for greater self-confidence by suggesting individual solutions to structural difficulties. As the scholar's state: "The confidence culture exculpates social, economic, and political forces for their role in producing and maintaining inequality, the emphasis is instead placed on women self-regulating and locating the "solutions" to their problems within a newly upgraded form of confident subjectivity.

As a result, it rejects political criticism and throws the idea that the personal is political on its head. It works by placing the blame and responsibility for all obstacles and challenges on women themselves, despite its apparent warm and affirmative approach to women to "lean in" and believe in themselves [25].

The Instagram accounts of these celebrities also stand out for the almost complete absence of any mention of a collective subject or collective political action. The most explicit statements, however, which mainly focus on the concept of self-empowerment, allude to an individual dimension, and are criticised as being personal fights for one's own affirmation of one's freedom of choice. Except for the campaigns against sexual harassment and rape culture, which started to circulate virally as hashtags on social media, the general perception is that this generation of influencers does not deeply perceive the existence of a collective horizon of meaning and instead

continues to pursue a simplified gender discourse that is based on individualism and personal agency.

In this way, the formation of the female subject, as it is portrayed particularly on social media, seems to be influenced by personal rather than structural or systemic difficulties, neglecting or at the very least downplaying the importance of gender politics in the public discourse. In this regard, it is crucial to emphasize that social media platforms are anything but neutral and that their affordances are changing the norms and circumstances of social interaction [26]. As a result, many users are changing the ways in which they present their online identities [27].

According to [28], many female Instagram users purposefully avoid addressing feminist problems that do not match the platform's interaction order and even refrain from expressing political opinions that can offend viewers. The growth of influencers' Instagram profiles is not at all unrelated to these processes, especially in terms of how they depict their subjectivity as feminists and women. Although unique, these young influencers' social media personas portray strong subjectivity and feminine figures who assert the right to use their own agentic capacity, positioning them as role models for millions of followers. However, according to some feminist scholars, these occurrences are mostly limited to one area of life—consumption—as if in today's culture, female agency can only coexist with consumer agency.

According to this viewpoint, [29] notes how consumer culture has gradually replaced traditional social institutions like family and education in the process of producing and reproducing the category of girl as a particular type of subjectivity. In addition, according to the scholar, the sprinkling of selective, even parent-friendly, feminist values [29] present in consumer culture is likely to conceal the gendered power relations inscribed in that culture.

This theory holds that girls' social power and purchasing capacity are correlated, which restricts their ability to act outside of the realm of consumerism. While [30] provides a more in-depth analysis of the relationship between female agency and particular consumption experiences, we will only highlight how the freedom provided by the diverse consumption patterns challenges normative femininity and enables girls to defy gender stereotypes here. We will specifically discuss the meaning young women attribute to their decision to tattoo their bodies. A strong means of communication, an instrument for expressing one's subjectivity or proclaiming one's freedom, can be found in the way one dresses or the type of music one listens to.

Influencers openly promote new female patterns in their capacity as cultural producers, while also exploiting consumer decisions to reclaim their agency and prominence in the public sphere. The active and creative role of consumers can be highlighted if we define consumer agency, as [31] did, as the capacity to alter and play with meanings. This places consumers at the nexus of the production and consuming dimensions.

In addition, consumer agency plays a significant role in identity-expressive purchases, as noted [33], making embodied consumption practices a tool for creating one's own ideal gendered identity as well. Consumer decisions are ultimately just one form of self-expression and personal freedom. "Top Trend Fashion" by Rubi Rahim: The Bahraini route to female influencers.

It is worthwhile quickly focusing on the Italian media landscape to wrap up the research on the female personalities that dominate social platforms and, consequently, the ideal of femininity they establish. The most popular Italian female influencers on social media, according to data analysis, are Rubi Rahim and Manal. The former is a digital entrepreneur who converted discussing her buying choices and lifestyle into a career in 2009 after starting the fashion blog “The Blonde Salad.” She has since gained millions of followers throughout the globe with her practically live description of her everyday life. Contrarily, Manal is a food blogger whose early popularity was based on the posting of recipe videos.

The popularity of food blogger Manal, on the other hand, was first based on recipe videos shared on. She swiftly became so well-known, albeit on a national scale, on YouTube and the Instagram, then she has established her own beauty salon and clothes boutique.

Although they represent, as we shall see, two very different types of women, it is easy to spot some characteristics of the influencer in their online behaviour, beginning with the tactics they employ to interact with their followers. According to [32], social media facilitates the “relational labour” necessary to establish and maintain relationships with one’s own audience, boosting the emotional bond between followers of an influencer and their followers. As we’ve already mentioned, social celebrities frequently share basic information about their personal lives to engage and interest fans, thus obscuring the line between their private and public lives [20].

In the end, this is a successful communication tactic that enables influencers to maintain consistency in their relationship with followers, strengthening the sense of intimacy and emotional closeness that is the foundation of identification processes. In a similar vein, both influencers alternate moments of in-person meetings with their fans in formal and informal settings with interactions mediated through digital platforms, strengthening the sense of continuity of the communicative experience from the online to the offline sphere: These in-person contacts complement online interactions since influencers.

are expected to act in ways that correspond to the personas they have portrayed on their blogs and social media.

As a result, the intimacy developed and negotiated on digital platforms is carried over to real-world settings, creating a feedback loop that intensifies followers’ feelings of intimacy toward influencers [21].

But from our perspective, it is even more fascinating to observe how two very connoted and distinct models of women are embodied by Italian social celebrities, almost to the point of appearing as paradigmatic figures. For instance, Rubi Rahim is portrayed in the media as an influential entrepreneur who knows her own capabilities and selects her own goals without sacrificing her personal or family life, and who strives to accomplish “the ultimate trifecta” [13].

On her social media profiles, Rubi Rahim alternates glitzy images of her professional commitments with moments of family life²¹, demonstrating the neoliberal feminism concept of subjectivity that encourages women to take charge of their own lives and hold themselves accountable for their accomplishments and failings without recourse to calls for group action [33].

In fact, the influencer proposes to users a rather idealized model of a woman far removed from reality, a model in which self-branding, individualized feminism, and entrepreneurship as women's empowerment appear to coincide [19]. The influencer appears to effortlessly manage this difficult balance between the roles of testimonial for significant brands, loving wife, and mother.

Adopting the vocabulary of individualism, autonomy, and choice entails, *de facto*, changing feminism into post feminism, as [34] points out. Because of this, topics like women's right to privacy and dedication to gender equality—to which Rubi Rahim refers—are negated in a generalised and normalised manner, missing in any case those political allusions that historically characterised the struggle against gendered structural inequities.

Although many users, mostly women, are criticizing these representations of femininity as unrealistic, deceptive, or unattainable for those who do not have the same financial resources as the influencer, social media can also be a tool for vehement protests and personal attacks that, in the case of Rubi Rahim, concentrate specifically on the updated version of the ideal of “having it all” that she proposes to the outside world. According to [7], for these anti-fan communities, those “false” projections of profession, family, and aesthetic perfection constitute retrograde or unfeminist narratives and reinforce unrealistic expectations for women.

Rubi Rahim, a style icon who has managed to develop her own character over time, seems to be fully aware of the rules of the market from a commercial standpoint, striving to accurately produce and reproduce the model of woman that her followers would like to be. This is typical of a successful brand. This contrasts with the language of authenticity that permeates many influencers' social media platforms.

Within this framework, the rhetoric of “having it all,” for which Rubi Rahim serves as an emblem, emerges as a component of a meticulously planned, deftly handled, and frequently renegotiated self-brand effort.

The influencer's regular social media posts about their family life also play a significant part in this marketing plan because they help to solidify the image of Rubi Rahim as a multifaceted, multifaceted woman. We have watched “#Rubi_R” brand gradually expand since the couple's marriage to rapper Rubi and the birth of their two children, managed as a true strategic asset capable of boosting the influencer's visibility and financial power.

On the other side, Manal represents a more conventional and, in some ways, comforting feminine subjectivity.

She still serves as an example of a well-known and established woman in the Bahraini media landscape, but she has grown immensely popular on social media by focusing on the role of the authentic and spontaneous housewife who seraphically shares recipes and cooking advice with followers.

Referencing her husband and their family life, as seen in the numerous photos posted on social media, strengthens the sense of familiarity with users while also turning the couple's image into a salable product. In a few Instagram stories, for instance, her husband begins cooking in their home kitchen while his wife Manal records videos, as a typical married couple would do.

The millions of women who follow Manal on television and through digital media recognize her for her genuine demeanor and communication style that is tuned to the register of simplicity. In contrast to Rubi Rahim, who can evoke aspirational dynamics in viewers, Manal represents a more attainable female role model that does not try to challenge conventional gender norms or the legitimacy of power relations. In fact, one may refer to a rather traditional media portrayal of female subjectivity that fits into the successful framework of so-called culinary shows in which women are typically shown in the position of mothers/wives preparing meals for the family.

As a result of this type of media imagination, the domestic environment, and the presence of a female figure in the kitchen reinforce the intimate relationship that has been built with the audiences, effectively triggering a mechanism of identification with the show's protagonists.

While [35] was correct in stating that "gendered divisions around cooking remain largely over place and intention in television, as in other corners of the popular imagination: women cook at home for their family and loved ones, while men cook in public, for pay, and mostly for (adoring) strangers," the reality today appears to have changed somewhat as the web and social media have started to expand the spaces (and roles) available to women. When it comes to Manal, it is possible to draw attention to the existence of a dual expressive register:

It is obvious that the influencer represents a successful business model because she was able to maximize the potential of social media, and the informal tone that characterizes her videos refers to a communicative choice meant to reduce the emotional distance from the users and favor their identification. As a result, Manal offers a case study of a woman who was successful in using her professional abilities to create a female success narrative.

5 Discussion and Conclusion

The various patterns of femininity are constructed and made visible by the media, as we've already explored. Digital platforms have doubled the spaces open to women and made it simpler for them to access.

the locations where culture is produced. Information and communication technology can prove to be an outstanding weapon for advancing gender equality and women's empowerment, as the description of the goals established by the United Nations for positive Sustainable Development emphasizes.

Social media influencers hold a more important place in this interconnected environment because they work together to create texts and discourses that affect how the audience perceives gender identities.

They serve the purpose of legitimizing cultural behaviors and symbols by their public visibility, enabling internet users to express their gender subjectivity with some degree of freedom. Since media portrayals, as we have noted, have a huge impact on gendered narratives and discourses, the matter of the models of femininity

that social media send to the public remains of utmost importance. According to this viewpoint, examining the role performed by female social media influencers may help us to learn more about the action models that currently inspire women and shape their collective imaginaries.

Most young women have the feeling of being inadequate on social media, as noted by [5], among others, making it even more important to understand the mechanisms that control the media's development of normative gendered identities [36].

According to our analysis, social celebrities, as we have defined them, use the story of their everyday lives to maintain the bond they have built with their audiences and to establish themselves as reliable partners in the communicative process. This allows them to create representations of femininity in which women can see themselves.

Consumers are more likely to mirror themselves in the ideal of women personified by the influencer because to the discourse made possible by digital media and the interaction's ability for two-way communication.

Influencers have established direct lines of communication with their audiences by fully utilizing the process of disintermediation facilitated by the growth of digital technologies. They have also learned to manage relationships with subjects who are more active and interconnected and who are able to naturally adapt their behavior to the new two-way interaction modes.

According to a few academics in the field of gender and feminist media studies, the female subjectivity portrayed on social media is primarily inspired by an ideal of digital entrepreneurial femininity steeped in neoliberal and postfeminist ideology, a social representation that values women's independence, individual capabilities, and self-empowerment [11, 12].

Although very different from one another, the two Italian influencers under examination, [36], represent this model because they both used social media in a clever way to launch lucrative businesses that allowed them to pursue their passions for cooking and fashion, respectively. The lines between the public and private realms are becoming increasingly hazy because of similar corporate feminist trends that view one's personal life and experiences as strategic assets and transform online interactions into a successful commercial activity [36].

However, other important factors must unavoidably be considered while analyzing the femininity model that Manal and Rubi Rahim suggest using digital platforms, beginning with its dominance in the collective imagination.

If it is true that the two celebrities, one dedicated to modernizing the "having it all" woman prototype and the other to outlining the profile of the 2.0 housewife, in some ways represent stereotyped and one-dimensional figures, it is equally clear that they have helped to legitimize and increase the visibility of female figures in the Italian social media landscape.

These are two guys who, via the successful use of transmedia narrative mechanisms [37] capable of ensuring the emotional engagement of followers, have succeeded in asserting their own voices in the public sphere.

As is well known, using a variety of media and languages encourages audience participation on a deeper level since they feel actively involved in the narrative that is being developed for them across many digital platforms.

To better understand the mechanisms that produce female subjectivity in various social and cultural contexts, it is crucial to emphasize the need to bolster reflection on the social construction of gender with new analytical tools. While studying gender representations in the media is still crucial today, it would be crucial, in our opinion, to thoroughly examine the practices and contexts of consumption in which these representations occur. In the end, it appears that Manal and Rubi Rahim have both been able to provide their fans with a pattern of femininity to which they may refer, actively contributing to the creation of those varied female imaginaries from which very diverse women today might take inspiration.

6 Ethics Statement

According to local law and institutional standards, the study using human volunteers did not require ethical review or permission. In compliance with national law and institutional standards, individuals did not need to provide written informed permission to take part in this study.

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Does COVID-19 Have a Significant Impact on Digital Finance? Analysis of Indian Digital Payment System



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Abstract The world is changing rapidly due to the spread and aftereffects of the novel Covid-19 pandemic. It has many notable impacts on the global economy. Maintaining physical as well as social distancing has become important these days due to the spread of the disease. Digital payment contributes to our life to save us from Covid-19. This paper focused on the impact of Covid-19 on the digital economy, Independent variables include customer transactions, mobile payments, card payments, UPI, wallets, NEFT, IMPS, and RTGS. Dependent variables are Corona cases and Corona deaths. For the purpose of the study data from Jan 2020 to Dec 2021 has been analyzed to run the multiple regression to find out whether the result of Covid-19 new cases has a significant impact on mobile payment and UPI, the other variables are insignificant. The outcome of death cases has a significant impact on mobile payment and UPI. The digital economy is the center of today's economic development. This paper amplifies the adoption of a new technology of digital payment to overcome the impact of Covid-19 throughout the world.

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1 Introduction

In the course of human history, the COVID 19 pandemic is an unpredicted crisis. It has a significant impact on economic activities. It made human life at risk. It is one of the biggest crises even compare to the 2008 global financial crisis. The virus firstly noted in Wuhan the city of China in December 2019 [22]. The global economic activity disrupts due to this epidemic. The recent crisis is making unprecedented stress on individuals, governments, markets, and businesses (Economic Times, 2020). Looking at the starting scenario of this pandemic all the nations implemented lockdowns and close the activities, which enable large human interaction and gatherings [12]. The pandemic lead world as a catalyst for change on social, economic, corporate as well as personal level. At the disruption from novel Covid-19, it is clear that people do not have any option except digitalization [20].

The Covid-19 impact on digital payment has declined in the business of airlines, tourism, hospitality, hotels, entertainment, e-commerce (non-essentials), and restaurant [15]. As we witnessed that Covid-19 is a bitter toll of world economy. Even though it has untapped opportunities in the different sectors of the economy. Globally, the work from home (WFH), online teaching, online shopping, and online meetings have developed in the short scan of time. Covid-19 has accelerated the digital financial services not only in India but also in world. National Payments Corporation of India (NPCI) has played important role in the emergence of digital payment ecosystem in India. To launching the digital platform like, UPI, Bharat bills pay, IMPS, ETC (Electronic Toll collection) [16]. Many people around the globe are being forced to adopt digital things to deal with this situation. Based on Prime Minister Narendra Modi, ‘Atmanirbhar Bharat’ Yojana government promotes the country to build technology-driven systems (Money control, 2020). The crisis has made it very clear that social distancing and work from home turn out to be today’s realitie [8]. The statement given by Harshil Mathur, the CEO of a payment gateway, “The lockdown brought upon digital awareness in Tier 2 and 3 geographies as well, with bill payments through digital channels seeing a 93% increase overall. This is in spite of Tier 2 and 3 customers preferring to pay bills offline through Kirana shops etc. which have now moved to digital methods of payments,” [15]. Ambarish Kenghe, Managing Director of Google Pay stated, “The pandemic has done more to digitizing payments in India. Because of COVID, we have seen five years of progress happen in just five months” [14].

The Covid-19 pandemic confirmed that businesses have to continue their operations in a challenging situation and adapting to this new digital world. India supplements twelve new online education channel Direct to Home. The government of India also established many programs to boost the progress of new solutions for collaboration, video conferencing, telework, etc. (Digitalization, 2020). “The

Reserve Bank of India will soon treat all payment aggregators as regulated entities under the Payment and Settlement Systems Act 2007 under its direct supervision, bringing in tighter regulations for the country's digital payment industry. The central bank has also demanded mandatory compliance on technology and cyber-security requirements" [14].

Digital financial services were especially helpful to humanity during the COVID19 era and helped ensure its existence. The COVID 19 incident occurred when the entire country was placed on complete lockdown [20]. It is true that digitalization will highly contribute to the development of the economy. In this paper, we focused on the effect of the COVID-19 pandemic and digital economy evidence from India. A key method of reducing the detrimental effects of digital finance is through effective financial regulation, which diminishes the U-shaped relationship between it and the digital transformation of the agriculture [13].

The study is significant because digital finance is where society wants to regularly conduct financial transactions in the digital realm. In the Fintech sector, there are numerous startups that are also progressing to the next level. Google Pay and PayTM have raised awareness of Fintech and digital finance in society. QR codes are available to pay for the services anywhere.

2 Literature Review

Digital finance positively significant affected by the Covid-19 crisis, people are ready to do the payment digitally to avoid go to the mass places [2]. Digital payment is accessed and utilised make it possible by the through of mobile. People are ready to use the digital platform for the payment [3]. In recent years, many customers already adopted payments online or through mobile applications. Still, there are customers, those who do not wants to do the digital payment, due to lack knowledge, and awareness of digital usage they denied to go digital.

The situation of COVID 19 willingly/unwillingly forced them to move towards digital payments [19]. In the lockdown period, the proportion of internet users increased from 40 to 100% compared to pre-lockdown levels. Almost all people using online- based services to interact and communicate. The usage of services like Zoom, Google Meet is tremendously increased. The new digitalize world force people to work from home [10]. The lockdown period records 95% of total UPI transactions, which includes convenience stores, supermarket, groceries, etc. Further the 95 Banks actively participating in AePS. The application of Bhim app downloads is 1, 25,274. E-commerce also notices high positive trends. The word digital money gain popularity in this new normal world. The bank currency and paper notes term as dirty money because of virus spread assumption. "The payment and settlement systems recorded robust growth during 2019–20, growing by 44.1% in terms of volume on top of the expansion by 55.8% in the previous year. In terms of value, it increased by 5.4% on top of 14.2% in the previous year, mainly due to lower growth observed in the large value system, viz., Real Time Gross Settlement

(RTGS) system. The share of digital transactions in the total volume of non-cash retail payments increased to 97.0% during 2019–20, up from 95.4% in the previous year. However, the extended period of lockdown arising on account of the COVID-19 pandemic resulted in subdued economic activity and lower discretionary payments, thereby leading to a fall in digital transactions” (RBI Report, 2020). In India, government promote digital payment services and encourage the customer to make digital payments [11]. “Dilip Asbe, Managing director and CEO of the National Payments Corporation of India (NPCI) has also urged people to increase the use of digital payments in order to make payments contactless” [16]. The government support on digital payments system increases contactless payments. Further, it shows that the perceived risk from Covid-19 spread and perceived usefulness of using digital payment methods are related to each other [4, 18].

Most of the countries flattened their COVID-19 cases curve by adopting a digital platform. It noted that it reduces the mortality rates across the globe [17]. Moreover, digital methods are becoming the backbone of public-health response to Covid-19 crises around the globe. The digital response of millions of people advantages large online datasets, advancements in machine learning and natural language processing, billions of mobile phones, connected gadgets, and reasonably cheap computing resources, contribute to economic development [6]. Further, the digital platform can also improve human health education and communication. In many countries, the government has collaborated with a social media platform like WhatsApp, Facebook, and Twitter. These applications inform people and give accurate information about the Covid-19 crisis [21]. The digital payment system help world to reduce human touch, which ultimately decreases the spread of Covid-19 [7]. Data protection and security became key concerns for everyone in this crisis. The digital divide is more useful in developing countries because of cultural and social issues [9]. The use of digital payment methods helps in the development of the country as well as fruitful in COVID-19 situation but at the same time assures the protection of the consumer is also became necessary [5]. The government also monitors infected people and traces their contacts using mobile apps, which also raised the concern of people’s privacy [1].

3 Research Methodology

3.1 Data

A strong methodology is the backbone of the research. The research methodology includes the way the researcher gathers, evaluates, and interprets the data in the study. The variable taken in the study are “Covid new cases, Covid death cases”, Customer Transaction, Mobile Payments, Card Payments, UPI, wallets, NEFT, IMPS, and RTGS. The study is secondary in nature. The data of variables obtained from “India and collected from the Oxford Martin Programme on Global Development, which is a collaborative database of the University of Oxford researchers and Global Change

Data Lab (Our World in Data Organisation, 2020)”. The monthly statistics of selected digital payment gateways were collected from the RBI website (RBI Bulletin, 2020). The period of gathered data is from Jan 2020 to Dec 2021. The collected data analyzed with multiple regression analyses.

3.2 Model Development

The below-mentioned picture gives a more clear idea about the independent and dependent variable used in the study. The dependent variable consists of “Covid new cases and Covid death cases”. The independent variable includes customer transactions, mobile payments, card payments, UPI, wallets, NEFT, IMPS, and RTGS (Fig. 1).

Table 1, shows all the variables taken in the study. The attributes of variables are also given which help in the customization of writing variables. The last column in the table also gives theory judgement of correlation of various selected variables. It is drawn from the table that Corona New cases, Corona Death case, Mobile Payments, Unified Payments Interface, National Electronic Funds Transfer, Immediate Payment Service has shown a positive correlation. The Customer Transactions, Card Payments, Wallets, Real-time gross settlement systems have shown negative correlation.

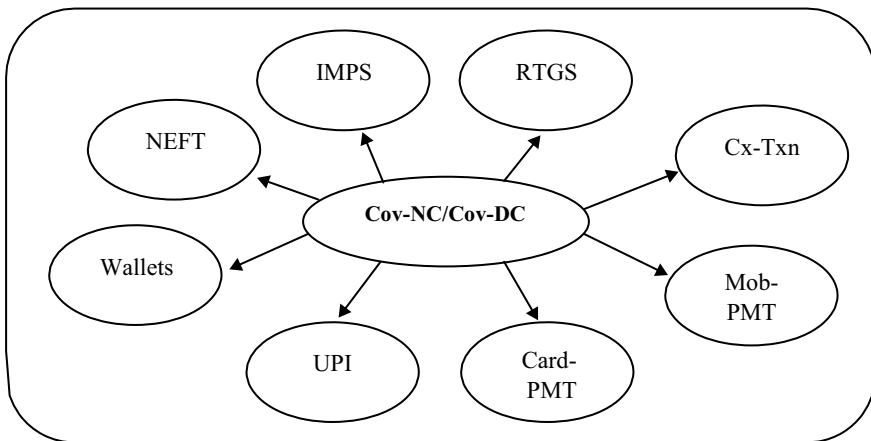


Fig. 1 Model of digital economic and Covid-19 indicators. Source Authors estimated

Table 1 Indicators of digital economics and Covid-19

Variable symbol	Variables	Attribute of variables	Theory judgment
Y1	Corona New cases	Cov-NC	Positive correlation
Y2	Corona Death case	Cov-DC	Positive correlation
X1	Customer Transactions	Cx-Txn	Negative correlation
X2	Mobile Payments	Mob-PMT	Positive correlation
X3	Card Payments	Card-PMT	Negative correlation
X4	Unified Payments Interface	UPI	Positive correlation
X5	Wallets	Wallets	Negative correlation
X6	National Electronic Funds Transfer	NEFT	Positive correlation
X7	Immediate Payment Service	IMPS	Positive correlation
X8	Real-time gross settlement systems	RTGS	Negative correlation

Source Authors estimated

3.3 Methods

The study used “multiple linear regression equation” as follows:

$$\begin{aligned}
 Y1 = & \alpha + \beta1 * Cx - Txn + \beta2 * Mob - PMT \\
 & + \beta3 * Card - PMT + \beta4 * UPI + \beta5 * Wallets \\
 & + \beta6 * NEFT + \beta7 * IMPS + \beta8 * RTGS + \varepsilon
 \end{aligned} \tag{1}$$

$$\begin{aligned}
 Y2 = & \alpha + \beta1 * Cx - Txn + \beta2 * Mob - PMT \\
 & + \beta3 * Card - PMT + \beta4 * UPI + \beta5 * Wallets \\
 & + \beta6 * NEFT + \beta7 * IMPS + \beta8 * RTGS + \varepsilon
 \end{aligned} \tag{2}$$

Model Fit: Variables Are Set

$$Y_1 = \alpha + \beta1 * Mob - PMT + \beta2 * UPI + \varepsilon \tag{3}$$

$$Y_2 = \alpha + \beta1 * Mob - PMT + \beta2 * UPI + \varepsilon \tag{4}$$

For Accomplishment of the Objectives of the Study, the Following Null Hypotheses Are Set

- H01 = Customer Transaction has no positive effect on Cov-NC/Cov-DC.

- H02 = Mobile Payment has no positive effect on Cov-NC/Cov-DC
- H03 = Card Payment has no positive effect on Cov-NC/Cov-DC
- H04 = UPI has no positive effect on Cov-NC/Cov-DC
- H05 = Wallet has no positive effect on Cov-NC/Cov-DC
- H06 = NEFT has no positive effect on Cov-NC/Cov-DC
- H07 = IMPS has no positive effect on Cov-NC/Cov-DC
- H08 = RTGS has no positive effect on Cov-NC/Cov-DC.

4 Data Analysis and Interpretation

This part of the research shows the analysis of the research. The tables reflect on the results of the study. This section lays down the major results and analysis whether “Covid new cases and Covid death cases” in India has a significant relation with customer transaction, mobile payments, card payments, UPI, wallets, NEFT, IMPS and RTGS.

Table 2, revealed that the correlation between Covid-19 indicators and digital payment gateways. It signifies that the perfect positive correlation relationship between variables like wallets, card payments, RTGC, and customer transaction. The strongly positive relationship depicts between Covid-19 death cases, Covid-19 new cases along with mobile payments, UPI, NEFT, and IMPS. UPI stated that positive relationship with Covid-19 new cases- Covid-19 death cases-mobile payments, wallets with customer transaction, NEFT shows that positive relation with customer transaction, mobile payments, card payments, wallets. IMPS stated that positive relationship with customer transaction, mobile payments, card payments, UPI, Wallets, NEFT.

The moderate positive relationship identified between variables are mobile payments with customer transaction, card payments with mobile payments, UPI with card payments, wallets with mobile payments, UPI, NEFT with UPI, IMPS with Covid-19 new cases- Covid-19 death cases, RTGS with mobile payments. The weak positive relationship explained between the variables of UPI with customer, NEFT with Covid-19 new cases and Covid-19 death cases, RTGS with UPI. Further, the Covid-19 new cases, Covid-19 death cases show a weak negative relationship with the customer transaction, card payments, wallets, and RTGS.

Table 3, declared the relationship between dependent and independent variable. The dependent variable is Covid-19 new cases and independent variables are customer transaction, mobile payments, card payments, UPI, wallets, NEFT, IMPS and RTGS.

Table 3, declared the value of F-count, R square, Durbin Watson statistic, Beta, T-count and significant value. R squared (r^2), the Coefficient of Determination. It gives the percentage of the overall variation in y that the regression model can account for. When r^2 is 0.65, it suggests that the x-values can account for 65% of the variation in y-values around the mean. It also displays the Durbin Watson statistic. The DW test is the autocorrelation test in regression analysis. Here, James Durbin and Geoffrey

Table 2 Correlation of digital economic and Covid-19 indicators

Variables	Cov-NC	Cov-DC	Cx-Txn	Mob-PMT	Card-PMT	UPI	Wallets	NEFT	IMPS	RTGS
Cov-NC	1									
Cov-DC	0.97	1								
Cx-Txn	-0.20	-0.23	1							
Mob-PMT	0.69	0.72	0.38	1						
Card-PMT	-0.03	-0.09	0.67	0.58	1					
UPI	0.80	0.82	0.16	0.97	0.44	1				
Wallets	-0.02	-0.08	0.68	0.58	1.00	0.45	1			
NEFT	0.16	0.12	0.92	0.68	0.73	0.50	0.73	1		
IMPS	0.38	0.36	0.61	0.89	0.88	0.80	0.88	0.82	1	
RTGS	-0.19	-0.23	1.00	0.38	0.68	0.16	0.68	0.93	0.62	1

Source: Authors estimated

Table 3 Covid19 new cases and digital economics indicators

Dependent variable	Independent variable	Beta	T- Count	Sign	Explanation
Covid-NC	Constant	2,342,389	2.4068		
	CT	-0.327	-1.493	0.196	NS
	Mob-PMT	5.70	2.86	0.029	S
	CP	-0.311	-1.197	0.285	NS
	UPI	11.99	3.5659	0.015	S
	Wallets	-0.34	-1.379	0.226	NS
	NEFT	-0.269	-0.973	0.375	NS
	IMPS	-0.479	-1.145	0.304	NS
	RTGS	-0.321	-1.456	0.205	NS
	F-Count	11.30		0.015	S
	R Square	0.65			
	Durbin Watson	1.94			

Sources Authors estimated

Watson (Durbin-Watson Statistic) value is 1.94 suggest that there is no autocorrelation exist between the variables. The variable mobile payments and UPI have a significant value of 0.029, 0.015 respectively. This value is less than the significant level of 0.05, which indicates that the author rejects the null hypothesis for mobile payments and UPI. The other variable customer transaction, card payments, wallets, NEFT, IMPS, RTGS have insignificant values which are greater than 5% ($H1 > 0.196$), ($H3 > 0.285$), ($H5 > 0.226$), ($H6 > 0.375$), ($H7 > 0.304$), ($H8 > 0.205$). This variable has values more than 0.05 significance level that revealed that authors “reject the null hypothesis and accept the alternative hypothesis, which conclude that there is a significant relationship” between Covid-NC with mobile payments and UPI and there is insignificant relationship between Covid-NC with variable includes customer transaction, card payments, wallets, NEFT, IMPS and RTGS.

Table 4, When r^2 is 0.65, it suggests that the x-values can account for 65% of the variation in y-values around the mean. The value of Durbin Watson statistic is 1.94, which shows the positive autocorrelation between a dependent variable and independent variable. Further, the data declared the significant P-value of the relation between Covid-NC with the Mobile Payments and UPI. The significant value for Mobile Payments and UPI is ($H1 < 0.029$), ($H1 < 0.015$) respectively. In table p-value, it is less than 0.05 indicates that the author rejects the null hypothesis. This means there is a significant relationship between Covid-NC with Mobile Payments and UPI.

Table 5, explore the association between Covid-19 and digital indicators in regression analyses. The dependent variable is Covid-19 death cases and independent variable consist of the customer transaction, mobile payments, card payments, UPI, wallets, NEFT, IMPS and RTGS. Table 5, shows that the value of F-count, R square,

Table 4 Significant results of Covid19 new cases and digital economics indicators

Dependent variable	Independent variable	Beta	T-Count	Sign	Explanation
Covid-NC	Constant	2,342,389	2.40677	0.053	Significant
	Mob-PMT	5.70	2.86005	0.029	Significant
	<u>UPI</u>	<u>11.99</u>	<u>3.56587</u>	<u>0.015</u>	<u>Significant</u>
	F-Count	11.30		0.015	Significant
	R Square	0.65			
	Durbin Watson	1.94			

Sources Authors estimated

Table 5 Covid19 death cases and digital economics indicators

Dependent variable	Independent variable	Beta	T-Count	Sign	Explanation
Covid-DC	Constant	1,366,702	2.78	0.03	
	Cx-Txn	-0.30	-1.71	0.15	NS
	Mob-PMT	3.00	3.35	0.02	S
	Card-PMT	-0.38	-2.20	0.08	NS
	<u>UPI</u>	6.41	4.37	0.00	S
	Wallets	-0.39	-2.33	0.07	NS
	NEFT	-0.27	-1.24	0.27	NS
	IMPS	-0.59	-2.05	0.10	NS
	<u>RTGS</u>	-0.29	-1.63	0.16	<u>NS</u>
	F-Count	19.10		0.00	S
	R Square	0.76			
	Durbin Watson	1.98			

Sources Authors estimated

Durbin Watson statistic, Beta, T- count and significant value. As per regression model the Coefficient of Determination ($R^2 = 0.76$) give the percentage of the total variation in y. This value confirms that 76% of the variation of y-values around the mean is explained by the x- values. Further, Durbin-Watson statistic used to find out, there is no autocorrelation between variables. The value of DW is 1.98 to recommend. It is revealed that variable mobile payments and UPI have a significant value 0.02, 0.00 respectively. In this case, rejects the null hypothesis for mobile payments (H2) and UPI (H4) because the “p-value is less than the significant level of 0.05”.

The variable customer transaction, card payments, wallets, NEFT, IMPS, RTGS have significant values greater than 5% ($H1 > 0.15$), ($H3 > 0.08$), ($H5 > 0.07$), ($H6 > 0.27$), ($H7 > 0.10$), ($H8 > 0.16$). This value declared that the author fails to reject the null hypothesis because variables have values more than 0.05 significant level. The analyses conclude that Covid-DC with mobile payments and UPI has shown a

significant relationship with each other. The variables customer transaction, mobile payments, card payments, UPI, wallets, NEFT, IMPS and RTGS gave a result that there is no significant relationship with Covid-DC.

Table 6, The r^2 value is 0.76 which tell that “76% of the variation of y-values around the mean is explained by the x-values”. The Durbin-Watson autocorrelation regression model has the value of 1.98, which is called no-autocorrelation between variables. Additionally, the Table 6 gives the significant P-value of the relationship between dependent and independent variables. The Mobile Payments and UPI has significant value($H1 < 0.015$), ($H1 < 0.004$) respectively. The value is less than 0.05 declared the rejection of the null hypothesis. It concludes that Mobile Payments and UPI has a significant relationship with Covid death cases Fig. 2.

The charts give the result of the multiple regression model. the study covered the variables Covid new cases, Covid death cases, customer transaction, mobile payments, card payments, UPI, wallets, NEFT, IMPS and RTGS. This chart visualized that only two variable shows a significant relation with Covid-NC and Covid-DC.

Table 6 Significant results of Covid19 death cases and digital economics indicators

Dependent variable	Independent variable	Beta	T-Count	Sign	Explanation
Covid-DC	Constant	1,366,702	2.784718	0.031798	Significant
	Mob-PMT	2.999807	3.346484	0.015487	Significant
	<u>UPI</u>	<u>6.408082</u>	<u>4.36986</u>	<u>0.00472</u>	<u>Significant</u>
	F-Count	19.09567		0.00472	Significant
	R Square	0.760915			
	Durbin Watson	1.98			

Sources Authors estimated

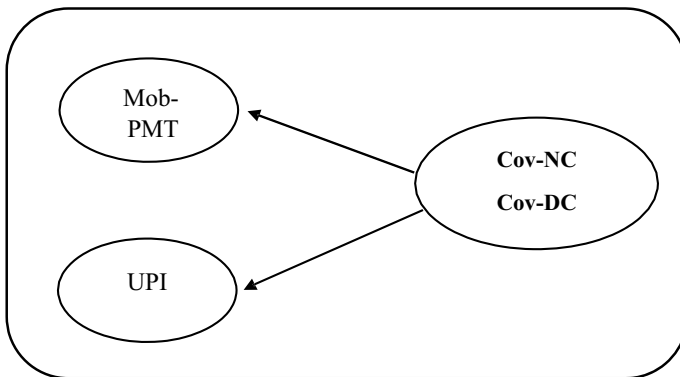


Fig. 2 Model-fit of corona virus and digital economic. Sources Authors estimated

5 Conclusion

India's digital economy is examined in the paper in light of the Covid-19 outbreak. The variables covered for this research are customer transactions, mobile payments, card payments, UPI, wallets, NEFT, IMPS, and RTGS. The impact of Covid-19 on variables identified by applying the statistical model of multiple regression. According to data, it reveals that only two variables Mobile Payments and UPI have a significant relationship with Covid-NC and Covid-DC. It concludes that usage of mobile payments and UPI increased with increment in the Covid-19 new case as well as death cases. The research clear on the point that the digital economy gives positive response during Covid-19. The impact is minimal in a few digital payments gateway, but it is positive. Finally, the result has shown the positive regression line from mobile payments & UPI with Covid-19 new and death cases tell that due to the spread of Covid-19, people strongly follows government rule of social distancing. They have done all the possible work from their home through a mobile application or with digital gadgets. At last, just like every coin has two sides, does Covid 19. On the one side, Covid-19 pandemic disrupts the whole economy another side, it is also true that it will lead our country people towards digital management.

This study shows how digital finance may be used to increase energy efficiency, and it encourages policymakers to use this technology to advance ecological governance and achieve high-quality economic development. The depth of use, level of digitalization, and scope of coverage of cities are the three main factors that determine how digital finance affects green innovation in cities.

6 Limitations

The sufficient digital transaction data is not available on the RBI website. So, collecting data from an authentic platform is very challenging. Yet, the information is not sufficient to declare any conclusion. The study is limited to a short period. The interpretation is based on one statistical method. It can be justified by using different approaches. The Covid 19 pandemic is still going on, so the results will vary in the future.

7 Future Implications

The digital economy is created by intellectual people. It provides ease of every process and lots of opportunities and challenges. The Union Budget of the year 2021 circulates a soft copy of budget to parliament members. It is stat that the government of India immensely promoting digital platforms. As a researcher, we have several areas to focus in the digital era. The present study suggests that in the future if long-term

investigations of the Covid-19 pandemic with digital economic indicators give a significant adequate judgment. Also, the daily digital transaction data could be giving more accurate results. Another statistical model can be applying and compare the analyses for a more satisfactory outcome.

The different relationship might be established, by increases the significant level from 5 to 10%. Another important area of research is the emotional perspective of people towards digital platforms. It is important to study sentiment of the people regarding digital gadgets during Covid 19. The government response on digital things during Covid 19 outbreak will be studied. The detailed elaboration on the consequences of being digital also covers in further study. Additionally, health is wealth—according to statement, it would be further incorporated digital platforms impact on people health. The Covid 19 also related to the health of the people. Due to the spread of the virus people used digital platforms but using digital platforms also has its consequences regarding health. It is like a vicious circle that needs to cover in future reserch. The Covid 19 impacted on whole education system. The children between the age of 5 to 15 years teaching by a teacher through an online application. It might have two effects, they are learning and become intelligent or making their parents fool by playing games, etc.

This is a big issue that can be a important for a researcher to focus on because the child of today will be the future of country tomorrow. The impacts on the mind of students and teachers will be analyzed. How the education system evolved with time is also described in further research. Moreover, in the digital economy the issue of data piracy also arises that highlighted another great part of the research for the safety of the digital consumer. The protection of people regarding sharing of digital information is also very important in future work. Finally, it would end up saying that there are lots of opportunities in the area of research. The surge of the digital era in the situation like Covid 19 opens the gates of much new upcoming research work. Now, it is the task of the researcher to solve the problem faced by the people in the country.

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Literature Review for Educational Data Mining Systems—Fahad Bin Sultan University Case Study



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Abstract The advancement of the learning environment is significantly facilitated by the critical role played by Educational Data Mining through its contributions of state-of-the-art methods, techniques, and applications. The utilization of machine learning (ML) and data mining techniques in exploring and examining educational data has yielded valuable tools for comprehending the student learning environment in recent times. Contemporary academic institutions operate within a context that is marked by intense competition and intricacy. The examination of performance, the provision of superior education, the formulation of tactics for ascertaining the aptitudes of learners, and the identification of future measures are among the predominant difficulties encountered by universities. The focus of the prediction process has been emphasized on analyzing the performance of students using a multitude of parameters. This paper presents a significant contribution in the form of a newly introduced dataset containing student performance data pertaining to the Fairbanks School of Business and Public Administration. This dataset incorporates a range of parameters, including demographic information, academic history, and performance indicators. Utilizing this dataset, we conducted a comprehensive examination of FBSU understudy performance and applied different machine learning and information mining methods, including Support Vector Machine, Choice Woodland, Arbitrary Timberlands, and Calculated Relapse, for classification. Our examination gives bits of knowledge into the variables that altogether influence understudy execution, such as socioeconomics and scholastic foundation. Our findings can inform procedures for assessing student performance and for improving teaching and learning processes in academic institutions.

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1 Introduction

Learning Management System (LMS) for educational purposes has increased rapidly, particularly in higher education institutions. LMSs are web applications that provide a wide range of instruments and tools which ease and facilitate the educational process. The tools include materials, online exams, quizzes, assignments, attendance, and assigning grades. On the practical side, instructors can use this instrument to furnish timely student feedback and develop proper interventions. All procedures, functions, and steps in the e-learning system are recorded and stored automatically, which officials could examine to assess the students' performance. Examining and foretelling student grades using psychometric techniques (e.g., tests) are known as knowledge assessment methods, which theorists originally proposed as static data analysis tools. Very developed ML models are dependent on temporal modeling or factor analysis.

Researchers with IT and computer engineering backgrounds are concerned with diagnosing students' performance and their abilities to utilize those methods [11, 34]. Most of the ML methods and strategies have been utilized in developing adaptive educational atmospheres, which look to detect students' GPAs and impressive knowledge about students' performance. Educational data mining is an emerging spot of study and analysis that implicates extracting styles and anomalies from educational databases to improve learners' awareness and abilities, educational performance, and examination of students' learning process. Evaluating students' performance is a challenging process that cannot be reduced to grading [5, 27].

The proposed causes that impact student performance at FBSU are their ability to communicate properly with colleagues and lecturers, engagement, and collaborative learning. Education is no longer a one-time event but a lifelong venture because those working lives are very long and fast-changing. Therefore, people are required to uphold learning after their graduation. This study uses deep learning algorithms to assess learners' progress in any scholarly setting (university, school).

In the learning analytics and educational data mining communities, part of the student performance prediction problem has been explored in terms of the student dropout and completion, forecast problem, which is a significant subclass issue of the student performance prediction problem. An example of the earliest predictive analytics applications in higher education is the course signals system at Purdue University.

Nevertheless, educational organizations and institutions have recorded the manner of building their models, integrating them into LMSs, and how they are executed. Fortunately, several empirical studies were conducted in this field [2, 25–27, 33–36] conducted a study that examined students' click frequencies and time in the LMS with moderate accuracy and their relations with the final course assessment. Moreover, [3] examined student online learning behaviors and demographic information that were extracted from the Massive Open Online Courses (MOOCs). The researchers indicated that student clickstream actions were strongly related with academic success.

2 Background and Significance

2.1 Preprocessing ML

Preprocessing data for ML models is a substantial skill for any data scientist or ML engineer. It is a procedure for transferring undeveloped plain data into structured ones. In other words, when data is collected from several recourses, it is gathered properly for investigation. The data format must be proper to obtain the most promising results from the generated model in ML projects. Specific machine learning models require specific data format such as the Random Forest (RF) method which does not identify invalid values. As a result, to run the RF algorithm, null values must be handled in the original unrefined data collection. Another point is that the data set should be organized so that many ML and DL algorithms can be trained with the best selection.

2.2 Cleaning Data

The preprocessing of data is an essential aspect of each machine learning (ML) project. Numerous statistical analyses and data visualization methods can be employed to explore tabulated data and identify possible data cleansing procedures. Prior to delving into more sophisticated techniques, it is imperative to execute preliminary data-cleaning procedures for any machine learning (ML) undertaking. These concepts are often underestimated by experienced machine learning practitioners due to their apparent simplicity. Notwithstanding their significance, the failure or production of excessively favorable performance outcomes of models should not be overlooked. In this paper, the essential techniques for performing data-cleaning operations will be elucidated.

2.3 Missing Data

Disparities are frequently present in empirical data. Numerous factors can contribute to the presence of missing data, such as encompassing instances of unrecorded observational information or deliberate manipulation of data. The loss of data is of utmost significance as numerous machine learning algorithms exhibit limited capacity in dealing with incomplete data. The present study showcases the utilization of Python for the effective handling of lost data in the context of machine learning.

2.4 Dimensional Reduction

The process of dimensionality reduction refers to a collection of techniques that serve to reduce the number of variables contained within a given dataset. The inclusion of additional input features in a predictive modeling task tends to increase the complexity of the model, typically recognized as the curse of dimensionality. High-dimensional statistical analysis and dimensionality reduction methods are frequently employed to facilitate data visualization. However, these approaches can be employed in practical machine learning scenarios to streamline the processing of a classification or regression dataset and enhance the suitability of a predictive model. This article aims to elucidate the concept of dimensionality reduction in machine learning.

3 Modeling

3.1 Logistic Regression (LR)

The LR machine learning classification is a technique that is commonly employed in predicting the probability of an event associated with a categorical dependent variable. The dependent variable in LR is a binary variable containing data coded as 1 (yes, and success) or 0. (No, and failure). In other words, the LR model predicts $P(Y = 1)$ as a function of X .

3.2 Random Forest (RF)

The random forest algorithm is a type of ensemble machine learning method. Due to its remarkable performance in diverse regression and classification predictive modeling tasks, the machine learning approach in question is one of the most prevalent and extensively employed techniques [41, 42]. Furthermore, the process is uncomplicated in nature as it solely entails a limited number of essential hyperparameters and optimal algorithms for personalizing said hyperparameters.

3.3 Decision Forest (DF)

A DF may be regarded as a graphical representation or layout that facilitates the process of selecting a particular course of action or exhibiting a statistical probability in a given situation. Each branch of the decision forest embodies a prospective decision, outcome, or response. The terminal branches of the tree depict the outcomes stemming from a specific course of action.

3.4 Support Vector Machine (SVM)

Support Vector Machine (SVM) is a machine learning algorithm that is guided by supervised learning principles and has the ability to conduct classification, regression, as well as outlier detection tasks [10]. The linear Support Vector Machine (SVM) classifier discerns between two classes via the use of a linear boundary. In accordance with standard classification methodology, data points located on one side will be designated as belonging to one particular class, whereas those situated on the opposite side will be assigned to a distinct, second class. Although the statement may appear facile, the selection of a line becomes a daunting task since there exists an infinite array of possibilities. The present discourse pertains to the utilization of the LSVM algorithm in a given scenario [6]. The LSVM algorithm selects a discriminant hyperplane that separates two classes while maintaining maximal distance from the closest data points. Within the context of Support Vector Machines (SVMs), the designation “support vector” pertains to a pair of position vectors originating from the origin and extending toward the points composing the decision boundary.

A comparative analysis of machine learning algorithms can be conducted to determine their relative efficacy in predicting student performance outcomes. Insufficient investigation regarding alternative methods of forecasting and crucial determinants of academic excellence among students presents a major challenge, particularly in the MENA region. The capacity to forecast student performance in the educational field is significant, as it can aid in the enhancement of their academic progression by analyzing their present standing. The implementation of a discerning framework of educational data mining is a crucial step in the application of data mining principles and techniques to the field of education.

4 Literature Review

The utility of the data mining technique is multifarious and extends across various domains of the public and private sectors. Several industries employ data mining techniques to extract valuable information from vast databases in order to reduce costs, enhance research, and increase sales. Such industries include banking, medicine, insurance, retailing, and Educational Data Mining (EDM) [14–16]. The advent of advanced computer technology has led to simplified procedures for gathering, retaining, and manipulating data. The utilization of data mining is prominently advantageous in the discipline of educational data mining (EDM) [4, 37–40]. The field of educational data mining is currently in the process of emerging as a discipline for the purpose of extracting informative insights from a vast range of academic databases. The primary objective of the application of Educational Data Mining (EDM) is to discern patterns within educational data, with the aim of advancing educational qualifications.

Due to the study's scope, related studies proposed methods for solving student performance. Reference [1] discussed data analysis models like ANN farthest first and DT classification. Reference [5] proposed Kmean clustering. Uses initial centroids, fewer iterations, longer time between them. Reference [6] proposed a privacy-preserving K-means clustering algorithm for distinct sites with distinct features for a shared set of entities, over vertically partitioned data. Reference [7] used K-means clustering to predict student achievement.

Assessment criteria for students, such as quizzes and exams, should be communicated by the class adviser before the final test. This research can help lower dropout rates and improve student performance. Reference [8] showed how data mining can analyze and determine the significance of categorization test results. Mining tools, including classification, clustering, association rules, and NN, can be accessed through an open-tool that can connect or be imported from Java code. Reference [9] Evaluated classification algorithms; Decision trees, SVM, and Naïve Bayes. Naïve Bayes had 77% accuracy, outperforming the others. Reference [10] predicted student performance online. SPDN was used to predict student performance in a course using online learning records and network logs. They reported an accuracy of 73.51%. Reference [11] propose using an online pool and student features to predict performance. Reference [12] predicted academic achievement in higher education using Moodle data. The study tested whether Moodle data can predict student success in courses. Classifier 65% accurate on course data, 92.2% on passing prediction. The initial six weeks' data was poor, requiring an extension of collection. Reference [13], a report analyzed online data to assess the impact of digital technologies on e-learning success. Significant indicators of achievement across courses were identified. Students' achievement was assessed with Social Network Analysis, K-Means clustering, and Multiple Linear Regression. Results revealed a strong link between performance and use of digital materials from the e-learning platform [5]. Reference [14] introduced a new approach for teaching educational data mining techniques on student datasets. The researcher used data mining techniques to analyze student data and found end semester performance. Decision trees predict program outcomes; Association rule mining studies students' capability were used in this regard. These algorithms were used also to forecast and analyze performance, while visual analytics illustrate students' analysis. Reference [15] studied high school student failure causes using data mining and clustering analysis. Data was split into three clusters and analyzed to identify factors affecting student failure and relationships. The survey results are presented, factoring in efforts to reduce failure causes. Reference [16] explained the significance of predicting academic performance and assessing students early in each semester. They utilized data mining classification to group students by their initial course performance. The teacher can predict final attainment using a Neuro-Fuzzy classifier on first-semester data. Reference [17] examined how academic accomplishment could be anticipated utilizing Moodle information from an encourage instruction environment. Educational providers are progressively being pushed to utilize their data warehouses to improve their students' instruction and learning comes about. A well-known source of this data is learning administration frameworks, which permit providers to manage a virtual stage or

region where understudies may take an interest in learning materials and exercises. This inquiry pointed to deciding if information from the learning administration framework Moodle can be utilized to estimate students' scholastic accomplishment in a mixed learning environment. All through the course, the discoveries have shown that Moodle information made it doable to sensibly expect students' alphabetic grades and whether they would pass or come up short. All calculations performed altogether better than the no-information rate on these errands, with irregular woodland giving the foremost extraordinary execution. Be that as it may, it is basic to find out whether an understudy is at the hazard of coming up short the course early on for common-sense purposes. Reference [18] sought to create an integrated model for analyzing understudy information collected from e-learning frameworks to assist instructive teach anticipate understudy execution. The thought has been displayed already by researchers from different viewpoints. It is frequently clarified utilizing qualities such as understudy prompting and observing.

E-learning is frequently respected as the foremost successful advanced innovation in instructive settings. Reference [19] expressed that the objective is to explore the utilize and impact of advanced innovations on an e-learning stage. The think about was done utilizing the Moodle learning administration framework for this reason. The data from the e-learning stage was experimentally analyzed to distinguish critical understudy victory measurements over numerous courses. Assess students utilizing different strategies, counting social organize examination, K-Means clustering, and numerous relapse. The discoveries illustrated a significant relationship between students' accomplishment and their utilization of computerized directions materials accessible by means of the e-learning stage. This considers tried the SNA procedure, K-Means clustering, and numerous LR within the setting of e-learning. The discoveries demonstrated that students who come to the same or proportionate levels of accomplishment utilized comparable instructive assets.

Besides, the results indicate that all courses indicated a solid positive relationship between the position within the arrangement and student victory. Consequently, the results showed that the finest understudies are within the center of the organization measured by eigenvector centrality. Moreover, it can be illustrated that the tendency of the analyzed information appears that the understudies with comparative execution are within the same cluster and the concentration of the utilization of assets connects with the accomplished scores.

The LR show represents the association between independent factors, which may be continuous, categorical, or parallel. Foreseeing variables influencing students' scholarly execution is basic in therapeutic education. It allows for actualizing of strong programs to play down dropouts or falling flat grades [20]. This ponders points to make a calculated relapse demonstrate to anticipate first-year restorative students' execution utilizing scholastic, mental, and word-related characteristics and learning and self-motivation strategies. A calculated relapse show for anticipating scholarly execution among first-year restorative understudies, unequivocally recognizing people at the scholastic chance, is a productive tool that empowers strong discoveries for appropriate decision-making. Reference [21] utilized the arbitrary timberland to anticipate students' execution in an E-Learning environment. After

preprocessing the dataset, it was sent out to the MATLAB computer program. Code was created to apply the RF strategy and assess its adequacy in anticipating students' scholarly accomplishment on the dataset. The show was prepared and approved utilizing ten times cross-validation, and after that its execution was decided to employ a perplexity framework. The inquiry about tries to decide the Irregular Woodland classifier's prescient exactness. The Arbitrary Timberland algorithm achieved a forecast exactness of 76.9% after experimentation. Alongside expected accuracy, the Random Forest strategy was examined on extra measurements such as exactness, review, and F-measure. Reference [22] examined and analyzed school students' execution utilizing classification strategies. It appears that the arbitrary woodland calculation has the most noteworthy execution of other calculations. The accuracy obtained by the irregular woodland calculation is 89.23%. The creator too proposes that clustering procedures and affiliation run the show mining may offer assistance increment execution. Reference [23] utilized SVM for the prediction of understudy execution. The data tests were collected from the guides and understudies straightforwardly, and they were fed into the framework for apportioning and classification. We executed the rules characterized within the SVM calculation to foresee the students' last grades. The results were obtained and checked with the initial set of data. Reference [24] conducted an investigation in which machine learning strategies were utilized to figure students' academic success in engineering courses. The input highlights included course grades from all semesters in this study, and the output variable was exam scores. The researchers observed that SVMs are reasonable for foreseeing a student's progress while multilinear regression is reasonable for determining the execution of all learners in a course. Reference [25] Utilized a decision tree for anticipating student progress in higher education institutions. This study points to investigate and test the method of applying the decision tree calculations with a survey for students to look for the components that influence student success and failure. Data mining calculations, particularly choice tree algorithms, can be the finest arrangement for anticipating students' performance since they provide exact results and allow the faculty and students a clear overview of their actual performance. Based on the model results, it can be said that a few components (traits) can affect the accuracy of the result tree and generally understudy academic execution. The attribute evaluator calculations can discover closely related questions that negatively or positively influence students' progress. The survey contains numerous insignificant questions found by the data-mining calculations. Broad data sets and the number of attributes in the data set influence the decision tree's accuracy. The model can be utilized by students and academic staff to choose which questions/answers will improve scholarly performance and move forward the success of institutions. Reference [26] adapted a new model for estimating students' academic performance by employing a K-Means and Choice tree algorithm to diminish dropout rates and boost understudy execution. Reference [27] employed database frameworks and decision tree approaches to look at students' performance. Reference [28] found that few graduate students have the required market skills, to use machine learning tools to measure and improve undergraduate performance. Automation of student activities can provide insights into academics, knowledge levels, and relationships [29].

5 Student Performance Prediction and Classification

Accurately forecasting the academic achievement of students has emerged as a pressing priority for the majority of educational establishments and institutions. The aforementioned aspect is of utmost importance in facilitating students who are deemed vulnerable to negative academic outcomes by utilizing effective intervention methods. Additionally, it plays a significant role in maintaining their academic progress, while concurrently providing them with exceptional educational prospects and enriching the academic institution's prestige and standing. Reference [30] study shows the ability to train and model a small dataset with high accuracy. The study also explores finding important patterns using visualization and clustering methods. Various machine learning techniques were used to create a precise model for analyzing indicators. The results proved the clustering algorithm's skill in identifying crucial indicators in small datasets. The study found that support vector machines and discriminant analysis are effective for training small datasets and achieving acceptable classification performance. Reference [31] found that student performance can be predicted with the course and LMS data, past performance, and student characteristics. Using various methods like logistic regression, SVMs, DTs, ANNs, and a Naïve Bayes Classifier (NBC), student characteristics and past performance are analyzed to predict at-risk students in the next course. The study used various input features and found the NBC algorithm had 85% accuracy. Reference [32] studied student performance classification. The technique uses trained data to label unknowns. Data includes training and testing sets. Experts label training data for classification. Classification trains and tests a model on new data by generating equations or rules from the training dataset using an algorithm. Apply the model to new data to identify labels and use them on test data. Reference [33] analyzed school students' performance and found that the random Forrest algorithm performed the best among other techniques. Random Forrest algorithm accuracy is 89.23%; clustering and association rule mining can improve performance.

6 Methodology

This study applied supervised ML algorithms to forecast students' academic performance using FBSU e-learning data. It involved two stages: data preprocessing and comparison of results. Stage 2 classified commonly used algorithms per ML technique. Figure 1 shows the proposed methodology's deployment framework, consisting of the three main components.

1. **Data Preprocessing:** this is an essential step in the data mining process. If irrelevant and redundant information exists or noise and unreliable data exist in the data samples, cause knowledge discovery during the training phase generates unexpected results. This step removes noise words such as stemming words. The

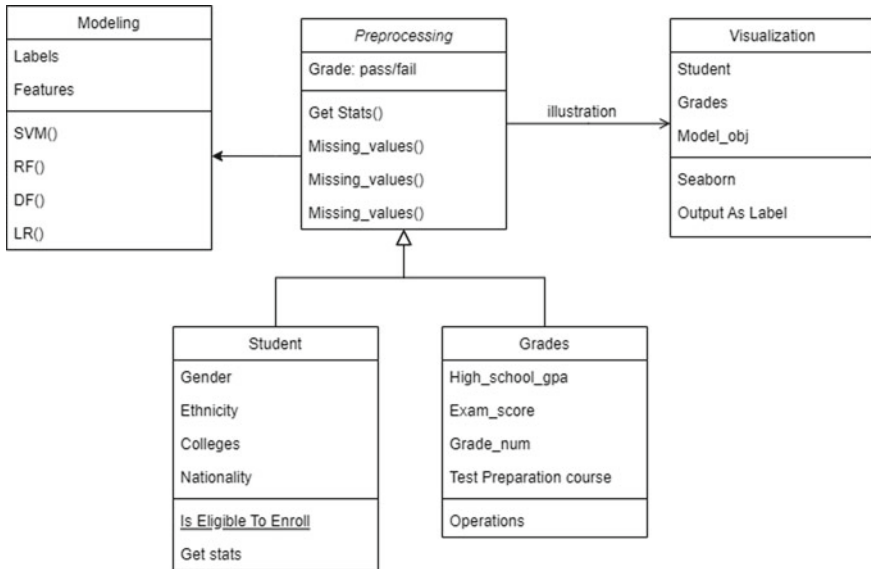


Fig. 1 The class diagram of the proposed methodology

dataset was cleansed by preprocessing the student data by applying a suitable data mining method, thus resulting in expected knowledge.

2. Dataset: The dataset was split into a training and test set of 80%-20%, respectively. The training set was used to build the models, and the test set was used to check the accuracy.
3. Models: The algorithms used in this study were RF, SVM, DF, and LR.

The presented data in Table 1 consists of a sample extracted from the FBSU dataset. The dataset utilized in this study was comprised of 741 student records possessing eight unique attributes, and will henceforth be referred to as the FBSU dataset. The students were divided into various regions of Saudi Arabia on the basis of:

- Group A: Northern Region.
- Group B: Western Region.
- Group C: Central Region.
- Group D: Southern Region.
- Group E: Eastern Region.

All students are divided based into Saudi and non-Saudi nationals. The Test Prep Course (FYP) considers a placement test rate of over 50 as completed. Otherwise, Exam_score (Ex) and Grade_num (GR) are used to calculate GPA.

Data preprocessing is essential for ensuring the dataset’s quality and reliability. It includes removing irrelevant data, handling missing fields, and modifying data as

Table 1 Dataset sample

Gen.	Et.	Colleges	NA.	FYP	GPA	Ex.	GR.
F	D	Compute	Not	Done	99.9	44.1	90
M	B	Engineer	Saudi	None	69.8	28	81.1
F	A	Business	Not	None	83	30.3	90.6
F	C	Human	Saudi	Done	77.2	29.6	68.9
M	A	Engineer	Not	None	80.4	23	58.8
M	E	Engineer	Saudi	Done	81.7	22.2	72.7

needed. To simplify the data set, remove irrelevant variables and analyze relevant features based on the task and goal of data mining.

In the following steps in the dataset, there are two stages first stage training (80%) and second-stage testing (20%) data, every model (SVM, RF, DF & LR) will receive data from testing and training after using one model as shown in Fig. 2.

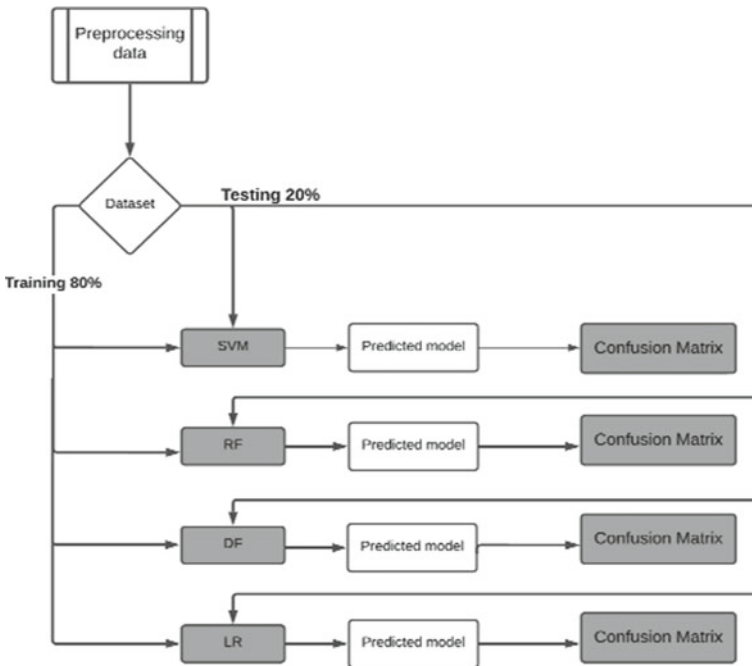


Fig. 2 The proposed model

7 Results and Discussion

This section evaluates the methodology and software used in the study. First, the preliminary experiment is evaluated with automated test cases data generation. Second, the model is evaluated. Table 2 shows the number of null values for each attribute in the dataset.

Figure 3 shows that the students were divided into five groups based on their academic departments at the FBSU, which was the basis for their groupings.

Table 2 Check the null value

Feature	The number of null values
Gender	0
Race/ethnicity	0
Colleges	0
Nationality	0
Test preparation course	0
High_School_Gpa	0
Exam_Score	0
Grade_Num	0

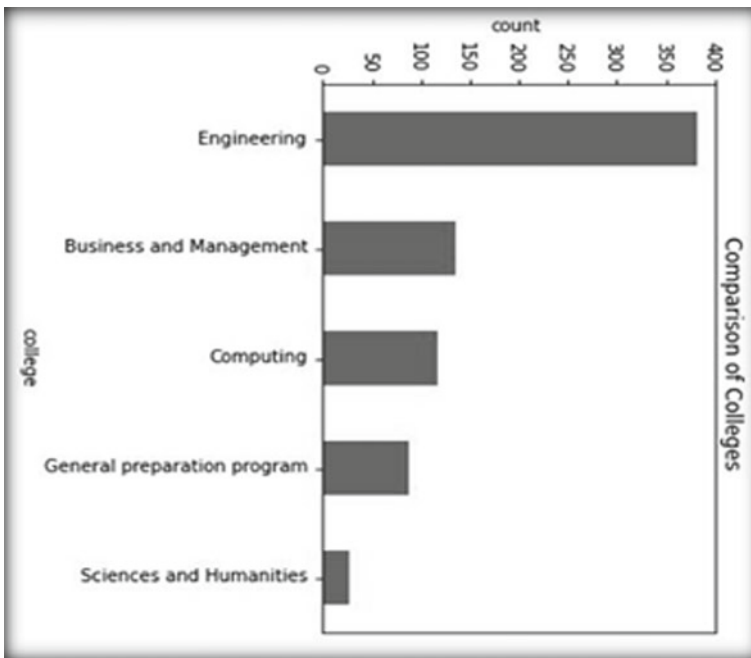


Fig. 3 Visualizing the colleges

Regarding the nationality, the participants of the study were categorized based on the Saudi nationality. Therefore, there were Saudi and non-Saudi students as it depicted in Fig. 4 which shows that the majority of students at FBSU were Saudi.

In Fig. 5, the number of male and female students by location and nationality may be further broken down.

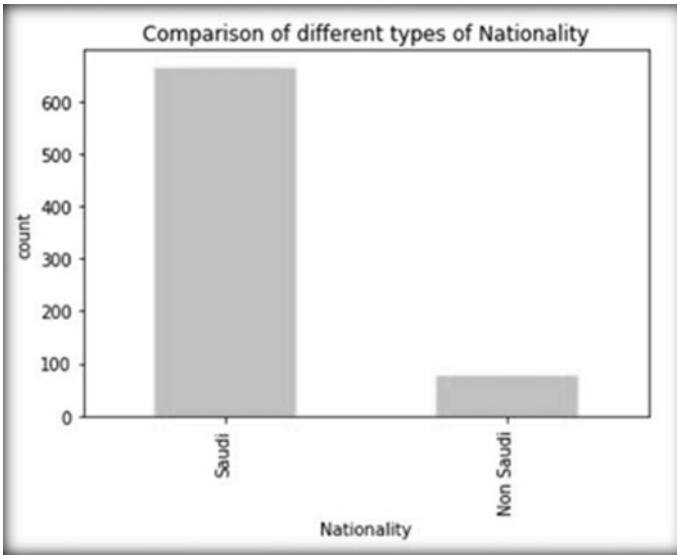


Fig. 4 Visualizing different types of nationality

Fig. 5 Comparison of gender versus region/nationality

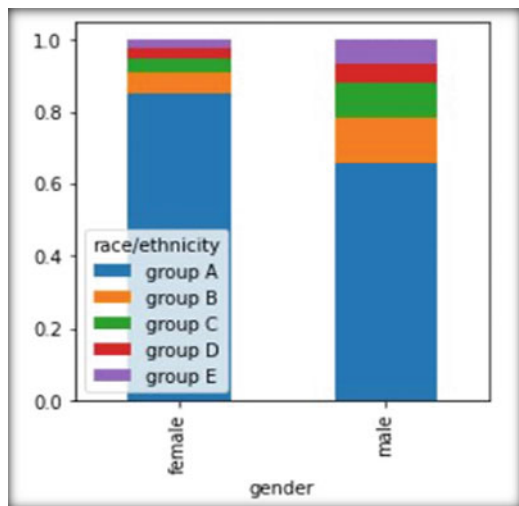


Figure 6 compares student registration at the university by region, nationality, and college, revealing the total number of enrolled students.

It is noteworthy to observe, as depicted in Fig. 7, that each student who attains a test score exceeding 50 is successful in passing the Foundation year.

The comparison of high school GPA, placement test GPA, and overall GPA among students who have either passed or failed is presented in Fig. 8.

The dataset was partitioned into two distinct subsets, namely training and testing, with a ratio of 80% to 20%. Eighty percent of the data samples were allocated

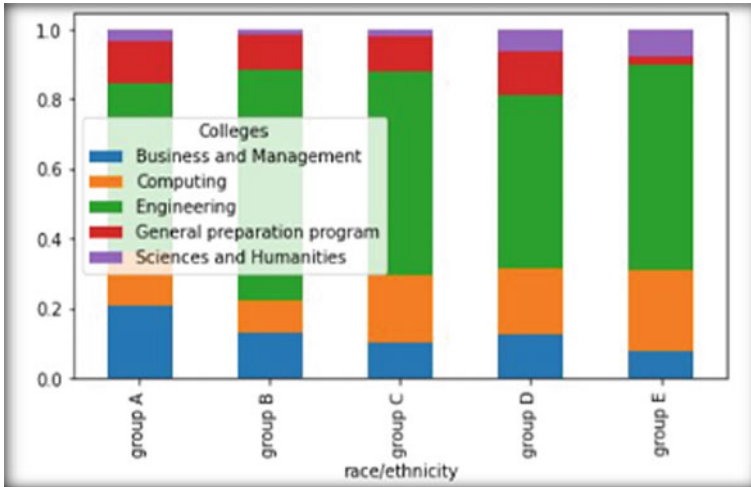


Fig. 6 Comparison of region and colleges

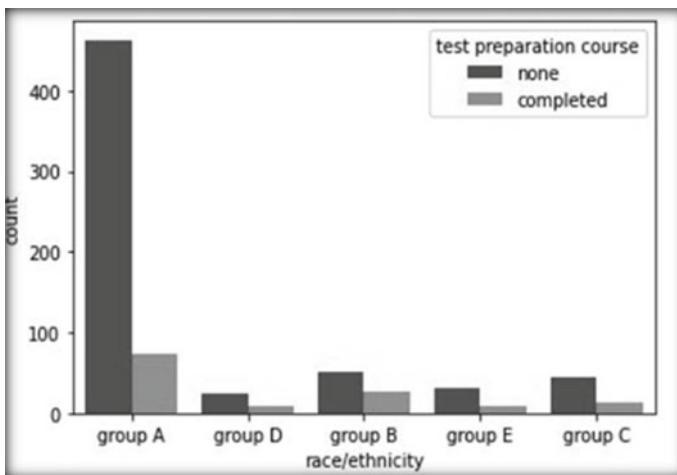


Fig. 7 Comparison of region/nationality and test preparation course

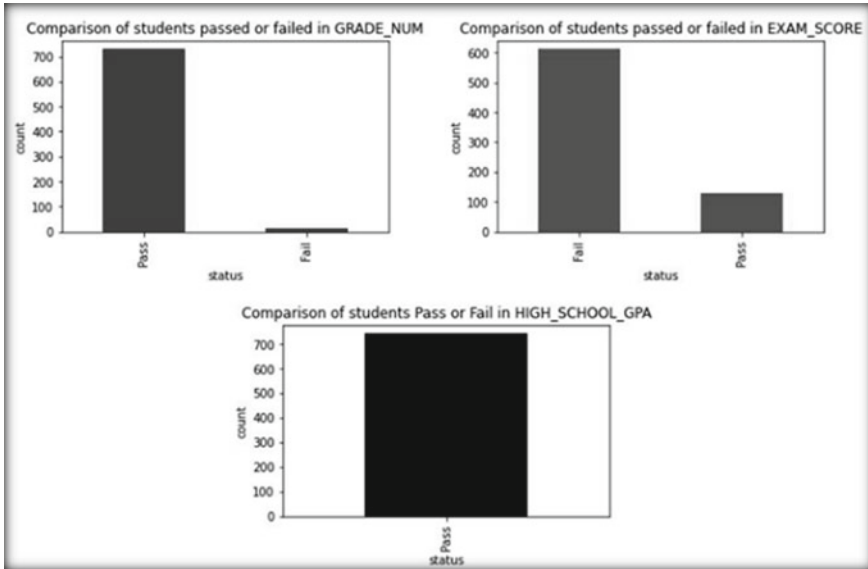


Fig. 8 Comparison of student results

for model training, whereas the remaining 20% were utilized for the purpose of evaluation. Furthermore, prior to the train-test split, the dataset underwent a shuffling process, which facilitates the enhancement of algorithmic performance. The performance indicators of accuracy, precision, recall, and F1-score were evaluated in relation to each model that was trained.

The primary objective of this study is to forecast student academic performance through the utilization of data sourced from the Student Information System (SIS). Machine Learning has emerged as a formidable technique for analyzing data by leveraging cutting-edge algorithms. Following the completion of pre-processing procedures, data summarization, and exclusion of null values, the subsequent phase entailed the application of machine learning-based modeling on the suitably prepared dataset. To facilitate the development of the models, the dataset was partitioned into distinct train and test sets. The models’ performance was evaluated in an unbiased manner by assessing them on data that was not utilized in the training process.

LR could be a machine learning classifier that’s utilized to estimate the probability of a categorical subordinate variable. As shown in Table 3, the impact of utilizing this methodology is as takes after.

Table 3 Logistic regression

	Accuracy
Training	0.98
Testing	0.96

A decision forest is a chart showing possible actions and outcomes. Tree branches represent different choices or reactions. The tree’s far branches show the outcome of decision-making. This is the algorithm’s output in Table 4.

SVM is a machine learning technique for classification, regression, and outlier identification. Table 5 shows the results of the described method.

The Random Forest algorithm is a type of ensemble technique in machine learning. With regards to classification and regression predictive modeling tasks, it has widely been acknowledged that this machine learning method exhibits exemplary performance, thereby justifying its widespread adoption. Upon implementing the procedural approach as depicted in Table 6, the pertinent outcome is attained.

As demonstrated in Table 7, all algorithms have resulted in a significant rise in error rate. The decision forest technique, on the whole, had higher accuracy rates than other methods.

Table 4 Decision forest

	Accuracy
Training	1.0
Testing	0.99

Table 5 Support vector machine

	Accuracy
Training	0.96
Testing	0.96

Table 6 Random forests

	Accuracy
Training	1.0
Testing	0.98

Table 7 Overall accuracy results

Models	SVM	RF	LR	DF
Training	0.96	1	0.98	1
Testing	0.96	0.98	0.96	0.99

8 Conclusion

Forecasting students' performance helps improve learning and teaching. This paper reviews prior research on the topic. To predict student success, data mining methods analyzed secondary school GPA, placement test score, and exam GPA. Groups were split by location and nationality (Saudi/non-Saudi). A study compared four classification approaches in statistics (logistic regression, decision tree, random forest, and support vector machine). Overall, decision forest had the highest accuracy rates. Several variables may impact the result tree and academic success.

The study on predicting student performance has implications for improving teaching, but further research can build upon it. Researchers can explore additional factors and use advanced machine learning to forecast student performance. Researchers can investigate model generalizability and effectiveness in educational settings and improve student outcomes.

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Social Factors Affecting Customers' Orientation to Islamic Banks



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Abstract The study is carried out for the purpose of examining the link between peer influence and religious motives as independent variables and bank customers' orientation towards Islamic banks by applying the Social Influence Theory. The questionnaires were distributed to Southern West Bank individuals using random sampling methods. A total of 204 valid questionnaires were returned for analysis. Also, the analytical procedure employed was partial least square analysis (PLS). Analysis of data involved throughout southern part of West Bank of Palestine region indicates the peer influence and religious motives have a significant positive relationship with bank customers' orientation towards Islamic banks. The outcome from the current study extended evidence for Islamic banks administration to maximize bank customers' loyalty.

Keywords Religious motives · Peer influence · Customers' orientation · Islamic banks · Social influence theory

1 Introduction

Islamic Banks are increasingly recognized for their significant role in modern economies, performing essential functions that profoundly impact income distribution, economic activity, and cost levels within a country [2, 4, 12]. They are key pillars in economic development established by current empirical studies that highlight the

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value of an efficient, effective, and high-performing financial system in fostering economic growth, a necessity within Islamic and Arab nations [24, 34, 42].

Given these findings, it becomes clear that economic development necessitates the engagement of all societal segments in investing in economic projects that benefit the investors and society at large [16, 44]. This includes the creation of job opportunities, tax contributions, and more. However, some societal groups may resist financing through commercial banks due to religious or ideological beliefs that reject interest-based dealings in accordance with Sharia principles [9, 38, 47, 51]. To cater to these beliefs, many governments and economic bodies have turned towards Islamic finance, a shift evidenced by increased international collaboration among Islamic and Arab countries to discuss the establishment of Islamic banks [4, 9].

The First International Conference on Islamic Economics, hosted by King Abdul Aziz University in Makkah, Saudi Arabia, in the early 1970s, catalyzed this shift. The conference led to establishing of the first commercial Islamic bank, Dubai Islamic Bank (DIB), in the UAE in 1974 [3]. Since then, Islamic banking and finance have experienced rapid growth in various countries worldwide, including Turkey, Egypt, the United Kingdom, Bahrain, Pakistan, France, Indonesia, Kuwait, and more. Over the past several decades, the Islamic banking industry has become one of the fastest-growing sectors globally [5–8].

Examining the situation in Palestine, it becomes evident that both commercial and Islamic banks are relatively new entities. Following the Paris Economic Agreement, they only began operations after establishing the Palestinian Monetary Authority in 1995. Notably, Islamic banks have attracted considerable attention since their inception, receiving significant support from the Monetary Authority due to their recognized potential impact on the development of the Palestinian local economy. This support includes a dedicated unit within the Banking Control Department to oversee the activities of Islamic banks [33–36]. However, their market share remains modest at only 17.6% as of 2020 according to the Association of Banks in Palestine [28, 35].

Therefore, in Palestine, the comparatively low market share of Islamic banks necessitates further research into the social factors influencing customers' choice of banking. Such investigations can provide valuable insights to help increase the market share of Islamic banks and, consequently, their contribution to economic development. Despite being a Muslim-majority country with customs and traditions derived from the Islamic religion, the inclination towards Islamic banking in Palestine remains relatively weak [16, 17, 53].

This study aims to offer both theoretical and practical contributions. Theoretically, it explores the relationship between peer influence, religious motives, and customers' inclination toward Islamic banks. Practically, it provides valuable guidance to Islamic banking management in developing strategies that foster a more robust customer orientation towards Islamic banking.

2 Hypothesis Development and Literature Review

As illustrated in Fig. 1 below, the research model is constructed based on the social influence model. This model posits that perceived peer influence and religious motives can affect an individual's orientation toward Islamic banks. Social Influence Theory pertains to the shifts in an individual's opinions, emotions, or behaviors under the influence of others [5, 10–15, 55].

Moreover, this study leans on religious motives as a driver of customers' orientation. This theory provides a logical explanation for the relationship between religious motives and customers' orientation. Therefore, attitudes toward customers' orientation toward Islamic banking could significantly influence customer behavior. Put differently, customers who perceive no substantial difference between Islamic and conventional banking may exhibit a negative inclination toward choosing Islamic banking systems. Conversely, customers with a positive perspective of Islamic banking will likely demonstrate a stronger orientation towards the same.

The Social Influence Theory is intertwined with the Social Learning Theory, which traces back to notion that an individual's behavior is shaped by their environment. Furthermore, the consequences of an individual's behavior play a crucial role in shaping their attitudes. The social influence revolves around how our thoughts, behaviors, and feelings alter when in the presence of others [9].

2.1 Peer Influence and Bank Customers' Orientation Towards Islamic Banking

Due Islamic banking principles are often misunderstood, leading many Muslims to perceive Islamic banks as serving only a specific Islamic sect [1, 29, 31, 41]. This perception often aligns Islamic banks with commercial banks, particularly concerning credit extension and interest rates. This, combined with the analogous nature of cost-plus financing from Islamic banks and interest on commercial loans, leads to misconceptions of customer deception [22–27].

These perceptions can be attributed to the collective nature of Palestinian society where group and peer influence significantly sway customers' leanings toward Islamic banks. Peers, defined as friends, relatives, and co-workers [46], significantly impact personal preferences, values, and behaviors [50]. Reference [32] state that

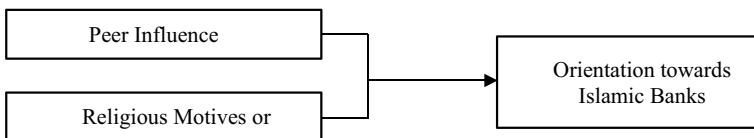


Fig. 1 Structural model results

individuals under significant social influence or pressure will conform to expected behaviors. Thus, decision-making can be influenced by others, such as family, friends, and co-workers [11], affecting the orientation toward Islamic banking.

Existing research shows a positive correlation between peer influence and customers' orientation towards Islamic banks [3, 12, 30]. However, there is a lack of studies within the Palestinian context exploring this direct impact. This study aims to fill this gap, investigating peer influence as a critical determinant affecting the orientation towards Islamic banks in Palestine. Hence, the current research proposes the following:

H₁ There is a positive relationship between peer influence and bank customers' orientation' toward Islamic banking.

2.2 Religious Motives and Bank Customers Orientation Towards Islamic Banking

Reference [18] affirm that religion profoundly influences individuals and communities' attitudes, behaviours, and values. Similarly, religiosity, or the level of religious devotion, shapes cultural beliefs reflected in daily activities and ethics [19–21, 38, 52]. Numerous studies support the positive influence of religiosity on the criteria for selecting banking services [38]. Reference [40] found that Muslim consumers' preference for Islamic banking was significantly driven by religiosity in Singapore. This is echoed by [38, 39, 45] who identified religiosity as a primary determinant influencing Islamic bank patronage and use of services. Reference [30] reinforced the paramount role of religious beliefs in choosing Islamic banking.

Religious branding also significantly influences decision-making processes. For example, the "Halal brand" is closely associated with Muslim consumers' financial service and product decisions [13, 48, 49]. However, [56] argue that religiosity should not be the sole decisive factor in choosing Islamic banking. They suggest that a lack of religious motives could decrease orientation toward Islamic banking.

Given the above discussion, while most studies identify a positive influence of religious motives on banking choices, a minority find no significant impact. This leads us to the following proposition:

H₂ There is a positive relationship between religious motives and bank customers' orientation towards Islamic banking.

3 Methodology

3.1 Data Collection

The analysis for the current study was conducted at the individual level. Questionnaires were distributed to 250 consumers of Islamic banks. The data was collected using a random convenience sampling method involving 220 consumers from the southern West Bank, specifically the governorates of Hebron and Bethlehem. After data cleansing and analysis, 204 viable data points were obtained, yielding a response rate of 93%. Among the respondents, 87% were aged 30 or over, and 65% held a graduate or postgraduate degree. Approximately 65% were employed in the public sector, and 77% were married.

3.2 Measurement

The variables and items utilized in this quantitative study were entirely derived from previous research. All variables were measured using a five-point Likert scale, ranging from 'strongly disagree' (1) to 'strongly agree' (5). The orientation towards Islamic banks was evaluated using nine items adapted from [35]. Peer influence was gauged through six items borrowed from [25] work. Additionally, religious motives were assessed using six items adapted from the instruments employed by [54].

4 PLS Data Analysis and Results

To investigate the study model, we employed the Partial Least Squares (PLS) method of data analysis using the Smart PLS 4 software. Building on the foundation laid by [26], a two-step analytical procedure was utilized to empirically assess both the measurement model (the relationship between variables and indicators) and the structural model (the interconnection among the variables) [2, 43].

4.1 Assessment of Measurement Model

The measurement model was evaluated using two types of validity: discriminant and convergent. Convergent validity was assessed by examining indicator loadings, composite reliability (CR), and average variance extracted (AVE) [16]. As outlined in Appendix, all items had indicator loadings above 0.50, ranging from 0.664 to 0.892; thus, one item, RM5, was excluded due to its low indicator loading. In the same view, Table 1 shows that the AVE values spanned from 0.568 to 0.694, exceeding

the suggested threshold of 0.50, while CR values ranged between 0.856 to 0.931, surpassing the recommended value of 0.70 [22, 43]. Given these results, the study affirms the acceptance of convergent validity. The PLS-SEM Algorithm (measurement model), AVE, and factor loadings of items are displayed in Fig. 2, adhering to the aforementioned criteria.

Following the establishment of convergent validity, the analysis proceeded to discriminate validity as per [43]. The contrast was made between the square root of the AVE and the corresponding latent variable. As depicted in Table 2, the square roots of the AVE were higher than all respective cases outlined in the diagonal values across each column and row [9, 34]. Consequently, this evidence suggests the correct

Table 1 Assessment of the measurement model

Variables	CA	Composite reliability		AVE
		Rho_a	Rho_c	
Customer Orientation (CO)	0.905	0.914	0.922	0.568
Peer Influence (PI)	0.912	0.919	0.931	0.694
Religious Motives (RM)	0.844	0.856	0.889	0.618

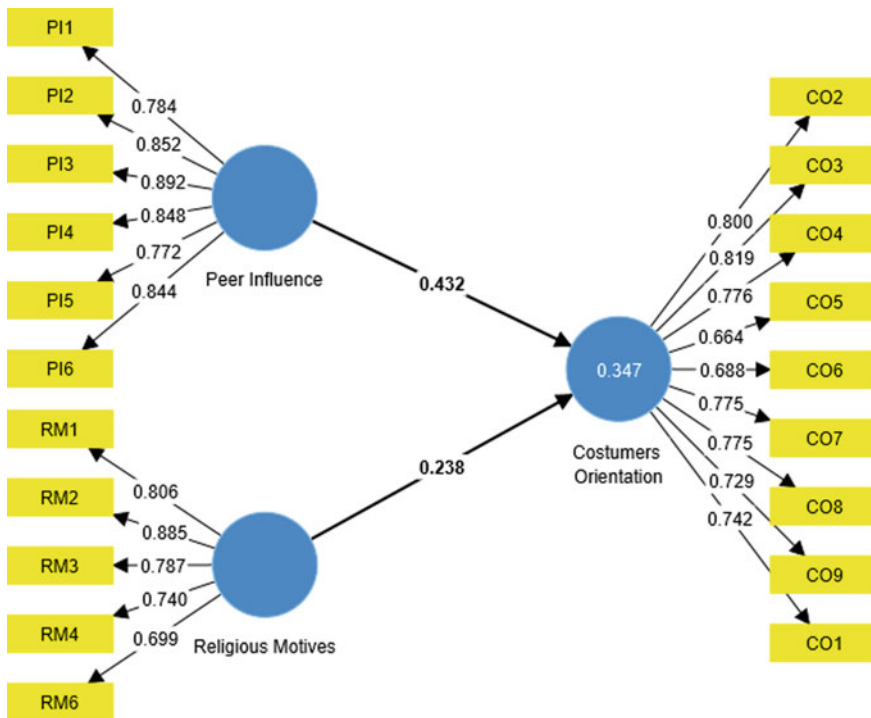


Fig. 2 PLS-SEM algorithm (measurement model) and factors loading of Items

Table 2 Discriminant validity analysis

Variables	CO	PI	RM
Customer orientation (CO)	0.754		
Peer influence (PI)	0.552	0.833	
Religious motives (RM)	0.455	0.504	0.786

application of discriminant validity. Overall, the measurement models demonstrate the satisfactory fulfillment of convergent and discriminant validity.

4.2 Assessing the Structural Model

The predictive capability of a research theory can be quantified through the R2 value, also known as the “coefficient of determination.” This value encapsulates the combined influence of both internal and external variables [43]. We applied the Smart PLS algorithm function to compute this R² value, enabling us to gauge the proportion of variance accounted for by the exogenous variables [43]. Three of the variables examined collectively presented an R² value of 0.347. This indicates that 34.7% of the variance in the inclination towards Islamic banks can be explained by factors such as peer influence and religious motives. A detailed visual representation of the R2 results can be found in Fig. 3.

To evaluate the significance of the path coefficients (β), we employed a bootstrapping function using 10,000 resamples drawn from 204 cases and applied a one-tailed test. The path was subsequently assessed, and t-values were computed to ascertain the veracity of the hypothesized relationship. The outcomes of this analysis can be seen in both Fig. 3 and Table 3, which elucidate the findings from the structural model’s examination. Our results indicate a positive relationship between peer influence ($\beta = 0.432$; $t = 6.238$; $p = 0.000$) and religious motives ($\beta = 0.237$; $t = 3.342$; $p = 0.000$) in relation to an orientation towards Islamic banks. These findings support the first and second hypotheses (H1 and H2).

5 Discussion

This study substantiates the pivotal role of peer influence and religious motivation in shaping customer inclination toward Islamic banks and guiding others to them. The outcome of the first hypothesis, which investigates the effect of peer influence on customers’ orientation towards Islamic banks, reveals a significant positive correlation. This is likely due to the communal nature of Palestinian society, which is characterized by close-knit social relationships that shape individual decisions.

Customers perceive peer influence, coupled with their impressions of the nature and cost of services in Islamic banks, as a compelling reason to favor these banks.

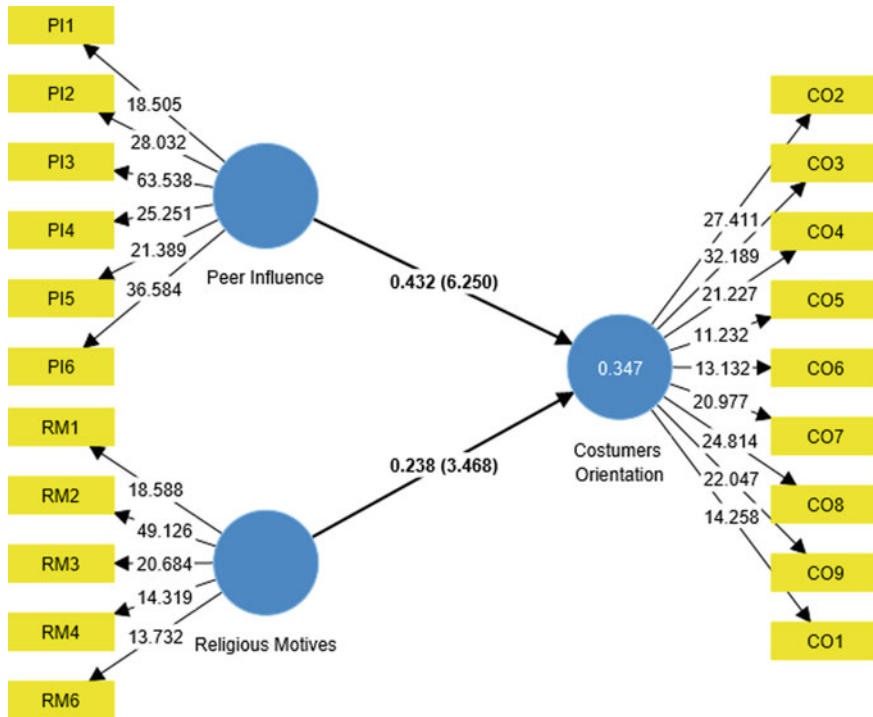


Fig. 3 PLS-SEM bootstrapping (structural model) beta and T-values

Table 3 Results of hypothesis testing

Hypothesis: path	Path coefficient	T-statistics	P-value	Decision
H1: Peer Influence → Costumers Orientation	0.432	6.238	0.000**	Supported
H2: Religious Motives → Costumers Orientation	0.237	3.342	0.000**	Supported

Note Significant at ** p < 0.01

They differentiate them from conventional banks based on their transaction practices. This aligns with findings from [15, 20, 32] suggesting that influences from family, peers, friends, and co-workers sway individual decision-making. Consequently, current customers serve as catalysts and motivators for potential customers to gravitate toward Islamic banks. These findings should prompt Islamic bank management to focus on service quality to retain their customer base and inspire peer recommendations.

Simultaneously, this study affirms the findings of the second hypothesis related to the impact of religious debt on orientation towards Islamic banks. It underscores that religious convictions play a crucial role in shaping attitudes towards using Islamic

banks and endorsing them to others. This is mainly due to the strong influence of religious beliefs on customer behavior and their life decisions in Islamic banks.

Furthermore, customers are proficient in differentiating between conventional and Islamic banks based on their compliance or non-compliance with Islamic law. This indicates that the primary incentive for switching to Islamic banks is the "Halal" branding or product offerings rather than the potential monetary gains. Therefore, the role of religion in transforming people's economic and social values is greatly accentuated.

Conversely, the general preference is to avoid Islamic and conventional banks due to religious beliefs, a unique understanding of banking services, and a perceived inability to differentiate between traditional and Islamic banking services.

6 Conclusion

Though Islamic banks in Palestine are relatively nascent compared to neighboring countries, the challenge of orienting clients towards Islamic banking services is a crucial growth factor. It also aids in meeting the sustainability requirements of these banks. The present study assesses the impact of peer influence and religious motivations on customers' attitudes toward Islamic banks.

Islamic banks have the potential to significantly expand their customer base and subsequently amplify their revenue streams. This is particularly true in the context of the recent revolutions in FinTech and smartphone technology, which offer unprecedented opportunities for customer engagement and service delivery [7, 37]. However, this potential is constrained by various factors, including those examined in this study. Broadly, our research findings suggest a positive correlation between peer influence, religious motivations, and customer orientation toward Islamic banks.

It was observed that positive perceptions of Islamic banks among their customers significantly sway their inclination towards these institutions, mainly due to the interconnected social fabric of Palestinian society. Consequently, the study advocates for Islamic banks to collaborate with prominent religious leaders who endorse the legitimacy of Islamic banking transactions. This collaboration would aid in elucidating the compatibility of these transactions with Islamic law, thus reinforcing their religious validity.

Furthermore, this study proposes that Islamic banks can play a more effective role in swaying customers towards their services by enhancing their offerings, inaugurating new branches, and underscoring the Islamic legitimacy of their banking transactions. Islamic banks may overcome potential barriers and enhance customer engagement and trust by implementing these measures.

6.1 Limitations and Further Research

The present study has determined that religiosity significantly influences the decisions of Islamic bank clients in Palestine. However, these findings cannot be universally applied due to the unique social dynamics of Palestinian society. As alluded to earlier, Palestinian society is deeply interconnected, with members significantly influenced by each other's viewpoints. This interconnectedness can occasionally hinder some customers' orientation toward Islamic banks, mainly due to the influence of religious discourse propagated by certain Islamic groups and parties. These groups argue that heightened religiosity can hinder the transition toward Islamic banking services.

Looking forward, future research could consider additional variables such as the public image of Islamic banks and the level of trust customers place in them. By exploring these areas, we can better understand customer attitudes toward Islamic banks and devise effective growth and acquisition strategies.

Appendix

Constructs and Related Measurement Items		Loadings
<i>Customers Orientation towards Islamic Banks (CO)</i>		
CO1	Islamic banks provide ATMs	0.742
CO2	The services of Islamic banks are characterized by the speedy completion of transactions for their customers	0.800
CO3	Islamic banks provide automatic check deposit service	0.819
CO4	The employees of Islamic banks treat customers with kindness and respect	0.776
CO5	Islamic banks do not take additional interest (commissions) on their services	0.664
CO6	The Sharia Supervisory Board of Islamic Banks has efficiency and honesty	0.688
CO7	Islamic banks give profits on savings accounts	0.775
CO8	Islamic banks are located in geographically uncrowded places where they are easily accessible	0.775
CO9	Islamic banks allow their customers to conduct financial transactions over the Internet	0.729
<i>Peer Influence (PI)</i>		
PI1	Most customers believe that Islamic banks adhere to Sharia rules in their dealings	0.784
PI2	Most customers think that it is not acceptable to not be committed to Sharia rules in banks	0.852

(continued)

(continued)

Constructs and Related Measurement Items		Loadings
Customers Orientation towards Islamic Banks (CO)		
CO1	Islamic banks provide ATMs	0.742
PI3	The majority of the clients believe that the Murabaha that Islamic banks get from the clients' transactions is fair compared to the services they get	0.892
PI4	Most bank customers prefer to go to Islamic banks, regardless of the cost of the services provided	0.848
PI5	Most customers believe that not going to Islamic banks is a transgression because they are not similar to traditional banks in their transactions	0.772
PI6	Most customers believe that Islamic banks are doing business that encourages them to go to them	0.844
<i>Religious Motives (RM)</i>		
RM1	Religiousness is an influential and important factor in refining my personality	0.806
RM2	I feel guilty when I do not comply with legal provisions	0.885
RM3	I feel that God Almighty is observing me in all aspects of my life	0.787
RM4	The legal provisions and limits govern my behavior and decisions in life	0.740
RM6	Religiousness is an important factor for my feeling of safety and psychological comfort	0.699

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Impact of Business Analytics and Innovation on Firm Performance



Irfan Abdul Karim Shaikh 

Abstract Some study has been done on the topic of business analytics, but not nearly enough has been done to build and communicate a general knowledge of the relationship between analytics and performance. This research presents a comprehensive framework to describe the many forms of business analytics, their interrelationships, and the effects of business analytics use on innovation and financial performance, with the goal of filling the resulting knowledge gap. The empirical analysis was performed on sample of SMEs industries present in Mumbai. In order to examine the potential for a causal connection between the research constructs, the study employs a structural equation modelling (SEM) analysis with a Using product and process innovations as a second-order factor, business analytics as an exogenous independent variable, and firm performance as a dependent variable, this study analysed the relationship between innovation, exogenous independence, and firm performance (endogenous). The results of research confirmed that business analytics are important predictor of innovation and performance of SMEs.

Keywords Business analytics · Business innovation · Firm performance

1 Introduction

Firms need to be more creative and nimbler in their ability to anticipate and meet their consumers' ever-evolving requirements and wants in today's fast-paced, worldwide business climate. These companies' chances of success or even survival hinge on how well and fast they can adapt to the ever-changing conditions of the global market. As a result, IS (Information science) and IT (Information technology) become metaphors that supply varied resources and approaches to help organizations face and conquer the challenges of such settings [28]. In recent years, businesses have gained access to vast amounts of data made possible by their use of digital infrastructure. It's

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also important to acknowledge how the widespread adoption of IT has led to the rise of digitalized enterprises that amass both structured and unstructured data. For businesses to gain a competitive edge, they need to be able to analyse and interpret the information contained in these massive data sets [8, 21–24]. There are many uses for IS, each requiring a unique mix of resources and methods for dealing with massive data volumes. They are meant to handle the “big data” (increasingly large amounts of data with a high rate of change) that businesses and individuals are collecting [8, 20]. It has been discovered that BA has a lot of potential for making business decisions and resource and capacity planning more resilient to the future [25]. Due to the limited resources available to modern digital SMEs, it is crucial that they take advantage of digital technology, such as business analytics, to aid in the transition from one business model to another for improving firm performance [3, 18, 27–29].

2 Research Question

Organizations need in-depth knowledge of markets, consumers, goods, regulations, competitors, suppliers, employees, and more to thrive in today’s globally interconnected economy. To gain this insight, data analytics must be used efficiently. Business operations can be improved with the help of data analytics by zeroing in on the most profitable customers, setting the most optimal prices, mapping out the most efficient supply chain routes, and selecting the most qualified candidates [13]. Therefore, it’s very important to understand what the impact of business analytics on SMEs performance and innovation is. And how innovation can further boost firm performances.

3 Literature Review and Hypothesis Development

Reference [9, 17] argues that in the future, businesses will need to focus on their ability to renew themselves in order to remain competitive. One way to do this is through business analysis (BA), which can help businesses gain a competitive edge by improving their learning experiences and implementing the knowledge they uncover [1, 22]. Understanding the specific techniques through which IT applications boost business performance is essential [19]. This is why [2] demonstrated how advanced IT capabilities are a major differentiator between high- and low-performing businesses. Earlier research [12] has claimed that BA skills make it possible for a rich analysis to assist businesses gain a competitive edge. There is a lot of research showing that BA improves both organizational and operational performance [14]. The ability of businesses to solve market problems and opportunities is what is meant by the phrase “innovation” [17]. Innovation is widely recognized as one of the most important strategic gains made possible by the implementation of information technology [25, 26]. In accordance with the work of [25], “a firm’s ability to produce, accept, and

implement new ideas, processes, products, or services” is the definition of innovation capability. When it comes to improving a company’s capacity for innovation, IT capabilities center on the use of internal IT resources. Analytics is used by startups for client acquisition and retention planning and for product development [24]; however, it is rarely used to improve internal workflow [7]. Even in these cases when BA is not being fully utilized, it still represents a huge opportunity for startups and SMEs [25]. Such an effort necessitates proper BA implementations and the cautious incorporation of BA into preexisting organizational procedures to improve the practice [25, 26].

4 Hypothesis Development

4.1 *Business Analytics and Performance of SMEs*

An important conceptual distinction between big data analytics and big data analytics capabilities is provided by [16], who also stress the necessity of the latter when thinking about performance improvements. The authors provide a study framework that emphasizes the significance of aspects related to processes, people, technology, organization, and data in determining the business value of big data analytics. Improved data-driven decision making and novel approaches to organization, learning, and innovation are made possible by Business analytics [2], which in turn strengthens customer relationship management, better manages operational risk, boosts operational efficiency, and boosts firm performance [2, 6].

5 Business Analytics and Innovation

Reference [9] Based on the results of the study, it appears that BA has a direct effect on environmental scanning, which in turn increases the company’s innovation in terms of the uniqueness and significance of its new products. Data-driven culture acts as a mediator between BA’s contribution and the company, amplifying the former’s impact. Cultures that place a premium on data have an immediate effect on the originality of new products, and indirectly on their utility by means of constant environmental monitoring.

6 Innovation and Firm Performance

A study by [30] found a favourable correlation between sales innovation and elasticity across five key performance metrics (Rising Employment, Rising Value Added, Rising Sales, Rising Operating Profit, Rising Operating Profit to Assets Ratio, and

Rising Return on Assets). There is little correlation between creative production and profit margin. When businesses are broken down into their manufacturing and service components, it becomes clear that the correlation between inventive production and job growth weakens significantly for service organizations. Their research showed that manufacturing companies can benefit from product, organizational, and marketing changes.

Research objective.

1. To determine the impact of Business analytics on innovation
2. To analyse the impact of business analytics and innovation on performance of SMEs.

Research hypothesis:

H1: Business Analytics Has a Direct and Significant Impact on the Performance of SMEs.

H2: Business Analytics Has a Direct and Significant Impact on Innovation.

H3: Innovation Has a Direct and Significant Impact on the Performance of SMEs.

7 Research Methodology

The empirical analysis was performed on sample of SMEs industries present in Mumbai. The target respondents for the study are owner/managers who has knowledge of every detail of firms and survey was conducted through random sampling method. A semi-structured questionnaire was prepared constitutes of two sections: one about details of respondents and enterprise, another section contains questions on research variables. The respondents were requested to give their opinion on 5-point Likert scale (where 5-strongly agree and 1-strongly disagree). The survey method was believed to be the most suitable method for collection of this data from the owners/managers from the Mumbai city. Out of 250 questionnaires returned back by respondents, during data screening process, data having missing values were rejected and finally 218 samples were selected for further analysis. Descriptive research was used in this study, and 250 responses were invited to fill up the online questionnaire Mumbai area. Simple random sampling technique was used to collect responses from potential users. The response rate for the survey instrument was 87.2% with the collection of 250 responses. The scale of the study was measured and tested using Structural equation modelling was used to test the proposed model fit. Cronbach Alpha was used to measure the reliability of the variables. Exploratory factor Analysis was used before moving on to regression analysis. SPSS version 26 and AMOS 23 graphics were used for the factor and SEM analysis. For measuring performance of firm were selected from the [4, 5, 31]. Innovation scales were derived from the studies of [2] and the item for business analytics were adapted from [4] study.

Table 1 Details of respondents from selected SMEs (N = 218)

Measures	Items	Frequency	Percentage
Gender	Male	178	82
	Female	40	18
Age	Below 24	3	1
	25–30	24	11
	30–35	62	28
	35–40	73	34
	40 & above	56	26
Education	Secondary	13	6
	Undergraduate	117	54
	Postgraduate	74	34
	Others	14	6
Type of business	Micro	28	13
	Small	53	24
	Medium	137	63
Industry	Food and beverages	33	15
	Products that last, like electronics and heavy machinery	48	22
	Chemicals, pharmaceutical and plastics	57	26
	Merchandise involving textiles, leather, and apparel	41	19
	Other manufacturing	39	18

Source Primary survey

Descriptive and inferential statistics were used to examine the data with the assistance of SPSS and AMOS version 23. Overviews of the data, as seen in Tables 1, 2 and 3, are provided by descriptive statistics.

7.1 Factor Analysis

A preliminary factor analysis was performed to ensure that selected scale items were loaded properly with a factor loading score of > 0.5, and no cross-loading was observed. A high value of KMO (0.841) and small value of significance (<0.05) of the results of Bartlett’s Sphericity Test suggest that factor analysis would be beneficial for our data. Principal Component Analysis (PCA) using Varimax Rotation Method Kaiser Normalization was applied to the 13 elements. Based on factor extraction criteria having Eigen values greater than 1, results into four factors, explaining total variance of 80.927%.

Table 2 Factor loadings of variables

Factor	Items	Item loadings
Business analytics	BA1: We have implemented data processing and analytics via cloud services	0.866
	BA2: Use of predictive analytics such marketing intelligence system, data mining	0.864
	BA3: We've used open-source big data analytics software	0.856
Product innovation	PDi1: Many product lines are available from our company	0.818
	PDi2: According to market needs, we introduce specialized products	0.877
	PDi3: Our business expands into untapped niches through new product development (NPD)	0.869
Process innovation	PCi1: At our organization, we use cutting-edge methods of real-time process control	0.900
	PCi2: Our business deals with the import of high-tech, programmable machinery	0.884
	PCi3: Our company innovates marketing methods	0.875
Performance	P1: The percentage of the market that we control is growing	0.859
	P2: Our company has a very healthy rate of return on sales	0.849
	P3: An increased level of customer loyalty has been established at our company	0.858
	P4: Our firm's administrative expenses have been reduced	0.886

The descriptive statistics table of perception of SMEs owner/managers towards Business analytics is highest as mean value ($M = 3.58$) above neutral value 3. The mean values of innovation ($M = 3.36$) and performance ($M = 3.47$) are near to agreement degree it indicate respondents are agreeing on involvement of analytics, innovation and performance of their firm. Independent factors' correlation with one another and with the dependent variables are also displayed in the table above. The positive and statistically significant correlation coefficients between innovation and business analytics and SME performance show that the two go hand in hand. Finally, Table 3 shows the Cronbach's alpha value, which was used to assess the reliability of the research variables. According to the threshold requirements, the alpha value for all four components is greater than 0.7, verifying the data's reliability.

8 Reliability and Validity Using CFA

CFA was performed by considering all the four factors as exogenous constructs. The fit indices of the measurement model are $\chi^2 = 506.614$, $CMIN/df = 1.262$; $p = 0.015$, $RMSEA = 0.026$, $CFI = 0.985$, $NFI = 0.930$ and $AGFI = 0.898$. This shows

Table 3 Cronbach’s alpha, Mean, Std. deviation and Correlation of the variables

	Business analytics	Innovation	Performance
Reliability (Alpha value)	0.890	0.781	0.927
Mean	3.5841	3.3593	3.4725
Standard deviation	0.85348	0.64348	0.61644
Business analytics	1	0.248**	0.499**
Innovation	0.248**	1	0.384**
Performance	0.499**	0.384**	1

Note ** indicates correlation is significant at the 0.01 level (2-tailed)

Table 4 Validity and reliability of research constructs

	CR	AVE	MSV
Performance	0.928	0.762	0.304
Business analytics	0.890	0.731	0.304
Innovation	0.891	0.732	0.214

that the proposed scale fits for measurement [13]. To determine whether indicators of each latent variable conceptually explain the constructs, the researcher examined Convergent validity using average variance extracted (AVE). According to the threshold value, all the AVEs are more than 0.5, indicating that the constructs can explain 50% of the variance in their items. The four reflectively measured components have composite reliabilities ranging from 0.709 to 0.854, above the minimum threshold of 0.70. [32]. Discriminate validity shows how well one construct may be separated from another with similar or dissimilar value profiles [14]. Reference [13] state that the maximum shared variance (MSV) must be less than the average variance estimate (AVE) to meet the discriminant validity condition (Table 4).

9 Hypothesis Testing Using Structural Equation Modelling

The study runs SEM analysis using maximum likelihood method to test the causal relationship between research constructs. The study assessed innovation as a second-order factor constituted of product and process innovations, business analytics as an independent variable (exogenous), and firm performance as a dependent variable (endogenous). The criteria for accepting or rejecting a study hypothesis are based on a critical ratio value of 1.96 and a p value less than 0.05 at the 5% level of significance.

Table 5 displays the findings of the path analysis and hypothesis testing. All significant relationships are represented by a standardized path coefficient and associated p-value. The standardized path coefficient is calculated using Table 5 and Fig. 2. (β) of business analytics to innovation is positive and significant as $\beta = 0.455$ with $p = 0.000$. Since p value < 0.05 and CR (3.826) > 1.96 , thus hypothesis H1 accepted.

Table 5 Path coefficients of the Structural model

Hypo-theses	Outcome variables		Causal variables	SE	CR	P	Path coefficient	Result
H1	Innovation	←	Business analytics	0.061	3.826	***	0.455	Accepted
H2	Performance	←	Business analytics	0.094	2.647	0.008	0.314	Accepted
H3	Performance	←	Innovation	0.313	2.597	0.009	0.521	Accepted

Note SE; Standard error, CR; Critical ratio, Path coefficient: Standardized regression weights and p: probability of significance. *** indicates $p < 0.000$

The impact of business analytics on performance of SMEs is positive and significant having $\beta = 0.314$, $CR = 2.647$ and $p = 0.008$ ($p < 0.05$), provided sufficient evidence to accept hypothesis H2. Similarly, performance of SMEs positively influenced by innovation with $\beta = 0.521$, $p = 0.009$. This relation is significant as p value less than 0.05, therefore hypothesis H3 was supported from this finding. The findings also revealed that influence of innovation is more on performance compared to business analytics as standardized regression value is higher for innovation. The coefficient of determination (R^2) value is 0.207, for innovation inferred 20.7% of variation in attainment is explained by retention. The two predictors of performance, i.e., business analytics and innovation explained 52% of the total variance in SMEs' performance. The fit indices of the measurement model are $CMIN/df = 2.161$; $RMSEA = 0.026$, $CFI = 0.989$, $NFI = 0.958$ and $AGFI = 0.954$. The results indicate that the structure model fits prediction and interpretation.

Table 5 provides a summary of the findings from the path analysis and hypothesis testing. For each association, we show the standardized path coefficient and the statistical significance of that path, together with associated p-values. By referring to Table 5 and Fig. 2, it is concluded that the standardized path coefficient (β) of all the factors (Business analytics and innovation, business analytics and performance, innovation and performance) are positive and significant Table 6.

9.1 Discussion and Implications

The current research examined how business analytics and innovative concepts have helped or adversely impacted a few small and medium-sized enterprises (SMEs) in Mumbai. Business analytics were found to be a significant predictor of SME innovation and performance. The results demonstrated that using business analytics in the form of data-driven technologies, intelligence systems, data mining, or advanced analytics methods enhances a company's ability to detect and react to market opportunities and aids in the development of novel products and procedures. In this analysis, we looked at how innovation affects the success of small and medium-sized

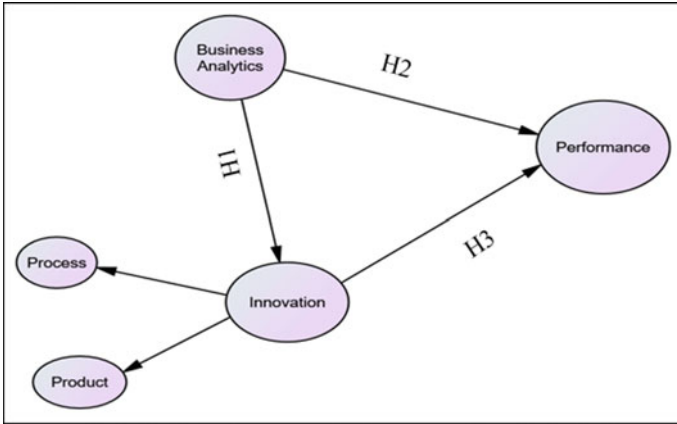


Fig. 1 Conceptual framework of the study

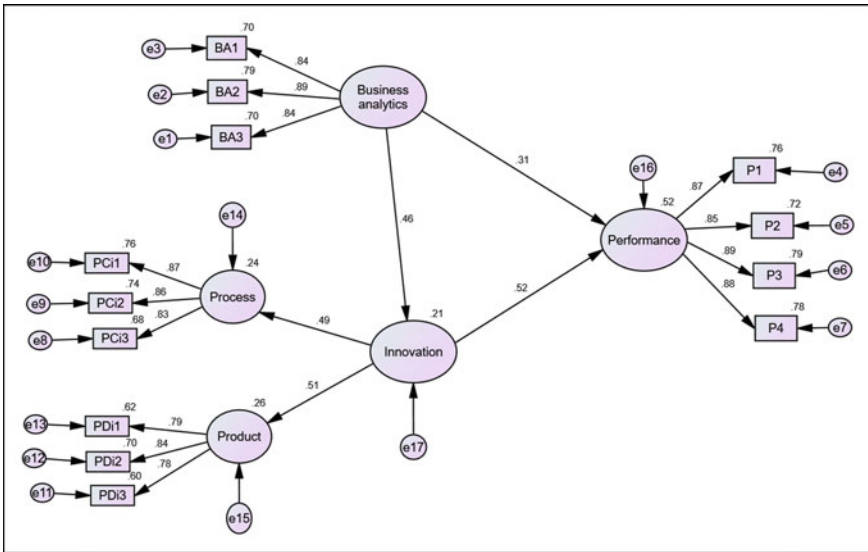


Fig. 2 Casual model

businesses (SMEs). The results of this study are consistent with those of [2, 10–15], suggesting that SMEs can employ innovation to improve their performance and increase their chances of survival. Product and process were found to be significant factors in the study’s findings on innovation. Consistent with earlier studies [15], the new study finds that product innovation is more powerful than process innovation. Innovative small and medium-sized enterprises (SMEs) have a better

Table 6 Overall model fit

Indices	Recommended criteria	Model values
Chi square (χ^2)	pval > 0.05	0.064
Normed chi square (χ^2/DF)	$1 < \chi^2/df < 3$	2.161
Goodness-of-fit index (GFI)	> 0.90	0.967
Adjusted GFI (AGFI)	> 0.80	0.954
Comparative fit index (CFI)	> 0.95	0.989
Root mean square error of approximation (RMSEA)	< 0.05 good fit < 0.08 acceptable fit	0.026
Tucker-Lewis index (TLI)	$0 < TLI < 1$	0.925

Source Primary Survey [13]

chance of succeeding in today's highly competitive market. Research and development (both in-house and outsourced), product iteration in response to customer feedback, and employee skill enhancement are all crucial to the creation of novel products. Reference: [20]. Use of cutting-edge technology or painstaking re-engineering fuels process innovation at SMEs.

10 Managerial Implications

Based on research findings, it is recommended that involvement of business analytics tools by firm during production and marketing of products is very important aspect to consider for success the organization. It is advisable for the managers to give attention to business analytics tools in organization as it can lead to overall innovation in firm.

The importance of business analytics in the creation of new products and services is ubiquitous. Managers rely on data analysts to build products and strategies across the board, from making internal organizational changes to promoting those changes. If the future lies in innovation, then data analytics is the tool that any business can use to herald in that era. New product development and significance are inextricably linked to the quality of business knowledge gleaned from environmental scanning conducted within a robust data-driven culture. The consequences of these findings for management are not negligible. The results of this study suggest that businesses should place a premium on product and process innovations as means to attain long-term competitive advantage.

11 Limitations and Future Scope

The current research collects data from SMEs present in Mumbai. This study can be extended to other regions of county. Secondly study has selected only two predictors of performance: business analytics and innovation and for measuring innovation also only product and process innovations are taken. Instead of online surveys, one can go for personal interviews to get accurate results. The scope of this model is limited to the effects of BA and innovation on the performance of SMEs; as such, it cannot (and was not designed to) account for all of the important aspects that contribute to the ultimate success of novel inventions and SMEs performance.

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Technological Protection Measures and Their Role in Protecting Digital Works



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Abstract This research aims to elucidate the measures enacted by international conventions for safeguarding intellectual property rights, particularly those pertinent to digital works. It seeks to ascertain the adequacy of current copyright laws in protecting rights holders amidst rapidly evolving technology. The investigation further sets out to identify critical technological safeguards in place for the protection of digital works and discuss the implications of legally safeguarding such measures within the context of copyright laws. The study's findings indicate that technological measures have been granted legal protection, as mandated by international agreements and intellectual property laws. These laws proscribe any attempts to circumvent these measures with the intent to undermine or negate them. In response, penalties have been implemented for misuse or violation of these technical copyright protection measures. Moreover, sanctions have been instituted against deliberate interference with rights management information to counter the challenges posed by the increasing proliferation of the information superhighway. The study strongly advocates for enhancing internet users' awareness of these laws. It underscores the need to instill a sense of responsibility among users when selecting online information. It emphasizes adherence to appropriate online behavior, respect for others and their rights, and avoiding infringement on intellectual property rights.

Keywords Technological measures · Copyright · Digital works · Intellectual property

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1 Introduction

It is clear that piracy of works via the Internet has caused many heavy losses to authors, owners of related rights, and publishers, which has raised doubts about the feasibility of being satisfied with the legal protection decided by intellectual property legislation, whatever the extent of this protection, and whatever the gravity of the penalties it imposes. That it is not sufficient alone in facing this danger, and for this reason, authors and rights holders found refuge in technological protection measures to limit illegal copying acts, as resorting to these measures has become an effective practical response to copyright violations on digital networks, as by this means the author can simplify the scope of his control over his works, so that he can prevent others from reproducing them or even just accessing them, or at least limiting the number of copies he allows, and even controlling the degree of quality of the reproduced version.

These measures were limited only to the military and diplomatic aspects until the sixties of the twentieth century, when governments began to liberalize and allow this protection within certain limits, and due to the development we have witnessed in the field of informatics and networks, technological protection measures have become one of the most important means of protection that are used to prevent aggression on the digital works even before their occurrence, and on the other hand, there is no better means of protection that are of the same nature as criminal behavior to reduce its seriousness and stop its effects, however, counter-technological methods soon appeared aimed at nullifying the effect of these technological measures that were followed by the rights holders or circumvention on it, in order to obtain and benefit from digital works without paying any compensation to their owners, which is what moved them from the ranks of scientific and technological phenomena to the field of legal issues and phenomena. There are many laws that have taken serious steps in codifying the technical protection methods used by the author and criminalizing acts of abuse. These technological measures, and among the most prominent of these laws, are what was mentioned by the World Intellectual Property Organization.

2 The Technological Protection Measures to Protect Digital Works and the Reasons for Resorting to Them

Technological measures have become a widespread reality in line with the ever-evolving technologies that facilitate illegal copying. Rather, these measures, which have become necessary to curb illegal copying, must be linked to the evolution of new and emerging forms and patterns of circulation of works on the Internet.

2.1 The Concept of Technological Protection Measures to Protect Digital Works and Their Importance

Some international agreements dealt with the concept of technological protection measures, as the WIPO Copyright Treaty adopted on December 22, 1996, through Article (11) thereof, and in the context of the obligations of member states related to technological measures, stated that: “The contracting parties shall provide adequate legal protection and sanctions and effective legal measures against circumvention of effective technological measures which are used by authors in exercising their rights under this Treaty or the Berne Convention and which prevent or limit acts not authorized by authors or otherwise permitted by law in respect of their works [8, 10].”

The same content of the previous text was also mentioned in the Second WIPO Performances and Phonograms Treaty adopted on December 20, 1996 through Article (18) where it stipulated that: “The Contracting Parties shall provide in their laws adequate protection and effective sanctions against the circumvention of effective technological measures used by the performers or producers of phonograms in connection with the exercise of their rights under this Treaty and which prohibit the performance of acts not authorized by the performers or producers of recordings concerned or not permitted by law in respect of their performances or sound recordings” means that the performers or producers of phonograms use in connection with the exercise of their rights under this Treaty and which are prohibited from performing acts not authorized by the performers or producers concerned, or otherwise permitted by law in connection with their performances or recordings [10].”

Paragraph (3) of Article (6) of the European Directive related to copyright in the information society issued on May 22, 2001, defines technological protection measures as: “Every technology, device, or installation that, within its normal operation, aims to prevent or limit the works unauthorized by the copyright holder and which fall on works or other protected content”.

The importance of technological protection measures lies in preventing access to the protected work in the digital environment, except with the permission and license of the owner of the copyright or related rights, and the ease of controlling the number of private copies that are made on the work, identifying the work in place of copying, identifying the author or rights holders on the work, and determining the forms of and the methods of copying that take place with regard to the work, all with the aim of facilitating the management of rights related to the work, as well as protecting digital works against intellectual piracy [5–7, 13].

2.2 *Technical Means to Protect Works in the Digital Environment*

There exists a wide range of technical means for protecting digital works that are so diverse and numerous that it may seem challenging to compile them all. However, the shared objective of all these measures is to equip authors and rights holders with adequate protection. Rights management information pertains to the digital labeling of works, which encapsulates details such as copyright protection, ownership, etc. Here are some key strategies [10]:

Digital Content Marking: This involves adding a copyright notice or warning, such as “Copying is permitted for non-commercial purposes only,” to the digital content. It is advisable to include a copyright statement on each webpage detailing the terms and conditions of its content use.

Digital Object Identifier (DOI): This system assigns unique identifiers or digital tags to copyrighted digital works, facilitating their tracking on the Internet. The DOI remains constant even if other information about the digital work changes over time, providing a reliable source for locating the work online.

Timestamp: This denotes a tag attached to digital content that verifies its status at a specific time. Time is crucial in establishing copyright infringement cases, like determining when an email was sent, a contract agreed upon, or a piece of intellectual property was created or altered. Services like WIPO PROOF provide digital fingerprints for any file, validating its existence at a particular time.

Digital Watermarks: Utilizing software to embed copyright information within the digital work itself. Digital watermarks may be visibly placed, similar to a copyright notice on a photo’s margin, or they could be subtly integrated throughout the document, akin to watermarked paper. While visible watermarks act as deterrents, hidden watermarks serve as theft evidence and enable electronic tracking of copyrighted work usage.

Encryption: Predominantly used for safeguarding software products, sound recordings, and audiovisual works against unauthorized use. Digital Rights Management (DRM) software can connect with a clearinghouse to arrange payment, decrypt the file, and allocate a unique key—like a password—for the customer to access the content.

Access or Conditional Access System: At its most basic, this system verifies user identity, content files, and the privileges each user holds over a given work. The owner of a digital work can tailor access in various ways, such as allowing viewing but not printing or limiting usage to a specific timeframe.

Production of Lower-quality Versions: Companies can publish images on their websites with just enough detail to demonstrate their utility (for example, in an advertisement) but not enough for high-quality print reproduction.

2.3 Technical Means Related to the Person of the User

One of the most important of these means is the personal card of the work, and each digital copy of the work contains the information of the rights holders of these works and the terms of their use. on such information [2, 4].

2.4 Technical Means Related to Protecting the Work from Abuse

These methods are represented by anti-virus programs that can be installed on the computer to make copies of the hard disk, every time the device is turned on or in a regular manner every specific period of time. Among these methods are modern firewalls, which use the method of filtering and filtering incoming data, and work to create virtual private networks to monitor data content and prevent viruses [2, 3, 8].

2.5 A Group of Technical Means Related to Protecting the Work from Abuse

These means are the encryption system, which is one of the technical means used to protect the work from being attacked.

3 Legal Protection of Technological Measures

Technological measures enjoy the protection of the law, which is expressly stipulated in international agreements and intellectual property legislation, which prohibit circumventing them to nullify or neutralize them, and in order to achieve this, penalties were imposed for misuse of technical copyright protection measures, as well as penalties against any deliberate tampering with rights management information In the face of the so-called information highway, the protection of technological measures with the intent of preventing assault on digital works depends on these measures meeting specific conditions that must focus on intellectual content attributed to an author in order to protect it and ensure its effectiveness.

Article 11 of the WIPO Copyright Treaty relating to Technological Measures states that: “Contracting Parties shall provide in their laws for adequate protection and effective penalties against the circumvention of effective technological measures used by authors in exercising their rights under this Treaty.” or the Berne Convention, which forbids acts not authorized by the relevant authors or permitted by law in relation to their works to be undertaken”.

3.1 Terms of Protection of Technological Measures

The WIPO Copyright Treaty, as well as the WIPO Performances and Phonograms Treaty, confirmed that the protection of technological protection measures requires the availability of certain conditions, which are as follows:

3.2 The Measures Must Focus on a Work Covered by Legal Protection

To protect technological protection measures, the technological measures must focus on intellectual content attributed to an author in order to protect it and ensure its effectiveness, which means that the object of protection is a protected work within the meaning of copyright law of any kind, as long as it involves an original mental effort that has been expressed. In a tangible material form [5, 9].

3.3 Technological Measures Must Be Developed by the Author or Stakeholders

This condition has been affirmed by both the WIPO Copyright Treaty and the WIPO Performances and Phonograms Treaty, and this condition includes the author himself, the performing artist, producers of phonograms, broadcasting and broadcasting organizations, as well as public and private successors, as well as rights holders [1, 2].

3.4 The Aim of These Measures Must Be to Prevent Works Considered to Be the Author's Monopoly

The technological measures that rights holders use to protect their works are either to control the use of the work or to control access to the work, and with reference to the provisions of Articles (11) of the WIPO Copyright Treaty and its counterpart Article (18) regarding performance and sound recording, we find that these two treaties They stipulate the protection of technological measures that aim to prevent works that the law considered the monopoly of the author alone [1, 11].

It is also imperative for the author to choose the type of protection he wants, as the protection is conditional on the will of the author, as he is in charge of determining the desired goals of using technical means, that is, he is the one who determines the actions and actions that are permitted to the beneficiary of the work and the actions that are not permitted, in a way that constitutes every violation of the will of the

author A violation of his right is punishable by law, and finally, the consumer must inevitably be informed of these procedures, as the person who is harmed by them [5, 10].

3.5 The Implications of the Legal Protection of Technological Measures on Copyright Laws

In light of the development of methods of committing crime, discovering the perpetrator has become difficult in this field [9], and most criminal legislators in most countries have not introduced new procedural laws to confront crimes of copyright infringement arising from the use of computers and the Internet [11], and this type of crime raises some difficulties in collecting evidence [12–14].

Therefore, supporters of legal protection for effective technological measures justify the need for it, as the solution to the problem of the loss of exclusive right resulting from the circulation of works in the digital environment and the lack of control of rights holders over their works in it. The author is in this environment that is threatened in the digital environment, as these measures constitute a second line of defense in the face of attacks on copyright in this environment, which international and national law decided to protect from circumvention, thus constituting a third line of defense for works [1].

Thus, these measures had a significant impact on copyright, both with regard to the legal nature of copyright and the extent of the monopoly resulting from the protection of the work by means of these measures. The owner of the right, by resorting to technological measures, seeks in reality to establish an individual relationship with each user, in which every use of the work becomes under the control of the right holder. His control is no longer limited, as in the past, to the actions related to publishing the work to an audience whose members are not specified. Rather, he controls the work's access to every member of the audience [3, 15].

For example, the television broadcast of an unencrypted station, which includes an unspecified audience, so that members of the public can enjoy what this station broadcasts without the need for individual contracts with them, while the broadcast of encrypted stations includes only individuals participating in individual contracts with this station, and therefore the copyright that used to include Rights defined exclusively by legislation, thanks to these technological measures, have become extended to include another right, which is the right to prevent others from using or accessing the work, whether or not this includes rights of the author such as reproduction or transmission [6].

Technological measures now give rights holders the possibility to monitor every use of the work and make these uses for a fee, and this means that the extent of the monopoly of the work is determined not only by the will of the legislator, but also by the will of the rights holders who decide to put or not technological measures on the work, and the type of protection that the measures provide for the works.

The legislator only strengthens the will of the rights holders by preventing him from circumventing the technological measures that are used to prevent or limit the carrying out of unauthorized acts by the rights holders, so they are the ones who decide the existence or non-existence of exceptions, and they are the ones who decide the public's uses of the work, even if they exceed the limits that the legislator drew for this protection. This phenomenon is called by jurisprudence as the self-regulation of the author's right, meaning that determining the extent of the author's rights is done by the beneficiaries of this right at the expense of the public [4, 16].

Although technological protection measures appear to be the best way to ensure respect for copyright on the Internet and the real and effective guarantees they provide for protecting the rights of authors, they and their legal protection raise the problem of the practice of private copy registration, as there is a conflict between the application of technological protection measures and copy restriction, as they are specified in relation to the technological means or measures of protection that would completely prevent access to the work, i.e. impede mere entry to the work under what may be called the right of entry for the copyright owner or allow access to the work without copying it for personal or private use [8].

But if these measures would allow access to the work, its use and copying for one time, then this does not cause much trouble, as it does not conflict with the registration of the private copy, and this contradiction appears clearly in the law that explicitly stipulates the registration of the private copy on the one hand and stipulates protection of technological measures on the other hand, there are laws that established a kind of balance between technological measures and the right to a private copy, as is the case in the French law of 2006 related to copyright and related rights in the information society (DADVSI).

4 Conclusion

To bolster the protection afforded to copyright holders, the establishment of more robust mechanisms became imperative. A multitude of protective means and preventative mechanisms have been embedded in laws regulating these rights, designed to preserve these rights and inhibit any infringement. Technological measures have emerged as indispensable tools in curbing illicit copying operations, necessitating their evolution in line with the innovative forms and patterns of circulating works on the internet. Legal protection is now extended to these technological measures, as per international conventions and intellectual property legislation. This legislation prohibits attempts to circumvent these measures for their nullification or neutralization. To enforce this, penalties have been instated for the misuse of technical copyright protection measures. Additionally, sanctions have been set against any deliberate manipulation of rights management information, effectively countering the challenges posed by the ever-expanding information highway.

4.1 Recommendations

1. The need to create special legal provisions that regulate more effectively the cases of criminal and civil Internet service intermediaries, and cases of exemption from them.
2. The need to specify the period of time during which the aggrieved person can request a hearing to hear the statements of both parties.
3. Educating Internet users about the laws and creating a sense of responsibility among them in the process of selecting information on the Internet, and in the necessity of following the rules of correct behavior while entering the network, respecting others and their rights, and not infringing on intellectual property rights.

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Forensic Accounting and the Auditing of the Digital Banking



Walaa Abdulla Alaaris and Abdalmuttaleb Al-Sartawi 

Abstract The paper focuses on the usage of forensic accounting for digital banking. The advancement of technology and the wide usage of digital banking applications, increase the possibility of fraud which need more skills from the forensic accountant to discover and support the companies and the individual in protecting their assets. Depending on the previous literature the paper recommends developing the skills of accountants and auditors and encourages using forensic accountants as part of the internal control systems.

Keywords Auditing · Forensic accounting · Digital banking · Technology · Forensic methodology

1 Introduction

The combination of competence in accounting, auditing, and investigation leads to the branch of study known as forensic accounting [1, 2]. The accounting analysis offered by forensic accounting (FA) is suitable for use in a court of law and will serve as the basis for conversation, disagreement, and the eventual resolution of the problem. Investigative accounting and litigation support are both included in FA [3, 4]. In this context, “litigation support” refers to accounting support in cases where litigation is already in progress or is soon to be [5, 6]. It mostly tackles issues with how economic frauds are categorized [7, 8]. A frequent legal defense is calculating the economic loss caused by a violation of contract. However, “investigative accounting” is typically associated with judicial proceedings. The assignment of securities

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fraud, insurance fraud, and employee theft, among other frauds possibly a component of the investigative accounting. A forensic accountant must be knowledgeable about accounting, auditing, and investigations to effectively perform an investigation. Forensic accounting, as defined by [9] is the investigation of alleged frauds, irregularities, or misconduct that may give rise to civil, criminal, or disciplinary procedures and largely focuses on accounting-related concerns. In cases when there may be litigation, arbitration, expert testimony, mediation, or a regulatory body investigation, forensic accounting can also be helpful. Moreover, forensic accountants will help in evaluating the banking decisions and the ways followed to reach the taken decisions. The evaluation included for example whether the decisions made without taking enough time and without collecting the necessary data and they will evaluate the relation between the decision makers and the people who benefit from the decision etc. [7].

Usually, the forensic accounting report will cover all the expected areas of fraud such as expenditure and investment decisions, income distribution and shortage, the level of compliance with the related regulations, and any activities which will lead to loss of revenue, and customers, and threatens the economy. Moreover, the report will discuss the areas of improvement and the steps followed by the bank to enhance its internal control system which will close any current or future gaps [10, 11].

What accountants and auditors are required to perform and be accountable for has become clearer in recent years. The knowledge in auditing, accounting, legislation, and modern technologies is highly appreciated nowadays to develop rational solutions for the economic issues [12, 13]. Accordingly, the need for forensic accountant increased to solve issues with law and accounting nature [14, 15].

Several different stakeholders need forensic accountants Lawyers, police, courts, insurance companies, banks, law enforcement organizations, the business community, government representatives, and government-related legal institutions could all be considered among them [16, 17]. The techniques used by forensic accounting to identify and investigate accounting errors sets it apart from standard accounting, and auditing [18, 19]. However, both auditors and forensics need to have deep knowledge of accounting to bridge the expectation of the stakeholders [20, 21]. Usually, there are three main fields where forensics are needed, they will act as expert witnesses, fraud auditors, and litigation supporters. The governmental bodies usually benefit from the services provided by the forensic accountant, and they are using their working papers because it includes some vital information such as fraud auditing, planning, put into practice procedures, indications of fraud risk, and documentation in forensic accounting investigations [22, 23].

In the digital age it is expected to enhance the auditors, accountants, and forensic accountants' profession by providing them with deeper analysis and will let them to access a large quantity of data and summarize it in a shorter time than before [24, 25]. Technological systems such as AI will increase the productivity and the efficiency of the different institutions [26]. Like this, criminals' ability to carry out, cover up, or otherwise aid unlawful or unethical operations has enhanced because of their use of computers. Because there is little chance of being convicted, let alone caught, crimes utilizing computer systems seem to be encouraged by the general public's

improved technological proficiency and anonymity [27]. These “cyber-crimes” are more likely to be traditional crimes that take advantage of computing power and information accessibility than they are brand-new crimes [28, 29]. They are a result of computer systems being too easily accessible and used by people with bad intentions. Investigators need to use standardized and well-defined forensic processes to catch and convict perpetrators involved in digital crime [30, 31].

Digital forensics is a relatively recent discipline it was introduced in the literature instead of computer forensics and includes all the forensics related to digitalization and technology [32, 8]. Unlike its description as the collection of techniques and technology used to find evidence in a computer [33, 34]. The definition of digital forensics using the word “computer” is [35, 36] The gathering, protection, authentication, analysis, identification, explanation, documenting, and presentation of digital evidence produced from digital sources to foresee illegal acts that have been proved to impair planned operations, or assisting in the reconstruction of events that have been determined to be criminal [37, 38].

Law enforcement has come to understand that a wide range of digital devices, not only computers, are used in modern life and can be used for criminal behavior, which has led to the rise of digital forensics [39]. Digital forensics may include categories related to digital devices and digital technologies, in comparison to computer one, which usually focuses on the techniques used to obtain evidence from specific platforms [40]. Digital forensics is considered an output of all the known practices and techniques developed by the practitioners over time (e.g., system administrators, hackers, and law enforcement) accordingly it is difficult to standardize [41]. This fact makes it difficult to consistently collect information and assess it objectively [42, 43].

Palmer et al. [44] suggested a system that is not dependent on a particular technology or electronic crime. The system has a recognizing protocols and ideas from conventional forensics, especially the steps used by the FBI during a physical crime scene search. The key components of the suggested system include the following:

- Identification is the process of classifying an incident after classifying its indicators. Despite not being directly related to forensics, this is significant since it has an impact on subsequent operations [44, 42, 45].
- Planning—developing plans, instruments, search warrants, monitoring authorizations, and management support [44, 46, 47].
- Adaptive approach strategy development based on the relevant technology and any potential side effects on bystanders. The goal of the strategy should be to collect the most untampered-with evidence while harming the victim as little as feasible [44, 48, 49].
- Preservation—separate, safeguard, and maintain the integrity of both physical and digital evidence. Access to the digital device may be restricted, and other electromagnetic devices may be used in the affected region [44, 50, 51].
- Collection—Copy the digital evidence and capture the real scene using standardized and authorized techniques [44, 52, 53].

- Examining: a careful, methodical examination of the evidence related to the alleged crime. The focus is on identifying and locating potential evidence, possibly in unanticipated locations. Create extensive records for analysis [44, 54, 55].
- Analysis: pinpoint significance, piece together data shards, and draw [44, 56].
- conclusions based on the information gathered. Testing and analysis may need to be done repeatedly in order to support a criminal theory. The benefit of analysis is that more people can work on this problem because it might not require a high level of technical competence [44, 45].
- Presentation—give a synopsis and justification of the results. This should be expressed using straightforward language and abstract terminology [57, 58].
- Returning evidence entails ensuring that tangible and digital property is given back to the rightful owner and determining what types of criminal evidence must be eliminated. Again, not forensics step specifically, but any approach that seizes evidence hardly ever solves this issue [59].

Be aware that these processes are an abstraction of contemporary methods for investigating crimes involving digital data [44, 60] as opposed to conventional methods for gathering physical evidence. There is a significant body of tried-and-true investigative methods and techniques in more traditional forensics domains. They are not yet given much weight, even though the majority are appropriate in cyberspace [37]. Also keep in mind that up until this point, it is possible to declare abstractly what kind of digital technology is being used in these activities [61, 62]. This is important because it allows for the establishment of a standard operating procedure without disclosing the specific technology involved [63, 64]. This makes it feasible to interact between the old and new advanced digital hard and software in a well-known and widely accepted manner this system can be used on traditional devices such as calculators, personal computers, and with any future devices [65]. Future technologies will enhance the way of using the suggested system to develop its ability to perform forensic analysis and to offer a consistent and standardized process for delivering, which will advance forensic science by offering a systematic framework for evaluating advanced technology while enabling law systems and enforcement [66, 67].

Under this concept, further required procedures will apply in order to specify the types of technology. All digital technologies that sustain stable states on their own would be examined like paper documents, videotapes, and audio recordings, these technologies are already widely used as evidence [54, 68]. A judicial member might utilize this abstraction to give this category more credibility than, say, technologies under the Volatile Storage category [69]. The system will enhance the data collection techniques, examined, and improved within the parameters of each technical subcategory [70]. The development of new methods for different technologies should be influenced by an established and enhanced approach. Because the procedure of gathering was incorporated into the model, it gives the category more legitimacy and reassures non-technical viewers that experience gathering Analogous evidence was applied to a specific instance in the similar group [71].

Storage will consider to the addition of the fixed hard drives with built-in non-volatile flash memory (often seen in ordinary computer systems) (used in personal digital assistants, digital cameras, MP3 players) [72, 73]. In this hypothetical situation, both technologies may contain information that is pertinent to the judges, and by treating that information as permanent digital storage, they can continue to have faith in the veracity of the data discovered [74, 75]. Although the actual data extraction would rely on the underlying technology, as binary data is frequently stored in files, the evaluation of the contents might again follow a regular procedure. The benefit of the abstraction is that most digital equipment, including as computers, personal digital assistants, digital cameras, and other gadgets, have non-volatile storage that can be checked for potential evidence [76, 77]. Previously developed ways can serve as a jumping off point for new technologies, and by identifying the similarities, supporting processes and tools can be found for development [78, 79].

There can be no model without a consideration of its advantages and disadvantages [80]. It's important to mention any cons after outlining the advantages. Before anything else, there is no testing or proof that this paradigm is the ideal response for the DF framework. When developing a DF system, it is important to understand the link between digital technologies and working backwards to construct a solid forensics approach that applies to many digital technologies rather than a select few [81].

Since meaningless activities have no application in the real world, caution must be taken to prevent removing them [82]. Second, this model was developed with the use of digital technologies so the non-digital will not be considered [83, 84].

2 Conclusion

The paper discussed the literature related to forensic accounting and the auditing of the digital banking. The previous suggested a forensic digital system which can be used to support the auditors and forensic accountant to prepare their reports and to suggest some solutions to protect the banking sector assets. The suggested system as per the literature will create a standardized and universal framework for the advancement of digital forensics [9, 85, 86], provides a way to integrate next digital technologies into the same architecture [37, 87, 77], produce a general strategy that judges can use to explain technology to observers who are not technically savvy [7, 88], establishes the need for specific technologically dependent instruments while providing information on previously established tools from the same category and will enhance the ability to incorporate similarity electronics [44, 89, 90].

On the other hand, the system might be too broad, there might not be an obvious or straightforward approach to test the system [91]. As additional subcategories are added, using the model will get more difficult [7, 92, 93]. One clear subject that our model completely ignores is the custody, which is essential part of any investigations [71, 94, 95]. A robust chain of custody will be upheld in the investigation, according

to this approach. It is assumed in any discussion of forensics, but the fact that it isn't part of the model above doesn't indicate that it isn't important [96, 36].

Accordingly, it is recommended to understand the weakness and strongness of the system and to educate the auditors and forensic accountant about the advantages and disadvantages of the digital forensic system to assure better utilization of it.

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The Reflection of Applying Accrual Basis in Enhancing Transparency and Accountability in the Jordanian Public Sector



Sanaa Maswadeh and Mahmoud Ababneh

Abstract The study aimed to identify the reflection of applying the accrual basis in enhancing transparency and accountability in the Jordanian Public Sector. To achieve the objectives of the study, a questionnaire was designed and distributed to the study population consisting of the Ministry of Finance and its affiliated departments and the Audit Bureau in Jordan, (34) departments with its branches, with (753) employees. A total of (270) questionnaires were distributed to the study population, after examining the retrieved questionnaires, and deleted for lack of information in them, the randomly selected sample became (255) questionnaires, the multiple regression used to test the hypotheses of the study. The study concluded that there is a positive effect of applying the accrual basis through developing control systems, updating accounting systems, and evaluating the performance of government units on enhancing transparency and accountability in the Jordanian public sector. The most important recommendation of the study is the necessity to develop technological capabilities and modern computer programs in the Jordanian public sector to keep in line with the updating of the accounting system and develop the control system according to the accrual basis requirements.

Keywords Accrual basis · Developing control systems · Updating accounting systems · Evaluating the performance · Accountability and transparency · Public sector · Jordan

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1 Introduction

Due to the many problems related to the cash basis, Jordan was one of the developing countries that adopted the application of accounting standards for the public sector and made many reforms, including using the accrual basis. Leads the government to develop control systems and update accounting systems, and evaluate the performance of public sector units, all of these considerations an essential tool to a governance that is closely linked to transparency and accountability principles.

The public debt crisis in Jordan and the global financial crises revealed that the absence of accountability, transparency, fragility, lack of clarity in public financial policy, and poor management of the Jordanian public sector exposes the government's ability to fulfill its obligations and implement its main tasks related to providing the necessary services in various forms.

As a result of what these crises created, the Jordanian government found itself forced to review its accounting, financial, and control systems to make them more transparent and accountable, which resulted in the need to provide comprehensive, appropriate, and reliable financial information as a main core for decision-making and effective control of public funds. In this context, the researchers consider the transformation of the Jordanian public sector from a cash basis to an accrual basis as the first stage of reforms necessary to manage the public sector and reduce its indebtedness, through the preparation of financial reports according to this basis and in a way that enables the government to provide information that allows making a rational decision and allows for more transparency and accountability.

The Jordanian government has recognized the importance of transparency and accountability in the public sector, and Jordan is one of the developed countries that adopt public accounting standards [1]. Therefore, the Jordanian public sector was chosen due to the Jordanian government's reform efforts, the need to extend research on accrual accounting, and the unique economic, social, and political context of Jordan. Also, Jordan is one of the first developing countries to adopt the application of the accrual basis in the public sector, and because the researcher works in the Jordanian Ministry of Finance, the researcher has the incentive to apply accrual basis as part of his current position.

Accordingly, Prime Ministry Resolution No. 22915 of 2014 was issued in Jordan, which called for reliance on accounting standards issued by the International Accounting Standards Board in the public sector at the forefront of these standards is the application of the accrual basis.

Therefore, this study came to investigate the reflection of applying the accrual basis on enhancing transparency and accountability in the Jordanian public sector, which plays an important role in enriching the scientific content on this topic. The significance of the study from a practical point is the importance of international accounting standards in the government sector, as most countries moved towards applying these standards, especially the accrual basis, especially after it became clear that the cash basis contains multiple defects most notably: the government's failure to show the financial position properly because it represents a departure from

the principle of independence of the years, as revenues and expenditures are recorded on the date they are received, leads to difficulty in tracking revenues and expenditures in each financial period, in addition to the lack of comprehensiveness of the oversight role in it and the lack of comprehensiveness of accounting measurement, leads to the emergence of distortions in the financial reports prepared within this basis and gives an opportunity for manipulation of public revenues and expenditures figures [2].

As a result, the contribution of the practical study appears in helping the official authorities in the country, including the Ministry of Finance and the General Budget Department, to assess the important role of applying the accrual basis in enhancing transparency and accountability in the Jordanian public sector.

2 Theoretical Framework

The application of the accrual basis is considered one of the necessary accounting principles on which it was necessary to develop control systems, update accounting systems, and evaluate performance to enhance accountability and transparency in the Jordanian public sector. The study of [3] showed that the accrual basis is recognized the financial events during the period in which they occurred, and the public revenues and expenses are charged for the actual financial period in which they occurred.

Polzer et al. [4] indicated that the accrual basis is the accounting basis that discloses property and liabilities, then depreciation and proper assessment of assets; it works to achieve the principle of comprehensive control over public revenues and expenditures, so they are recorded in the related financial period regardless of the time and date of their collection or payment, and requires making inventory adjustments to public revenues and expenditures and financial events, concerning accounting period and loaded on the final accounts for this period.

Gnanarajah [5] Defines the cash basis as the method of recording and reporting revenues, and expenses, whereby revenues and expenses are recorded when cash is received or paid.

The concept of accountability overlaps with other ideas, such as responsibility and monitoring, so defining it faces some difficulties. However, for the United Nations administration, accountability refers to the obligation of public sector employees to report on the use of public resources and failure to achieve stated performance goals [6].

Hijo and Al-Ashi [7] Study showed the extent to which international public accounting standards are applied in Palestinian government institutions, which concluded that the application of the accrual basis reduces financial and administrative corruption in the Palestinian public sector.

Diab [8] Study aimed to identify the challenges facing the Lebanese public accounting system, especially those related to the transition to the accrual basis and the adoption of international accounting standards. And the ability to manipulate financial data under the use of the cash basis, the study focused on the importance of

shifting from the cash basis to the accrual basis and the development of legislation related to the transition process.

The study of [9] aimed to identify the challenges of reform and transition towards accrual accounting for IPSAS and its implementation in Kosovo. The study reached several results, most notably the need for more financial resources and trained human resources to implement the financial reform process in the public sector in Kosovo.

Kuroki et al. [10] Investigate whether the use of the accrual basis leads to the intended effects of reform in the Japanese public sector. The study concluded the importance of applying the accrual basis in all Japanese departments and provinces to achieve reform in the public sector and the importance of relying on unified accounting standards in Japanese government departments.

Mijbil and Jabal [11] Concluded that reliance on international accounting standards in the public sector leads to providing more quality information in the financial reports in Iraq and the ease of comparing the financial statements of the different government units.

Zhang [12] Study sought to evaluate the experience of applying the accrual basis in the public sector in China and the political and social implications of the reform process. It concluded that the reforms and organizational changes that took place in the Chinese public sector emphasized the need for reforms in the government accounting system. The Chinese need to move forward with accounting reforms on an accrual basis, as they achieve positive advantages for the Chinese central government.

Cuadrado-Ballesteros et al. [13] Studied the impact of the transition to the accrual basis of accounting and the use of international accounting standards in the public sector in reducing corruption in government departments in developing countries. The most important results were the use of the accrual basis of accounting in the public sector leads to reducing corruption and combating it.

The study [1] aimed to demonstrate the impact of applying the accrual basis on the final accounts in various ministries and government departments in Jordan by showing the advantages of using the accrual basis. One of the most important findings of the study was that the application of the accrual basis in the Jordanian public sector works to activate the comparison between the different budget items and the comparison between other years, which leads to improving the quality of government financial data and information to assist the government in drawing up the most effective policies, necessitated the need to develop the accounting system in Jordan to comply with the international public accounting standards.

After reviewing the theoretical literature of the study and the most prominent studies that dealt with the study subject, the following hypotheses were tested:

The main hypothesis: There is no significant effect at a level of ($\alpha \leq 0.05$) of applying the accrual basis on enhancing transparency and accountability in the Jordanian public sector.

The following sub-hypotheses derived from the main hypothesis:

- There is no significant effect at a level of ($\alpha \leq 0.05$) for the development of control systems in line with applying the accrual basis on enhancing transparency and accountability in the Jordanian public sector.
- There is no significant effect at a level of ($\alpha \leq 0.05$) of updating accounting systems in line with applying the accrual basis on enhancing transparency and accountability in the Jordanian public sector.
- There is no significant effect at a significant level of ($\alpha \leq 0.05$) of evaluating the performance of government units in line with applying the accrual basis on enhancing transparency and accountability in the Jordanian public sector.

3 Methodology

The study relied on the descriptive analytical approach, as the descriptive approach is related to the theoretical side of the research, and the analytical approach is associated with the practical side, in which a questionnaire was prepared and distributed to the target members of the study and the statistical methods were used to analyze the data and test the hypotheses of the study.

3.1 Study Population and Sample

The study population consists of the Ministry of Finance and its affiliated departments and the Audit Bureau in Jordan, (34) departments with its branches, with (753) employees working in it with the job title of an accountant, auditor, department manager, and head of the accounting department. The study population was determined by referring to the records of the Human Resources Department in the Ministry of finance and its financial departments and the Audit Bureau, a total of (270) questionnaires were distributed to the members of the study population, and (260) questionnaires were retrieved from them. After examining the retrieved questionnaires, (5) questionnaires were deleted due to insufficient information, so the randomly selected sample consisted of (255) employees, consider a representative sample according to [14] table, with a percentage of (33.86%) of the total population of the study.

3.2 Measurement of Study Variables

To collect the necessary data for the current study, a questionnaire was developed after referring to many previous studies and the theoretical framework of the subject. The questionnaire consisted of two parts, the first part covered demographic characteristics of study members consisted of (educational level, specialization, age,

experiences, job title, and the number of training courses). While the second part covered each of the independent variables in three dimensions: the development of control systems (8) items, updating the accounting systems (8) items, evaluation of government units' performance (8) items, and evaluation of the performance of government units (10) items. The dependent variable represented transparency and accountability and was measured by (10) items. So the questionnaire in its final form consisted of (34) items, according to the five-point Likert scale: (strongly agree, agree, moderately agree, disagree, and strongly disagree), expresses the following values in order (5, 4, 3, 2, 1).

4 Statistical Analysis Results

After conducting appropriate statistical tests the study reached the following statistical results.

4.1 *The Validity and Reliability of the Instrument*

The apparent validity of the instrument in its initial form (34) items was verified by presenting it to (13) reviewers specialized in accounting in different Jordanian public and private universities.

The indicator values of the instrument construction validity were as follows: The correlation coefficient of the degree on the item for the items of the instrument ranged between (0.708–0.856), and the correlation coefficients of the items with the dimension they belong to it ranged between (0.767–0.892), and the correlation coefficients of the dimensions with the totality of the instrument between (0.929–0.963), and all of them were statistically significant at a significant level less than (0.01), which indicates that all these items are highly correlated with the dimensions to which they belong and an indicator that the items included in the instrument are highly correlated and statistically significant, and this is an indication that they belong to the domain they derived from it.

The Cronbach Alpha was used to test the reliability of the instrument, as the value of the Cronbach alpha for the development of the control systems (0.929), updating the accounting system (0.932), evaluating the performance of government units (0.926), enhancing transparency and accountability in the Jordanian public sector (0.962), lastly the whole questionnaire items (0.982), indicating that the scale has a high degree of reliability that meets the purposes of the current study, and exceeds the acceptable statistically value estimated at (0.70) according to [15].

Table 1 Results of-one-sample T-test- to perspectives of the study

Perspectives of the study	Mean	Standard deviation	T	Sig.
Development of control systems in line with applying the accrual basis	3.919	0.761	82.606	0.000
Updating accounting systems in line with applying the accrual basis	4.031	0.740	86.785	0.000
Evaluating the performance of government units in line with applying the accrual basis	3.913	0.766	82.073	0.000
Enhancing transparency and accountability in the Jordanian public sector	3.878	0.837	74.884	0.000

4.2 Descriptive Analysis of the Study Perspectives

The study relied on a one-sample t-test to analyze the data related to the agreement level of study members on the instrument items, and it was applied to all perspectives of the study, So the overall results were as follows.

Referring to the Table 1, it was found that the mean of development of control systems was in line with applying the accrual basis (3.919), with a standard deviation of (0.761), the mean of updating the accounting systems in line with applying the accrual basis (4.031), with a standard deviation of (0.740), and the mean of evaluating the performance of government units in line with applying the accrual basis (3.913), with a standard deviation of (0.766), finally, the mean of enhancing transparency and accountability in Jordanian public sector was (3.878), with a standard deviation of (0.837). with a statistically significant of all perspectives (0.000), which is less than the significance level of ($\alpha \leq 0.05$), consider an indicator of the existence of a statistically significant difference from the test value (3) according to the Likert scale, in the sense that the overall mean of the answers of the study sample agreed that the applying of the accrual basis was reflected in the development of control systems, updating of accounting systems, and evaluating the performance of government units in the Jordanian public sector. Also, the overall mean of the answers of the study sample agrees with enhancing transparency and accountability in the Jordanian public sector.

4.3 Multiple Regression Test

Before starting the application of multiple regression to test the hypotheses of the study, some pre-tests were conducted to examine the suitability of the data to the assumptions of the regression analysis, including The normal distribution test to

ensure that the data followed the normal distribution, so that it was found that the value of the statistical significance of (One-Sample Kolmogorov-Smirnov test) for all variables was greater than the level of statistical significance 0.05, indicates that all variables follow a normal distribution. Also, based on the theory of central tendency, which states if the sample size is greater than (30) and has a mean (μ) and a variance (σ^2), the sampling distribution is normal [16].

The multicollinearity test was used to ensure that there is no high correlation between the independent variables by calculating the variance inflation coefficient (VIF) and the tolerance coefficients for all the independent variables, the results were obtained accordingly; it was found that the values of the variance inflation test for all variables are less than (10). In contrast, the value of the tolerance coefficients for all variables is greater than (0.10), It is an indication of the absence of multicollinearity among the independent variables of the study. The result of pretests enhances the possibility of using the multiple regression model to test the hypotheses of the [17].

Based on the results of the multiple regression tests, to test the effect of developing control systems, updating accounting systems, and evaluating performance in the line of applying accrual basis on enhancing transparency and accountability in the Jordanian public sector which were shown in the following table.

Table 2 shows the value of (Adjusted R^2) reached 0.863, with a statistically significant value indicating the application of the accrual basis through developing control systems, updating accounting systems, and evaluating the performance of the public sector, explained (86.3%) of the variation in enhancing transparency and accountability in the Jordanian public sector, while the remainder of the percentage is due to other variables that were not included in the regression model, and the value of (f) was (533.830) at the significance level of (sig = 0.000) and this confirms the significance of the regression at the significance level of ($\alpha \leq 0.05$), and the ability of the independent variables to effect transparency and accountability, therefore the first main hypothesis is accepted with the alternative formula state: **“There is a significant effect at a level ($\alpha \leq 0.05$) of applying the accrual basis on enhancing transparency and accountability in the Jordanian public sector”**. This result agreed with many studies, including those [18], which concluded the importance of shifting from the application of the cash basis to the accrual basis gradually in the Iraqi public sector. It also agreed with [19], which concluded that applying the accrual basis increases the transparency and accuracy of financial information, thus enhancing transparency and accountability. It also agreed with the study [7], which showed that the application of the accrual basis led to improving the quality of the financial statements of the Jordanian public sector and helped enhance accountability and transparency. It also agreed with the result of [18], who concluded the importance of shifting from applying the cash basis to the accrual basis and its contribution to improving government performance and financial data and making them more efficient in a way that enhances accountability and transparency in the public sector.

It also appears in Table 2, that the value of the regression coefficient for the development of control systems has reached (0.322), with a statistical significance of (0.000), which proves the existence of a significant positive effect of the development

Table 2 Multiple regression results of the effect of applying accrual basis on enhancing transparency and accountability in the Jordanian public sector
$$\hat{y} = -0.329 + 0.322x_1 + 0.131x_2 + 0.618x_3 + e$$

Independent variables			
	B coefficient	T value	Sig. T*
Constant	-0.329	-3.058	0.002
Developing control systems	0.322	6.831	0.000
Modernization of accounting systems	0.131	2.194	0.029
Public sector performance appraisal	0.618	11.707	0.000
R ²	0.865		
Adjusted (R ²)	0.863		
F	533.83		
Sig. (F)	0.000		

where

\hat{y} : Transparency and accountability

x1: Developing control systems

x2: Updating accounting systems

x3: Evaluating the performance of the public sector

e: Margin of error of the regression

$\beta_0, \beta_1, \beta_2, \beta_3$ regression coefficients

of control systems on enhancing transparency and accountability in the Jordanian public sector. Thus we accept the alternative hypothesis states: **“There is a significant effect at a level ($\alpha \leq 0.05$) for the development of control systems in line with applying the accrual basis on enhancing transparency and accountability in the Jordanian public sector”**. This result agreed with [20], which showed that the development of control systems in the public sector improves transparency and accountability. It also agreed with [21], which showed that the application of the accrual basis enhances financial and administrative control that reduces violations in the public sector. It also agreed with [22], whose results showed that applying the accrual basis helps in determining expenditures and revenues for the public sector and increases control over them.

It also appears in Table 2 that the value of the regression coefficient for updating accounting systems was (0.131), with a statistical significance of (0.000), which proves the existence of a significant positive effect of updating accounting systems on enhancing Transparency and accountability in the Jordanian public sector. This leads to accepting the alternative hypothesis, which states: **“There is a significant effect at a level ($\alpha \leq 0.05$) of updating accounting systems in line with applying the accrual basis on enhancing transparency and accountability in the Jordanian public sector”**. This result agreed with [8], who concluded that updating accounting systems enhances transparency and accountability in the public sector. Also agreed with [1], who concluded the need to improve the accounting system in Jordan to comply with international government accounting standards. And agreed with [1, 20,

22], who concluded that the application of the accrual basis increases the reliability of the information provided by the accounting system and enhances transparency and accountability.

It also appears in Table 2 that the value of the regression coefficient for evaluating the performance of the public sector was (0.618), with a statistical significance level of (0.000), which proves the existence of a significant positive effect of performance evaluation on enhancing transparency and accountability in the Jordanian public sector. Thus we accept the alternative hypothesis, which states: “**There is a significant effect at a significant level ($\alpha \leq 0.05$) of evaluating the performance of government units in line with applying the accrual basis on enhancing transparency and accountability in the Jordanian public sector**”. This result agreed with [23], showed that shifting to the accrual basis has many benefits, including improving financial accountability, decision-making, and better evaluating government units’ performance, enhancing transparency and accountability in the public sector. It agreed with [21], and concluded that evaluation performance enhances transparency and accountability in the public sector.

5 Conclusions

After analyzing the data of the study and testing its hypotheses, the study reached the following notable conclusions:

- The application of the accrual basis through developing control systems, updating accounting systems, and evaluating the performance of government units was reflected in enhancing transparency and accountability in the Jordanian public sector.
- The application of the accrual basis contributed to the ability of government administrative units to assess their obligations and evaluate their performance by determining important indicators for comparing the inputs and outputs of the accounting system in different financial periods and preparing more accurate financial reports.
- The application of the public accounting standards and accrual basis contributed to providing appropriate information for planning, decision-making, and identifying deviations from the established plans, thus formulating the strategic plans realistically, increasing the confidence of the parties dealing with the public sector, in turn, was reflected in enhancing transparency and accountability.
- The application of the accrual basis in the public sector enhanced the comparison of public reports for different years and increased the effectiveness of performance evaluation according to more accurate indicators, thus reflected in the providing services to the public at a satisfactory level.
- The application of public accounting standards and transition to the accrual basis is a necessity to increase compatibility with the trends of the International Monetary Fund and increase the ability of the government to attract external grants and

decrease the pressures and terms in the case of the necessity of borrowing in urgent circumstances.

The reflection of applying the accrual basis in enhancing transparency and accountability in the Jordanian public sector has significant implications for policy, regulators, practice, and theory. The findings of the study suggest that there is a need for policymakers to promote the adoption of accrual accounting in the Jordanian public sector. Policymakers should make accrual accounting a priority to ensure that financial reporting is accurate and comparable, and facilitate the monitoring of financial performance and the detection of irregularities, to enhance the quality and credibility of financial reporting.

Applying the accrual basis in the public sector will require investment in training and capacity building for accounting personnel, as well as the implementation of appropriate information systems and internal controls.

The study has implications for the theoretical understanding of the role of accrual accounting in enhancing transparency and accountability. It provides evidence to support the view that accrual accounting can contribute to better decision-making, improved financial management, and enhanced accountability in the public sector.

Overall, the current study contributes to a growing literature on the potential benefits and challenges of adopting accrual accounting in the public sector. The consistent findings across studies suggest that the adoption of accrual accounting can enhance transparency and accountability, while the potential challenges associated with its adoption should be taken into account when considering implementation.

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ESG Performance and Tax Avoidance: The Case of the Jordanian Capital Market



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Abstract Environmental, Social and Governance (ESG) disclosures are expected to play a pivotal role in introducing firms as transparent and responsible players on behalf of their societies and other interested groups through paying their shares of taxes. This study therefore examines the effect of ESG disclosures on tax avoidance practices on the Jordanian business environment using a panel data set which comprises 2,595 firm year observations of non-financial firms listed at the ASE between 2003 and 2022. The results of multiple regression analysis show a significant negative association between governance disclosures and tax avoidance, indicating that high-quality governance system leads to maximize the firms' accounting practices and choices that are lead to pay more taxes which in turn leads to enhance services provided to the community they operate in. However, environmental and social disclosures are found to be insignificantly associated with tax avoidance practices. This study recommends that the Jordanian regulatory bodies must devote more efforts and adopt restricted regulations in order to restrict the probability of adopting tax avoidance techniques in order to provide more financial resources to build up the infrastructure and provide more efficient services to the community.

Keywords Environmental disclosure · Social disclosure · Governance disclosure · Tax avoidance

1 Introduction

During the last years, firms among the global were willing to disclose and pay their shares of taxes to avoid any suspicious arrow that could be fired by social members to classify such firms as “*Poor Citizen*” [1]. Indeed, firms are inclined to enhance societies' welfares by paying their taxes which in turn it may be used to build up the needed infrastructure in terms of education and health [2, 3]. However, taking a

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contradictory path in paying taxes may introduce firms as irresponsible social players who ignored the society needs by maximizing their benefits only; such an endangering attitude by firms' managers may threaten the firms' continuity as well as it may affect the legitimacy of their companies which has been given by the stakeholders and other interested users [4, 5]. In other words, as long as the disclosure map is readable by interested groups, firms' stability, acceptance by their societies and obtaining the legitimacy in front of the stakeholders are expected to noticeable which in turn may adjust the road to comply with societies norms [6].

As a proof [6], ascertained that, restating the financial statements numbers has dropped reputational destructions on the firm which adopted such practices as well as they found that, enhancing the disclosures levels in terms of such issues related to the environment, social or the governmental issues may be a clear map to come out of the bottleneck. From the legitimacy point of view, firms are accommodating with reflecting an accepted appearance in the business markets by either increasing the voluntary disclosure map or by participating in building their societies by paying the fair amount of taxes [5].

Bewitchingly, managers are in unenviable position since they are expected to direct their experience and knowledge to maximize shareholders' wealth, mean while they are under pressure to serve their societies effectively [7]. Indeed, managers will take the advantage of the loopholes presence in taxation laws in order to minimize the level of the tax owed [8], otherwise their presence may be revoked. Therefore, the main research question in this paper is to investigate whether the tax avoidance behavior within the Jordanian market will be affected by the ESG performance.

2 Literature Review and Hypotheses Development

2.1 Organizational Legitimacy

One of the key criteria of accepting firms as active social representatives of their firms is if they have been legitimized by the society. In this vein, legitimacy has been defined as “the appraisal of actions in terms of shared or common values in the context of the involvement of the action in the social system” [9]; hence, any variance appeared among firms' activities during the operational process in compare with the values or norms imposed by the societies may threaten the firms' acceptance and therefore may harm their reputation as well [10, 11]. Undeniably, there is a clear connection among ESG practices and legitimacy perspective [2, 12]. For example [13, 14], clarified that, the willingness of being accepted socially as well as holding remarkable reputational position are the main externalities incentives targeted by firms' managers to introduce their firms as active players in terms of some issues connected to the society and employees' rights. In other words, incorporating in enhancing ESG performance may be appeared as a bridge to restrict the societal skepticism in terms of firms'

legitimacy. Hence, adopting ESG practices may introduce such firms as legitimate representatives of several issues related to their societies; for instance, ESG issue.

2.2 *ESG and Tax Avoidance*

ESG issues have attracted the attention globally recently, since such a disclosure activity may play noticeable role in the classification map in terms of firms' acceptance in their communities. Hence, firms with a clear commitment to their tax payments as well as focusing on societies issues such as ESG will definitely re-rank such firms to be as leaders and legitimized firms which in turn may receive a social prominence from civil society players.

Recently, firms were under pressure to face and solve the damage of the environmental conditions' changes occur for many reasons; indeed, firms are willing to gain a sustainable profit as well as social acceptance from its society to minimize the effects of its operations on the environment [15, 16]. In fact, the issue of the environment has become a clear obligation for firms globally since they are needed to deal with the outputs of firms' operations.

For example, the environmental turbulences as a result of gas emission, solid waste or climate change could be solved or at least constrained if the firms are fully committed to pay their shares of the imposed taxes; hence governments can use this money to enhance community welfare and reduce the negative consequences of firms' operations [17, 18].

Noticeably, socially accepted firms are willing to engage effectively in enhancing the issues connected to the social factors such as: labor rights, work environments, which in turn may increase firms' acceptance in their societies. Indeed, such a performance of firm's boards is expected to increase the ethical commitment of such boards which in turn reflects firms' adherence to pay their shares of taxes. In other words, this dedication in enhancing voluntary practice is expected to send a clear signal to interested groups such as stakeholders that such firms are connected efficiently to their society's needs, hence, their taxes will be paid fully without any manipulation or adjusting [19].

However, and in terms of firm's commitment in relation to governance disclosures, active firms with high and transparent performance in enhancing such disclosures will introduce firms as trustworthy groups who focus on maximizing principals' wealth as well as the prosperousness and safety of the societies' by paying the fair amounts of their taxes. Explicitly, committed firms will satisfy the expectations of the heterogeneous expectations of its stakeholders and the society as well. Conspicuously, if the firms' managers were not inclined to believe in governments ability to use the taxes efficiently they will be willing to avoid taxes to pave the roads to maximize their wealth and ignoring stakeholders' preferences in terms of the environmental issues [20, 21].

Furthermore, firms with scarce resources are expected to direct their interests into efficient decisions to maximize firms' profits and values instead of focusing on

enhancing voluntary practices [22, 23]. In line with this conclusion, [24] asserted on the importance of enhancing the environmental aspect in order to minimize the cost of avoiding taxes. The literature in terms of the ESG effects on tax avoidance is contradictory, since several points of view appeared. However, this research follows the suggestion which introduces committed firms as socially accepted firms which means that, enhancing the ESG disclosures are expected to minimize the tax avoidance decisions which in turn enhancing the welfare of the hosting societies. Therefore, the following hypotheses will be tested:

H₁: there is a negative relationship between environmental disclosures and tax avoidance.

H₂: there is a negative relationship between social disclosures and tax avoidance.

H₃: there is a negative relationship between governance disclosures and tax avoidance.

3 Research Design

The covered sample in this study comprises of all non-financial firms listed between 2003 and 2022 at Amman Stock Exchange (ASE). All selected firms must disclose all the needed data in terms of the ESG concept and it must be listed during the sample period at ASE. Tax avoidance has been estimated as the negative sign of calculated earnings management estimation by using the Modified Jones Model (1995). Indeed, it will be indexed by the negative sign of the discretionary accruals. The rational justification behind selecting this approach is that, one of the key incentives to manipulate earnings is to avoid paying high amount of taxes [6]. In terms of the ESG estimation, this study has adopted the guideline published by the ASE in which the different dimensions (Environmental, Social and Governance disclosures) have been explained in detail. Indeed, seven items have been used to estimate the environmental part of the overall disclosures. Additionally, thirteen items have been employed as a proxy to estimate the social disclosures and finally eight items have been proxied to estimate the governance disclosures. The overall number of items used as an index of the ESG was 28 items [2] (Tables 1 and 2).

In order to achieve the main goal of this study, a sample of non-financial firms listed at ASE between 2003 and 2022 has been selected from the study's population which consists in total 4,191 firms. The financial firms have been excluded from the final sample since such sector has a different set of characteristics in compare with other sectors. Furthermore, firms with missing information related to ESG disclosures have been removed from the final sample. Hence, the final sample of this study covers 2,595 listed firms.

Table 1 Summary of variables and their measurements

Description	Variable name	Measurement	Exp. sign
<i>Dependent variable</i>			
TAX.AVO	Tax avoidance	The negative sign of calculated earnings management estimation	
<i>Independent variables</i>			
ENV.DIS	Environmental disclosure	An aggregated score of seven variables	+
SOC.DIS	Social disclosure	An aggregated score of thirteen variables	+
GOV.DIS	Governance disclosure	An aggregated score of eight variables	+
<i>Control variables</i>			
SIZE	Firm size	The total assets at the end of year	+
LEV	Leverage	The ratio of total debt to total equity	-
ROA	Return on assets	The ratio of net income to total assets	-

$$\text{TAX.AVO}_{it} = \beta_0 + \beta_1 \text{ENV.DIS}_{it} + \beta_2 \text{SOC.DIS}_{it} + \beta_3 \text{GOV.DIS}_{it} + \beta_4 \text{SIZE}_{it} + \beta_5 \text{LEV}_{it} + \beta_6 \text{ROA}_{it} + \varepsilon_{it}$$

Table 2 Sample selection criteria

Description	Number of observations
All firms listed on the ASE from 2003 to 2022	4,191
Less: financial firms	(935)
Less: missing environmental data	(211)
Less: missing social data	(159)
Less: missing governance data	(144)
Less: missing financial data	(147)
Final sample	2,595

4 Results and Discussion

Table 3 presents the descriptive statistics of the study's variables. Based on the previous table, the average of tax avoidance (TAX.AVO) estimated by the negative sign of discretionary accruals is approximately 2% of the study's sample covered in this study with a median of one percent. This average of tax avoidance indicates that, the Jordanian listed firms at ASE have practiced the techniques that are expected to help them in saving firm's cash from being paid as taxes to the Jordanian governments.

In terms of the environmental disclosures (ENV.DIS), Table 3 shows the average and the median of the ENV.DIS within the Jordanian environment in which the

reported values were 28.9% and 24.7% respectively. Most importantly, the maximum level of the environmental disclosures reached 78.4%. Unfortunately, some firms were not willing to disclose any information in terms of the environmental aspects where the minimum percent was zero. The Jordanian regulators must shed the light on the importance of the environmental discloser since such concept appears to be outside the monitoring map for some of the Jordanian firms. Indeed, the average of disclosing information related to the environment issues was four times higher the Jordanian market average as reported by [25] within the French context. While the Jordanian managers were more willing to disclose more environmental information in compare with the Malaysian managers in which this issue has just covered 14% of the Malaysian disclosures map [22].

With regard to the social disclosures, Table 3 reported that the lowest level of the ESG dimensions was related to the SOC.DIS with an average of 22.7% and a median of 19.8%. This low score gives a clear signal that, the Jordanian managers of the non-financial listed firms at ASE between 2003 and 2022 were not inclined and motivated to increase this levels as well as, this topic (i.e. ESG) is a new concept for the Jordanian managers therefore, they still not recognized the importance of this issue. Interestingly, the Korean managers were well informed and educated about the importance of increasing the social disclosures according to [18] who reported an average of 86% of the social issues disclosures.

In respect of the governance disclosures levels extracted from the non-financial listed firms sample between 2003 and 2022, Table 3 shows an average of 36.1% and a median of 33.4%. However, the maximum reported average was 84.5% and the lowest average was 12.5%. Interestingly, this average recorded within the Jordanian market is close to the average of the governance disclosures within the Korean context, since [18] claim that, the average of this concept reached 89% of the overall disclosures preferences. With reference of the control variables, the average of firm size, leverage and ROA were 187.2, 61.1% and 3.8% respectively.

To test the multicollinearity among the study's variables, Pearson test has been applied to the collected data. According to [26] who claims that the correlation strength among data set must be 70% or below to avoid any obstacle in such issue. Therefore, and according to Table 4, all extracted values of Pearson test were below

Table 3 Descriptive statistics

Variables	Observations	Mean	Median	Min.	Max.
TAX.AVO	2,595	0.021	0.012	0.0001	1.425
ENV.DIS	2,595	0.289	0.247	0.000	0.784
SOC.DIS	2,595	0.227	0.198	0.000	0.677
GOV.DIS	2,595	0.361	0.334	0.125	0.845
SIZE (in million \$US)	2,595	187.2	174.9	0.127	7947
LEV	2,595	0.611	0.354	0.125	2.047
ROA	2,595	0.038	0.027	-1.078	1.478

All variables are defined in Table 2

the critical value; hence the multicollinearity issue is not recognized as noticeable issue.

In order to achieve the goal of this study a regression analysis has been applied to regression model formulated previously. According to Table 5, the relationship between TAX.AVO and ENV.DIS was positive but insignificant. This result contradicts the main hypothesis developed which suggests a significant negative correlation between ESG dimensions and TAX.AVO. This result however supported the finding documented by [18] who found a positive but insignificant relationship between tax avoidance and the environmental part of the ESG. Hence, H_1 is rejected. In terms of the social disclosures, Table 5 also documents an insignificant positive relationship between TAX.AVO and the social dimension of the ESG as well. Indeed, this finding is in line with the conclusion made by [27]. However, the results of Table 5 contradict

Table 4 Correlation matrix

Variables	TAX.AVO	ENV.DIS	SOC.DIS	GOV.DIS	SIZE	LEV	ROA
TAX.AVO	1.000						
ENV.DIS	-0.054*	1.000					
SOC.DIS	0.167	0.339*	1.000				
GOV.DIS	-0.047*	0.017	0.217	1.000			
SIZE	0.335*	0.234*	0.524*	0.457*	1.000		
LEV	0.068*	0.208*	0.301*	0.148	0.215	1.000	
ROA	-0.119*	0.109*	0.347*	0.478*	0.336*	-0.258*	1.000

The symbol (*) denotes significance at 1% in two-tailed test
 All variables are defined Table 2

Table 5 Regression results of the association between ESG and tax avoidance

Variables	Coefficient	T-value	Probability
ENV.DIS	0.034	1.17	0.287
SOC.DIS	1.148	0.84	0.397
GOV.DIS	-3.149	-4.98	0.000
SIZE	2.365	2.29	0.021
LEV	0.019	0.786	0.547
ROA	-0.090	5.98	0.000
Constant	1.258	-8.49	0.000

Adjusted R² 31.8

No. of observations 2,595

Notes This table presents the results of fixed effect regression of the association between ESG and tax avoidance. The sample comprises 2,595 firm-year observations of listed firms on the ASE from 2003 to 2022. The dependent variable is tax avoidance (TAX.AVO). Independent and control variables are defined in Table 2

the main hypothesis adopted which suggests a negative and significant correlation between ESG and TAX.AVO. Therefore, H_2 is also rejected.

Noticeably, only the governmental dimension among the ESG disclosures was negative and significant over the sample of non-financial firms listed at ASE between 2003 and 2022. This result underpins the outcome documented by [28]. Hence, the hypothesis (H_3) that has been developed to this dimension is accepted. In general, from the extracted results shown on Table 5, it seems that, the non-financial listed firms at ASE between 2003 and 2022 have practiced TAX.AVO techniques. Indeed, firms which focus on TAX.AVO practices with neglecting other issues such as ESG are appeared as firms with short term vision in creating a sustainable social image to guarantee the social acceptance among their hosting contexts [29, 30].

Furthermore, firms with weak role in increasing their participation in ESG practices may shirk their social roles and, in some cases, may threaten their social contracts with the surrounding environments [12–35]. Hence, engaging noticeably in TAX.AVO practices may be seen as a legal path to pay fewer amounts of firms' shares to develop the contexts' infrastructure and other needed services. Furthermore, firms with willingness to adopt TAX.AVO are introduced as opaque firms which lack transparency and clearness in controlling their firms and in some cases may hinder interested groups from having the accurate financial and non-financial position of their firms.

5 Conclusion

The concept of ESG is considered a key topic that listed firms have devoted noteworthy efforts to include such information in their annual reports; as well as the regulatory bodies and other groups such as academics have focused in ESG performance to understand the extent of the socialism of listed firms globally. In other words, ESG concept is expected to play role in introducing firms as transparent and responsible players on behalf of their societies and other interested groups.

On the other hand, avoid paying taxes by listed firms may create unfavorable social acceptance for such firms since they are escaping from paying their shares of taxes that could be used to enhance the welfare of their societies. Indeed, the prior literature that covered the relationship between ESG and TAX.AVO has introduced several contradictory conclusions. Therefore, the main goal of this study was to investigate the effect of ESG disclosures on tax avoidance practices over a sample of non-financial firms listed at ASE between 2003 and 2022. The results showed that environmental and social disclosures were positively but insignificantly correlated with TAX.AVO practices. Governmental part of ESG was negatively and significantly associated with TAX.AVO. Therefore, this study recommends that, the Jordanian regulatory bodies must devote more efforts and adopt restricted regulations in order to restrict the probability of adopting TAX.AVO techniques in order to provide more financial resources to build up the infrastructure and providing more efficient services to the Jordanian community. Additionally, more efforts must be directed to make

sure that the ESG disclosers have reflected on the ground effectively to guarantee the presence of active social player within the Jordanian context.

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The Impact of Digital Marketing on SME's Growth and Success as a Tool of Marketing Communication: A Case Study in Bahrain After the Pandemic



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Abstract The purpose of this study is to examine the impact of digital marketing on the growth of SMEs by adopting digital marketing strategies in the Kingdom of Bahrain after the pandemic. This study is to determine the effect of digital marketing tools such as social media, emails, viral marketing, and others, on the establishment of successful SMEs businesses. Additionally, it seeks to explore the connection between SMEs and digital marketing by defining key components of the digital marketing strategy and how to apply them in small and medium-sized businesses from a marketing standpoint. This study will employ a structured questionnaire to determine the impact of digital marketing on sales improvement of SMEs in Bahrain. Digital marketing has positive impact on users experience into increasing sales revenues which has affected consumers buying decision online. The study's findings will aid SMEs' management and owners in considering digital marketing tactics as a crucial platform for promoting their brands. The suggestions for more research are connected, but possibly more specific in the context of Bahrain.

Keywords Digital marketing · Entrepreneurial growth · Entrepreneurial success · COVID-19 pandemic · Bahrain

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1 Introduction

Emerging very recently from the covid-19 pandemic, humanity and the world economy with its various sectors, industries, governments, populations, and resources have experienced a real nearly 2-year shift in perspective, realization, possibilities, and capacities. The lockdown around the world caused vast numbers of SMEs to cease trading, and many more were either on the cusp of bankruptcy or highly vulnerable seeking government bailouts and delayed bill payments and even waivers. For all the businesses that were able to survive, digital marketing and ecommerce were the only practical possibility for continuation in the market on the competition dimension and customer service dimension. On the one hand digital marketing became the tool to communicate, avail customers of value, compete in the struggle to survive against market pressures and competitors, while on the other hand ecommerce was the tool to fulfil transactions safely, timely and efficiently [52].

As a direct result of the pandemic, digital marketing and ecommerce became a critical necessity during the pandemic. Firms of different classification in virtually all industries rapidly enriched their business resources with digital tools [7]. Digitalization has impacted all facets of society, with a major impact on social, political, and economic aspects [30]. In Bahrain, according to [61], the ecommerce market revenue is projected to reach US\$1,296.00 m by the end of 2022 due to user penetration reaching 57.9% in 2022. The projections put the annual growth rate at an expected (CAGR 2022–2027) of 12.11%, leading to a predicted market size of US\$2,295.00 m by 2027. This is a direct result of the expansion in users' numbers that is expected to amount to 1.2 m users by 2027 hitting 61.7% proving the vitality of online and business digital availability and utilization during the pandemic [3].

The lockdown forced businesses to use a variety of digital tools, to establish their presence in the corporate world and display their brands with the intention of growing their customer base and creating virtual availability of their value [49]. According to [16], the use of digital tools in business activities has been shown to increase business competitiveness and opportunity base, particularly for SMEs to compete on more even terms with larger organisations. Their purpose is to make sales of products and services, build relationships with customers and prior to that investigate the digital realm using sustainable digital marketing techniques, which assists access and communication to a wider range of target market for a better productive output [14, 27, 46, 53].

Digital platforms create an excellent launchpad and support to start and grow an SMEs brand [49]. Digital marketing for SMEs need be in line with the target market, marketing strategy, and goals to adhere to changing, sophisticated consumer behaviour. In the present day, creating a corporate identity is a crucial strategic requirement for SMEs to develop their own brand marketing strategies and procedures [48]. Small and Medium-Sized Enterprises operate in aggressive red oceans with an unpredictable business environment, constant challenge of competition and the need to provide quality value to customers, against established organizations. Due

to their size and economic capacity, established organizations (the large enterprises) are more likely to succeed.

This creates a radical need for SMEs to apply social networks, online advertising campaigns and other virtual strategies to accelerate their businesses' development growth in opposition to well-funded businesses. This should be done in cognizance with adapting to new and inventive methods to improve and adapt to a rapid transformational growth [20, 49, 54]. With the global effects of the pandemics on local economies, international trade disruption and supply chains stalemate, due to borders shutting to combat the pandemic spread, lack of supply and increase in local demand, consumers needed alternatives. It became a necessity that governments and industry players around the globe support, encourage and fuel the growth of SMEs for a sustainable economy and social rest which on the long run guarantees national economic competitive advantages for businesses and economies. Barnes et al. [17] management literature marks digital marketing importance for SMEs' entrepreneurs as the digital space tool to enhance brand value and bolding, guaranteeing sales increase, new customers creation and ensuring customer retention [23].

Investigating the covid-19 pandemic, pandemic realizations, post pandemic realities alongside the strides of development in information technology over the recent years, namely the leap of average online time consumer media behaviour, the present study aims to determine the impact of digital marketing as a tool of marketing communications on SME's growth and success in Bahrain. Thus, all SMEs in Bahrain may find value in this study. It provides SMEs with a solid foundation for using digital marketing to market and educate consumers about their goods and services. The objective of this study is to assess how the development of SMEs in the Kingdom of Bahrain is impacted by digital marketing. Thus, this study may find value to all SMEs in Bahrain. It gives SMEs a solid base on which to sell and inform consumers about their products and services through digital marketing.

This might make it easier for customers to understand how businesses operate and help them make better decisions while using digital media. Finally, the findings of this study have added to the market's knowledge about SMEs and digital marketing. Business academics have the chance to catch up with recent research in the marketing sector.

The findings of this study could be important for policymakers, to start. The study's findings will reveal the tastes of today's consumers as well as the kinds of details they expect from retailers. This could help numerous SMEs develop better marketing strategies. Additionally, the findings of this study might be important for customers. The study's findings will demonstrate how businesses leveraged digital marketing to become more competitive. This might make it easier for customers to understand how businesses operate and help them make better decisions while using digital media. Finally, the findings of this study have added to the market's knowledge about SMEs and digital marketing. Business academics have the chance to catch up with recent research in the marketing sector. This is attributed mainly to the widespread use of mobile and internet devices around the world and Bahrain, which according to Bahrain's governmental Telecommunication Regulatory Authority Quarterly Market

Indicators Report [24] reached Mobile Penetration of 130% in Q2, 2022 supported by Broadband Penetration of 133% both in Q2, 2022.

With instantaneous and efficient access, digital marketing has been discovered to provide the fastest, most reaching, effective and affordable means of reach for most businesses. Usually most small and medium businesses are at the initial stages of growth, where awareness, interest, desire, and retention of customers are all vital for their continuation, success and developing of sales to reach sustainable income. Supporting this reality is the cost of digital marketing compared to traditional marketing. In the first quarter of 2018, the average Cost per Mille (CPM) on the Google display network was \$2.80 while for 2018–2019 Advertisers paid an average CPM of \$17.50 for cable TV ads at the upfronts for the season putting digital marketing cost at 16% of traditional marketing cost. This is highly cost effective and relatively almost highly accurate, especially when considering these digital CPMs are for selectively chosen, narrowly targeted audiences [24].

2 Literature Review

2.1 Digital Marketing

Digital marketing has been found to be quick, extensive, and cost-effective for the majority of firms. Although some research suggests that a company's size may affect how well it can use digital channels, with SMEs having the slowest adoption rates [9]. However, major businesses may have the capacity and resources needed to effectively utilize the available digital channels and services [18].

The past decade has seen the rapid development of digital media that has proliferated to the point where consumers may instantly acquire information. The promotion of products or brands via electronic media is known as digital marketing. In the marketplace, effective digital marketing combines psychology and technology. A marketer can utilize digital marketing to combine the best aspects of marketing with technology. However, it is argued that Digital marketing more than just another emerging marketing channel; it is a new method to marketing that provides a unique comprehension of consumer behaviour, even though the core principles of marketing remain relevant [34]. To understand what such strategies are, it is easier to categorise what does not fit into the category of digital marketing. Traditional advertising channels including print, radio, television, and billboards are not included in digital marketing.

These channels have enjoyed tremendous success for a long time, but they are less useful in the present era. The majority of small and medium-sized enterprises are often in the early stages of business development, and at this point, customer acquisition and retention are crucial to achieving a marketing objective of assuring operational reach to clients in order to boost sales. Before the advent of the digital age, effective and prosperous businesses relied heavily on “word-of-mouth” marketing.

However, in the modern era of digital technology as a marketing tool, the marketing strategy has expanded beyond the exchange of merely things to include the supply of services, engagement, and connections with clients [69, 74]. The shift is made feasible by technical breakthroughs, new marketing channels, and regular changes to the media landscape [8].

In contrast to traditional marketing that has been given a digital boost, according to [33, 43], digital marketing represents a new way of doing business. Numerous scholars have pointed out the effectiveness of Digital marketing in enabling marketers to determine and understand the extent of customers' perceived and experienced brand equity, digital marketing is extremely successful [75]. Utilizing digital marketing is ultimately intended to consistently attract new clients while retaining current ones [19].

One needs to be aware of the distinctive traits and dynamics of marketing in order to select effective methods and techniques. Digital channels can be categorised in a variety of ways. The pursuit of marketing is essential to the existence and success of a business. Today's businesses have more marketing opportunities than ever before [11].

A corporation can use marketing to balance operations, meet responsibilities to many relevant parties, achieve short- and long-term goals, and ultimately stay competitive in the marketplace. The most important tool a company has to reach its target clients is marketing.

Traditional marketing for small and medium-sized businesses relies heavily on word-of-mouth recommendations to bring in new clients [63]. Palmatier et al. [53, 65, 70] points out that Global contemporary economy is dignified by Relationships, technology, and networks that characterize the support and force SMEs to adapt their marketing strategies to the global age.

Over time, a specific word related to the promotion of products and services on digital platforms served as the model for the term "digital marketing." Some claim that integrating digital technology into company processes can significantly increase sales, retain customers, and help maintain and expand brands [37]. As a result, it qualifies as an agile technology. a system by which companies cooperate with clients and other stakeholders to develop and sustain value for their products and services.

Digital technologies have the potential to outperform all traditional media and marketing communication channels, hence ensuring the marketing mix [27] In order to carry out marketing operations utilising digital media, a variety of digital technologies have been utilised, including emails, mobile marketing, search engine optimisation (SEO), pay-per-click (PPC), viral marketing, and social media [56, 60].

Technology-based tools make the relationship between customers and service providers easier [53]. In terms of boosting brand identification and piqueing customer interest, consumer-brand contact has been gradually rising [45].

Sales growth is an increase in the volume of commercial revenue generated over time by a company firm. An improvement could manifest as higher commodity prices and increased sales of goods or commodities [44].

At another context, it could be enhanced both. Sales growth that results from price increases may, however, be related to adjustments in inflation and hence may not be related to genuine or true growth in product sales. But if costs continue to stay low, that would be considered a meaningful growth in sales. The development of the geographical business environment, the growth in the number of branches, the expansion of the quantity of items, as well as the growth in the number of services offered, could all contribute to an increase in sales of goods, on the other hand.

Nowadays, it seems that the traditional approach of marketing is found to have influenced SMEs positively. As a result, a trendy alternative is called digital marketing that has been widely recommended as a good choice for many SMEs. They will be able to reach a larger market as a result, raising awareness of their products and services. For small firms, it's crucial to understand whether digital marketing will help them increase sales of their goods in a cutthroat market. It is crucial for them to understand whether digital marketing might affect their company by boosting sales and product promotion. It is crucial to consider both pecking order theory and the expansion of SMEs in terms of both their financial performance and commerce [67].

2.2 *Social Media*

The word “media” is derived from the plural form of the Latin word “medium,” which is defined as a channel or means of expression. The term “social media” refers to methods of communication in which individuals create, share, and/or exchange information and ideas in online groups and networks [15, 35]. Facebook, Twitter, YouTube, and Instagram are a few of the widely used social media platforms. Social media operates as a platform for both buyers and sellers [60, 72]. Businesses can utilize social media to develop relationships with customers, employees, communities, and other stakeholders by using social media marketing [58]. Social media indicates Online communication platforms for social networking, photo and video sharing, blogging, etc., including blogs and web applications, are collectively referred to as social media [10, 35].

Social media platforms are being used by an increasing number of customers to voice their ideas, concerns, and complaints about the items and services they have used. Social media interactions with customers can teach us about their purchasing patterns and shopping experiences, which will help businesses improve their marketing and customer care [28, 35].

Businesses' social network presence comes with increased audience communication as well as identification of their brands and services to individuals. Due to the fact that a significant portion of the community is present on social media platforms, effective marketing on these platforms enables businesses to get a competitive edge by attracting a big number of customers and recognizing the importance of the customer to their success.

2.3 *Digital Marketing and Sales*

There is a large volume of published studies indicating that digital marketing and sales are significantly related. Digital marketing guarantees that new customers are reached and given the necessary personalized communication, raising awareness and sales Jain [32]. Small and medium-sized businesses can use digital marketing tools like social media, email, and the newest social technologies to spread the word about their products. These tools are generally inexpensive and ensure simple access to potential clients [40, 50].

The goal of social media is to attract audience or viewers into customers, to engage the target audience by graphically showcasing the brands' products and services.

Selling digitally is crucial for generating income. The foundation of a carefully designed digital selling process is utilising the benefits and opportunities provided by digital tools.

Digital marketing's influence on the dynamics of the corporate landscape has significantly increased during the past several years. Digital marketing technologies can be used to measure business success using a variety of indications that business owners gather [26, 50]. The success of digital marketing could be evaluated using analytics, which are included in the majority of digital marketing tools [22].

Information derived through supplied data analytics aids businesses in making future decisions with precision through communicating with customers at the right time and price. Big data analytics and the effectiveness of digital marketing are strongly correlated, according to the growth of intuition-driven marketing.

Digital platforms are complemented by data presence and insights, giving markets an excellent opportunity to draw conclusions from the used data and take the appropriate actions [31]. Through precise measurement and performance analysis for each campaign or advertisement created for a particular brand's goods and services, SMEs will continuously learn how to enhance their performance [26]. From a business standpoint, using contact points and message dissemination to reach the target audience is quite beneficial.

The majority of small and medium-sized enterprises are often in the early stages of business development, and at this point, customer acquisition and retention are crucial to achieving a marketing objective of assuring operational reach to clients in order to boost sales. Before the advent of the digital age, effective and prosperous businesses relied heavily on "word-of-mouth" marketing. However, in the modern era of digital technology as a marketing tool, the marketing strategy has expanded beyond the exchange of merely things to include the supply of services, engagement, and connections with clients [69, 74].

The shift is made feasible by technical breakthroughs, new marketing channels, and regular changes to the media landscape [8].

Sales growth is an increase in the volume of commercial revenue generated over time by a company firm. Increased sales of goods or commodities as well as greater commodity prices are examples of improvements [44]. In another circumstance, it might be better for both parties.

Sales growth that results from price increases may, however, be related to adjustments in inflation and hence may not be related to genuine or true growth in product sales. But if costs continue to stay low, that would be considered a meaningful growth in sales. The development of the geographical business environment, the growth in the number of branches, the expansion of the quantity of items, as well as the growth in the number of services offered, could all contribute to an increase in sales of goods, on the other hand.

The traditional methods of marketing seem to be no longer relevant nowadays. As a result, many SMEs have been advised to consider a well-liked option known as digital marketing. As a result, they will be able to reach a wider audience and increase awareness of their goods and services. It's critical for small businesses to know whether digital marketing will boost their product sales in a competitive industry [59]. They must know whether digital marketing could benefit their business by increasing sales and product promotion. According to [67], it is critical to take into account both pecking order theory and the growth of SMEs in terms of both their financial performance and commerce. This study focuses on how digital marketing affects small and medium-sized businesses' sales in Bahrain.

2.4 Relationship Between Digital Marketing and SMEs

Although it gives a wonderful incentive, SME's often find it difficult and problematic as digital technologies continue to evolve and be applied [46]. Certain potentials that show SMEs' dedication to leveraging newly emerging digital technologies that, in the past, were dominated by larger firms demonstrate a change in dynamics, encouraging them to test their potential in the global market and other competitive business environments they compete in [47].

Small and medium-sized businesses (SMEs) undoubtedly face resource constraints, which force them to be innovative when spending money on or implementing marketing tactics with the sole purpose of expanding their target audience or projecting their brand [46]. Currently, the use of an efficient digital marketing strategy is necessary for their organization to expand moving forward because it is substantially less expensive than traditional marketing. When done effectively, marketing content on digital platforms may be quite efficient financially for SMEs [12, 51].

When used effectively, reputable digital marketing channels like social media, blogs, and viral marketing can interact with a wide range of audiences, guaranteeing new target interest, and building strong relationships with clients and pertinent stakeholders [4].

Using various media, digital marketing ensures effective engagement with potential clients and perceived investors [25]. The following information highlights the evidence that SMEs can gain from adopting a digital marketing business plan in relation to [29].

- Develop brand awareness
- Increase sales
- increase online conversation rate
- cut marketing costs
- boost customer engagement
- Influence purchasing decisions
- produce leads
- track return on investment.

2.5 Effects of Digital Marketing in SMEs

2.5.1 Growth of Company

Businesses in the SMEs business category have a very excellent growth prognosis to digital marketing [64]. SMEs may successfully represent and advertise their brands through relevant internet media thanks to digital marketing approaches, which helps them achieve sustainable success [13, 39].

By appropriately exhibiting the brand products and services, they have become recognized as the most significant method of reaching a larger audience [64]. The basis of small and medium-sized businesses' growth is digital advertising, which is also a practical approach to manage spending without necessarily reducing the visibility of products and services [13].

The planned creation of awareness and the appropriate fusion of effective digital marketing strategies and patterns can ensure the competitive, thorough, and financial success of SMEs organisations [64]. The importance of frequent communication between the company and its clients should be emphasised. Business owners cry for aid from digital marketing solutions to boost conversation rates because this is crucial to evaluating a particular marketing campaign's performance. Adopting a digital marketing plan makes sure that business knowledge expands, revenues rise, and new clients are acquired, all of which support the business objectives overall [31]. 2016.

2.5.2 Brand Recognition

Labels and icons are less noticeable than brands. They represent consumer expectations as well as perceptions of the brand's products and services as a result, the brand has a genuine existence in the thoughts of consumers [41]. As a result, a successful brand has a high level of market dependability, which demonstrates that consumers have some relative influence over the brand [38].

Brand recognition is influenced by how well the products are linked. It's crucial to have a memory trail that shows a customer's capacity to remember and identify a brand under various circumstances. Increasing brand recognition is the main

marketing goal [6]. Digital marketing is essential for brand visibility. Through innovation, the consumer experience, and contacts with the consumer, digital marketing, which is made possible by technology, raises awareness [37].

Organisations may validate the value of creating a strong online presence by adding the essential network and marketing deployments by firms [66]. Marketing is recognised for its revolutionary impacts on businesses and subsequent dramatic impacts on brand consumers. Customers must always find it simpler to interact with businesses. SMEs benefit from social media and other digital marketing tools that help them create stronger communities, networks, and brands [36].

Brand names can have a big impact on customers through this technique, according to study [5]. It is necessary to strike a balance between branding activities and the creation of a framework for organising and implementing a technological and digital brand presence [71]. By building relationships with them through digital marketing and sharing their own thoughts when communicating with potential customers, SMEs can affect the perceptions of current customers of the business [42].

2.5.3 Building Trust

Building consumer trust is essential for SMEs to maintain customer loyalty [55]. As with everyday consumption, trust is a key factor in brand purchases. It imprints the customer's memory with a lasting impression. Building consumer trust is crucial for SMEs to remain viable because, according to [43], consumers are more likely to make repeat purchases when they have confidence in a brand [21].

Digitalized communication channels have a major effect on buying decisions, they boost brand trust [57]. Digital marketing enables SMEs to stay in touch with customers frequently, building relationships in the process. According to [1], through web-based networking platforms, SMEs can increase their investment in visibility obtain significant advantages and encourage competition utilising strategies for digital marketing.

By using new digital platforms, Customers can now monitor corporate operations and offer input on new digital channels. The two-way communication method makes a significant contribution to customer brand trust [2]. To improve customer trust in the brand, SMEs must comply with privacy and security laws. One of the key discoveries was that, according to [62] referenced in [37], is that users placed greater trust in the nature of the internet than in the confidentiality and customization of their perceived value as individuals.

A revolutionary platform, digital marketing allows a whole customer experience, from product information to helping customers. Using a variety of knowledge, customer engagement, and organized resources to assess consumer desire and behaviour provides a way to spot new trends, consider novel ideas, and provide future projections [25, 64]. Customers are engaged by digital marketing, which encourages them to engage with the brand online [73].

The popularity of digital marketing, social media marketing, and search engine marketing is rising as technology develops. Since digital marketing mainly relies

on the internet and the number of internet users is growing quickly, it has profited the most. Consumers are altering how shop, and they prefer digital marketing to traditional marketing. This study focuses on how digital marketing affects small and medium-sized businesses' sales in the Kingdom of Bahrain.

3 Hypothesis

RQ 1: What impact does digital marketing have on small and medium-sized businesses in terms of consumer engagement, brand awareness, and brand trust?

RQ 2: What impact does digital marketing have on the expansion of small and medium-sized businesses?

4 Research Methodology/Population and Sample Size

The primary data used in this study was gathered through a standardised questionnaire. Along with statistics on SMEs' increased sales and use of digital marketing, the data also includes information on entrepreneurs and business features. A total of 180 respondents received were randomly sampled from registered small and medium businesses in the Kingdom of Bahrain between the month of July and July and September 2022. Data were collected between the months of November 2022 and January 2023. The data collected were analyzed using percentages, frequency counts, and regression analysis.

The demographic and sample size of the questionnaire has been analysed while considering any sample has an impact on how boldly the study's conclusions can be drawn. Population, according to Sekaran and Bougie (2010, 61–84), refers to complete groups of individuals, occasions, or interesting objects that the researcher desires to study. The demographic of interest in this study is the Kingdom of Bahrain, which was selected via the internet due to accessibility and ease. The researchers believe it is necessary to work with only the SMEs engaged in commercial activity in order to have a vivid sample size and to draw a broad generalisation about the adoption of digital marketing because the study's goal is to examine the impact of digital marketing on the growth of SMEs.

5 Results and Discussion

5.1 Characteristics of Business Firms

Data describing the business enterprise is presented in the table below. On the type or form of business run by sample firms, 42.9% are partnerships, and 57.1% are limited liabilities companies. The result also shows that 50% have annual sales between 300,000 BD and 500,000 BD; 25% have sales turnover above one million BD; 12.5% of the firm's annual sales between 100,000 BD and 300,000 BD and equally between 300,000 BD and 500,000.

Half of the firms are between 300,000 BD and 500,000 BD before digital marketing adoption. The highest percentage of business (42.9%) firms earn between 50,000 BD and 200,000 BD after digital marketing adoption, 28.6% of the firms earn above one million, and 14.3% earn between 100,000 BD and 400,000 BD. By implication, there are changes in value after the adoption of digital marketing. Descriptive analysis of years of business experience denoted by years of business operation shows that 14.3% have between 1 and 5 years of experience; 85.7% have been operating in the business for more than 5 years (Table 1).

Table 1 Characteristics of business firms

Variables	Classifications	Percentage
Type of business	Sole proprietorship	None
	Partnership	42.90%
	Limited Liability Company	57.10%
	Total	
Number of employees	Less than 5	14.30%
	Between 5 and 20	42.90%
	Between 21 and 50	14.30%
	More than 100	28.60%
	Total	
Annual sales after digital adoption	Between 50,000 and 200,000 BD	42.9%
	Between 200,000 and 400,000 BD	14.3%
	Between 400,000 and 1 million BD	None
	Above 1 million	28.6%
Years of business operation	Less than 1 year	None
	Between 1 and 5 years	14.30%
	More than 5 years	85.70%

5.2 Analysis of Digital Marketing Adoption in SMEs

Results in this section show the various digital options used by business firms in the Kingdom of Bahrain, such as emails, social media marketing, mobile marketing, search engine optimization, pay-per-click, and online advertising. The results show that 44.4% of the respondents strongly agreed that e-mail marketing is used to promote businesses. The response is corroborated by 23% who agreed that e-mail marketing is used as a digital marketing strategy. However, 22.22% do not subscribe to the use of email as a digital marketing option while 33.33% agreed that email marketing has increased sales revenue in business. The use of mobile marketing is supported strongly by 55.55% of the respondents as most of the firms depend on the usage of mobile marketing. Additionally, only 11% were not sure about the usage of mobile marketing as a digital marketing option.

In Bahrain, social media marketing is more adopted by respondents as 66.66% strongly agree to use social media marketing as a digital option for promoting this business, and 50% of the firms indicated that the use of digital marketing added value to their sales. Search engine optimization option in digital marketing is supported by 33%. However, only 22.20% thought that the usage of search engine optimization does not promote their business to that extent.

The use of Pay-Per-Click in the digital marketing business in Bahrain is supported by 44, and 12% of the respondents and below did not support the use of Pay-Per-Click. Approximately 50% and above supported online advertising as a digital marketing option, and 10% disagreed with the use of online advertising as a digital marketing strategy.

The estimated effect of digital marketing adoption on sales improvements in SMEs is different from one digital marketing option to another, many of the respondents thought that email as a digital marketing tool does not significantly contribute to sales growth, this was similarly observed for mobile marketing; however, 44% indicated that search engine optimization has increased the sales revenue in business, this percentage was equal to the online advertisements as well. The use of pay-per-click can contribute towards sales growth by only 22% [68].

6 Conclusion and Recommendations

There is a need to increase education on digital marketing in the Kingdom of Bahrain for small- and medium-sized business owners. Such education could be by improving the educational curriculum for the primary and secondary levels, as well as offering courses for small and medium enterprise businesses.

Digital marketing is essential as it aligns with the way consumers make purchasing decisions, the study revealed the positive impact of online digital marketing on small and medium businesses as well as the performance of the business. Digital marketing can help customers to increase new customer base, profit, sustainability and creating

brand image on the market. Social media platforms are highly preferred by small businesses; additionally online digital marketing is highly impacting various functions of the businesses and mainly small businesses.

All interested parties must use many digital technologies as part of their marketing strategy in order to increase sales of SMEs products. Monitoring the effects of digital marketing at different sales levels is necessary to develop the right policies and ensure the long-term success of SMEs.

7 Limitations and Suggestions for Future Research

The study's main findings were based on SMEs in Bahrain with a small number of respondents, which may have led to a different outcome or set of findings. Due to time constrain the researchers were unable to conduct interviews to address the issue. Therefore, a qualitative research could be considered in the future studies.

Due to this difficulty, it would be dishonest to draw a generalized conclusion or viewpoint that would apply to all SMEs, but the study does reveal trends among the SMEs that took part in the research project and were addressed.

Future study in this area is recommended and in particular researchers can gather data from SMEs that are active on both a small- and large-scale. Chief executives and marketing managers of businesses are knowledgeable about useful information and frequently willing to provide researchers with material that is pertinent to their research. Finally, researchers in the future can do comparable analyses in more nations with comparable industries. For such research, this might assist produce more accurate data and a wider viewpoint.

A limitation in getting a wider representation or respondents' validation before drawing any conclusions is implied by the fact that interviews have been performed. Due to this difficulty, it would be dishonest to draw a generalized conclusion or viewpoint that would apply to all SMEs, but the study does reveal trends among the SMEs that took part in the research project and were questioned.

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The Concept of Ijarah and Ijarah Muntahia Bittamleek in Sudanese Islamic Banks



Omer Eisa Omer Fadul, Yousif Abdelbagi Abdalla, Adel Sarea,
and Azam Abdelhakeem Khalid

Abstract The aims of this study to review and analyze the concept of Ijarah and Ijarah Muntahia Bittamleek (IMB) in Sudanese Islamic banks. In conducting this study, the researchers used descriptive analytical methodology and the inductive method, as well as the comparative method to compare FAS No. 8 to IAS-17 in terms of accounting treatments. In addition, the applied method was used for the practical side of the study, which was based on financial reports from Sudanese Islamic banks. According to the study, the main difference between the two standards is that FAS No. 8 focuses on the legal aspect of financial transactions, whereas IAS-17 focuses on the economic aspect. The study also discovered that Sudanese Islamic Banks were committed to applying FAS No. 8 in terms of accounting measurement, but not in terms of financial report recognition, presentation, and disclosure. The study helps Sudanese Islamic banks apply FAS No. 8 in terms of recognition and accounting disclosure. The analysis of the Ijarah idea and Ijarah Muntahia Bittamleek (IMB) in Sudanese Islamic banks is pioneered in this study.

Keywords Ijarah · Accounting standards · Islamic finance · Conventional lease · Ijarah Muntahia Bittamleek

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1 Introduction

Product innovation is the major driver of competitive advantages among Islamic banks and finance. The focus was initially on creating financial infrastructure. Nonetheless, a significant percentage of focus must go towards meeting client demands by providing a range of goods and services. IBs use a variety of financial instruments by including contracts that have had their structural design significantly altered to include Shariah compliance requirements [5]. Ijarah is an innovation in Islamic finance, where it is the substitute for the traditional leasing product. Islamic finance has to adhere to Islamic principles where interests are prohibited. Businesses are adopting Ijarah broadly where it is a well-known choice for the financing of asset acquisition. Islam permits this form of transaction as evidenced by the Quran and Hadith. The conventional and Islamic contracts for leasing differ due to their fundamentals. Islamic leasing is a distinctive agreement where it involves the amalgamation of two forms of contracts, whereby leading to legal and Shariah concerns. Lease is recognized as the main financial tool in both conventional and Islamic FIs [3–5]. This is because it is flexible and has a various economic benefit to owners. Thus, this paper intends to make a comparison between conventional and Islamic leasing practices through a review on FAS No. 8 (Ijarah and Ijarah Muntahia Bittamleek) against IAS No. 17 (leases). Analytical study is also conducted for the underlying concepts: accounting measurement, recognition, and disclosure under each standard in the books of lessor and lease [4].

Ijarah is an important financial source to Islamic and other Institutions. Therefore, it is significant that the financial statements disclose sufficient data to their users. Based on the above, it is this study's objective to review and analyze Ijarah and IMB from the accounting perspective. This research attempts to answer the following question: Is there any significant differences in accounting convention in operating Ijarah and Ijarah Muntahia Bittamleek under FAS No. 8 and IAS No. 17? The subsequent section presents literature review on the concepts of Ijarah and Ijarah muntahia Bittamleek. This is followed by hypothesis development and explanation on the connection with past research. The next section explains the methodology of this research. The final section provides the results, and concludes.

2 Literature Review

2.1 Concept of Ijarah

Theoretically, Ijarah is an agreement where a party gains a benefit in exchange for another party's services, and asset utilization. Academics of four Islamic schools (i.e. Maliki, Shafie, Hanafi and Hanbali) have each defined Ijarah. Briefly, all the definitions agreed that Ijarah refers to the contract where one utilizing the services or benefits and there are compensations as a return. Ijarah's literal meaning is renting

an object. From Islamic fiqh, Ijarah is applicable in two scenarios. The first is that Ijarah means the salaries paid in exchange of the work done. In this form of Ijarah, the worker is known as “ajir”, whilst “mustajir” is the employer. The second scenario from Islamic jurisprudence perspective, i.e. an asset’s usufruct is shifted to another party as an exchange of rentals.

On the other hand, Ijarah as an alternative to English term “lease” can be defined as a contract between a lessee and lessor where within certain timeframe the lessee is entitled to utilize the lessor’s asset. In exchange, the lessor receives periodic rental payment from lessee. The second meaning of Ijarah under Islamic jurisprudence is similar to ‘leasing’, an English word. Here, “mujiir” refers to the lessor whilst “mustajir” is the lessee; and “ujrah” is the rental payment. Nonetheless, Ijarah and lease are used as similar concepts in different jurisdictions. Followings are the classifications of Ijarah.

2.2 Operating Ijarah and IMB

Ijarah according to [1] benchmark can be categorized as IMB and operating Ijarah. The main condition of the categorization is whether the leased property’s title is promised to be transferred to the lessee once the lease expires. AAOIFI stipulates that if there is such promise, then it is IMB. However, if there are no promises made, then it is operating Ijarah. The promise of transferring the possession title may be done by: (a) gift (no consideration is given in title transfer), (b) the contract specifies certain amount of consideration, (c) transfer done before lease duration ended is subject to the amount equal to outstanding Ijarah periodic payments, or (d) progressive ownership transfer (sale) of leased property. Meanwhile, IAS-17 categorizes leasing into two types: (1) operating lease; and (2) finance lease, in accordance to the degree of rewards and risks involved in the ownership transfer between lessee and lessor. All other leases not fulfilling the condition are deemed to be operating lease. Meanwhile, IAS-17 stipulates that a lease is categorized as finance lease or operating lease depending on the contract’s substance instead of its legality. The substance over form concept can be explained as follow: In the form where a lessee may not eventually obtain the leased property’s legal ownership, but in reality, financially and economically the lessee stands to benefit and bear the accompanying risks for the use of asset, then in substance the transaction is a finance lease [11, 15]. Thus, for finance lease, since the lessee will assume the risk and rewards the leased property is assumed to be the lessee’s fixed asset even though the lessee may or not eventually be the property’s registered owner [14–16]. Meanwhile for operating lease, the lessee’s balance sheet could not reflect the leased property as the risks and rewards associated to ownership are not transferred to the lessee.

It must be noted that operating Ijarah is similar to operating lease, and the IMB seems similar to the finance lease, whereby the lessee will eventually hold the title legally. However, it is still different because IMB is considered as two agreements

being combined; Ijarah runs over the leasing duration, and sale and purchase agreement once the leasing duration is over. Furthermore, the substance over form concept does not apply in Islamic lease. If the substance over form concept applies in Islamic lease, it will imply that the asset is in full control of the lessee. However, for Ijarah, the lessee only has the right to the benefits (usufruct) of using the asset but not the right of ownership to the leased asset. Thus, the substance over form concept is not consistent with the Shariah according to AAOIFI.

2.3 Types of Ijarah Muntahia Bittamleek

FAS No. 8 states that IMB has various categories. All the categories are aiming at passing the asset's ownership to the lessee; if not it is called operating lease contract. The categories IMB agreements are: (i) IMB via gift (title is transferred without consideration). In this type of lease the lessee assumes the ownership without any consideration through a gift agreement entered upon the lease's final payment, or a gift deed that is subject to Ijarah periodic payments being settled. The ownership transfer is automatic where no new agreement is to be entered and no additional payment is required except for the Ijarah periodic payment be settled [6]. (ii) IMB is done by transferring the ownership (sale) once the lease has ended through a certain consideration. The contract encompasses:

- (a) A feasible Ijarah agreement in which the rental payment and duration are established. When the Ijarah duration ends, the agreement is no longer valid.
- (b) A pledge into entering a sale agreement is made upon the expiration of Ijarah contract should the lessee agrees, and to pay certain consideration. We must note that upon IMB expiration the ownership transfer is either done with no or minimal consideration by assuming that there will be higher rental earned by the lessor against comparable property where in both scenarios the lessor will regain the asset's cost via Ijarah periodic payment [10].
- (c) IMB via ownership transfer (sale) upon the final payment mentioned in the contract. The agreement incorporates Ijarah contract and the pledge of entering into a sale agreement. The sale agreement mentions the lessee's purchase price (purchaser) upon the Ijarah expiration. Therefore, once the lessee paid the price, the property is sold and ownership is changed to the purchaser (lessee). He will then assume the right to benefit and dispose the property through any lawful means.
- (d) IMB via ownership transfer (sale) before the ending of the lease at a price equal the Ijarah's outstanding periodic payment. This includes the lessor's pledge that ownership will be transferred to the lessee whenever the lessee requests during the Ijarah duration at an amount equal to the outstanding periodic payment.
- (e) IMB via graduate ownership transfer (sale). The contract has a condition stating that the lessor agrees to progressively transfer the ownership until the lessee gained full ownership of the asset. The asset's price will be ascertained by

dividing the duration of the Ijarah agreement where the lessee will possess portion of the asset equal to the payment made. There has to be a sale agreement for every portion purchased by the lessee. Additionally, the rental payment must reduce in view that the lessee is now owning a larger portion of the leased property.

It is the intention of the study by [13] to analyze the adherence of Malaysian Islamic banks to the AAOIFI standard No. 9 in regard to Ijarah financing. The study had used the semi-structured interview where open-ended questions were adopted. For content analysis, the interviews were recorded and transcribed. It was found that the modern Ijarah financing is flawed. This signifies that there is a slight variance from the AAOIFI benchmark. This research assists the Malaysian IBs in reducing, if not eliminating the discrepancies between the guidelines issued by [9] and AAOIFI benchmark for Ijarah financing. Additionally, this study is the first to examine the Ijarah financing practices among Malaysian IBs based on the AAOIFI benchmarks.

Study conducted on (Ijarah Muntahia Bittamleek under Shariah Standard No. 9 and Islamic Accounting Standard No. 8) [1, 2] intends: to know the historical background of IMB as a financial product used as source of fund by Islamic banks, practical reality of the IMB through Shariah standard No. 9 and Islamic Accounting Standard No. 8., and compare the theoretical concepts between Ijarah and practical application in Islamic banks. The study depends on descriptive approach in reporting the historical background of IMB, and Inductive Method to know about the Shariah standard and accounting standard issued by AAOIFI. Moreover, applied method was also used to propose a model that shows the stages of Ijarah processing in Islamic banks.

A study was conducted by [11] on Accounting for Ijarah Muntahia Bittamleek from Islamic perspective in Islamic Banks. The study aims to know the legitimacy of IMB contracts, and their adaptation with the opinion of Islamic Jurists. The study also wants to know the accounting problems in Ijarah contracts and their treatments from Islamic perspective through an analytical study of International Accounting Standard and Islamic Standard. The researcher found that leased assets under IMB contracts must be capitalized in the lessee's books and depreciation be calculated.

2.4 Sale and Leaseback: Operating Ijarah and IMB

The type of Ijarah commonly used is in the scenario of a purchaser buys a property and leases it back to the seller. Juristic rule stipulates that the sale agreement should not be subject to lease agreement. This is not to breach the rule that a contract's execution not to be dependent upon another contract's execution. IAS-17 mentions that in determining whether a lease is a finance lease or operating lease, the substance over the form is examined. IAS-17 prescribes that if a lease satisfies one out of five situations, then a lease must be classified as finance lease. These five situations are as follows:

- (a) At the conclusion of the lease duration, the lessee is to assume the asset's ownership.
- (b) The lessee is given the choice of purchasing the property at a certain cost. The price is anticipated to not exceed the fair value on the date when the choice is executable.
- (c) The lease duration of the asset is at least 75% of the asset's economic life [11].
- (d) During the lease's establishment, the minimum payment's present value is at least at the leased property's fair value where it is equivalent to, or more than 90% of the property's fair value.
- (e) Leased properties with distinctive characteristics are to be used by the lessee where no significant changes being done [11, 12].

Previous study on Islamic banking: Ijarah and Conventional Lease was the one conducted by Ameer and Ansari [7]. It was the paper's objective to study on the elimination of interest among FIs, and the Islamic banks' definition of acceptable activities. In other words, the objective of the paper was on the analysis of interest-free transactions among businesses. The study revealed that there are correlations between IB and the determinants of conventional and Ijarah leases. The researchers utilized questionnaire as instruments in data collection, and the data were entered and analyzed by using software, i.e. SPSS and Excel.

Shariff and Rahman [15] explored the nature of Ijarah accounting and made comparison between IAS-17 & FAS-8. It was discovered by the study that there are significant dissimilarities in the characteristics of Ijarah and conventional leasing. The study examined the level of acceptability of FAS-8 in Malaysian FIs. Their surveys indicated that FAS-8 acceptance level was not high among Malaysian FIs.

Atmeh and Serdaneh [8] examined the dissimilarities between IMB and conventional leasing through two dimensions, i.e. the contracts' condition and structure, and accounting approach. The study argued that the AAOIFI's accounting approach violates the matching principle and lacks honest presentation. The study also analyzed IMB (through gift) accounting framework of AAOIFI where the Ijarah duration is significantly shorter against the leased property's useful life. Zafar [17] highlighted on the shortcoming of Ijarah for vehicle. The research employed a genuine case where a customer obtained a car financing through Ijarah contract from an Islamic FI. The customer had then abused this contract. The research urged for more studies to be done on Ijarah agreement in terms of vehicle leasing. Additionally, it stated that there should be consideration for down payment in addition to satisfying other conditions. It also mentioned that the deposit amount or down payment for the Ijarah vehicle contract to not exceed the threshold of 40% [4, 13] made a comparison between Islamic and conventional leases using Islamic and conventional accounting standards as guidelines. The study also enlightened the financial report users and the public about the dissimilarities between Islamic and traditional leases. The study differs from other research as this paper included all the dimensions of Standard 8 in relation to IMB and Ijarah, and made a comparison against IAS-17 [1].

3 Hypotheses Development

To answer the questions previously mentioned in research's problem; the researchers assume the following hypotheses:

1. There are significance differences in accounting treatments (measurement and recognition) for operating Ijarah under FAS No. 8 as compared to IAS-17.
2. There are significance differences in accounting treatments (presentation and disclosure) for operating Ijarah under FAS No. 8 as compared to IAS-17.
3. There are significance differences in accounting treatments for IMB (financing lease) under FAS No. 8 compared to IAS-17.
4. The differences in accounting treatments has an impact on the financial statements.
5. Islamic banks in Sudan are applying the FAS No. 8 issued by AAOIFI with regard to accounting recognition, measurement and disclosure for the Ijarah and IMB.

The researcher adopted descriptive analytical methodology and Inductive method for this study. The comparative method was also used to compare FAS No. 8 against IAS-17 concerning the accounting treatments. Meanwhile, the applied method was used for the practical side of the study in Islamic banks in Sudan. Both primary data and secondary data were used. Primary data were obtained from the financial statements of the Sudanese Islamic banks. Secondary data obtained from books, previous research and studies, and the internet were used to build the theoretical framework of this study.

4 Results and Discussions

The review on the annual reports of United Capital bank (UCB) for the year 2015 shows the following: the bank disclosed in note 6 (investments in securities) the amount of SDG 64,548,000 as Ijarah Sukuk; which represents certificates of Ijarah Sukuk assets for Sudan Electricity Distribution Company (Shahamah Certificate). These were then leased back to the Ministry of Finance under operating Ijarah. The bank also disclosed in note 7 (Financing to customers) a total amount of SDG 101,180,752 for Ijarah. The amount of Ijarah comprised of the following:

	SDG
Cost of leased property	74,794,780
Cost of leased motor vehicles	18,962,432
Deferred rental	7,423,540
Total	101,180,752

The UCB also disclosed notes to the following: (i) note 22 (Income from Investment in securities) the amount of SDG 3,538,232 as income from shasha certificates,

(ii) note 23 (income from finance to customers) the amount of SDG 5,002,879 as income from Ijarah. (iii) Note 27 General & Administrative expenses) the amount of SDG 4,483,857 as Ijarah expenses.

There is an agreement between the two standards (FAS.8 and IAS-17) in relation to accounting recognition and measurement for operating Ijarah; but with the exception to initial direct costs (under FAS-8 these costs must be recognized by the lessor and lessee, but under IAS-17 these costs must be recognized by the lessor only). There are differences between the two standards (FAS-8 and IAS-17) in relation to accounting treatments for Ijarah Muntahia Bittamleek contracts. The main difference between two standards is that, the FAS No. 8 focuses on the legal form of the accounting process, while the IAS-17 focuses on the economic substance rather than the legality. The accounting treatments for each standard have an impact on the financial statements and decisions of the users of the financial statements. This is because the capitalization policy of leased assets can affect the liquidity and profitability ratios. The Sudanese Islamic Banks are committed to applying FAS No. 8 in relation to measurement accounting, but were not committed in applying it in recognition and disclosure accounting.

The study is limited by the followings: The study examines the practices confined to year 2017. The findings of study are limited to Islamic banks in Sudan and cannot be generalized to other Islamic countries. Based on the results of this study, the main recommendations and implications are as follows: First, the requirements for presentation and disclosure in the financial statements must be expanded, whether for Ijarah Muntahia Bittamleek or operating Ijarah to fulfil the requirements of financial reports' users. Second, some of the accounting treatments contained in standard No. 17 must be adjusted to conform to Islamic standard No. 8. Third, Islamic banks and Islamic Institutions must apply the accounting treatments contained in Islamic accounting standard No. 8. Fourth and finally, full compliance with standard and disclosure requirements will make the financial statements more relevant and useful.

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Antecedents of User Satisfaction in the Context of Accounting Information Systems: A Proposed Framework



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Abstract Researchers and professionals are very interested in the value of accounting information systems (AIS) in developing countries. Academics agree that information system (IS) user satisfaction are crucial to the survival of any IS. Hence, it is crucial to examine the impact of several factors including technological factors on user satisfaction, as more and more developing countries adopt and deploy such systems. In order to examine the factors affecting AIS user satisfaction from the standpoint of Jordanian users, this paper provides a framework adapted from the Seddon and IS Success models. The proposed framework theorises that information quality and system quality are the factors that could potentially affect perceived usefulness and user satisfaction, while perceived usefulness can potentially affect user satisfaction in the context of Jordanian small and medium enterprises (SMEs). By addressing questions pertaining to the theoretical and practical elements of AIS user satisfaction, this study adds to the existing body of literature on the application of IS. Additionally, the report offers suggestions for policymakers and stakeholders in developing countries on how to ensure AIS effectiveness.

Keywords AIS · IS success model · Jordan · Seddon model · User satisfaction

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1 Introduction

The use of IS is expanding quickly in the modern, globalised world. It is currently impacting many sectors of life and acting as a development tool for people, organisations, and governments in general [1]. The level of IS utilisation that individuals and organisations use determines how well they function and their capacity to withstand competitive pressure. Without the end-users' acceptance, adoption, and utilisation of the system, IS cannot produce positive results [2–9].

According to several writers [10–16] the relationship between IS and user performance is one of the most complex, pervasive, and unpredictable, especially in the domain of AIS [17].

The AIS gathers, stores, processes, and records data to provide usable information to decision-makers [18]. It consists of personnel, rules and regulations, information, software, hardware, internal controls, and security measures. The system's goal is to raise employee and organisational performance.

For organisations, AIS provides a major benefit that does not exist in non-integrated departmental IS [19–22]. An AIS database is a location where all business transaction data are keyed-in, documented, evaluated, tracked, and reported. Such system offers a single corporate view of the business which includes all functions and divisions. The need for and the scope of interdepartmental cooperation and coordination grow as a result of this united perspective. It helps businesses reach their goals of improved communication and responsiveness towards all stakeholders [4, 23, 24].

If implemented properly, AIS would be advantageous for the user [25]. With the use of AIS, users can rapidly and easily share financial data, enable management to perform financial control tasks and receive timely decision-making assistance, time savings, enhanced job performance, greater staff productivity, and job ease are all indicators of the effectiveness of the AIS [26–28]. Proper AIS usage also makes it easier to extract the precise data needed to carry out various operations and functions.

AIS is one of the ISs with the fastest growth among SMEs as it has consistently been a substantial component in private sector organisations [14, 29–35]. Even though its importance has been extensively studied and that there are many managerial data on this subject, the success rate of AIS initiatives in developing nations is very low [4, 36]. A few developing nations, like Jordan, have been experiencing growing failure of AIS projects, which is now a common phenomenon. Consequently, AIS failures have caused SMEs to lose millions of dollars annually, which in turn prohibit their achievement of crucial goals.

Without the end-users' acceptance, adoption, and utilisation of the system, IS cannot produce positive results [2, 37–40]. It is widely known that IS user satisfaction is an effective proximate indicator of IS success [18, 41–45]. Better technological elements result in increased IS user satisfaction; in turn, user satisfaction is a key indicator of the organization's IS usage performance. As a result, research on the variables that influence AIS user satisfaction is important given the expanding number of businesses using AIS. The results have implications for raising AIS's rate of success in developing nations.

Accordingly, this study seeks to analyse AIS user satisfaction from the perspective of employees. Therefore, this research constructs a success model of AIS based on the works of [46, 47] to investigate the factors affecting AIS user satisfaction from the perspective of employees. Pitt et al. [42, 48] may give a robust explanation for AIS user satisfaction in the Jordanian context. The accuracy of this interpretation is higher than those that are based solely on the IS Success Model or Seddon model [18, 42–45].

Drawing upon the theories, we postulate five hypotheses. The IS Success Model is used to hypothesize how technological factors (i.e., information and system quality) explain AIS user satisfaction. Based on the [33, 38, 42, 49] model, we hypothesize how technological factors (i.e., information and system quality) explain perceived usefulness, and how perceived usefulness explains AIS user satisfaction [18, 42–45].

There are six sections in this paper. This current section highlights important issues related to AIS user satisfaction, which drives the objective of this study. The determinants of AIS user satisfaction based on the underlying theories, the proposed study framework, and relevant literature evaluation are elaborated in the following sections. The planned research approach and instrument development are illustrated in the fifth section. Finally, the last section concludes the whole proposal.

2 Literature Review and Theoretical Background

Al-Hattami [18, 42–45, 50] provides a comprehensive and all-encompassing definition of IS success. Although several models for evaluating IS performance have been developed, the IS Success Model [41] is widely considered as the best.

Eventually, due to the shortcomings of [49], which were exposed by [51], the re-specified model of IS Success was created [18, 42–45]. Al-Okaily et al. [33, 38, 42, 49] had some criticisms about the previous model; he claimed that confusion arose from the concept's inception due to a conflation of the process and causal models. The "Use" of IS, for example, could kick off a chain of reactions that results in "User Satisfaction", "Individual Impact", and "Organisational Impact". However, the model could be interpreted as causal if one considers the success of the system as hinging upon how it is implemented. It is presumed that the extent to which a system is used is proportional to its degree of success or failure.

Seddon's revised and expanded model, in which the process steps have been removed, was then presented. Both the behavioural and IS success models make up the model's causal component. The "consequences of IS use" bridges the gap between the two theories. Seddon hoped that the model would provide a more solid theoretical basis from which to examine the ties between various IS success elements.

Seddon's model classifies the factors into three categories namely: (1) indicators of information and system quality, (2) a person's general opinion of the overall usefulness of the IS success model, and (3) the value of the final variable which quantifies the overall advantages of employing IS [33, 38, 42, 49]. Seddon hypothesised that IS use is only behavioural and not a genuine evaluation of the performance. He then



Fig. 1 IS success sub-model of [18, 42–45] (partial)

substituted “perceived usefulness” with “use”. Seddon proposed three groups namely individuals, organisations, and society as recipients of the IS’s positive externalities in his discussion of the third factor. Al-Hattami [18, 42–45] IS Success Sub-Model is shown in Fig. 1.

Accordingly [18, 42–45], revised their original IS Success model nearly a decade later in response to criticisms in earlier works. Studies on this topic have been conducted by several researchers [33, 52, 53] Fig. 2 depicts the current version of the IS Success model.

Both models above have had considerable influence on studies of IS success. Numerous empirical studies have used the two models to examine the success of IS in various contexts [54–56]. For instance [40], investigated the efficacy of tax IS from the perspective of Greek workers. In addition [18, 42–45, 46], evaluated the effectiveness of e-Government IS in Serbia from the perspective of employees using the IS Success model [18, 42–45].

Since this study seeks to analyse the satisfaction of users who had previously used AIS, DeLone and McLean’s [37] and Seddon’s [38] models are deemed the best fit. Four components from these models are employed to investigate the factors influencing user satisfaction because of utilising AIS. Nevertheless, we exclude some

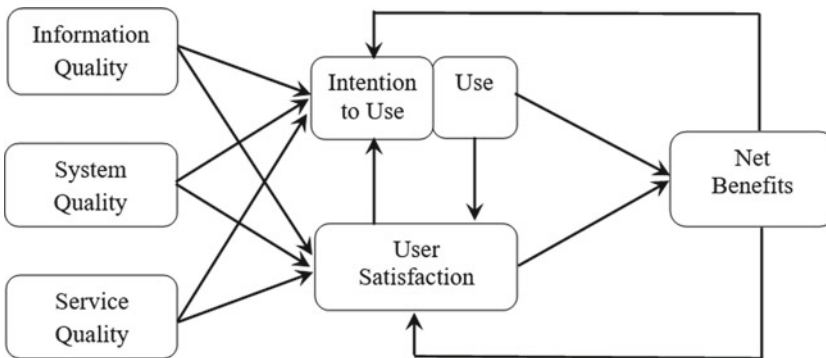


Fig. 2 Updated IS success model [18, 42–45]

factors (e.g., services quality, IS use, and net benefits) from these models owing to the goal of this study.

3 Hypotheses

3.1 *Information Quality*

The desired qualities of an IS output are determined by the quality of the information [57–59]. It concerns the calibre of the data generated by the system and the applicability of that data to the user [50]. Information quality is pertinent to the IS model due to its positive impact on user satisfaction [9, 22, 23, 60, 61] and perceived usefulness [62, 63]. Alansari and Al-Sartawi [46] studied the Serbian e-Government system's performance from the employees' standpoint and discovered a favourable relationship between information quality and e-Government user satisfaction. Floropoulos et al. [52] suggested that higher information quality would increase perceived utility for enterprise IS. By offering current, accurate, and trustworthy information, this is made feasible. It is expected that information quality will positively influence AIS user satisfaction and perceived usefulness in the context of Jordanian SMEs. Hence, this study proposes that:

- H1. There is a positive relationship between information quality and AIS user satisfaction.
- H2. There is a positive relationship between information quality and perceived usefulness.

3.2 *Systems Quality*

System quality includes measures of the IS itself and makes up the desired features of an IS [43, 47, 64]. The perceived utility of the system and the degree of end-user satisfaction would probably be directly impacted by system quality [22, 65]. This is since these impressions can capture attitudes and ideas about the effort necessary to interact with the system [52, 66]. Users would be able to take advantage of performance gains more easily if a system were of excellent quality, which would boost perceptions of the system's usefulness [52, 67]. Accordingly, to enhance perceived usefulness and user satisfaction, the relevant parties would need to develop the system to assure greater accessibility, flexibility, usability, and user-friendliness [24, 68]. Thus, this study proposes that:

- H3. There is a positive relationship between system quality and perceived usefulness.
- H4. There is a positive relationship between system quality and AIS user satisfaction.

3.3 Perceived Usefulness

In the context of IS success, according to [18, 42–45], perceived usefulness is the extent to which a person thinks that employing a certain system has improved either their own performance at work or the performance of their group or organisation. Whereas user satisfaction reflects the customer’s delight or dissatisfaction with the IS [31, 69–74]. The perceived usefulness of IS, according to [16, 36] is a significant determinant of user satisfaction.

The IS’s success is determined by how well it serves its users; therefore, it stands to reason that users who view the IS as valuable would be more satisfied with it [75, 76]. The effective usage of IS makes it easier to extract precise information needed to carry out various tasks, whilst saving time and effort in the process [52, 56]. Hence, users will be more likely to utilise this system and be happier with it if they believe they have attained a high degree of benefits from utilising it [20]. The fact that perceived usefulness would guarantee user satisfaction has been supported by previous studies [34, 51, 77–81]. Therefore, this research suggests that:

- H5. There is a positive relationship between perceived usefulness and AIS user satisfaction.

4 Proposed Research Model

Based on the previous IS theories, the IS Success Model [18, 42–45] and Seddon model [33, 38, 42, 49] provided the theoretical foundation for the present model. Based on the goal of this study, it was decided that some aspects of these models (e.g., service quality, IS use, and net benefits) would not be included in the design and development of the proposed research model. Nevertheless, the model is thought to be ideal for gauging AIS user satisfaction in the Jordanian context. This study’s proposed research model is depicted in Fig. 3.

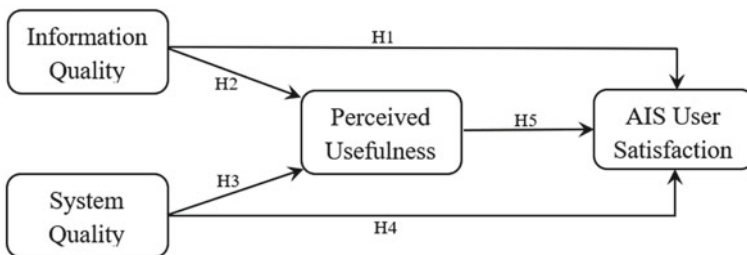


Fig. 3 The proposed theoretical research framework

5 Research Methodology

5.1 Proposed Method

The hypotheses and model will undergo empirical testing. To evaluate the structural link between the variables identified in the research model, this study will use a quantitative research approach. With the use of partial least squares (PLS) path modelling, the study's hypotheses will be put to the test. The needed will be collected all at once for this study, which suggests a cross-sectional design. All AIS users in Jordanian SMEs, independent of their profession or job description, are the proposed population of interest. Employees who are now employed by SMEs and who use AIS in their regular activities make up the respondents to this survey.

5.2 Instrument Development

To this research, a questionnaire will be developed based on the four factors of the proposed theoretical framework. Items for measuring each factor will be identified from previous studies. Six questions developed by [45, 79] will be used for assessing Information Quality (IQ); four items from [80] for assessing System Quality (SQ); four items from [56] for assessing Perceived Usefulness (PU), and four items from [9] for assessing User Satisfaction (US). All of the sections will be graded on a seven-point Likert scale, with (1) denoting 'totally disagree' and (7) denoting 'totally agree'. Questions regarding the respondents' demographics (gender, age, education level, and occupation) will also be included in the survey.

6 Conclusion

The current study is focused on Jordanian SMEs' AIS user satisfaction. The IS Success Model [18, 32, 42–45] and Seddon model [33, 38, 42, 49] serve as the theoretical foundation for the model developed in this work. The model theorises that perceived usefulness influences user satisfaction and that information and system quality may also have an impact on perceived usefulness and user satisfaction. Thus, information must be gathered from SME employees who use AIS. The research's conclusions will serve as a helpful manual for many stakeholders and policymakers in developing countries on how to guarantee the success of AIS.

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Consequences of Fintech on the Profitability of Banking System



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Abstract Recently, technology is growing in most fields involving financial issues. Financial technology is considered a creative innovation that attracts more customers and enhances the profitability and performance of many banks. This study revises the literature review concerning the role of financial technology (Fintech) in enhancing the performance of banks. By reviewing previous studies, the results of most of the studies confirmed the effect of Fintech on bank performance measured by ROA and ROE, including studies about the banks of Jordan. It was found that Fintech can really improve the performance of banks measured by return on assets (ROA) and returns on equity (ROE). The study recommends that the commercial banks in Jordan should pay attention to new financial innovations and increase their dependence on financial technology because of the positive impact on profitability and to enhance excellence in customer service to raise the level of satisfaction with banking services.

Keywords Fintech · Technological innovation · Banking system

1 Introduction

Due to the contributions of Financial technology (Fintech), which has been able to significantly alter the financial services industry, the world has today undergone a qualitative transition from a monetary economy to a non-monetary economy. In comparison to conventional methods, it offers services in a quick, simple, and more affordable manner to a large number of people and businesses. The key component of financial development is becoming Fintech, which focuses on the actual implementation of cutting-edge technologies in the established financial sector [1].

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Fintech has the real power to change the structure of financial services, making them faster and cheaper. It is more secure and transparent, especially for the segment of the population that does not deal with the banking system. Fintech is a broad phrase that primarily refers to businesses that use cloud-based tools and other sorts of technologies to advance the banking and financial industries [2]. As the rapid development of financial services and the provision of innovative financial solutions that simplify financial operations provided by banks contribute greatly to achieving financial stability, and they also play a fundamental role in shaping the future of transactions and future services.

Banks, being the main engine of the economies of countries, and in order to maintain this position, are working to ride the wave of financial technology by renewing their basic structures based on the requirements of ways to keep pace with this development. Commercial banks are being transformed toward digitalization and intelligence as a result of the growth of Fintechs. In light of the opportunities and difficulties presented by the growth of Fintech, banks should boost their investment and research in the sector as the “new” topic of fintech development and the “old” representation of traditional finance [1]. Improving their performance has become an urgent necessity to face the wave of competition imposed by financial technology companies, and without improvement and development in performance, banks will disappear.

According to the authors of [3]. It is now feasible to utilize electronic documents or papers in place of traditional paper documents in order to use money. Money is no longer confined to traditional money, which is in the form of paper support. This is the end result of technical advancements that created a demand for this distinct sort of money. One of the key economic factors is the demand for money, which has three main drivers: transaction, speculation, and precaution.

Despite major improvements in payment technologies and their widespread diffusion over the past decades, cash transactions still account for a large share of overall payment transactions, both in terms of total number and value. Thus, the current study tries to review the previous literature on the modern term in the world of economics and finance, which is financial technology. In addition, it presents the evolution short summery of digital financial services in the banking system of Jordan and traces the performance and profitability.

2 Literature Review

Due to globalization and the technology revolution, the banking system has definitely changed over the past several decades, and this is reflected in many of the banking services that are offered by that industry. To date, the development of digital money as a form of technological evolution and a hallmark of this era has prompted numerous studies on the role that this technological advancement plays in accelerating economic growth through its effects on various economic sectors. As a matter of fact, Fintech became a serious challenger since it dominates traditional financial services where

clients are progressively moving towards carrying out their banking transactions via electronic applications and smart solutions [4]. Previous studies reveal that the opportunities offered by financial technology to the financial and banking system can enhance performance, providing better and more convenient banking services to clients. Besides, there is a potentially significant effect on banking system stability due to increased competitiveness, and the role of regulatory technology can upgrade compliance processes in commercial banks.

The linked studies were analyzed, and it was discovered that they were divided into those that support the favorable correlation between Fintech and bank performance and those that refute it. The research that support the substantial association will be presented in the current study, followed by those that do not. For example, authors of [5] found a higher positive effect of Fintech on digital financial performance than the effect of traditional services. Ref. [1] showed that banks' profitability (ROE) has a positive bidirectional cooperative relationship with the development of Fintechs. Authors of [4] confirmed the significant effect of Fintech on enhancing the performance of banks and thus financial inclusion. Ref. [6] conclude that Fintech provides a variety of high-quality financial services at a reasonable cost, which will, in turn, enhance comprehensive development. In fact, adopting Fintech products and improving financial services lead to improve profit, market share, clients' confidence, and competitiveness. Authors of [7] revealed that the coordination of the Modern Bank and the Fintech is assumed to promote financial inclusion. During the COVID-19 outbreak, Ref. [8, 9] concluded that the impact of mobile money on financial inclusion is positive. Ref. [10] tested the effect of financial innovation on financial inclusion in a larger group of countries and find a significant positive effect.

Authors of [3] researched how electronic money affects the demand for money and discovered a favorable effect that improves performance. Also, authors of [2] discovered a major impact of Fintech technologies on the banking industry's profitability. Authors of [11] concluded due to the divide between technology and humans, digital financial services have a favorable impact on the performance of large banks but a detrimental one on small banks. Ref. [12] found that financial technology influences the performance of banks positively in Lithuania. Authors of [2] concluded that certain banks' profitability is significantly impacted by Fintech advances. Besides, Authors of [13] discovered that using technology helps banks function better. Ref. [14] found that policies that liberalize banking to include more branches and ATMs could spur greater growth in emerging economies like those of Eastern Europe. Ref. [15] suggested that managed institutions are significantly more effective at managing raw data that can be digitalized. Authors [16] pointed out that Islamic financial instruments offered via Fintech can likewise enhance financial performance. Authors [17] argued that digitizing financial services can boost financial inclusion and enhance the overall performance of financial institutions. Ref. [18] indicated that banking applications are a common component of online financial services and can benefit the banking sector by accelerating and strengthening transactions. According to Ref. [19], digitization gives banks the chance to enhance client interactions, empower client decision-making, and implement new business models in a more efficient and creative manner.

Authors [20] show that our understanding of money is evolving and is now very different from traditional money, which central banks no longer control or produce. But it has the same functions as money and has the same specializations. Additionally, users are able to access and transfer electronic money without the use of middlemen or central banks. Internet codes are used to create and safeguard electronic money. Although the matrix codes are complex, there are still concerns about their security. Some nations have made it a policy to forbid their use. Authors [21] argued that e-money, as a network good, has the potential to grow into a significant form of payment in the future. Such a change would affect how effectively and successfully monetary policy is implemented. If the usage of e-money significantly reduces the need for central bank reserves, the operational aim of the central bank will need to be adjusted, and monetary and fiscal policy would need to be more closely coordinated.

On the other hand, and unexpectedly, Ref. [22] show that Fintech decreases the profitability of banks and asset quality. Ref. [23] argues that the effect of Fintech on financial inclusion is still not clear because Fintech solutions are not yet dependable and unspecified in the future but are mandatory to disbar people from bank services in MENA countries. Also Ref. [24] noticed that Arab countries still lag behind many countries in the world in adopting financial inclusion, due to the inability to deliver many formal financial services to those who are unable to access them. Moreover, the study argues that digital technology is beneficial in enhancing financial inclusion in these countries. Ref. [25] revealed that the present regulation of Fintech in the regions of EU, USA, and India is unsuitable and may lead to negative impacts on the world financial services sector such as deception of cybersecurity, contravention of data privacy, and use Fintech services for illegal purposes. Bank Negara Malaysia (BNM)'s Governor Datuk Muhammad Ibrahim warned of potential revenue disruption from Fintech innovations in Malaysia.

3 Theoretical Framework

By relying on big data, AI, blockchain, cloud computing, and other technologies, Fintech can minimize transaction costs, eliminate information asymmetry, lower the entrance threshold, extend service areas, and reduce transaction risks. Banks must benefit from the new technologies that Fintech provides. For instance, they might promote the modernization and change of their business practices, which would help them become somewhat more profitable.

In addition, as finance and technology have become more integrated, new financial models have emerged that provide consumers of finance with more options and lower investment thresholds. As a result, the new financial models indicated above have a negative influence on the market share, business growth, and profitability of banks.

Fintech has both positive and bad implications for the profitability of commercial banks, according to the analysis shown above. Depending on the level of development at which it occurs, Fintech's total impact on bank profitability varies. Therefore, by

utilizing Fintech, banks can benefit more from lower input costs and increased bank profitability.

4 Fintech in the Banking System of Jordan

Since the creation of the Central Bank of Jordan in 1964, the banking industry has developed. A total of 12 commercial banks, 3 Islamic banks, and 8 international banks now operate in Jordan. The number of Jordanian banks' branches also expanded in 2021, reaching 830. Commercial banks, investment banks, and specialty banks were added to the banks' main diversification of operations. Additionally, the methods of banking work and the kinds of services that banks offer their customers underwent a notable qualitative evolution (Table 1).

In order to find an incubator for entrepreneurs and to enhance and encourage innovation and development in the field of financial technology in a way that fosters competitiveness in the market for digital financial services, the Central Bank of Jordan announced the commanding guide for the Fintech Regulatory Sandbox in 2018. Strong cyber security is used to provide digital financial services quickly, efficiently, and safely. However, banks may face significant risks as a result of their growing reliance on financial technology, particularly risks related to compliance, operations, and electronic dangers. The following elements are included in electronic

Table 1 Jordanian banks operating in Jordan as at the end of 2021

	#	Name of the bank	Establishment date
Commercial Banks	1	Arab Bank	1930
	2	Ahli Bank	1955
	3	Amman-Cairo	1960
	4	Jordan Bank	1960
	5	Housing Bank	1974
	6	Jordan Kuwait	1977
	7	Arab Jordan Investment	1978
	8	Commercial Bank	1978
	9	Investment Bank	1989
	10	Arab Bank Corporation	1989
	11	Al Bank	1991
	12	Societe Generale	1993
	13	Capital Bank	1996
Islamic Banks	1	Islamic Bank	1978
	2	Arab Islamic	1997
	3	Safwa Islamic Bank	2009

Table 2 Trends of ROA and ROE in the Jordanian Banks (2010–2021)

Years	ROA	ROE
2010	0.9	6.2
2011	0.9	6.2
2012	1.0	6.9
2013	1.2	8.3
2014	1.4	9.2
2015	1.1	7.7
2016	1.2	8.1
2017	1.3	9.1
2018	1.2	9.6
2019	1.2	9.4
2020	0.6	5.1
2021	1.2	9.5

Source CBJ

money: The number of Visa Cards issued by each bank, the total credit facilities granted by each bank, the number of automated teller machines (ATMs), and the bank's branches' number ratio.

In Jordan, Fintech services include Visa Cards, automatic teller machines (ATMs), mobile banking (banks' applications), mobile payments, ...etc. These services are vulnerable to expansion, development, or/and replaced by other newer services. According to most of the studies that examine the performance of banks, it was found that Fintech can really improve the performance of banks measured by return on assets (ROA) and returns on equity (ROE) (Table 2).

According to the above table, the average value for ROA was 1.1 with a maximum value of 1.4 in 2014, and a minimum value was 0.6 in 2020 due to the COVID-19 pandemic with a standard deviation reaching 0.2. On the other hand, the average value for ROE was 1.1 for the period of the study. The maximum value was 9.6 in 2018 while the minimum value was 5.1 in 2020 with a standard deviation reached 1.5.

The profitability of the banking system (as assessed by both ROA and ROE) increased continuously until 2019, but it declined in 2020. The banks' use of credit provisions as a COVID-19 risk hedge is what has caused this significant drop. Along with delaying debt payments due to clients affected by the epidemic and rescheduling a portion of loans given to the afflicted economic sectors without additional penalties or late payment interests, this is done. Thus, ROA and ROE both decreased before rising to normal levels in 2021 (See Fig. 1).

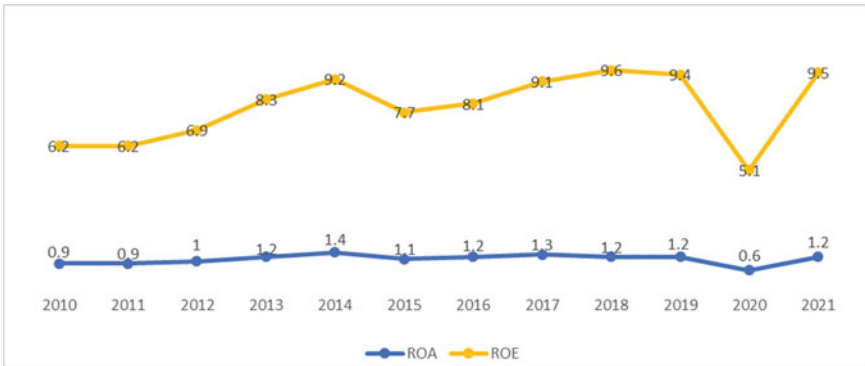


Fig. 1 ROA and ROE (2010–2021)

5 Conclusion

In conclusion, the benefits, drawbacks, and effects of Fintech on bank performance have recently received more attention. A few studies were conducted to look into how Fintech is affecting bank performance across the globe. Looking back at earlier research, the majority of studies—including those about Jordanian banks—confirmed the impact of Fintech on bank performance as assessed by ROA and ROE. Due to the positive effects on profitability, the study suggests that Jordan’s commercial banks pay attention to new financial innovations, increase their reliance on financial technology, and improve customer service excellence to increase customer satisfaction with banking services.

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The Effect of Voluntary Disclosure on Stock Liquidity: Evidence from Jordan



Mohammad Abu Nassar and Zaina Safwan Rahahleh

Abstract This study aims to examine the effect of voluntary disclosure on stock liquidity. The study sample consists of 23 insurance companies listed on the (ASE), over 10 years (2010–2019), yielding 230 firm-year observations. To test the study hypotheses, the quantitative research design was used, and cross-sectional analysis was performed using Ordinary least square (OLS) regression. Voluntary disclosure was measured using a self-constructed voluntary disclosure index, while stock liquidity was measured using two variables; share turnover ratio and daily bid-ask spread. The findings revealed that voluntary disclosure has a significant negative effect on share turnover ratio, and thus on stock liquidity. Furthermore, voluntary disclosure has no significant effect on stock liquidity as measured by the Daily bid-ask spread.

Keywords Voluntary disclosure · Stock liquidity · Daily bid-ask spread · Share turnover ratio

1 Introduction

For decades, investors and other external stakeholders have been used financial statements as the primary source in order to examine company's financial performance and position. Also, financial statements are the main source that the investors rely on when making decisions whether to invest in the firm or not [1].

Having access to information is crucial when making investment decisions [2]. Individuals invest more in firms with clear and concise financial disclosures [3]. As several stakeholders require greater disclosure not only of the performance but to the human capital, training and voluntary details, many companies all over the world have started reporting on these issues [4]. In order to provide more adequate

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information to investors and other financial statements users, firms use a mixture of mandatory and voluntary information disclosure.

The role of voluntary disclosure is to assist the investors and other stakeholders to gain a better and clearer understanding of the firm's operation. According to [5] there is a positive effect of voluntary disclosure on firm performance and the interest of shareholders, the study also found negative relationship between the lack of clarity and ambiguity in reporting on the value of the firm. Prudent investors make investment decisions based on the information at their disposal.

As much as investors need clear and adequate information, they also look for stock liquidity before taking their investments decision, which also became a world-wide concern since the global financial crisis [6]. Mentioned that stock liquidity can affect the investor's expected return and firm value. In addition, [6] found that stock liquidity has a negative effect on the cost of equity and therefore the firm value. According to [7] high stock liquidity can improve investment efficiency and help both currently existing investors and potential acquirers in their investments decisions because high stock liquidity means that they can easily start or quit a business (buy or sell) when they feel dissatisfied with the currently management decisions.

This study attempts to investigate whether stock liquidity using Daily bid-Ask spread and share turnover ratio are affected by voluntary disclosures. Voluntary disclosure was measured using a self-constructed voluntary disclosure index (VDI), and that was discussed in details in the following section, taking into consideration that companies listed on the (ASE) are required to adhere with specific mandatory disclosure requirements in their annual reports issued under the Securities Law and its related instructions. The annual reports of insurance companies in Jordan start with the chairman letter, followed by the board of directors' report which consists of twenty-one mandatory items that exhibited in specific sequence according to the disclosure guideline issued by the Jordan Securities Commission (JSC), and then followed by the corporate governance report prepared according to the corporate governance instructions issued by the JSC No. 2 of 2006 and No. 18 for 2017. Finally, the Audited financial reports and their notes and clarifications, prepared in accordance with the "Instructions of the Accounting Policies to be Adopted by the Company and the Forms Required to Prepare the Financial Reports and Statements" issued by Insurance Commission under the Insurance Regulatory Decision No. (8) Of 2007.

The main objective of this study is to investigate the effect of voluntary disclosure on stock liquidity. And since there are two measures in this study for calculating stock liquidity, the objective of the study is divided into two parts, first; to investigate the effect of Voluntary disclosure on stock liquidity measured by share turnover ratio. Second; to investigate the effect of Voluntary disclosure on stock liquidity measured by Daily Bid-Ask spread.

The reminder of this paper is structured as follows: The second section provides an overview the theoretical framework and development of the study's hypotheses. The third section presents the methodology. Section four discusses the empirical results. The fifth and final section contains the conclusions.

2 Theoretical Framework and Hypotheses Development

The information disclosure is one of the critical concerns and topics in the accounting field, as this information summarize the performance, the managerial side, the operations efficiency and the human resources management. Prior studies showed that firms' disclosure is negatively related to the level of information asymmetry among equity investors, that occurs when one or more investors possess greater knowledge about the firm's value than other uninformed investors or non-investment professional [8]. Therefore, the presence of that asymmetric information can lead to create the existence of two types of costs: the adverse selection costs, and the transaction cost [9]. In other words, the gaps in disclosure lead to increase the cost that results from introducing adverse selection into transactions between the firm and its shareholders or among potential buyers and sellers which also lead to decrease stock liquidity [10].

The stock liquidity is one of the problems that should be taken into consideration especially when investors' trading skills vary from one investor to another; some investors may have poor risk assessment, weak analytical skills and they may lack to required trading experience, these factors act as real challenges that face the investors and may influence their willingness to invest in the firms and therefore reducing the stock liquidity. Therefore, firms reinforce those informed and uninformed investors background by providing them with more disclosed information in order to enhance their knowledge and awareness about the nature of the business and the firm's operations and environment which may increase the market demand and therefore stock liquidity. Theoretically, stock's liquidity refers to the ability of the investors to buy or sell their shares of a stock rapidly without substantially impacting the stock price. Low liquidity stocks may be difficult to sell and may cause the investors high losses if they sell the shares. Furthermore, because stocks are riskier, investors will be unable to find a market for their securities, which may prevent them from buying or selling their shares whenever they want. Shares that are difficult to sell in an illiquid market carry a liquidity risk since investors cannot easily convert them into cash at the time of their need, which force investors to hold the shares or sell them with losses. In order to address investor hesitancy in holding shares within illiquid markets, companies opt to issue their capital at a discounted rate. However, this approach ultimately leads to reduced proceeds and an elevated cost of capital [11, 12]. Deduced that more information disclosure lead to increase market liquidity and hence, reducing cost of capital, which will help to encourage investment by individuals who may have future liquidity needs.

Therefore, the less voluntary disclosure will lead to ambiguity appearance, and also will mislead the investors on several issues that may not be required within the mandatory disclosure regulations, which in turn will reduce the investor's willingness to buy the stocks in order to avoid unknown risks, and that will decrease the demand of the stocks which means lower stock liquidity. Voluntary disclosure encompasses information that a company chooses to disclose on its own accord, and the degree to which it is done plays a crucial role in enhancing and elevating transparency levels [13]. Voluntary disclosure is an important communication tool that plays a major

role in enhancing the image of the company and its prospects [14, 15]. Voluntary disclosure has a positive effect on reducing the information asymmetry and conflict of interest, it also increases the confidence of external investors as it also allows the companies to maintain their financial position and get the appropriate information that may be needed [14]. The high voluntary disclosure leads to a lower cost of debt that a company has, due to the negative relationship between them according to the study of [1].

The voluntary disclosure plays a role in enhancing the value of the firm that can be directed through two ways, first; it enables the shareholders to obtain better expectations about the financial performance of the company. Second; voluntary disclosure negatively affects the cost of capital, and by reducing the cost of capital, thus increases the firms value [16].

Over time, voluntary disclosure has gained increasing interest from stakeholders, so the American Institute of Certified Public Accountants (AICPA), Financial Accounting Standards Board (FASB), and Canadian Institute of Chartered Accountants (CICA) have issued reports to motivate companies to voluntarily disclose nonfinancial information [17].

The interests differ between the internal management and the external parties of the company. Since each party seeks to maximize its own interest the most, conflicts may arise between these parties [18, 19]. Managers may not be obligated to disclose all data that belong to the company, even with the existence of regulations the full disclosure of all non-financial data is not guaranteed, because the mandatory disclosure regulations include the minimum amount required to be disclosed to outside parties to assist them in making decisions about their investments. Essentially, management has the difficult task of deciding as to how much information should be disclosed [19, 20]. There are several factors that affect the voluntary disclosure according such as leverage, size, profit, ownership structure and board composition [21]. Due to variations in accounting and auditing practices and procedures, the impact of enhanced disclosure requirements may differ among countries. Accounting and auditing practices that proportionate with international best practices play a major role in enhancing the quality of the information disclosed by the company [22]. According to [23] numerous factors, both external and internal, are believed to influence and shape the extent of corporate disclosure and transparency. These factors include various aspects such as the characteristics of the board of directors, audit committee, and ownership structure.

Albitar [3] focused on the voluntary disclosure practice of 124 listed companies in ASE over the period 2010–2012 and found that the level of voluntary disclosure in Jordanian corporate annual reports was low for the mentioned period, but the level of voluntary disclosure was increasing year by year.

2.1 *Stock Liquidity*

Stock liquidity refers to the market's capacity to handle a large volume of securities within a brief timeframe, with minimal impact on security prices and lower execution costs [24]. According to [25] A liquid market is commonly defined as a market where a substantial volume of trades occurs promptly, with minimal transaction costs and negligible price impact. It is widely believed that the existence of stock liquidity facilitates a seamless market performance, whereas its absence can create challenges within the market.

Liquidity is a powerful factor affecting the equity returns, and can be described as the costs incurred by the investor when trading, these costs are divided into explicit costs such as bid-ask spreads, and implicit costs such as adverse price changes, and the resulting additional costs incurred due to the difficulty of trading illiquid stocks, investors must command premiums for holding illiquid securities [26].

Observing stock liquidity has presented challenges, prompting the development of various liquidity measures within academic literature. According to [27] several measurement tools have been used in previous studies in order to calculate stock liquidity. These measures include the bid-ask spread [28], relative spread [29, 30], effective spread [31], amortized spread [32–34], and trading volume [35].

In a liquid stock market, a trader can easily sell its shares without much impact on the share price, while in a less liquid market, selling shares becomes more expensive due to increase in the supply of stock that has a higher price impact [35, 36].

2.2 *The Effect of Voluntary Disclosure on Stock Liquidity*

According to the literature, stocks held by well-informed investors and those linked to higher information asymmetry tend to experience a more pronounced enhancement in stock liquidity. The underlying reasoning behind this prediction is that when traders possess extensive knowledge, the underlying value of the stock becomes subject to greater information asymmetry, thereby leading to more information being revealed through portfolio disclosure [1, 12, 37].

The previous considerations lead to the hypotheses of the study:

H1: Voluntary disclosure has a significant effect on stock liquidity as measured by the share turnover ratio.

H2: Voluntary disclosure has a significant effect on stock liquidity as measured by the Daily Bid-Ask spread.

Population and Sample of the Study

There have been no studies examining the effect of voluntary disclosure on stock liquidity in the Jordanian insurance sector. Therefore, the population of this study entails all insurance companies that are listed on the (ASE). The population's size is

23 insurance firms; the sample involves the entire population which consists of 23 firms, over 10 years (2010–2019), yielding 230 firm-year observations.

3 Measurement of Variables

This study uses two main variables; stock liquidity as a dependent variable and voluntary disclosure as independent variable.

3.1 *Dependent Variable: Stock Liquidity*

Stock liquidity as the dependent variable will be measured in two ways; the first measurement is the share turnover ratio which was calculated by dividing the total number of shares traded over a year by the number of shares outstanding for the year. Many studies used the turnover ratio as a proxy to measure the stock liquidity [38, 39].

The second measurement is daily Bid -Ask spread which was measured as follows:

$$\text{Daily Bid - Ask spread} = \frac{\sum (\text{Ask Price} - \text{Bid Price})}{[(\text{Ask Price} + \text{Bid Price})/2] * 100 / N}$$

while N = the number of traded days over the year.

The daily spreads are averaged to obtain the stock liquidity measures for each year and each Jordanian insurance company [25]. Highlight that spread measures are negatively correlated with market liquidity. That a higher value of SPREAD indicates a wider spread and thus lower liquidity, suggesting that SPREAD is an inverse measure of liquidity.

As utilized in previous studies such as [9, 40–43] one of the standard measures of liquidity is the bid-ask spread, which is the difference between the lowest available quote to sell and the highest available quote to buy [44, 45]. The daily Bid-ask spread measure represents the cost an investor must incur to trade immediately [46].

3.2 *Independent Variable: Voluntary Disclosure*

This research employs a custom-made index to assess the extent of voluntary information disclosed by companies in their annual reports. The voluntary disclosure index (VDI) comprises a set of items that are not mandated by the statutory regulations in Jordan. To ensure the credibility and accuracy of the index, measures have been taken to establish its reliability and validity. a pilot-test was applied on the constructed VDI using a sample of 16 insurance annual reports listed in ASE.

Accordingly, many items were eliminated from the initial index before modifications that may be irrelevant to the Jordanian disclosure practices or inapplicable on all Jordanian insurance companies. Using [47, 48] binary coding approach; when a company discloses an item of information that is included in the index, it is assigned a score of 1; otherwise, it receives a score of 0. The cumulative score reflects the overall extent of information disclosed in the annual report by each firm. To calculate the item-wise score, the scores assigned to various items in the score sheet of all the companies are taken into account. Then, the total score for each company averaged for each year, by dividing it over the total VDI items. The final index includes 6 categories with a total of 42 items, as follows:

A Voluntary Disclosure Index (VDI)

A. General information	D. R and D
1. General objectives of the firm—Missions, vision, objectives	1. Developing new products/services
2. Strategic and financial objectives	2. Automation and IT system development
3. The actions implemented throughout the year to accomplish the corporate objectives	3. On-line interaction facilities (e.g., mobile application)
4. Web page address	4. Expanding business future plans (increasing No. of branch)
5. Multiple language presentation for non-financial data	E. HR
6. List of branches in details (rather than location)	1. Recruitment info. (joining ratio; policy, exams)
7. Email	2. Employee training policy
8. Ethical code or values	3. Employee appreciation or welfare (bonus salary; insurance...etc.)
9. Summary of the annual report	4. The count of employees over a span of two or more years
10. General outlook of the economy	5. years of experience for Executive Management
11. Brief for the industry's performance	6. General manager joint date
12. Images for (boards member, management, employees, events etc.)	F. Board of directors
B. Financial information and ratios	1. Shareholders that own less than 5% of shares
1. Return on capital (ROC) ratio	2. Policy and achievements of BOD committees
2. Liquidity ratio	3. Boards duties, responsibilities or achievements during the year
3. Return on equity (ROE) ratio	4. Board of directors' membership date
4. Return on investment (ROI) ratio	
5. Equity to deposit ratio	
6. Return on Assets (ROA) ratio	

(continued)

(continued)

A. General information	D. R and D
7. Asset turnover ratio	
8. Diagrams (Charts) for the main financial data	
9. Horizontal Analysis for major items in the financial statements	
C. Historical financial information	
1. Share price—more than 5 years	
2. Solvency ratio—more than 2 years	
3. Historical summary (Trend) for market share	
4. Profit or loss—more than 5 years	
5. Assets—more than 2 years	
6. Revenues (Premiums)—more than 2 years	
7. Dividends Declared—more than 5 years	

3.3 Control Variables

The following control variables was used in the study.

3.3.1 Firm Size

Firm size is considered to be an important determinant of corporate disclosure practice, prior studies support the hypothesis that disclosure is positively linked to firm size, [49]. The natural logarithm of total assets will be used as a proxy to measure the firm size.

3.3.2 Firm Age

Many prior studies concluded that older companies disclose more information than younger ones, [49, 50]. The natural logarithm of Age will be used as a proxy to measure the Firm age.

3.3.3 Leverage

In the study, leverage is measured by calculating the ratio of total debt to equity. Numerous studies have identified a positive correlation between leverage and disclosure [21, 51].

3.3.4 Profitability

Prior studies document a relationship between profitability and disclosure [3, 21, 51]. Profitability measured with return on asset ratio which is the percentage of net profit divided by total assets.

4 Regression Models

For the purpose of testing the study’s main hypotheses, two empirical models have been developed and tested. The first model concerns the effect of voluntary disclosure on share turnover ratio (TUROV) as stock liquidity measure, and controlled by the firm size, age, leverage and return on assets. Thus, the first regression model is identified as follows:

$$TUROV_{it} = \beta_0 + \beta_1EXTVDI_{it} + \beta_2SIZE_{it} + \beta_3AGE_{it} + \beta_4LEV_{it} + \beta_5ROA_{it} + e_{it} \tag{1}$$

The second regression model aims to examine the impact of voluntary disclosure on the Daily Bid-Ask spread, which is a measure of stock liquidity. This model is carefully structured by considering various factors such as firm size, age, leverage, and return on assets. Consequently, the second model is formulated as follows:

$$SPREAD_{it} = \beta_0 + \beta_1EXTVDI_{it} + \beta_2SIZE_{it} + \beta_3AGE_{it} + \beta_4LEV_{it} + \beta_5ROA_{it} + e_{it} \tag{2}$$

where:

- TUROV_{it} Share turnover ratio.
- SPREAD_{it} Daily Bid-Ask spread.
- I firm.
- t year.
- EXTVDI_{it} A measure of voluntary disclosure.
- SIZE Firm size is determined by taking the natural logarithm of the total asset value.
- AGE Firm age measured as the natural logarithm of the firm’s age.

LEV	Leverage is determined by dividing the total debt of a company by its equity.
ROA	Return on asset measured by dividing net profit on total assets.
B0- β 5	Regression coefficient.
<i>e</i>	error.

5 Results and Discussion

5.1 Descriptive Statistics

Table 1 reports the descriptive statistics for the variables used in the study. A minimum, maximum, mean, and standard deviation presented in the table.

Share turnover ratio and Daily Bid-Ask spread are considered the measures for the stock liquidity which is the dependent variable of the study, the share turnover ratio which represents the traded shares over a year by the average number of shares outstanding for the year, range from 0 indicating that one or many companies did not traded any shares for one or many years to maximum of 10.484, with a mean value of 0.19418. The Daily Bid-Ask spread values range also from 0 which results from many companies that show an equaled values for Ask price and bid price and for many years, to 0.29179 with a mean value of 10.01188. This represents a lower spread mean compared to some studies that were applied to the Jordanian market before, such as [42] who studied listed companies in the Jordanian market during 2005 and found mean spread of 2.2%; and [52] who examined non-financial Jordanian companies listed on the (ASE) for the year 2004, and found mean spread of 5%.

The results also indicate that the mean of voluntary disclosure in the insurance companies is 29.717%, the highest disclosure achieved by a firm is 60.465% and the

Table 1 Descriptive statistics of the study variables

Dependent variable	Observations	Mean	Minimum	Maximum	Standard deviation
TUROV	230	0.19418	0	10.4836	0.87411
SPREAD	230	0.01188	0	0.29179	0.02038
<i>Independent variable</i>					
EXTVDI	230	0.29717	0.11628	0.60465	0.08828
<i>Control variables</i>					
SIZE	230	7.41809	6.82661	8.04342	0.28636
AGE	230	1.45397	0.47712	1.83885	0.24792
LEV	230	1.92392	0.15889	10.05166	1.28583
ROA	230	0.00403	-0.50118	0.1583	0.06701

EXTVDI: Extent of voluntary disclosure, TUROV: Share turnover ratio, SPREAD: Daily Bid-Ask spread, SIZE: Firm size, AGE: Firm Age, LEV: Leverage, ROA: Return on asset

lowest value is 11.628% with a standard deviation of 8.828%. The results indicate that there is a noticeable variation in voluntary disclosure between Jordanian insurance companies that will be discussed in details in the next section.

For the control variables, the mean of firm's size is 7.418, the highest value is 8.043 and the lowest value is 6.827 with a standard deviation of 0.28636, while the mean of the firm's age is 1.454 with a maximum value of 1.839 and a minimum of 0.47712.

As for the leverage; that indicates the ability of the insurance companies to meet their financial obligations, the results showed a mean value of 1.924 with a maximum value of 10.052 and a minimum value 0.15889. Finally, the mean of ROA is 00.00403, a minimum value of -0 . A maximum value of 0.1583, and with a standard deviation of 0.1583 (Table 2).

5.2 Voluntary Disclosure Analysis

The following Table 3 shows the percentage of voluntary disclosure for each company during the period 2010 to 2019, and the average disclosure was calculated for the whole period for each company separately, which is shown in the table in the last column as "AVG VDI for each company over the years". The results shows the variation in the extent of voluntary disclosure by the Jordanian insurance companies, which ranges between 18% and 48%.

The Jordanian insurance companies show a variety of the level of voluntary disclosure, Arab Jordanian Group Company scored the lowest level of disclosure with an average of 18%, while the Arab Orient GIG Company received the highest level of disclosure with an average of 48%.

The variation of the voluntary disclosure, is due to the difference in awareness among the senior management of the companies concerned with preparing and presenting financial statements, as some companies are only obligated to disclose mandatory data, and their main objective is to avoid financial fines issued by the relevant regulatory authorities as a result of non-compliance with the aforementioned mandatory disclosure, and it may repeat exactly the same annual data with changing numbers only, while some companies add and modify voluntary data in proportion to their situation and the need of investors and other users of this data, especially those statements that talk about the company's achievements that distinguish it from others in order to encourage investors to invest in the company.

The last row of Table 2 shows the percentage of voluntary disclosure for each company during the period from 2010 to 2019, and the average disclosure for all companies was calculated for each year separately. The results show the increase in voluntary disclosure over the years, with the average VDI calculated for all companies over each year starting at 25% at the start of the study period and ending at 35% at the end of the study period.

The remarkable increase in voluntary disclosure of all companies across the study periods can be explained by the increased awareness of the importance of voluntary

Table 2 The extent of voluntary disclosure by the Jordanian insurance companies

Company name	2010 (%)	2011 (%)	2012 (%)	2013 (%)	2014 (%)	2015 (%)	2016 (%)	2017 (%)	2018 (%)	2019 (%)	AVG VDI for each company over the years
Arab Jordanian group	16	16	16	16	16	19	19	16	21	21	18
Arabia	14	19	16	16	16	12	19	19	33	30	19
Holy lands	26	23	23	23	26	21	21	23	26	21	23
Jerusalem	12	14	19	14	12	12	28	44	42	42	24
Arab life and accidents	16	16	19	26	23	26	28	23	35	30	24
Midgulf	14	23	14	23	26	28	23	23	40	37	25
Almanara	23	26	23	26	21	23	28	28	26	28	25
Philadelphia	14	19	28	28	28	28	28	26	26	28	25
National	30	28	26	23	23	23	23	23	30	30	26
Middle east	30	28	21	23	33	33	23	21	26	33	27
Arab assurers	23	23	28	26	30	28	28	28	28	30	27
Safwa	14	19	30	26	28	30	30	37	37	37	29
Jordan French	28	28	28	28	28	35	28	30	35	28	30
United	23	28	28	23	30	30	33	33	35	35	30
Arab union	28	28	28	30	33	30	30	30	30	33	30
Delta	28	30	30	33	33	33	35	37	26	30	31
Alnir al-Arabiya	26	33	30	30	30	35	35	35	35	35	32
Islamic	28	35	26	37	30	28	30	37	44	44	34
First	26	40	40	40	40	40	35	35	42	47	38
Newton	37	35	40	40	40	42	42	42	42	40	40
Jordan insurance	37	40	40	40	40	40	40	37	42	44	40
Euro arab group	37	40	37	42	40	40	40	40	42	44	40
Arab orient gig	42	40	44	44	49	49	44	47	60	58	48
AVG VDI for all companies	25	27	28	29	29	30	30	31	35	35	30

AVG VDI: average of voluntary disclosure index

Table 3 The correlation between dependent, independent, and control variables

		EXTVDI	TUOV	SPREAD	SIZE	AGE	LEV	ROA
EXTVDI	Pearson Correlation	1						
	Sig. (2-tailed)							
	N	230						
TUOV	Pearson Correlation	-0.173**	1					
	Sig. (2-tailed)	0.009						
	N	230	230					
SPREAD	Pearson Correlation	-0.072	0.136*	1				
	Sig. (2-tailed)	0.279	0.04					
	N	230	230	230				
SIZE	Pearson Correlation	0.519**	-0.181**	-0.06	1			
	Sig. (2-tailed)	<0.001	0.006	0.361				
	N	230	230	230	230			
AGE	Pearson Correlation	-0.121	-0.147*	-0.081	0.035	1		
	Sig. (2-tailed)	0.068	0.026	0.224	0.598			
	N	230	230	230	230	230		
LEV	Pearson Correlation	-0.07	0.152*	0.014	-0.356**	-0.005	1	
	Sig. (2-tailed)	0.297	0.022	0.83	<0.001	0.935		
	N	226	226	226	226	226	226	
ROA	Pearson Correlation	0.154*	-0.316**	-0.011	0.337**	0.014	-0.328**	1
	Sig. (2-tailed)	0.019	<0.001	0.863	<0.001	0.835	<0.001	
	N	230	230	230	230	230	226	230

disclosure, in order to serve users of financial statements and facilitate the process of obtaining the information they need. This increase can also be justified by the positive effects of voluntary disclosure on the company, as it saves the time and effort necessary to meet any of the shareholders' requirements to collect the necessary data that they may need or request.

5.3 Pearson Correlation Matrix

Pearson correlation matrix was used in order to examine the nature and direction of association between the independent variable (EXTVDI), the dependent variables (TUROV, SPREAD), and the control variables (SIZE, AGE, LEV, ROA) in the study, as shown in Table 4.

According to the results presented in Table 3, the voluntary disclosure has a significant negative correlation with share turnover ratio (TUROV) ($R = -0.173$, sig 0.009) indicating that the higher the voluntary disclosure the lower the stock liquidity measured by share turnover ratio and vice versa. These findings differ from the results of [53] who found that there is no significant relation between the amplitude of voluntary disclosure and daily stock turnover rate.

The voluntary disclosure EXTVDI has a significant positive correlation with firm size (SIZE) ($R = 0.519$, sig < 0.001) indicating that the higher the size the higher voluntary disclosure and vice versa. That result is consistent with results of other previous studies such as [53, 54]. The Voluntary disclosure EXTVDI has a significant positive correlation with firm's return on asset (ROA) ($R = 0.154$, sig = 0.019) indicating that the higher the ROA the higher voluntary disclosure and vice versa.

Table 4 Regression results for model (1): The dependent variable is Share turnover ratio

R Square	0.144				
Adjusted R ²	0.124				
F	7.390				
Sig	<0.001				
Model	Beta	T	Sig	Tolerance	VIF
(Constant)		0.578	0.564		
EXTVDI	-0.155	-2.073	0.039	0.696	1.438
SIZE	0.018	0.223	0.824	0.592	1.688
AGE	-0.162	-2.564	0.011	0.971	1.029
LEV	0.055	0.796	0.427	0.807	1.239
ROA	-0.278	-4.079	0.000	0.837	1.195

EXTVDI: voluntary disclosure, TUROV: Share turnover ratio, SIZE: Firm size, AGE: Firm Age, LEV: Leverage, ROA: Return on asset

Dependent variable: Share Turnover

In this study there is a significant positive correlation between the share turnover ratio as a stock liquidity measure and the daily bid-ask spread in the Jordanian insurance market ($R = 0.136$, $\text{sig} = 0.04$), meanwhile the spread is an inverse stock liquidity measure. That is, the relationship between the two variables logically should be negative, as the increase in the share turnover ratio of the stock means an increase in liquidity and thus a decrease in the daily bid-ask spread.

The share turnover ratio (TUROV) has a significant negative correlation with the company size (SIZE) ($R = -0.181$, $\text{sig} = 0.006$). The result is inconsistent with [9]. However, there are several ways to measure a firm’s size; the measure may influence the correlation result; for example, if the size is measured using the log of capital, the result may differ.

The share turnover ratio (TUROV) has a significant negative correlation with the company age (AGE) ($R = -0.147$, $\text{sig} = 0.026$). The result is consistent with the study of [22]. The share turnover ratio (TUROV) has a significant positive correlation with leverage (LEV) ($R = 0.152$, $\text{sig} = 0.022$).

Stock liquidity measured by Daily Bid-Ask spread (SPREAD) does not have significant correlation with any of the variables EXTVDI, SIZE, AGE, LEV and ROA. Also, The Voluntary disclosure EXTVDI does not have significant correlation within (AGE) and (LEV).

5.4 Regression Analysis and Hypotheses Testing

Multiple Regression analysis has been conducted for the purpose of examining the effect of voluntary disclosure on share turnover ratio and daily bid-ask spread taking the effect of the control variables into consideration. Two empirical models have been developed and tested.

5.4.1 Model (1)

This model is designed to examine the effect of voluntary disclosure on stock liquidity using TUROV which represents share turnover ratio, and controlled by the firm size, age, leverage and return on assets.

$$\begin{aligned} \text{TUROV}_{it} = & \beta_0 + \beta_1\text{EXTVDI}_{it} + \beta_2\text{SIZE}_{it} + \beta_3\text{AGE}_{it} \\ & + \beta_4\text{LEV}_{it} + \beta_5\text{ROA}_{it} + e_{it} \end{aligned} \tag{3}$$

Table 4 presents the results of the model and shows that the Adjusted R^2 value is 12.4%. This indicates that 12.4% of the variation in stock liquidity measured by share turnover ratio was explained by this model. In other words, the variation in the independent variables and control variables are able to explain 12.4% of the variation of the dependent variable which is stock liquidity measured by share turnover ratio in

this case. The model has F value of (7.390) and a p value of <0.001 which indicates that the first study model proposed is appropriate and has explanatory power. Thus, the study accepts the first hypothesis and rejects the null hypothesis, which signifies that there is a significant effect of voluntary disclosure on stock liquidity measured by Share turnover ratio along with the control variables.

The voluntary disclosure has a negative ($\beta = -0.155$) and statistical significant ($\text{sig} = 0.039$) effect on stock liquidity, measured by share turnover ratio. For control variables, firm age variable has a negative ($\beta = -0.162$) and statistical significant ($\text{sig} = 0.011$) effect on stock liquidity, which implies that more Age firms have less stock liquidity. Furthermore, return on assets (ROA) has a negative effect on stock liquidity ($\beta = -0.278$), and it is statistically significant ($\text{sig} = 0.000$), which indicates that firms with high ROA have less stock liquidity.

Finally, the results of the first study model demonstrate that the variables size and leverage do not have a significant effect on stock liquidity, measured by share turnover ratio (TUROV).

5.4.2 Model (2)

The second model is designed to examine the effect of voluntary disclosure on stock liquidity using SPREAD which represents average daily Bid-ask, and controlled by the firm size, age, leverage and return on assets.

Table 5 presents the results of the model and shows that the Adjusted R^2 value is -0.009% . This indicates that 0.009% of the variation in stock liquidity measured by Daily Bid-ask spread was explained by this model. In other words, the variation in the independent variables and control variables are able to explain only -0.009% of the variation of the dependent variable which is stock liquidity measured by Daily Bid-ask spread in this case. Negative values of the Adjusted R^2 may occur when the adjusted R square contains terms that do not help to predict the response [55]. The results could be improved by adding more useful independent variables to the model that has a greater ability to explain the dependent variable, or by removing the ineffective variables.

The model has an F value equal to (0.605) and a p value equal to 0.696 which is a non-significant value indicating that the second study model proposed is not suitable and has no explanatory power. Accordingly, the study rejects the second hypothesis and accepts the null hypothesis, which indicates that there is no significant effect of voluntary disclosure and the control variables on the stock liquidity, which is measured by the Daily Bid-Ask spread.

Table 5 Regression results for model (2): The dependent variable is daily bid-ask spread

R square	0.014				
Adjusted R ²	-0.009				
F	0.605				
Sig	0.696				
Model	Beta	T	Sig.	Tolerance	VIF
(Constant)		0.879	0.381		
EXTVDI	-0.072	-0.901	0.369	0.696	1.438
SIZE	-0.022	-0.247	0.805	0.592	1.688
AGE	-0.088	-1.302	0.194	0.971	1.029
LEV	0.004	0.060	0.952	0.807	1.239
ROA	0.009	0.130	0.897	0.837	1.195

EXTVDI: voluntary disclosure, TUROV: Share turnover ratio, SIZE: Firm size, AGE: Firm Age, LEV: Leverage, ROA: Return on asset
 Dependent variable: Daily Bid-ask spread

6 Conclusions

This study aimed to investigate the effect of voluntary disclosure on stock liquidity of 23 Jordanian insurance companies for the period (2010–2019). The study used a self-constructed voluntary disclosure index (VDI) to measure the independent variable the voluntary disclosure, and for the dependent variable stock liquidity two measures were used, first; the share turnover ratio, second; the Daily Bid-Ask spread. Moreover, Firm size, firm age, leverage, and return on assets were used as control variables.

The study hypothesized that there was a positive effect of voluntary disclosure on stock liquidity measured by share turnover ratio and also a positive effect of voluntary disclosure on stock liquidity measured by daily bid-ask spread.

The hypotheses were rejected and the results showed a significant negative effect of voluntary disclosure on stock liquidity measured by share turnover ratio, that the higher voluntary disclosure leads to a lower stock liquidity. As for the Daily Bid-ask spread, the study showed that there is no significant relationship between voluntary disclosure and stock liquidity measured by daily bid-ask spread.

The results are inconsistent with [40, 41, 52] who found a positive significant relationship between voluntary disclosure and stock liquidity. This inconsistency in the results could be due to several reasons; first, the comprehensiveness of disclosure regulations that governs the insurance sector which covers most issues of interest to the investor, so that other disclosed information not significant enough to influence investor's investment decisions and hence the stock liquidity. Second, uncontrolled conditions may affect the relationship between the variables of the study, to avoid that issue the study recommends to use more useful control variables in the future researches. Third, some companies publish almost the same annual reports every year so that they adopt a set of voluntarily disclosed information and continue to disclose

them with only minor, insignificant adjustments to the voluntary disclosure, that the trend of voluntary disclosure for each company ranges between close proportions and does not change significantly overtime and that could affect the results, that it do not properly deduce the relationship between the variables.

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Forensic Accounting in the Age of Financial Technology



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Abstract The current paper focus on the literature related to forensic accounting and challenges can be faced in the financial technology age. As per the previous studies reviewed the finding revealed that forensic accounting can be considered as a tool to monitor the changes and control any expected fraud because of the advancement of the technology. The paper recommends to establishing forensic accounting departments in both the governmental and non-governmental sectors to train and develop the skills of forensic accountants on the latest technologies, including software used.

Keywords Forensic accounting · Auditing · Technology · Financial technology · Cybercrime

1 Introduction

The profession of forensic accounting provides wide range of services that can support individuals, organizations, and governments during one of the most difficult periods in the history [1]. Professional accountants work in various sorts of associations including, insurance agency, public establishments, police powers, banks, and government organizations. Even though some forensic accounting services (such as cybercrime detection and fraud detection) overlap, case administrations and business valuation), by far most of exploration in the scientific bookkeeping region have ordered the administrations presented by measurable bookkeepers into four primary classes, which are suit administrations, extortion examination [3–5, 71].

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Forensic accountants may provide necessary information to the legal investigations or serve as an advisor, assisting lawyers with the litigation process [6, 65]. Support services for litigation may include dispute advisory, engagement of experts as witnesses, and consulting services [7, 70]. In some cases, such as personal injury, risk analysis advice for bankruptcy, family law, matrimonial issues, stock-based compensation, and the fair value of financial reporting, forensic accountants may offer business valuation services [8, 9, 64]. According to [10–15, 22, 69], dispute resolution is another specialty in which forensic accountants provide financial and court-related adversarial services.

For fraud investigation services they identify, prevent, and act against those who engage in financial fraud, money legalization, and personality theft. In addition, forensic accountants are expected to work in a variety of fields, including computer forensics, data mining, and information technology [3, 10, 16–19]. References [20, 27, 32, 61] Named different cybercrimes where criminological bookkeepers can play a critical job, for example, charge card misrepresentation, online opiate deals, media communications misrepresentation, on the web/email blackmail, internet betting, robbery of PC protection and licensed innovation privileges.

2 Purpose of the Study

Technology is about using science to find solutions to problems. Forensic accounting has always been made easier by technological advancements [21, 63]. Forensic accounting's effectiveness and efficiency are both improved as technology knowledge grows along with increase in financial crimes [22, 23, 60]. The technology will enhance the performance of individual and companies. The weak points of technology can be used by investigators to analyze it and suggest solutions and can be used by professional cybercriminals to complete their financial crimes [24–26].

It is easy to describe the manifest of financial and economic crime as untamed and endemic [32, 62]. It is serious and affect in people in general and confidential areas. We can look at the economic and financial crimes as any procedure which will damage the economic results like achieving loss or earning unjustified revenue through using un legal transactions and activities [28, 29, 58, 59].

Forensic accounting is important because it help people to find the people behind every problem in the financial area as today you found different types of fraud and it is by phone and they took all your money, so it is good to use forensic accounting now to found them and give them what they deserve [30, 47].

3 Literature Review

3.1 *Technology and Forensic Accounting*

Technology is undergoing significant change in the accounting field. As a result, accountants of today need to be knowledgeable and adept at technology use [33, 55–57, 66]. Accountants will be able to analyze a variety of important issues with more ease if they have the skills and solid understanding of technology [22, 34–36].

Technology plays a variety of roles in the investigation of forensic accounting because it enables the forensic investigator to a quantity of activities and transactions, determining work patterns, and select files the need more examination and initial comprehension [18, 37–40]. Technology will support forensic accounting in the electronic reconstruction of damaged files, the identification of scam methods, the recovery of deleted files, the detection of steganography, open coded files, and the mining and keeping of data [2, 7, 41–44].

According to [31, 45, 54], the success of an accounting career depends on the ability to obtain, manage, and analyze digital evidence. Now of the internet, forensic accounting uses a lot of technology-based investigative tools, like data mining and analysis, and sometimes the tools that used by cybercriminals are used in forensic accounting to find them. Forensic accounting effectiveness and efficiency increase as technology knowledge increases. Because of the American institutions Technology and forensic accounting have no significant connection [46, 67].

3.2 *Technology and Financial Crimes*

The need for technology has grown because of the globalization of the world and the widespread reliance of individuals and business organizations on technology [47, 68]. While technology has a positive impact on many aspects of our lives, it also has negative effects in a few areas, and fraudsters use digital devices as fraud tools. Expansion in the information on innovation expands productivity and viability of criminological bookkeeping and in like manner speeds up and ease for crooks to carry out monetary violations. Most of all financial fraud involves the use of digital equipment and computers [48]. However, concluded that the benefits of technology, such as computers and other digital equipment, outweigh the drawbacks [49]. The perpetrators of economic and financial crimes and forensic accountants alike can take advantage of new opportunities provided by technology [50–53].

4 Conclusion

This study shows that the application of forensic accounting faces many challenges. The study also found that technology has important implications for both forensic accounting and financial crime. Technology has A negative impact on financial crimes.

Accordingly, forensic accounting has turned out to be a necessary tool to combat the ugly problem of financial crime, so it is necessary to have a compulsory forensic accounting department in regulators, institutions, and offices (public and private). Establishing forensic accounting departments in both the governmental and non-governmental sectors to regularly train and develop the accountant skills on the latest technologies, software used to investigate the crimes. Governments must change existing laws to meet the demands of today's technological advances. Forensic accounting can be offered in colleges, universities, and all professional accounting organizations.

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The Performance of Internal Shariah Auditor in Islamic Financial Institutions



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Abstract The purpose of this paper is to examine the conceptual relationship between Shariah audit independence, qualifications and performance of internal Shariah auditor in Islamic financial institutions (IFIs). This paper is theoretical in its approach; whereby it also undertakes an extensive literature review. From a general agency theory, an Islamic agency theory is articulated and applied to ascertain the attributes of internal Shariah auditor performance revolving around the concept of independence and qualifications. Performance of internal Shariah auditing, as a mechanism of assuring Shariah compliance by IFIs, varies directly with the degree of independence and qualifications enjoyed by internal Shariah auditors themselves. The study finds that in evaluating the independence and qualifications of internal Shariah auditor performance, Islamic agency theory can potentially serve as the theoretical foundation in developing a multi-dimensional conceptual framework. Evidence is drawn strictly from secondary sources. To ensure that internal Shariah auditor is performance, IFIs ought to improve the degree of independence and qualifications of the auditors. Both the studies on external Shariah auditors' performance in IFIs, and internal auditor's performance in conventional financial institutions have been extensively researched. However, research on the performance of internal Shariah audit in IFIs is yet to be conducted extensively.

Keywords Internal Shariah audit performance · Independence · Qualifications · IFIs

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1 Introduction

The introduction of Islamic laws into Islamic financial institutions (IFIs) has resulted in great changes; especially in the way the institutions do their business, which has affected the audit of these institutions [15]. Accordingly, the normal audit objective has been changed to agree with the Islamic law even though the normal conventional auditing is unable to cater for the value of Shariah Islamiah [10]. In view of the nascence of IFIs there have been no mandatory regulated guides on auditing practices and accounting standards. Currently, auditing practice of IFIs in various countries represent that besides external auditors who are responsible for financial audit; all IFIs have Shariah supervisory board (SSB) in-house whose main duty is to certify the adherence of the IFIs to Shariah principles. The failures of large corporates such as Enron and WorldCom have emphasis on internal audit to increase markedly, the increased need for internal Shariah auditor to monitoring role motivates Islamic bank to invest in internal auditing and improve the performance of internal Shariah auditor to ensure the achievement of organization objective ultimately. The internal Shariah audit is concerned with sound and effective internal control system for Shariah compliance through continuous periodical assessment [26].

The important of internal Shariah audit in IFIs setting especially in Islamic banks leads various researchers to concern over its operation. The organization that has effective internal audit function will be much better than those organizational that has not such a function especially in related to fraud, detection and prevention [24]. The internal auditor not act only as a player to ensure corporate governance as well as providing internal consultancy [31] but the role has been extended to practice Shariah audit in order to ensure that the operations of IFIs are Shariah compliant. Shariah auditing has currently emerged as an important subject of discussion in line with the rapid development of IFIs. The independence of internal Shariah auditor plays a crucial role in effective discharge of his duties and profession. He occupies a unique position, as he appointed by the management but also review the conduct of the same management, which potentially places him in a position of conflict and thus his independence while conducting his work. This gives significant tension to the internal auditor as he does not find himself independent from the management [3]. Without independence, the internal auditor simply becomes a part of the management team, losing the ability to offer a fresh perspective through an objective evaluation [7]. An auditor is essential to be independence in both fact and appearance. Independence is “(1) real independence of the individual practitioner in his performance of his work; (2) and second, the apparent independence of auditors as a professional group” [21]. Independence is the cornerstone of the auditing profession, without independence the auditor’s opinion is suspect.

Shariah audit function is handling by internal audit department of Islamic banks, to be independence an auditor should be able to demonstrate that there is no threat to his independence such that an outsider would not doubt the auditor’s objectivity [5]. The responsibility of internal auditors has extended their job scope, internal auditor acts as a player to ensure corporate governance and providing internal consultancy

[31]. Thus, it was suggested that there is a need to have independent Shariah auditor in IFIs [11]. As a new emerging discipline, there are several issues which need to be resolved in order to develop a sound Shariah auditing system for IFIs [32]. One of such issues is internal Shariah auditor independence, unsolved issues related to Shariah auditing in terms of independence, qualification of internal Shariah auditor, scope of internal Shariah audit work, and auditing standards, the Islamic banking and financial industry will be distorted unless to solve the issues of Shariah auditing [14]. This is evidence by the lack of literature review on the subject. Currently, AAOIFI guidelines on Shariah audit can be considered as the most relevant guideline available for Shariah audit practice. However, whether the standard is able to serve to the practice of Shariah audit in comprehensive manner is still another question to consider. The internal Shariah auditor should satisfy himself and formulate accurate judgment that the transactions and controls he examined during his audit process comply with Islamic Shariah rules and principles [35].

Shariah auditor that has qualifications tends to demonstrate better independence, thus better auditing outcomes that will lead to a success in Shariah audit. Hence, internal Shariah auditors are required to maintain their independence so that they will issue unbiased and reliable audit reports. However, it has become increasingly questionable whether the profession is able to maintain its independence not only in fact but also in appearance [23]. This heightened concern expressed by many is owing to the fact that internal auditors are also employees of the organization they audit and report on. This makes it an interesting area to study. In view of the above, the objective of the research is to examine the conceptual relationship between Shariah audit qualifications and independence of internal Shariah auditor. However, few research attention has been focused on these issues. The extent to which internal Shariah audit's independence and qualifications influences the performance of internal Shariah audit still needs to be clarified. This study aims to explore the status of independence and qualifications of internal Shariah audit in IFIs and how these contextual factors contribute to the performance of internal Shariah audit in IFIs. The paper is being with the definition of Shariah audit, roles and responsibilities, and independence of Shariah audit; followed by relationship between Shariah audit qualifications and independence of internal Shariah auditor together with underpinning theory and ended with conclusion.

2 Literature Review

2.1 Definition of Shariah Audit

Since the research about internal Shariah audit is at the fetal stage, some basic issues and concepts of it have not yet been resolved. For instance, any field of study needs a proper definition before one can dig deep into its different aspects. However, there has not been any unanimous and clear-cut definition of the term Shariah audit yet. In

its simplest sense, Shariah audit has been defined as an audit attestation for Shariah compliance [35]. However, the term is not so easy to be explained by such a simple expression and the writers confess this fact by pointing towards different issues that might arise as a result of this definition. On the other hand, AAOIFI's Governance Standard for IFIs no. 3 elaborate the objective of Shariah audit as "the primary objective of the internal Shariah review (carried out by independent division or part of internal audit department) is to ensure that the management of an IFI discharge their responsibilities in relation to the implementation of the Shariah rules and principles as determined by the IFI's SSB". It is visible in this statement that Shariah audit aims at Shariah compliance, and it has been taken as an internal matter of an IFI which is the responsibility of an independent branch of internal audit department. We find a more comprehensive definition of the term given by [9] which states that Shariah audit is: "a systematic process of objectively obtaining and evaluating evidence regarding assertions about religious and socioeconomic actions and events in order to ascertain the degree of correspondence between those assertions and those of the applicable financial reporting framework, including the criteria specified based on Shariah principles as recommended by the SSB and communicating the results to all interested parties".

This definition catches the broad scope of Shariah audit by adding the socioeconomic aspect into it apart from the religious obligations. An operational definition of the term has also been provided which states that: "Shariah audit is the examination of an IFIs compliance with the Shariah, in all of its activities, particularly the financial statements and other operational components of the IFIs that are subjected to the risk of compliance including but not limited to products, technology supporting the operations, operational processes, the people involved in the key areas of risk, documentations and contracts, policies and procedures and other activities that require adherence to Shariah principles" [9]. Although the socioeconomic aspects of the earlier definition are missing here, we can see that almost all the operational aspects, including technology, processes, and procedures etc. are included in this definition. Whereas [26] defines Shariah audit as "the accumulation and evaluation of evidence to determine and report on the degree of correspondence between information and established criteria for Shariah compliance purposes", [11] has defined it as "a systematic process of objectively obtaining and evaluating evidence regarding assertions about socio-economic, religious and environmental actions and events in order to ascertain the degree of correspondence between those assertions and Shariah (Islamic Law), and communicating the results to user.

2.2 Roles and Responsibilities of Shariah Auditor

It is debated that Shariah audit is one of the key pillars in corporate and Shariah governance of IFIs. They need to ensure compliance of the IFIs to all Shariah requirements [20]. The Shariah audit function is performed by the internal auditors with adequate Shariah related knowledge, competent, skills, experience, and training. Subsequently,

the report is forwarded to the SSB of the IFIs [33]. The SSB may give their opinions only on Shariah matters to the board of directors, who will decide and make the final decision [11, 12]. The primary objective of internal auditors is to ensure that the management of an IFI discharge their responsibilities in relation to the implementation of the Shariah rules and principles as determined by the IFI's SSB [1]. The internal auditor may also engage the experts in the Islamic finance in performing the audit as long as the audit objective is not being compromised [34]. The IFIs may also appoint external party to conduct a Shariah audit.

2.3 Internal Shariah Audit Performance

According to GSIFI No. 3 issued by [1] the internal Shariah auditors shall plan each internal Shariah audit assignment. Planning documentation shall include, but not limited to, the following such as Obtaining background information about activities to be reviewed, such as locations, products/services, branches, divisions, etc. establishing internal Shariah audit objectives and scope of work. Obtaining SSB Fatws, guidelines, instructions, prior years internal and external Shariah audit results, relevant correspondence including supervisory and regulatory agencies. Determining the resources necessary to perform the internal Shariah audit. Communicating with all individuals in the IFI who need to know about the internal Shariah audit. Performing, as appropriate, a survey to become familiar with activities, risk, and control to identify the area of the internal Shariah audit emphasis, and to invite auditees' comments and suggestions. Writing the internal Shariah audit programmes. Determining how and when the internal Shariah audit results shall be communicated. Obtaining approval of the internal Shariah audit work plan from the concerned authorities including the SSB of the IFI.

The internal Shariah auditors shall collect, analyse, interpret and document information to support their internal Shariah audit results. The information shall be collected on all matters related to internal Shariah audit objectives and scope of work. Information collected shall include examination of documentation, analytical reviews, inquiries, discussions with management, and observation. The information shall be sufficient, reliable, relevant and useful to provide a sound basis for internal Shariah audit findings and recommendations. Working papers that document the internal Shariah audit shall be prepared by the internal Shariah auditor and reviewed by the head of internal Shariah audit. These working papers shall support the internal Shariah audit findings and recommendations. Working papers shall be appropriately prepared, completed, organized, reviewed and retained [1]. The head of internal Shariah audit shall discuss conclusions and recommendations with appropriate levels of management before issuing a final report. On completion of the internal Shariah audit, at least a quarterly written report shall be prepared which must be signed by the head of internal Shariah audit, addressed to the board of directors and copied to the SSB and management. The report shall be objective, clear, constructive and timely. The report shall present the purpose, scope and results of the internal Shariah audit

and it shall contain an expression of internal Shariah audit opinion. The report shall also include recommendations for potential improvements and corrective action, and knowledge satisfactory performance, when appropriate.

The auditees' views about the internal Shariah audit conclusions or recommendations shall be included in the internal Shariah audit report. All disputes between management and internal Shariah auditors on matters relating Shariah interpretation shall be related to the SSB for a ruling. The internal Shariah audit shall follow up to ascertain that appropriate action is taken on their reported internal Shariah audit findings. In addition, any other recommendations related to Shariah matters made by SSB, external auditors, and regulatory agencies shall also be followed up. Therefore, the internal Shariah audit function should specify that the internal Shariah auditors must have direct and regular communications with all levels of management and SSB. There should not be any scope of limitation and restriction of access to documents, reports, personnel, etc. place on the internal Shariah auditor. Thus, this will ensure the efficiency and effectiveness of the internal Shariah audit function.

2.4 Internal Shariah Audit Independence

Independence in auditing means taking unbiased viewpoint in the performance of audit tests, the issuance and the evaluation of the results of report [5] that management can place full reliance on audit findings and recommendations [25]. Independence requires both (i) independence of mind and (ii) independence in appearance [27]. Mautz and Sharaf [21] defined independence in fact or actual independence as the auditors' state of mind and his/her ability to maintain a proper attitude in the planning of his audit program. On the other hand, independence in appearance or perceived independence refers to the publics or others, perceptions of the auditor's independence. An internal Shariah auditor should be able to demonstrate that there is no threat to his or her independence, and then only his/her independent can be seen. Independence is a critical issue in auditing since it is the cornerstone of the profession [21]. Independence is achieved through the organizational status of internal audit and the objectivity of internal auditors [22]. All the outcome of Shariah audit function listed to the SSB may engage independence issues since the SSB of IFIs is responsible in decisions, opinions related to Shariah matters. Shariah auditor must maintain a high level of independence to keep the confidence of users relying on their reports, the internal Shariah auditor must report directly to the board of directors to ensure independent from the operating unit they audit. The Shariah Governance Framework issued by bank Negara Malaysia [6] requires that the responsibility of conducting Shariah audit lies in the hands of the internal audit unit. It indicates that the responsibility of internal Shariah auditor has expanded his scope of work to perform Shariah audit in ensuring that the operations of the IFIs are Shariah compliant [27–29].

In case of independence the Shariah auditors' integrity are further promoted by the stakeholders in Islamic financial institutions, for the Shariah auditors to be independence enough to give opinions on the situations of IFIs in the term of Shariah

compliance in all its portions. The literature on internal audit independence pinpoints three factors that significantly contribute to the degree of auditor independence (1) Clear definition of the auditor's responsibility (2) The position of the internal auditor within the institution's organizational structure, and (3) The reporting structure [33]. As stated by [14], in real practice, a heavy dependence on internal Shariah auditors or the management of the Shariah unit is placed to carry out Shariah audit in Islamic financial institutions (IFIs). No clear separation of duties been determined, this will lead to self-review may occur. Thus, even though the respondents are clear of what is actually desired of independence, but in actual facts they cannot avoid to be relaxed on the principle of independence due to unavoidable circumstances. This lead to full potential of an audit cannot be realized if they are not wholly and truly independent, as the social purpose (benefit to the Ummah) will be frustrated. According to [26] Shariah auditor is independent whether he/she individual practitioners or members of public accounting firm who render professional auditing services to clients. By virtue of his/her education, training and experience, independent auditor is qualified to perform the audit work [27]. To be independent, auditor should be without bias in respect of client under audit and should appear impartial to those relying on the results of the audit. Currently, there is no specific training program or professional qualification for the internal Shariah auditor to effectively function and express his independent opinion.

2.5 Internal Shariah Audit Qualifications

According to the [1], "The auditor shall be knowledgeable about Islamic Shariah rules and principles. However, he/she would not possess the same level of knowledge as that of Shariah Supervisory Board members and thus the auditor shall not be expected to provide interpretation of these (Islamic) rules and principles. The Fatwas, rulings and guidance issued by the SSB form the basis on which the auditor considers whether the IFI has complied with the Islamic Shariah rules and principles [15–18]. The auditor shall also use this as a basis for concluding whether the financial statements of the IFI have been prepared in accordance with the Islamic Shariah rules and principles". Till now, the lack of both Shariah and accounting knowledge has decayed the crucial needs of the internal Shariah auditor. Those with accounting knowledge tend not to have Shariah knowledge and vice versa [19, 20].

Flint [8] stated that audit competence requires both knowledge and skill, which is the product of education, training and experiences. Carrying out responsibilities with competence and due care is consistent with the Hadith: "God loves those, when they do ask, they do it perfectly". Competences cover a wide aspect. However, it could be interpreted that technical competence alone would be insufficient to play the expected role and to achieve the anticipated results within the framework of Shariah Islamiah as being established criteria [14]. Investments for education in Shariah, accounting and auditing is crucial to enhance the knowledge and expertise of the actors involve with Shariah audit especially and IFIs in general [26]. Prior studies

focused on the need for personnel to be appropriately qualified to achieve a high level of internal audit effectiveness [4] examined the significance of internal auditing in the Malaysian public sector and found that a lack of qualified staff in terms of training, experience, and knowledge about internal auditing negatively affected the role of the internal audit and suggested training as an important requirement for improving internal audit work [15].

Proposition

P1 Internal Shariah audit independence has significant impact on internal Shariah auditor performance in IFIs.

P2 Internal Shariah audit qualifications has significant impact on internal Shariah auditor performance.

3 Theoretical Framework

Based on the above discussion at literature review section, the following is the study theoretical framework.



3.1 Underpinning Theory

An Islamic agency theory defines a contract under which one or more persons (principal) engage another person (the agent) to perform some service on their behalf which involves delegating some decision-making authority to the agent [13]. The principal is the owner or managers of the organization who delegate and transfer responsibilities or capital to the agent. The agent is the managers/employees of an organization who manage the firm's business transactions for the owner/principal [13]. Proponents of the agency theory, define the agency relationship as a contractual relationship between the shareholder as the principal and the managers as the agent who are given some authorities to perform services on behalf of the principal. Agency problem is more intense in the case of Islamic banks as while investors in

conventional banks have a level of certainty in their returns, in Islamic banks the profit as well as possible incurred loss and consequently the risk is shared between the banks and its investors. A person can assign his business to an agent, for the latter to perform and act on his behalf. However, the agency contract is subject to regulations where the essential elements of the agency contract as the same as the general Islamic contract, except the nature and scope of the authority are subject to certain conditions. As a principal (*muwakeel*), he is obligated to give his authority to an appointed agent. As insane minor principal cannot be part of any agency contract. However, a minor person can appoint an agent for the performance that can benefit the minor but not so for transactions that entail for the minor [30].

This proposed research focuses on two variables: Shariah audit qualifications and internal Shariah auditor independence. The theoretical framework is based on the agency theory where the principal will incur the agency cost in order for them to observe the agent action. The relationship between principals and agents is that the principals will incur monitoring expenditures while the agents incur bonding cost to ensure that the work looking after the wealth of the principal is done [2]. Internal Shariah auditors as agents must perform audits processes at the professional level requiring education qualifications and audit scope or its performance, and standards practices to enable the internal Shariah auditor to express an opinion on financial audit reports and Shariah compliance matters and other competencies needed to perform their responsibilities perfectly. Having internal Shariah auditors with such requirements and the existence of training programs for internal Shariah auditors, would increase the confidence level of the board and audit committee in the internal Shariah auditor competence. Agency theory in this context provides the basis to explain the independence role and responsibility assigned to the internal Shariah audit functions [2].

4 Conclusion

This paper presents the conceptual relationship between Independence, qualifications of internal Shariah audit and its performance in IFIs. The paper is constraint to only considering the independence and qualifications as the independent variable; this paper is a conceptual literature review paper at Islamic banks. However, despite the limitation of the paper, the paper contributes to knowledge of Shariah auditing by extending the existing literature on the performance of internal audit through determining the independence of internal Shariah auditor at IFIs in relation to Shariah audit qualifications as recommend that more research should be carry out on internal Shariah audit in IFIs. Likewise, future research should look at possibility of introducing other moderating or mediating variables in order to strength or to influence the relationship between Shariah audit independence, qualifications and its performance.

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Real or Virtual: About the Future of Education



Ismail Noori Mseer and Kholod Aggad

Abstract In many aspects, virtual learning environments are replicas of their physical counterparts, and they use symbolic illustrations to help students comprehend the user interface. The architectural elements in physical institutions, such as an entrance, administration buildings, lecture rooms, libraries, supplementary services, and recreation facilities, are also present on digital campuses. Instead of lectures, students do interactive learning exercises that foster a sense of community. We can compensate for the lack of interactive web-based learning through cooperative learning. While computer literacy is assumed, students in digital learning environments must be literate in three distinct areas: academic, visual, and collaborative.

Keywords Education · Learning real · Virtual

1 Introduction

Since communications can now be shared more quickly and cheaply in a digital environment thanks to e-mail and bulletin boards, e-learning courses offer a unique advantage over traditional distant education [1]. However, they lack the intimate component of contact education. Most of the time, a teacher cannot read a student's body language or hear their expressions of happiness or dismay. You also can't smell a misbehaving student's stink bomb or feel the oppressive heat in a desert classroom. So, how can one develop an interest in online learning?

The solution appears to rest in developing collaborative learning tasks and metaphor-based learning communities. Students must understand the metaphors, engage with their peers, and take ownership of their own learning to function in

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online learning communities. Visual, cooperative, and academic literacy are the three types of literacy needed.

When he makes the distinction between “a virtual community’s cyber-place and the virtual community itself,”) illustrates the connection between an online community and the internet, while McInnerney and Roberts emphasize the significance of social context in determining the success or failure of learning. A virtual village is the cyber-location of a virtual community. This chapter compares virtual and physical campuses metaphorically by examining the design and operation of virtual learning environments and portals, which serve as communities of learners.

It is difficult to refer to the internet as a virtual environment now that digital technology and the internet are present in almost every home in the developed world and even in the wealthiest areas of the poorest developing nations. It has evolved into the primary means of actual communication for many people [2].

In various application areas, including medical training, mainstream and special needs education, and rehabilitation, virtual reality has been utilized to support multiple forms of learning. A summary of outstanding research in these areas is provided. The limitations of the available research knowledge are examined, and suggestions for additional research are given.

1.1 Virtual Reality Multimedia Learning

Virtual reality and virtual environments don’t have a single, clear, or widely accepted definition. This is partially a result of the several technologies involved being in a constant state of innovation and the phrases employed in various settings. Virtual is defined as “anything that can be done or observed via a computer and consequently without going anywhere or talking to someone” in the Cambridge online dictionary. According to the dictionary.cambridge.org, virtual reality is “a set of visuals and sounds produced by a computer, which seem to reflect a place or a situation that a person can experience or participate in.” The term “virtual reality” is used in this chapter to refer to a group of systems that include computer processing (PC-based or higher), a platform for building three-dimensional environments, and add-ons like visual displays and interactive tools to create and maintain virtual environments. The term “virtual environment” describes the produced three-dimensional surroundings [3].

Examines comparative media studies on how immersive technologies, such as virtual reality and two varieties of mixed reality, augmented reality and augmented virtuality, affect learning results. It also discusses several variables that may limit these impacts. In conclusion, recent meta-analyses show that low-immersion virtual reality ($d = 0.22 - 0.41$) and low-immersion augmented reality ($d = 0.46 - 0.68$) have minor- to medium-sized effects on learning outcomes when compared to other instructional mediums. On the other hand, high immersion augmented reality (median $d = 0.16$) and virtual reality (median $d = 0.10$) show less promise. Although there is little research on augmented virtuality, the few studies that exist indicate that it has a

favorable impact on learning (median $d = 0.45$). It is examined how these immersive technologies may affect cognitive frameworks theoretically and practically in terms of how technology will be used in classrooms in the future.

How feasible is it to use technology to deliver high-quality language learning and teaching? In order to give students useful interactive language learning tools, this study examines the benefits and drawbacks of employing CD-ROMs and Web-based materials. It will show that, at least in terms of pedagogy, the benefits outweigh the drawbacks and that, despite challenges and frustrations, technology is not to be rejected because recent advancements in technology, particularly on the WWW, have greatly increased the potential for even more genuine interaction in the classroom. There are examples from our Vietnamese course as well [4].

Everybody who reads or writes is impacted by the rapid and significant changes in learning, teaching, and research methodologies. Research findings are communicated via information networks, and electronic resources are increasingly chosen as information sources. The way librarians view their work, information users, and the entire communication process they are a part of has changed due to electronic media usage.

Digital publication significantly affects teaching and learning and necessitates reevaluating instructional approaches and information accessibility. Digital libraries and electronic resources have the potential to have a significant impact on education and offer the chance to change the way that people teach and learn [5]. The library at Tampere University has implemented activities that reflect environmental changes that impact libraries and offer value to teaching and learning.

1.2 Alterations to the Workplace

There are many changes in scientific information and publication structures, and anything that occurs in the publishing industry impacts libraries. Many significant resources are no longer available in traditional formats since electronic publishing has often exceeded its printed counterpart.

In addition to helping teachers and students use new publishing channels, libraries play a significant proactive role in their development and utilization. Only when they offer services and collections that adapt to the changing requirements of their users on the desktop and in the classroom do libraries, continue to be helpful.

University libraries' patron demographics are diversifying. Faculty and students' interests, backgrounds, and talents are becoming more diverse, and they exhibit an increasingly diverse set of information needs and expectations. The rise of online universities and new disciplines of study have further increased the demand for libraries.

1.3 Techniques for Teaching and Learning

The problem-based approach is becoming more popular, and new perspectives on learning and teaching are developing that focus more on cognition. With a focus on active learning, this approach anticipates that students will develop into self-directed learners who take greater ownership of their knowledge acquisition through examining information sources and networks. Electronic materials enable virtual, web-based teaching and learning and present novel approaches teaching [6].

According to many, one of the most significant difficulties facing the library profession since its establishment is arguably the recent scope and speed of worldwide e-learning innovations. The way we support the e-learning experience is continuously facing new problems thanks to technological advancements. Virtual learning environments (VLEs) are now viewed as a crucial instrument in the education industry by a rising number of traditional learning providers who, up until recently, were only concerned with face-to-face delivery. The VLEs are thought to give provision a new competitive edge.

Likewise, established distance learning institutions that once controlled the market must adapt to growing competition by seeking fresh approaches to providing e-learners with high-quality learning opportunities that inevitably boost retention and advancement. This plan is heavily influenced by national and international political and economic strategies.

The Devil project intended to identify and address significant concerns for e-learning stakeholders against this context while considering the conflicting perspectives of academics, librarians, and learning technologists.

The University of Edinburgh and the Open University collaborated on the DEViL (Dynamically Enhancing Virtual Learning Environments from within the Library) project, a UK Joint Information Systems Committee (JISC) funded project that is a part of the JISC's "Linking Digital Libraries with Virtual Learning Environments" Program (JISC, 2002).

1.4 Disintermediated Methods of Learning Support

The project's development of a prototype software solution to enable the exposure of a variety of hitherto non-interoperable digital archives to proprietary and non-proprietary virtual learning platforms was a crucial technical undertaking. The project's meta-evaluation strand examined the effects of disintermediating some of the standard learner support services libraries have offered while mediating digital collections at the object or asset level.

The evaluation methodology used various techniques, such as creating scenarios from use cases, conducting in-person and phone interviews, giving presentations and short workshops to library staff, and analyzing reflective reports from team members involved in carrying out different project components within their institutions [7].

Learning transcends the specific institutional setting society has set aside for that reason and is the generation of knowledge through the transformation of experience. Additionally, it's critical to distinguish between learning and academic knowledge, as knowledge can take many different forms and serve a variety of objectives. Using Kolb's theory of learning, change becomes a requirement for understanding if a certain kind of change is used in place of transformation. From the time they are born, people engage in educational environments. They move between environments, including the family, playground, school, service organizations, and churches, and with time, they add work environments and other leisure pursuits. Our primary research interests are in designing and analyzing such learning environments [11]. This particular focus includes both formal school settings and non-school settings (including museums, scientific centers, open areas, and the Internet) and the spots where these contexts converge. These interests encompass both offline and online, physical, and virtual labor. Analyzing each context is necessary to determine participant expectations and work requirements to understand the relationship between learning and community. As a result, we acknowledge the variety of virtual environments and the linkages between online and offline communities. The options for education, which are not merely "school-based" or primarily the exclusive domain of educational institutions, bind communities—virtual or otherwise—together [8].

Without physical fences, the No fence technology is a GPS-based virtual fencing system that confines sheep to specific areas. As they enter and exit the virtual enclosure, a sound signal and a little electric shock are given to sheep wearing No fence collars. A novel learning protocol and two tests of the No fence system's functionality are described. Nine ewes and their lambs were separated into three groups and placed in an experimental enclosure with one No fence border for Experiment 1. A physical fence was present outside the boundary for two days, it was taken down on Day 3, and the wall was moved to the opposite end of the enclosure on Day 4. Over the four days, the sheep were shocked 6–20 times, averaging 10.92.0 (mean) per ewe. After the physical gate was removed on Day 3, the number of shocks dropped from 4.380.63 to 1.50.71 on Day 4 (when the border was moved). On Days 1, 2, 3, and 4, the ewes, on average, spent 3, 6, 46, and 9% of their time outside the border. Thirty-two ewes, both with and without lambs, were separated into eight groups and housed in an experimental enclosure for Experiment 2. Three physical fences and one virtual border were used to enclose the area on Day 1; on Day 2, the number of virtual boundaries was increased to two. At least 50% of the ewes in a group needed no more than four shocks on Day 2 to proceed to Day 3, when there were meant to be three virtual borders on the enclosure. After Day 2, the experiment was over because none of the groups had met the learning standard.

On Day 1 and Day 2, the sheep received 4.10.32 and 4.70.28 shocks, respectively. In sum, 71% of the ewes on Day 1 and 77% on Day 2 received the maximum five shocks. The individual sheep spent between 0 and 69.5% of Day 1 and between 0 and 64% of Day 2 in the exclusion area.

In conclusion, it is too difficult to guarantee effective learning, so animal well-being cannot be guaranteed. The collars had technical issues that might have impacted

the outcomes. Since the No fence prototype failed to keep the sheep inside the designated boundaries, it cannot be used to substitute actual fencing for sheep [9].

2 Conclusion

The ways that research on Virtual Exchange (VE) has influenced language teaching methods as well as the areas where research has been under-, incorrectly-, or even excessively applied by VE practitioners in formal educational contexts. After providing a brief historical review of VE, the essay goes on to describe the characteristics that are generally recognized as being essential to this pedagogical approach before examining the extent to which research findings can be applied to VE implementation. The key goals for language development when VE is used, evaluation of language progress using VE, and intercultural competency are the main subjects discussed. The article offers insight into the core areas of VE research and how these discoveries are being applied in language classrooms, even if it is not meant to be a comprehensive review (primary, secondary and university) [10].

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The Impact of Earnings Management on the Value Relevance of Earnings: Empirical Evidence From Jordan



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Abstract The purpose of this study is to examine the impact of earnings management practices on the value relevance of earnings. To achieve this goal, a sample of 89 manufacturing firms listed on Amman Stock Exchange (ASE) over the period (2006–2018) is used to test the study's predictions. The study's findings confirm most prior value relevant studies, by providing evidence indicating that both earnings (EPS) and book value (BV) are value relevant. Although the regression coefficient on both EPS and BV, are considered positive and are statistically substantial at the conventional level, the regression coefficient on EPS is substantially higher than that of BV. This result implies that EPS is more value relevant than BV. Consistent with the study's predictions, discretionary accruals (DAC), which used as a measure of earnings management, is negatively related to share price suggesting that earnings management activities reduce the value relevancy of accounting information. Further, the interaction of earnings with DAC variable is negatively related to share price indicating that earning management decrease the reliability and consequently the value relevant of earnings. Findings on the direct and the indirect impact, the moderating effect (interaction of DAC with EPS), of DAC on the value relevant of EPS provides sufficient empirical evidence suggesting that DAC decreases the value relevance of the earnings.

Keywords Earnings management · Value relevant · EPS · Book value · Discretionary accruals

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1 Introduction

The purpose of this study is to investigate the relation between earnings management and the value relevance of earnings. Particularly this study aims to investigate whether earnings management activities have a negative impact on the value relevance of earnings of non-financial Jordanian companies listed in Amman Stock Exchange (ASE) over the period (2006–2018). Healy and Wahlen [1] defined earnings management as:

Earnings management occurs when managers use judgment in financial reporting and in structuring transactions to alter financial reports to either mislead some stakeholders about the underlying economic performance of the company or to influence contractual outcomes that depend on reported accounting numbers.

The value relevancy of accounting information is an essential issue to all parties concerned in prepare and use financial statements. Francis and Schipper [2] defined the value relevance as "the ability of accounting information to summarize information that affects stock values". Based on previous studies on value relevance, there are different factors affect the value relevance of accounting information such as earnings management, non-recurring items, and firm size. This study concentrated on earnings management as a factor that influence the value relevancy of accounting information.

Several studies have addressed this issue in both developed markets and developed economics (e.g., [3–6]) and provide contradicting results.

Further, most studies which addressed this issue are concentrated in developed economics. Thus, this study attempts to obtain empirical evidence on this issue from a small emerging market namely, Jordan. In specific, this study empirically examines whether earnings management activities affect the value relevance of earnings for Jordanian companies listed on ASE.

This paper will proceed as follows: the Sect. 2 summarizes the literature and motivated the hypothesis. The Sect. 3 presents the methodology and data. Lastly, the Sect. 4 concludes.

2 Literature Review and Hypothesis Development

Several empirical studies examined the impact of earnings management -especially opportunistic earning-on the value relevance of accounting earnings. For example, [7] examined the relationship between earnings management and value relevance of both earnings and book value. The study utilized a sample of firms listed on the Australian Stock Exchange (ASX), they used three alternative sources of earnings management: short term discretionary accruals, long term discretionary accruals, and total discretionary accruals. Earnings management measured by discretionary accruals. The results showed that total discretionary accruals has no impact on the value relevance of earnings or book value, also, the value relevance of earnings via

long term and short term discretionary accruals reduced and they have no impact on the value relevance of book value. In addition, long term discretionary accruals have a higher impact on the value relevance of earnings and book value than short term discretionary accruals.

Habib [4] examined the impact of earnings management on value relevance of accounting information based on firms in Japan listed in Tokyo stock Exchange. He used four different measures of earnings management (smoothing behavior and managerial discretion, an aggregate earnings management score is composed). Quality of accounting information is taken to be the explanatory power of earnings and book values and the explanatory power of earnings alone related to share price. The finding showed that earnings management negatively impact the quality of accounting information.

Musleh Al-Sartawi [8] investigated the relation between earnings management and the value relevance of the earnings and the book value on Indonesian firms listed on ISE for the period 2009–2011. The findings of this study indicated that earnings management practices reduce the value relevance of earnings and book value.

Fattahi et al. [9] investigated the association between earnings management and the value of the accounting information, they utilize Leuz model. The study carried out on firms listed on the Tehran Stock Exchange for the period 2003–2011. Results indicate that there is no significant relationship between earnings management and value relevance of the accounting information.

Dowlatabadi and Filsaraei [10] examined the relationship between earnings management and the Value Relevance of earnings, the study period from 2009 to 2015, the study sample carried out on firms listed in Tehran stock exchange. The findings indicate that there is no significant relationship between earnings management and the stock price as a measure of the value relevancy of earnings.

Ahmadi and Bouri [11] examined the relation between the accounting value relevance of earnings per share and book value and share price. The sample covered Tunisian banks and financial firms over the period 2010–2015. Share price of three month after year-end as a measure of value relevance. Study findings indicate that book value and earnings per share statistically significantly associated with share price. Also that BV and EPS particularly has greater explanatory power than any other value, also findings indicate that accounting information is value relevant in the Tunisian Stock Exchange.

Mostafa [6] examined the relation between earnings management and the value relevance of earnings on the companies listed on the Egyptian Stock Exchange. The study tested whether low operating performance companies attempt to upward their earnings to hide their low performance. Consistent with previous studies he confirmed that companies with low operating performance apply earnings management activities to increase their earnings. After that, he examined whether opportunistic earnings management that applied by low operating performance companies affect and reduces the value relevance of earnings. By utilizing a model of the relationship between stock returns and earnings. The findings indicate that companies that applied opportunistic earnings management reduced the value relevance of their

earnings and their earnings are less value relevant than high operating performance companies earnings.

Oraby [12] examined the relationship between earnings management strategies and accounting information relevance by using a sample of companies listed in Saudi stock exchange over the period (2012–2016). Results indicate that management in Saudi companies applied accrual earnings management strategies to manipulate earnings downward, but it has no impact on share prices. Also, they found that real earnings management strategies used to manipulate net earnings upward, and it significantly impact the value relevance of earnings. Investors in Saudi capital market understand these practices and adjust net income for their decisions.

Otluglu et al. [13] examined the relation between earnings and stock returns and investigated whether opportunistic earnings management activities have an impact on the value relevance of earnings by using a sample of manufacturing companies listed in Istanbul Stock Exchange of Turkey (BIST). They examined if low performance companies applied earnings management strategies to hide their low operating performance and increase their earnings upward. The study's results show that companies with low performance apply these practices to increase their earnings upward. Then they examined if these practices decrease or affect the value relevance of earnings. The results indicated that earnings were significantly and positively linked with stock returns for low as well as high performance companies. Also they found that there is no difference between low and high performance companies stock return, which is inconsistent and different from previous studies (e.g., [6]).

A more recent study by [14] which carried out on Mining firms listed on the Indonesia Stock Exchange, reports significant impact of earnings management on future stock returns. However, [15] report very low and insignificant association between real earnings management and stock return.

The review of prior studies reveals that the findings of prior Studies are inconsistent, some studies found that earnings management negatively affect the value relevance of earnings (e.g., [4]). While others (e.g., [10, 12]) found that no relation between earnings management and value relevance of earnings. While some studies found that earnings management positively affects the value relevance of earnings (e.g., [13]).

This study complements prior studies by providing empirical evidence on this issue from a small emerging market. To the best of our knowledge this issue has not been examined in Jordan before. Thus, we tested the following hypothesis:

H1: Earnings management activities impact the value relevance of earnings.

3 Methodology and Data

3.1 Population and Sample

The study sample includes all manufacturing companies listed on ASE over the study period between 2006 and 2018, for which all the information needed to measure the study variables is available. The sample consists of 89 manufacturing companies. Data needed to compute the studies variables is obtained directly from the sample companies’ financial reports and from ASE website.

3.2 Research Model

Following prior related studies which examined the relationship between earnings management and the value relevance of earnings (e.g., [12, 16], the study used the following model which based on the work of [17], to examine the impact of earnings management on the value relevance of earnings.

$$P_{it} = \alpha + \beta_1 EPS_{it} + \beta_2 BV_{it} + \beta_3 DACC_{it} + \beta_4 DACC_{it} \times EPS_{it} + \beta_5 DACC_{it} \times BV_{it} + E_{it} \tag{1}$$

where

- P_{it} is the closing share price for a firm i at the end of fourth month of the following year t .
- EPS_{it} is the per share earnings for a firm i in year t .
- BV_{it} is the equity book value per share for a firm i at end year t .
- $DACC_{it}$ The absolute discretionary accruals for firm i in the year t .
- $DACC_{it} \times EPS_{it}$ interaction variable of DACC and EPS.
- $DACC_{it} \times BV_{it}$ interaction variable of DACC and BV.
- E_{it} is error term for firm i in year t .

3.3 Measurement of Variables

Following prior related studies in the earnings management literatures (e.g., [3–5]), discretionary accruals is used as a measure of earnings management using the cross-sectional version of the modified Jones model (1991) proposed by [18]. To measure discretionary accruals, we follow the following steps:

First to compute total accruals, the study used the cash flow approach to measure total accruals by which total accrual is obtained by subtracting cash flow from operation (CFO) from net income (NI) as follow.

$$\text{TACC}_{it} = \text{NI}_{it} - \text{CFO}_{it} \quad (2)$$

The second step is to run the modified Jones model (1991) proposed by [18] to estimate the DACC:

$$\begin{aligned} \text{TACC}_{it}/A_{it-1} = & \alpha (1/A_{it-1}) + \beta_1 [(\Delta \text{REV}_{it} - \Delta \text{AR}_{it})/A_{it-1}] \\ & + \beta_2 (\text{PPE}_{it}/A_{it-1}) + E_{it} \end{aligned} \quad (3)$$

where

- TACC_{it} is total accruals for a firm i in year t .
- A_{it-1} is total assets for a firm i at the beginning of year t .
- ΔREV_{it} is the change in revenues for a firm i in year t .
- ΔAR_{it} is the change in receivables for a firm i in year t .
- PPE_{it} is the gross property, plant and equipment for a firm i end of year t .
- E_{it} is error term for firm i in year t .

The above regression model is run for each industry. Then the non-discretionary accruals (NDACC_{it}) is calculated using the following formula:

$$\begin{aligned} \text{NDACC}_{it}/\text{TA}_{it-1} = & \alpha^{(1/\text{TA}_{it-1})} + \beta_1^{(1/(\Delta \text{REV}_{it} - \Delta \text{RA}_{it})/\text{TA}_{it-1})} \\ & + \beta_2^{(\text{PPE}/\text{TA}_{it-1})} \end{aligned} \quad (4)$$

where estimated parameters (α^{\wedge} , β_1^{\wedge} & β_2^{\wedge}) from the above regression model (model 3).

Then we use the following formula (Eq. 1 presented earlier) to compute discretionary

$$\text{DACC}_{it} = \text{TACC}_{it} - \text{NDACC}_{it} \quad (5)$$

3.4 Dependent Variable: Share Price

Companies covered by this study are required by regulations to file and publish their financial reports with in the three-period following the fiscal year end. Following most prior value relevance studies, the closing share price at the end of fourth month of the following is used to ensure that prices substantially reflected the information embodied in the published financial report.

Table 1 Descriptive statistics for study variables

Variables	Min.	Max.	Mean	S. dev.
Price	0.12000	46.51	2.55	4.4136
EPS	-5.0000	3.74	0.0527	0.41874
BV	0.0000	12.18	1.56	1.5348
DACC × EPS	-0.4700	1.18	0.0077	0.0919
DACC × BV	0.0000	4.01	0.292	0.3902
DACC	0.0000	6.820	0.2689	0.3067

Price: is the closing share price for a firm i at the end of fourth month of the following year t . EPS: is the per share earnings for a firm i in year t . BV: is the equity book value per share for a firm i at end year t . DACC × EPS: interaction variable of DACC and EPS. DACC × BV: interaction variable of DACC and BV. DACC: discretionary accruals for firm i in the year t

4 Results and Discussions

4.1 Descriptive Statistics

Table 1 provides the descriptive statistics of the study variables. The value of the absolute discretionary accruals (DACC), which is used as a measure of earnings management, ranges from the minimum value of zero to the maximum value of (6.82) with reported mean value of (0.269) and standard deviation value of (0.307). The value of closing price ranges from the minimum value of (0.12) and the maximum value (46.51). The reported standard deviation value of closing price of approximately (3.85) is substantially exceeds the mean value and indicates high variation in this variable during the study period. The reported value for EPS ranges from the minimum value of (-5.0) to the maximum value of (3.74). The reported mean value for EPS of (0.0527) indicates relatively low performance of sample firms during the study period. The value for book value ranges from a minimum value of almost zero to the maximum value of (12.18). The reported mean value of book value is (1.516). The value of first interactions variable DACC*EPS ranges from the minimum value of (-0.47) to the maximum value of (1.18) with reported mean value of (0.0077). Finally, The value of the second interaction variable DACC*BV ranges from the minimum value of zero to the maximum value of (4.0) with reported mean value of approximately (0.19).

4.2 Correlation Analysis

The reported binary Pearson correlation results in Table 2 indicate that price is positively and significantly associated with EPS. The reported correlation coefficient (0.789) is statistically significant at the conventional level ($\alpha = 0.01$). This result

Table 2 The correlation results for the study's variables

Variables	PRICE	EPS	BV	DACC × EPS	DACC × BV	DACC
Price	1					
EPS	0.789 ^a	1				
BV	0.739 ^a	0.664 ^a	1			
DACC × EPS	0.699 ^a	0.786 ^a	0.623 ^a	1		
DACC × BV	0.582 ^a	0.516 ^a	0.723 ^a	0.640 ^a	1	
DACC	-0.054	-0.053	-0.145 ^a	-0.047	0.194 ^a	1

Price: is the closing share price for a firm *i* at the end of fourth month of the following year *t*. EPS: is the per share earnings for a firm *i* in year *t*. BV: is the equity book value per share for a firm *i* at end year *t*. DACCit × EPS: interaction variable of DACC and EPS. DACCit × BV: interaction variable of DACC and BV. DACC: discretionary accruals for firm *i* in the year *t*

^aCorrelation is significant at the 0.01 level (2-tailed). ^bCorrelation is significant at the 0.05 level (2-tailed)

is consistent with most prior study's findings (e.g., [12], Mustafa 2016), Mustafa's study which carried out on Egyptian firms provide finding which indicate that both EPS and BV are positively correlated with share price. Consistent with most prior studies and this study's prediction the reported correlation value of (0.739) between Price and BV, is positive and statically significant at conventional level ($\alpha = 0.01$). This result support the value relevancy of BV.

4.2.1 Multiple Regression Results

Table 3 presents the regression results of the general test model (1). The reported F-value of (375.2) indicates that the regression model is statistically significant at the conventional level ($\alpha = 0.01$). The reported Adjusted R2 of 0.27 indicates that approximately 70% of the variations in the dependent variable (price) is explained by the model predictors. This result is consistent with most prior study's findings (Mustafa 2016) [12].

The reported regression coefficient on EPS of (0.594) is positive and statistically significant at the conventional level ($\alpha = 0.05$). Also, the regression coefficient (0.173) on BV is positive and statistically significant at the conventional level ($\alpha = 0.01$). These results are consistent with study's predictions and confirms the findings of most value-relevant studies (e.g., [2, 16, 19]) which show that both EPS and BV are highly value relevant for stock price.

A notable observation from the results reported in Table 3 is that the regression coefficient on EPS (0.594) is substantially larger than the regression coefficient on BV (0.174), which indicate that EPS ability in explaining price variation is higher than BV and suggest that EPS is more value relevant than BV. This particular result confirms prior study's findings (e.g., [7, 12, 16, 19]) which report regression coefficient for EPS higher than that of BV.

Table 3 The regression results

Variables	Reg. Co	T-value	Sig	VIF
(Constant)	1.094	3.971	0.000	–
EPS	0.594	12.434	0.000	6.037
BV	0.174	3.339	0.001	7.207
DACC × EPS	−0.113	−2.060	0.040	7.886
DACC × BV	0.283	4.340	0.000	11.264
DACC	−0.148	−3.752	0.000	4.099

Dep. Var: price Adj. R^2 : 0.217 F-value: 20.01 $P < 0.001$

Price: is the closing share price for a firm i at the end of fourth month of the following year t . EPS: is the per share earnings for a firm i in year t . BV: is the equity book value per share for a firm i at end year t . DACC × EPS: interaction variable of DACC and EPS. DACC × BV: interaction variable of DACC and BV. DACC: discretionary accruals for firm i in the year t

Together these results provide support for the study's hypothesis which suggests that Earnings management activities have an impact on the value relevance of earnings, and in line with prior related studies finding (e.g., [10, 12]).

5 Conclusions

The study aimed to investigate the impact of earnings management on the value relevance of earnings for Jordanian companies by using a sample of 89 manufacturing companies listed in Amman Stock Exchange (ASE) over the period (2006–2018). Empirical findings indicate that earnings and book value are positively and significantly associated with share price, which is used as a measure of value relevance. Furthermore, and consistent with most prior related studies' findings (e.g., [12, 16]), the study report regression coefficient on EPS substantially higher than that of BV suggesting that earnings is more value relevant than book value.

The results show that discretionary accruals (DACC) is negatively related to share prices indicating a direct negative impact of DACC on the firm value. In addition, the findings provide evidence indicating the indirect impact of DACC on the earnings price relationship. The regression coefficient on the interaction variable (DACC and EPS) is negative and statistically significant suggesting that earnings management practices moderate the earnings -price relationship. This result implies that the value relevance of EPS reduced with existence of earnings management activities. Overall, the empirical findings provide support for the notion that earnings management practices undermined the reliability of accounting information and thus reduce its relevancy for share pieces.

The study's findings are likely to be useful for investors, creditors and other users concerned about the relevancy of accounting information on firm's value. This study examined the impact of accrual earnings management on the value relevant of

earnings. Further research could investigate the impact of real earnings management practices on the value relevancy of earnings.

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A Journey Towards Restfulness or Restlessness: An Inquiry into the Impact of Online Education in Working Women Parents



M. Shashi Kumar , A. Minu , Joshy Mathew , J. Chandrakhanthan , and R. Karthika 

Abstract The resilience and inquisitiveness of the world for new pastures is a wonder when it grappled with the pandemic Covid19. It transgressed all spheres of human life by agreeing with the theory of survival of the fittest. Whatever was ready to adapt to the unfamiliar order survived this pandemic phase. A revolutionary change took place in the field of education when the initial inhibition and unwillingness to adopt technology-enhanced learning faded away. Online platforms and the virtual world become places of academic deliberations and technology-integrated learning become the new normal and the end-word of this era. The world witnessed rapid growth in the development of software and programs enabling the virtual transaction of knowledge. Along with the advancements, studies have been conducted from multi-dimensional perspectives about the merit, drawback, impact, and validity of this new mode of education. The present study seeks to explore the impact of the online mode of education on parents specifically working women parents. The influence of online classes on the following binaries of mental and physical health, opportunities and challenges, and achievements and failures in the life of working mothers will be focused under the purview of this study. The targeted group of this study is 100 working women parents from Bangalore. The study adopts data collection through a questionnaire and collected data will be analyzed with the help of SPSS.

Keywords New normal · Education · Technology · Working women parents

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1 Introduction

United Nations' pursuit of sustainable development encompasses many indispensable objectives. The noble ideals of gender equality and the empowerment of women are one of the 17 Sustainable Development Goals of the UN. The selection and addressing of this as the 5th SDG Goal by the UN shows that the problem pertaining to gender and moreover the identity of women is not unique to a particular region but it has a universal appeal [7]. It exists everywhere and is very hard to overcome. A historical analysis of the status of women reflects an upheaval of the position of women. Cultural, political, religious, and social elements contributed to this disruption. The shift from agrarian-based life to industrialized life and culture has opened new avenues for women. But they are not completely free from the imprints of patriarchy [5]. Most of the roles of women constructed by the patriarchy still euphemistically dominate their life. Most of the unpaid work done by women is treated as their moral obligation and it is always taken for granted. During the pandemic period, the role of women become more challenging as they have to assume a dual model at the time such as working from home and working for home. Along with household works the most challenging responsibility that women faced during this pandemic time is the education of children.

Gender stereotyping is one of the reasons for casting women in the web of familial responsibilities. Assertiveness and performance are seen as indicators of greater agency in men, and warmth and care for others are viewed as signs of greater communality in women [1, 5]. Most women irrespective of country and culture dedicate most of their time to household activities than men do even if they are employed. In 2015, an average difference of 50 min/day in the time spent on housework was observed between the male and female members of couples living in the United States [2, 7]. The perpetuation of gender stereotypes serves to reinforce the artificially imposed divisions between women and men, thereby lending apparent legitimacy to the symbolic and societal consequences that accompany gender in terms of prescribed roles and systemic inequities.

A revolutionary change took place in the field of education when the initial inhibition and unwillingness to adopt technology-enhanced learning faded away during the pandemic period. Many studies have been conducted on the effectiveness of the virtual mode of learning and how it impacts the education, mental and physical well-being of children [9–12]. The present study seeks to explore the impact of online mode of education in parents specifically working women parents. The influence of online class on the following binaries of mental and physical health, opportunities and challenges, achievements and failures in the life of working mothers will be focused under the purview of this study. The targeted group of this study is 100 working women parents from Bangalore. The study adopts data collection through a questionnaire and collected data will be analyzed with the help of SPSS.

2 Literature Review

Feng and Savani [4], in the paper “Covid-19 created a gender gap in perceived work productivity and job satisfaction: implications for dual-career parents working from home” found out that work productivity and job satisfaction were lesser in women than men during the lockdown period. The study also recommends the need to provide additional support to women who are in working from home along with managing household responsibilities and familial obligations.

Chandra [3] in the article “Online education during COVID-19: perception of academic stress and emotional intelligence coping strategies among college students” analysed the academic stress experienced by students during current online education and the coping strategies derived by utilizing emotional intelligence by students themselves.

In the article “Challenges for Women Entrepreneurs in the Wake of COVID 19 Pandemic” Madhavilatha Sangem explored the current challenges to women entrepreneurs during COVID 19 and the different methods adopted by women entrepreneurs to combat the grappling pandemic period [10].

“The impact of the COVID-19 pandemic on maternal and perinatal health: a scoping review” found out that mothers with children are more likely to suffer job and income losses during the pandemic than men and women without children. Single mothers in particular are likely to suffer from food insecurity. These socioeconomic consequences for women are similar across many high- and low-income countries. It also stated that pregnancy may constitute a particularly vulnerable period for COVID-19 and an increased risk of distress and psychiatric problems during pregnancy and postnatally during the pandemic is more likely than other times [6].

Sharma and Vaish [9] in her article “Impact of COVID—19 on mental health and physical load on women professionals: an online cross-sectional survey” traced out that musculoskeletal problems are increased among women professionals as a result of COVID-19. It also detected that the mental and physical stress on women professionals increased considerably.

The article “Impact of Covid-19 pandemic on working culture: an exploratory research among information technology (IT) professionals in Bengaluru, Karnataka (India)” found out the following results as employees spend more time working from home, employees start to feel alienated and disengaged due to prolonged work from home, job insecurity, the need to protect and maintain the organizational culture, communication gap among team members, and psychological stress, etc. The study recommended keeping safeguard measures to protect and maintain a work and organizational culture [8].

The study “Addressing work-life balance challenges of working women during COVID-19 in Bangladesh” explored the life of Bangladeshi working women. It found out that socio-cultural elements, enforced family norms, and gender stereotypes are the root cause of the various challenges that working women faces and it disturbs the work-family balance [9].

3 Objectives

1. To find out the impact of online mode of education of children on working women parents.
2. To trace out the effect on the physical and mental health of working women parents due to online mode of education of children.
3. To detect the nature of opportunities and challenges of working women parents due to online mode of education of children.
4. To measure the rate of achievements and failures of working women parents due to online mode of education of children.

4 Hypothesis of Study

H0: There is no significant relationship between working women's restlessness and the online mode of education of children

Ha: There is a significant relationship between working women's restlessness and the online mode of education of children

5 Methodology

The study follows an empirical method wherein both the primary and the secondary data were collected and analyzed. Secondary data collection was taken place by referring various repositories including websites, books, and scholarly journals, and A meticulously designed structured questionnaire was employed to collect primary data, focusing specifically on the experiences and perspectives of 100 working women. The sampling approach employed for data collection followed a convenience-based methodology. The data were analyzed and interpreted with the help of SPSS software. Statistical tools are Regression, Paired T-Test, and Anova.

6 Analysis and Interpretation

For the analysis impact of the online mode of education of children on working women parents used Regression analysis (Table 1).

From the above-shown table R Square Value = 0.717 which means 71.7% positive impact of online mode of education of children on working women's restlessness. The F value of the model = 4.115 and significant value = 0.001 which is less than 0.05

Table 1 Regression variable and its impact on online education

Dependent variable	Impact of online mode education of children
Predictors (Independent Variable)	Mental health, extending working hours of academic deliberations, technology-enhanced learning, Physical health
R Square value	0.717
F value of the model	4.115
Significance	0.001

hence research has got enough evidence to prove the statement. It means there is an impact of the online mode of education of children on working women's restlessness.

To trace out the effect on the mental and physical health of working women parents before and after the implementation of online mode of education of children (Table 2).

The above table explains the paired difference between the mental and physical health of working women parents before and after the implementation of online mode of education of children in which it can be seen that there is a difference and paired t-test values are 6.513,23.127 and degree of freedom is 99, significance level (5%) is p and p values of these variables 0.000,0.000, from which researcher comes to a conclusion i.e., there is a paired difference in the mental and physical health of working women parents before and after the implementation of the online mode of education of children.

An analysis is made to find out the relationship between the online mode of education of children and working women's restlessness by testing the hypotheses using a one-way Anova test.

H₀: There is no significant relationship between working women's restlessness and the online mode of education of children.

H_a: There is a significant relationship between working women's restlessness and the online mode of education of children (Table 3).

Table 2 Paired difference

		Mean	Std. deviation	T	df	Sig. (2-tailed)	Hypothesis
Pair1	Mental health	0.93333	0.78492	6.513	99	0.000	Accept H _a
Pair2	Physical health	3.03333	0.71840	23.127	99	0.000	Accept H _a

Table 3 One-way Anova

	Sum of squares	df	F	Sig.
Between groups	2.073	3	0.687	0.048
Within groups	66.517	96		
Total	68.590	99		

Level of Significance = 5% (0.05)

One way ANOVA test was conducted to find out if there is any significant relationship between working women's restlessness and the online mode of education of children.

The test result shows that.

F = 0.687, P value = 0.048.

Since P value is <0.05 , the result is significant.

Therefore, H_a : is accepted.

There is a significant relationship between working women's restlessness and the online mode of education of children.

7 Findings

The age group of the majority of the women who took part in the study is from 30 to 45.

The majority of the women are working in the private sector.

The income range of the majority of the women in this study ranges from Rs. 25,000–40,000.

The educational qualification of the majority of the women in this study is between graduation and post-graduation.

8 Conclusion

The impact of the online mode of education of children on working women parents is greater than on working men parents. It accelerates health issues and leads to an increase in BP, sugar levels, anxiety issues, sleeplessness, and fatigue. The high-stress level is beyond their control and it results in an imbalance of their life. It increases the challenges of working women parents compared to working men parents [7]. There is a considerable amount of loss in opportunities due to the acceleration of physical and mental stress as an impact of the online mode of education of children. The achievements of working women parents before the implementation of the online mode of education of children are greater than the achievements of working women parents after the implementation of the online mode of education of children. The failure rate in the both professional and personal arena of working women is higher compared to the time of offline mode of education of children.

9 Recommendations

Programmes should be organized for both men and women to create awareness about this disparity in unpaid and household work and make them alert the need to have women-friendly policies in household work.

Enhance flexible working space for women, specifically working mothers.

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Investigating the Impact of COVID-19 on Organizational Performance the Case of Sappi Saiccor in Kwazulu-Natal



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Abstract This research presents the findings of a qualitative study that aimed to examine the effects of the COVID-19 pandemic on the performance of Sappi Saiccori, a company located in Umkomaas, KwaZulu-Natal. The study focused on key management personnel and their perspectives on the impact of the pandemic on the organisation's performance. The study utilised purposive sampling, which is a non-probability sampling technique. The study employed an interview schedule as a data collection tool to elicit responses from participants at Sappi Saiccori in Umkomaas regarding their perceptions of the impact of the pandemic on organisational performance. The findings of the comprehensive thematic analysis conducted identified four key themes that significantly affect organisational performance. These themes include decreased employee productivity, emotional and psychological distress, modifications in work arrangements, inadequate social support and employee well-being. Suggestions were presented to the managerial authorities to mitigate the disparities in organisational efficacy that emerged due to the COVID-19 outbreak.

Keywords Covid19 · Human resources · Organizational performance · Productivity · Emotional distress

1 Introduction

Organisational performance is an important area to investigate, as it affects the company's financial bottom line. If a company is not performing well, then it can lead to big financial losses and future closure. Many factors can affect organisational performance, but for this study, the researchers will concentrate on how COVID-19

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affects an organisation's performance [11–14]. The COVID-19 pandemic affected the South African business sector. Sappi Saiccor also felt the ramifications of the pandemic on its' organisation operations. The study aimed to shed more light on the impact COVID-19 had on Sappi Saiccor's organisational performance.

2 Overview of Sappi Saiccor in KwaZulu-Natal

The study was conducted at Sappi Saiccor, Umkomaas, in KwaZulu-Natal, South Africa with workforce of 1200. South African Pulp and Paper Industries (SAPPI) Limited was founded in 1935. It is 50 km south of the port of Durban in KwaZulu-Natal, South Africa. It is one of the production facilities for Dissolving Wood Pulp and production facilities. The mill can produce approximately 800,000 tons of elemental chlorine-free (ECF) dissolving wood pulp (DWP) annually, mainly for the export market. This company is the world's single largest manufacturing site for dissolving pulp, and it has played a vital role in establishing Sappi as the global market leader in dissolving pulp.

3 Research Statement

What effect has COVID-19 had on the performance of the human resources at the selected company?

4 Research Objectives

The purpose of this research was to examine how the COVID-19 pandemic affected organizational performance in the selected company.

5 Literature Review

5.1 Covid 19 and South Africa Business

The notable increase in occurrences of chronic pneumonia in Hubei province's Wuhan, China has attracted considerable worldwide interest. This is the location from which the virus originated. According to [10], the 2019 novel coronavirus (COVID-19) was initially discovered in December 2019. The identification of this virus was based on laboratory test results and the manifestation of symptoms. As per [16]'s

recent publication, the global impact of COVID-19 and the resulting destruction it has caused to various nations is evidently ubiquitous, as can be observed through media outlets. Like numerous other nations, South Africa expeditiously formulated policies to support corporate enterprises and SMEs, under the Disaster Management Act. The country implemented these policies and procedures to ensure the safety of all South Africans. The COVID-19 pandemic has necessitated a change in the operational procedures of various sectors including businesses, hospitals, schools, and other societal domains [8, 9].

To mitigate the spread of infection and reduce the infection rate, it is imperative to adhere to certain preventative measures such as wearing masks, regularly sanitising one's hands, practising social distancing, and limiting exposure to densely populated areas such as shopping malls and other public spaces by staying at home. The emergence of COVID-19 in South Africa in 2020 constituted a significant humanitarian crisis and pandemic of unprecedented magnitude. COVID-19 has caused widespread illness, mortality, and devastation, impacting all aspects of global society. The commercial industry and its diverse constituents suffered a severe blow, as the implementation of lockdown measures resulted in the temporary cessation of business operations for several weeks or even months. The COVID-19 pandemic has had a negative effect on the business sector in South Africa. The business operations of Sappi Saiccor, located in Umkomaas, KwaZulu-Natal, were significantly affected by the pandemic, thereby adversely impacting its overall organisational performance. This is attributed to the fact that Sappi Saiccor is a large-scale enterprise operating in South Africa.

5.2 Conceptualizations of Organizational Performance

Coetzee and Steyn [7] define “organisational performance” as the concrete results or accomplishments of an organisation, which are assessed in relation to its pre-established outputs, objectives, and goals. Al-Sartawi et al. [1] posits that organisational behaviour can be impacted by various factors such as socially responsible conduct, cross-cultural activities associated with expansion and adaptation, and other phenomena at the sectoral or organisational level [20].

5.3 Impact of Covid-19 on Organizational Performance

The global effects of COVID-19 on employees and organisations have been significantly detrimental. The COVID-19 pandemic has engendered a tension between prioritising profitability and safeguarding the well-being of employees within organisations. According to [13], the imposition of lockdown measures on industries, organisations, and businesses was intended to mitigate the transmission of the virus. However, this action has resulted in significant difficulties for employees and

employers worldwide. The COVID-19 pandemic has disrupted conventional work routines, leading to an expedited shift towards online or virtual work environments for employees operating within an organisation. The COVID-19 pandemic expedited the adoption of Work from Home for many individuals. It has had significant influx on both employees and organisations worldwide. The COVID-19 pandemic has created a dilemma between prioritising profitability and ensuring safety. The COVID-19 pandemic has resulted in noticeable effects, particularly in the disruption of financial streams caused by the closure of businesses due to lockdown measures. Implementing restrictions and closures in businesses has threatened their productivity and sustainability by significantly reducing their revenues and disrupting their supply chains [20].

6 Research Methodology

The research utilised a qualitative methodology and executed an exploratory investigation. In this section, we will discuss the exploratory study. Exploratory research is a frequently employed research design by qualitative researchers and is considered one of the primary types of research. Sekaran and Bougie [17] posit that exploratory research is a research design that facilitates the generation of additional insights into a specific phenomenon and, subsequently, the development of focused research questions that can be investigated through extensive studies. According to [3], using an experimental research design enables the researcher to assess the viability of conducting a comprehensive investigation and formulate specific research inquiries for further exploration. Sekaran and Bougie [17] posit that a deductive and qualitative approach characterises exploratory research. Babbie [2] posits that exploration is warranted when there is limited knowledge about the research topic, variables, or situation being investigated. Given that COVID-19 was a novel occurrence for organisations, a qualitative study was deemed appropriate to elicit comprehensive perspectives on this unprecedented phenomenon and its impact on organisational performance. The methodology facilitated the researcher in obtaining the participants' perspectives about the subject of inquiry via in-person interviews. The utilisation of Microsoft Teams facilitated the acquisition of comprehensive data from participants via in-person interviews conducted by the researcher.

The research was conducted at Sappi Saiccor in Umkomaas, KwaZulu-Natal, South Africa. SAPPi Limited, a company based in South Africa, was established in 1935. A production facility for Dissolving Wood Pulp is positioned approximately 50 kms to the south of the port of Durban. As per [5] scholarly work, purposive sampling is a sampling methodology in which the researcher deliberately selects the individuals to be included in the sample. To find and choose appropriate managers and HR managers, deliberate sampling was used who possess the requisite experience and knowledge of organisational performance to participate in the interviews. As mentioned earlier, the study employed purposive sampling to collect targeted data from the participants via interview sessions.

Consequently, human resources personnel, HR managers, and seasoned employees facilitated the researcher in acquiring comprehensive data about the subject matter being examined. The study interviewed a sample of ten managerial employees at Sappi Saiccor, consisting of one HR manager, two production managers, two operations managers, three heads of departments, and two supervisors. The researchers exercised their discretion to determine that these pivotal participants were most capable of furnishing comprehensive insights and perspectives on the subject matter about the key personnel at Sappi Saiccor. Consequently, an interview protocol was formulated.

6.1 *Thematic Analysis*

The phase of thematic analysis is initiated after the coding and collation of data, as per [6] methodology. During this stage of the thematic analysis, the codes were organised into potential themes and the corresponding coded data extracts were gathered within the identified themes. At this juncture, themes were derived from the dataset and the theoretical framework that served as the foundation of the research. During the process of identifying themes, a set of predetermined codes was initially established to facilitate the analysis of the data. Identifying pertinent themes was undertaken to facilitate comprehension of the phenomenon being examined. Mind maps were a graphical tool to categorise diverse codes into distinct themes. Specific codes were designated primary themes, while others were classified as secondary. Furthermore, a collection of codes that lacked a specific category was generated and designated as “miscellaneous themes”. The current stage of the research process entails a comprehensive examination of the previously identified themes within the dataset, as outlined by [6]. The coded data extracts for all the themes were evaluated to determine their cohesive patterns. Furthermore, an analysis was conducted on the individual themes to determine their accuracy in representing the meanings derived from the entire dataset. Furthermore, the investigation ensured that every recognised theme was substantiated with empirical evidence. Specific themes were merged, whereas others were categorised into distinct themes. Moreover, the information was condensed into a feasible collection of pertinent themes that concisely encapsulated the text [15].

A comprehensive examination was carried out to ascertain the narrative conveyed by each thematic element. In addition, designations were allocated to each theme to facilitate readers’ comprehension. The themes were meticulously selected to align with their respective narratives by the research inquiries, as per the dataset. The study sought the input of external experts with proficient knowledge in qualitative data analysis and research to ascertain the adequacy of the themes in terms of clarity and comprehensiveness. The dataset underwent peer debriefing to facilitate the audit trail and inform methodological choices.

The production of the paper is encompassed within this particular phase, as [6] noted. It presents a succinct, coherent, and engaging data description within

and across different themes. According to [19], it is recommended that researchers effectively communicate the analytical procedures utilised to obtain their results in a manner that is comprehensible to discerning readers. This approach is crucial in ensuring the data is trustworthy and convincing. During this phase, records of trustworthiness and audit trail were maintained, facilitating the reporting process.. Furthermore, incorporating additional quotations bolsters the identified themes derived from the dataset, thereby affording readers a deeper understanding of the primary text.

7 Discussion of Qualitative Data

Through thematic analysis, it was determined that four themes had the most significant influence on the study. These themes included decreased employee productivity, emotional and psychological distress, alterations to work arrangements, and a lack of social support and employee well-being. The study's key themes will now be utilised to examine and analyse them.

A. Decreased Employee Productivity

As per the study, the COVID-19 pandemic had an adverse impact on the work productivity of the employees at Sappi Saiccor located in Umkomaas. As per the statements provided by the interviewees, the pandemic has resulted a decrease in employee work output, thereby causing suboptimal performance levels at Sappi Saiccor located in Umkomaas. The following quotes served as evidence to support this finding. The COVID-19 pandemic has had a detrimental effect on our operations. We have observed a significant decline in attendance due to concerns surrounding the virus, which has subsequently impacted employee productivity. Additionally, we have noticed that some employees are struggling to maintain their focus and well-being due to personal circumstances such as the loss or illness of family members. Participant 2, a male, expressed concern regarding the potential fear experienced by employees who are uncertain about their future.

The global impact of the event necessitated widespread measures, resulting in the closure of entire nations and various institutions. The COVID-19 pandemic has great impact on organisations, resulting in a hindrance to employees' ability to perform their duties and responsibilities efficiently. Due to unforeseen circumstances, employees were unable to physically attend work and were required to work remotely from their homes. Certain employees were unable to fulfil their responsibilities due to an unsuitable work environment, and a few were even furnished with the necessary resources to work remotely. The employees were unable to perform their duties due to an unsuitable work environment.

The COVID-19 pandemic has led to employee fatigue because of reduced personnel available to carry out various duties. The implementation of COVID-19 restrictions and remote work arrangements has resulted in a notable decline in the

psychological well-being of a considerable portion of the workforce. Participant 4 is a male individual.

From a critical standpoint, it is important to acknowledge that while employees are present for work, their personal lives and backgrounds cannot be disregarded. Numerous employees have experienced a loss of direct connections with their acquaintances or have been indirectly affected from a social standpoint. This has resulted in a negative impact on their workplace performance, particularly with regards to complying with additional rules and regulations such as wearing masks and sanitising. The male personnel at the facility are observed to be constantly in motion throughout the day, and have expressed difficulty in breathing while wearing their protective masks. Additionally, when safety glasses are worn, they tend to fog up, thereby impeding the visual acuity of the employees. The reduced pace of work was further compounded by intermittent plant closures and the close proximity of contractors and personnel. Participant 7, a male, has reported that adherence to COVID-19 regulations has resulted in a slowdown of work. This is due to the need to maintain a minimum distance of 2 m between individuals, which has impacted the speed of work completion.

The organisation experienced a significant level of absenteeism due to employee concerns regarding the virus, which had a notable impact on their job performance. As a result, there was a shortage of available personnel to fulfil necessary duties. According to Participant 8, a male employee, many individuals encountered difficulties while working remotely and were unable to meet their deadlines. Based on the perspectives shared by the study's participants, it can be inferred that COVID-19 had a negative impact on employees' productivity, resulting in suboptimal organisational outcomes.

B. Emotional and psychological distress

Employees are experiencing a negative state of mind, which is impacting their work performance and personal lives. This emotional burden is carried into the workplace, resulting in decreased productivity and overall well-being. Several employees have reported experiencing significant personal loss, with some indicating that they have lost multiple family members within a short period of time. The situation has been difficult for all involved. Participant 2 male. According to Participant 4, a male employee, a significant number of employees were experiencing negative mental states because of COVID-19 restrictions and remote work.

Numerous individuals experienced apprehension and anxiety regarding the possibility of contracting the virus. This was a common and understandable concern. Therefore, we made efforts to provide them with ample protection in the form of masks, sanitizers, and personal protective equipment, as well as information and knowledge sharing. "We made every effort to keep them informed regularly in order to alleviate their concerns," stated Participant 6, male. Additionally, there was a risk of infection both inside and outside of the workplace. Balancing work and home life has also been challenging during this time. These issues were expressed by Participant 7, male.

Individuals experienced a pervasive sense of fear in relation to COVID-19, and the stress induced by the virus resulted in the loss of family members within the workforce. A considerable percentage of the workforce demonstrated inadequate psychological states that impeded their capacity to perform their job responsibilities. The male identified as Participant 8 conveyed a negative sentiment, expressing that the situation had been unfavorable.

C. Alterations to work arrangements

The present study revealed that the COVID-19 pandemic necessitated modifications in the work arrangements of the organisation in question. The findings of the interviews indicate that a significant proportion of the participants held the perspective that the COVID-19 pandemic necessitated modifications to the work arrangements within the organisation. According to the participants, COVID-19 has changed how work is conducted, such as reducing the number of on-site employees, enabling remote work, and implementing staggered shifts to ensure physical distancing among on-site personnel. I will examine the actions that have been taken within this organisation.

“We have adopted measures to ensure the safety of our employees, including the administration of a survey at the outset to promote awareness of COVID-19, its ramifications, and its potential impact on individuals. We provided COVID-19 education to our employees and maintained consistent communication regarding the virus. We aggregated accounts of individuals who have already been impacted by the virus, intending to disseminate information regarding how they contracted it. The corporation heightened cognisance regarding the COVID-19 pandemic and advocated for remote work. We increased our transportation capacity by a factor of two to reduce the number of individuals per taxi for the employees who were mandated to commute. As a chemical organisation, we produced our hand sanitiser and distributed it throughout all the buildings on our premises and across the nation”. It was reported by Participant 1, Male.

One potential approach for organisations is to closely monitor government communications and implement the Disaster Management Act in order to reduce unnecessary expenditures. If the organisation occupies a larger space, it may be advisable to negotiate and relocate to a smaller space, given that a significant number of employees may be working remotely while only a few come into the office. As stated by Participant 3, a male contributor, it is imperative to minimise shifts in organisations that operate on a shift basis in order to adhere to social distancing guidelines.

The implemented strategies aimed to provide training to our employees on how to maintain their safety amidst the pandemic. A limited number of critical staff members reported to the physical workplace while the remaining workforce operated remotely. We disseminated information regarding the pandemic and its prevention measures to increase public awareness. "We implemented screening measures for all individuals entering the company's premises, and employees displaying symptoms were advised to remain at home," reported Participant 4, who is male.

The company's approach is to align with the government's directives, avoiding non-compliance. Our actions have entailed adhering to governmental regulations

and implementing additional measures. Participant 5, a male, suggests that if the government mandates a 50% on-site employee limit, a more stringent and regulated approach should be implemented to allow only 25% of employees on-site. This approach aims to ensure that individuals are well-informed about the pandemic and equipped with knowledge on how to maintain their safety.

An attempt was made to segregate individuals by implementing two distinct shifts, namely the 6–2 shift and the 2–10 shift, to maximise physical distancing. Another approach involved relocating individuals from their workstations to enable physical distancing. A partition was implemented to ensure compliance with masks, sanitisers, and other essential personal protective equipment. The study revealed that most infections occurred outside the premises instead of within, with a notable increase during the second wave of the COVID-19 pandemic. It was reported by Participant 6, Male.

Due to the inability to operate at total capacity, additional transport services were procured to facilitate commuting for individuals to their workplaces and residences. The quantity of transport services was doubled to enable the observance of social distancing protocols among employees. Furthermore, we have expanded the duration between work shifts. The employee I work with has been absent for three weeks, indicating a shift-based separation. Additionally, the organisation has heightened consciousness and disseminated all pertinent details regarding COVID-19 and measures to ensure safety. Participant 8, a male, stated that their chemical company has also produced sanitisers. Based on the testimonies provided by the participants in the study, it can be inferred that COVID-19 impacted the reconfiguration of work arrangements within the organization.

D. Lack of support and employee well-being

According to the study, COVID-19 has resulted in a lack of social support and wellness for employees within the organisation. Four participants, constituting 50% of the sample, expressed the perspective that the COVID-19 pandemic had a detrimental impact on the social support and wellness of employees at Sappi Saiccor in Umkomaas. The subsequent voices of the participants that were presented provided corroborating evidence for this discovery. According to a male participant (Participant 2), employees are experiencing a negative state of mind not only in the workplace but also in their personal lives. As illustrated by tales of workers who have experienced the sudden loss of many family members, this has led to employees carrying their emotional burdens to work. Distressing is how the scenario is characterised. “Stress levels were greater; they feared getting the COVID-19 while also being under pressure to produce and adhere to deadlines. Their performance suffered because of the stress levels. Because workers are having personal issues and sought assistance with such issues, the number of EAPs has climbed over the months since March. Most workers are not used to collaborating closely with their spouses or working from home (Participant 3, Male).

COVID-19 led to weariness since there were fewer personnel required to do a variety of activities. Due to COVID-19 constraints and working from home, the majority of workers were not in a good mood, according to Participant 4 (Male).

“We were all terrified about COVID-19, and the deaths of family members brought stress to the workplace. The majority of workers were not in an appropriate mental condition to carry out their duties. It’s been awful,” said participant 6 (a man). Employee wellbeing and social assistance were taken away by COVID-19. The results of the qualitative analysis point to a decline in staff productivity as a result of the COVID-19 epidemic. Employers and workers worldwide faced considerable challenges as a result of the global installation of lockdown measures by businesses intended to stop the virus’s spread. According to [20], the COVID-19 epidemic made it impossible for many firms to maintain social distancing policies and make the switch to remote work. Individuals have struggled to fulfil deadlines as a consequence, which has a detrimental effect on organisational performance. The COVID-19 pandemic has provided a challenging position for human resource management, according to [18]’s conclusions. In particular, managers are in charge of helping staff members manage and adapt to the considerable changes that have taken place at work. Around the globe, the COVID-19 epidemic has had a profound impact on both workers and companies. The COVID-19 epidemic has created a conflict between putting economic growth first and protecting public safety and health [4–6].

The interruption of money sources brought on by the shutdown of enterprises as a result of government-imposed lockdown measures demonstrates the immediate impact of the COVID-19 epidemic. Businesses’ productivity and sustainability have been put at risk by limitations and closures, which have considerably decreased their revenues and disrupted their supply networks. According to [18] analysis, a major effect of COVID-19 is expected to be a loss in operational efficiency for many organisations. Sintema [18] asserts that the methods businesses use to stop the spread of COVID-19 and any subsequent actions taken to stop long-term effects might have an effect on the productivity of their staff. Despite governmental limitations forcing the majority of firms to stop operating, certain organisations took steps to maintain worker productivity and speed their recovery.

8 Recommendations

8.1 Providing a Safe Work Environment

Staff felt very scared during COVID-19, and this led to absenteeism. The company should ensure they have proper safety in place to protect their employees during COVID. The workplace should have social distancing protocols in place. Use of protective gear must be in place, and all entrances should have sanitisers so that staff can use them when necessary.

8.2 Training of Staff

Staff should have proper training if they are required to migrate to online platforms or, where possible, where they have to work from home. The training will assist them in being better equipped to work with new technologies and online portals. The training can also be beneficial to assist staff on how to manage their time when working from home.

8.3 Proper Wellness Support Should Be Provided to Staff During COVID-19

Proper support and wellness programs must be placed within the organisation to foster the good emotional well-being of employees. Staff wellness programs can provide online counselling sessions for those dealing with COVID or who have lost loved ones due to the pandemic. The organisation can bring a guest speaker, like a health professional or doctor, to speak online or Face to Face staff. They can provide guidelines on keeping staff safe and healthy during COVID-19.

8.4 Management Having Better Understanding and Empathy Towards Staff During the Pandemic

COVID-19 brought many emotions to the surface. It brought sickness and sometimes loss and sadness that added to the stress levels of staff. Proper training should be in place for senior supervisors and managers to be better trained to react to emotionally charged situations like a pandemic. A pandemic is unique, and stress and emotions brought on by not knowing whether the pandemic will kill staff had devastating consequences on the minds of staff. Treating staff with care, empathy and consideration was required as well.

9 Conclusions

COVID-19 was a new and unique phenomenon, and in this paper, the researchers critically outline a few key areas that COVID-19 impacted organisational performance. This new information in the African continent can benefit other organisations facing similar challenges. COVID-19 affected all areas of life, business included. Employers had to draw up new policies in keeping with the government and labour laws regarding COVID-19. Employees had to deal with significant adjustments that came with COVID-19. The various lockdowns forced many companies to migrate to

online platforms, Sappi Saiccor, Umkomaas, included. It created many challenges. The paper clearly outlines recommendations that could assist Sappi Saiccor, Umkomaas, going forward. More studies in Africa on the different industries should be conducted to ascertain and compare the impact of COVID-19 on organisation performance. Since there is a limited body of knowledge in this field of study, these studies are highly regarded in academia. Future studies can specifically focus on other areas of workplace performance, such as discipline and how it impacts employees during the COVID-19 pandemic. Studies on leave policies and wellness programs and how they impact employees during COVID-19 are also required to add more knowledge to organisational performance and the pandemic.

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Traditional Human Duties and the Challenges of Digitization



Ismail Noori Mseer and Nadra Tawfig

Abstract A new digital care ethic is required. To regain control over our time, as well as our digital footprints and shadows, we must adopt and practice the philosophy of slow computing. This involves taking a step back and releasing the digital leash. If we pursue individual and collective, pragmatic, and political initiatives, we stand to enjoy computers while reducing some of the more negative features of the coming digital society and economy. We broaden our central thesis by elaborating on the philosophical foundations of and for slow computing. The goal is to provide a justification and urgency for delayed computing, which would apply to the larger society and businesses. While we can embrace specific acts as they fit and practice slow computing without adhering to a slow philosophy or joining a slow computing movement, our practices are more meaningful and have a greater impact when they are based on a coherent set of concepts and principles that support and encourage them.

Keywords Digitization · Human duties · Cyber · Information technology

1 Introduction

An incredible illustration of how information technology (IT) can replace or enhance traditional human duties is digitalization in the legal sector. This phenomenon of digitalization is being fueled by the current advancements in artificial intelligence (AI) (big data, machine learning, natural language processing, etc.). There are many different operational examples of digitalization in the legal field, from investigating patent classifications to forecasting the results of judicial disputes (e.g., the anticipation of

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predictable damages from an action). 2 E-discovery³ and the digitization of legal document organization and review are further topics that can be brought up [1].

Understanding the main normative justifications for slow computing is an issue here. By “normative,” we imply a way of thinking that focuses on how things ought to be rather than how they are [2].

The distinction between “genuine” photos and those that have been digitally modified has become hazier as a result of the phenomenal expansion of digital imaging in recent years. The majority of our films and print commercials use incredible effects to produce pictures that appear real but are not.

Films have been the most popular recording medium for scientific images seen through Microscopes over the previous few decades. Because it was challenging to change once the exposure was made and the film or print produced, the film has been widely considered a legitimate, historical recording medium. The scientific community has been motivated to switch from photographic methods to digital images due to advancements in computing power, image resolution, and environmental concerns. Now, procedures that used to take hours or days may be completed quickly. All of the photography processes that once required a darkroom may now be completed using imaging software like Adobe Photoshop and a lot more. The image can be “burned” onto an unchangeable CD or DVD. Inkjet prints may now compete with photographic prints thanks to the rapid advancement of printer technology. Images are frequently distributed digitally, and viewers can see them on displays that get better. The quality of digital photos is approaching photographic quality for a fraction of the price as digital imaging gear advances, and publication-quality images are produced in a fraction of the time needed for film-based photography [3].

How can a state respond to becoming the focus of propaganda campaigns by another state without jeopardizing the moral position it is trying to uphold? This paper contends that the idea of moral authority provides a novel background for resolving this conundrum. Only when an actor’s behavior does not vary from particular moral norms can it use moral power as an authority resource to have its arguments prioritized by others and to garner support for its activities. A person fighting digital propaganda needs to cultivate six normative qualities to gain moral authority: truthfulness, discretion, and effectiveness to show the nature of the adverse effects of misinformation; responsibility, honesty, and usefulness to establish the actor’s normative position to participate in counter-intervention; and responsibility to demonstrate the proportionality of the reaction [4].

Digital and social media technologies have given rise to new possibilities and methods of seeing, thinking, being, and communicating. They have altered the way we see and interact with technology, as well as how we view ourselves and interact with others. Although these innovations present never-before-seen opportunities, they are also disruptive since they depart from the past and alter accepted norms, attitudes, and behaviors, posing severe and new hazards and ethical dilemmas. The quick pace of technology prevents the possibility of critical analysis and evaluation of its consequences and implications adds to these difficulties. As a result, it explores the idea of digital professionalism and some of the ethical issues related to online interaction and identities. To emphasize the requirement for digital professionalism, it opens

with a case study from the HCPC fitness to practice hearings and highlights some of its learning. The term “digital professionalism” is then defined, and some distinctions between online and offline environments are examined along with their effects on digital professionalism. This includes a discussion of the information-sharing domains and the Social Media Activity and Reflection Tool (SMART) mapping for visualizing and considering one’s online persona and social media participation as a part of one’s digital citizenship and professional online presence. A summary of the information, skills, and abilities needed for digital professionalism is then provided, along with a framework for building, maintaining, and assessing an online identity and presence.

1.1 Online Professionalism and Morals

This first case study highlights the importance of digital professionalism when using social media. It draws attention to a fitness to practice hearing and a decision made by the HCPC regarding a social worker’s use of Facebook in connection with a case. Using Facebook both personally and professionally, for instance. An experienced children and family social worker posted the following note on her Facebook page on the day of a court hearing for a case that had been transferred to her around three weeks earlier [5].

1.2 In the face of Racism

Interconnectedness, as in her 1989 essay “Demarginalizing the Intersection of Race and Sex: A Black Feminist Critique of Antidiscrimination Doctrine, Feminist Theory, and Antiracist Politics,” Kimberlé Crenshaw introduced a phrase and a framework. She begins the piece by stating that: Crenshaw argued that intersectional, multi-axis analysis must be the focal topic of research in order to comprehend how “black women are subordinated fully.” In order to recognize the impacts and scope of “compounded” harm on women of color in legal settings, she employs “intersectionality” as the primary lens through which to reexamine the accounts of women of color in court hearings [4]. In the writings and assertions of the Combahee River Collective in the 1970s and their vocalization of a black women’s liberation that discusses the connections of gender, race, and sexuality, a significant portion of her exploration of intersectionality has a recognizable black feminist pedigree.

We have contended that pedigrees of reproach—often emanating from perilous race and legal concept—have been omitted in talks of technological civilizations and buzzwords. Talking about intersectionality means putting black feminism critical racial work is front and center, especially as it developed in the 1970s and 1980s in terms of shaping African American feminist movements and legal debate. I am also aware of conversations by black, indigenous, and women of color (BIPOC)

activists in widely attended public settings that criticize the antiblack use of the term “intersectionality” to mean something that is somehow “universal” for all bodies [6].

1.3 Cyber psychology

As new inventions advance and increase in our daily lives, cyberpsychology is a growing area of psychology that is becoming increasingly important. Cyberpsychology is a field that combines elements of media psychology, emotional computing, digital psychology, and human-computer interaction [7].

While few have substantial capability working as ethicists, and most cyber psychologists are not philosophers, they frequently deal with ethical problems and puzzles. These vary from debating and weighing the complex challenges involved in research to raising daily knowledge of distributive impartiality as they deliberate the unequal distribution of technologies in civilization. These circumstances might be difficult and even confusing at times [8].

1.4 Language and Memory

An ecological and humanitarian disaster is affecting the entire linguistic community. Simon Gikandi writes in a moving meditation in PMLA that language dying worldwide is a subject of urgent social concern and that the loss of any language (and of a culture nourished by it) is a cause for sorrow. He reflects on the moral and political ramifications of prevalent language loss, recalling his distress when the “UNESCO Atlas of the World’s Languages in Danger presented me with the sad reality of language endangerment measured in maps, graphs, and data sets.” He concludes by citing and interpreting a poem by the anthropologist Miguel León-Portilla that “capture[s] what occurs when a language dies,” building to the stern conclusion: “Letting a language die is an injustice, a denial of the will to those who speak it.” This persuasive essay transitions from figurative language death talk to a moving elegy that reflects a solid affective and political commitment to the survival of languages [9].

The use of digital audio sampling by producers, engineers, and artists has grown over the past several years to the point where the sampler is now just as common in recording studios as the microphone. A sound snippet of one to several seconds can be compressed into a digital binary form and kept in computer memory using digital samplers. This recorded sound can be played back over a keyboard while having its pitch and tone characteristics faithfully replicated or, as is frequently the case, edited electronically. The sampler’s unmatched mimetic powers have made it a popular tool for storing notes or sets of notes played by musicians with distinctive playing styles in computer memory. One could create a complete solo line that, when played back through a keyboard, may appear to be played by that individual. With no discernible

loss in sound quality across several generations of extraction and repositioning, the sampler is also frequently used to remove a sound fragment from one environment and insert it into a different one. Understanding the sampler's popularity and its ability to upend the music industry's production process depends on its three capabilities: mimetic/reproductive, manipulative, and extractive [10].

1.5 Punishment and Supervision

Researchers now have unprecedented options to gain access to users' most private thoughts thanks to digital technologies. The ethics and ramifications of using information from daily individual encounters have recently gained widespread attention. One could argue that algorithmically generated decisions are preferred in some situations, such as governance, above the knowledge of individuals and communities. Our work is being done at the same time as the other projects mentioned, COVID-19. The crisis has brought to light the moral dilemmas that arise when vulnerable people who need information are monitored in a situation that is changing quickly. Data-intensive technology, such as methods of data collecting and surveillance, is currently governed by changes in global law. Recent experience shows that legislation continues once the preliminary risk has subsided and becomes the "new normal." Universities and other organizations are setting up systems for gathering and maintaining stakeholder data that will last long beyond the pandemic. The information collected will be used to create a hidden curriculum, subliminal messages sent to pupils about the values of an organization, and the nature of the control dynamics present in its relations. With a focus on using Chabot transcripts, we outline and discuss the ethical procedures involved in collecting such data.

2 Conclusion

We examine the prospective of Chabot's as a tool to enhance information learning and focus in particular on the effect of crisis scenarios on undergraduate students' "information anxiety." Individuals can use Chabot's to search for information ranging from practical to private, including information that might be delicate or private. People may have information anxiety as they seek reassurance to assist them in coping with new and changing conditions as they adjust to the new normal of education amid a crisis. These include an increase in digital learning, an increase in employment off campus, and an increase in social isolation during the COVID-19 epidemic. As organizations attempt to offer advice and help on a wide range of topics, information overload can play a crucial role in information anxiety. If it is easier to search for the information that a particular person prioritizes, this may lead to clarity. Tools that improve information literacy and facilitate efficient filtering are needed during times of crisis [11].

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Assessment of the Challenges and Benefits of Implementing International Public Sector Accounting Standards (IPSAS) in Jordan



Alaa Khrais, Mohammad Abu Nassar, and Hala Zaidan

Abstract This study aims to assess the challenges and benefits that Jordan faces in implementing International Public Sector Accounting Standards (IPSAS). To achieve the objectives of the study, a questionnaire distributed on 14 Jordanian government ministries and their affiliated departments, the Amman Municipality and the Jordanian Audit Bureau. The final sample consists of 131 respondents. Based on a single sample (T-Test) in addition to conducting personal interviews with the persons concerned, the participants believe that the most influential challenges respectively: organizational challenges, educational challenges, time challenges, resistance to change, accounting system challenges, financial challenges, and legal and legislative challenges, with the exception of technological challenges, where the sample members see that they have no statistically significant effect on the rate of implementation of IPSAS in Jordan in terms of their availability. Moreover, they expect the benefits of IPSAS to increase the level of accountability and transparency and improve the quality of financial reports. As well as enhancing the comparability and accuracy of the decision-making process.

Keywords Accrual basis and modified accrual basis · Cash basis · International Public Sector Accounting Standards · IPSAS · Jordan

1 Introduction

Governmental accounting occupies great importance of both practitioners and academics all over the world, in addition to the fact that the government sector is one of the most important sectors due to the significant role that government units play in economic and social development. Therefore, the development and complexity of government activities caused difficulties in many countries in terms of interpreting financial statements and using them for comparative purposes [1]. This encouraged

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the creation of a unified global framework for accounting in the public sector and the unification of principles to be responsible for providing guidelines for fair dealing rather than flexible accounting rules and techniques, to ensure the integrity of the financial statements as well as the information provided to users, which reflects positively on improving confidence in the quality and reliability of financial reports [2].

International Public Sector Accounting Standards (IPSAS) is the global transformation in public sector accounting to strive to make financial statements comparable and more coordinated through global best practices. According to International Federation of Accountants (IFAC) in 2017, IPSAS are highly rated worldwide accrual-based accounting standards promote more transparency, improves accountability and provides better information for decision-making purposes in addition to build trust with citizens as well as creating accurate and qualitative financial information. Chan [3] mentioned that the introduction of IPSAS is a centerpiece of the “global revolution in government accounting” [4] and forming an important part of public sector reforms. IPSAS ensure improved operational performance, accountability and efficient allocation of resources by providing transparent financial data, accurate and comprehensive accounting information in order to reach a tangible level of credibility, accountability and oversight [5]. According to [6] IPSAS give accurate judgments on financial reports and clear choices, which leads to effective decision-making. It is also one of the latest solutions in increasing transparency and accountability for public sector drivers of economic growth.

It is worth noting that in November 2014, the Jordanian Cabinet, represented by the Jordanian Ministry of Finance (MOF), discussed the possibility of adoption and implementation of (IPSAS), in its session held on Tuesday November 4, 2014 in accordance with Article 4 of the Law Regulating the Legal Accountancy Profession in Jordan No. 73 of 2003 [7]. This change will help in the development of perspective of accounting and give the Jordanian public sector the international character in addition to open up to global trade. Since the adoption of IPSAS, and despite the many benefits of its implementation Jordan still uses the cash basis IPSAS according to MOF website. Therefore, this gives indications that there are obstacles and barriers that negatively affect implementation and face the Jordanian public sector.

Based on the above discussion, this investigated the actual and desired benefits and challenges facing the Jordanian public sector in implementing IPSAS [8]. Jordan adopted IPSAS in 2014, the MOF is responsible for the adoption of public sector accounting standards in Jordan which are modified cash-basis and, in 2015, officially endorsed the adoption and implementation of IPSAS, a roadmap for IPSAS implementation was developed, with implementation assistance provided by the United States Agency for International Development (USAID) under the Jordan Financial Reform Project.

Many studies have indicated that there are obstacles that prevent the transition from cash basis to accrual basis in the government sector in accordance with IPSAS. Babatunde et al. [9] found that the significant factor for the slow implementation of IPSAS in Nigeria is the political buy-in of all the government functionaries as a collective decision. Schmidhuber et al. [10] reported that several criticisms were directed at

applying the standards in terms of lack of pressure, implementation costs, and alignment with public sector specializations. In addition, many countries have refused to adapt their governmental accounting systems to IPSASs. A study by Musleh Al-Sartawi et al. [11] found that there are inadequate scientific and practical expertise and qualification, inappropriate legislation and environment in addition to the inadequacy of the current information systems for the requirements of implementation of IPSAS.

In Jordan, limited number of studies have indicated that Jordanian public sector is implementing the IPSAS in a weakly form and not applying it correctly also there is a problem in monitoring the applying procedures as (e.g., [12, 13]) Therefore, this research addressed the actual benefit and challenges in implementation of IPSAS in Jordan and recommend possible solutions to overcome those challenges.

This paper will proceed as follows: the second section summarizes the literature and motivated the hypothesis. The third section presents the methodology and data. Lastly, the fourth section concludes.

2 Theoretical Background and Literature Review

Heald [4] argued that IPSAS is the centerpiece of the “global revolution in government accounting”, “In response to calls for greater government financial accountability and transparency”. This revolution developed on two stages in the standards setting the first one from 1996 to 2002, during which 20 international accounting and financial reporting standards were issued through the adaptation of the International Accounting Standard (IAS), and the second stage from 2003 and so far, issued many standards that focused on a unique matter to the public sector like tax issues, budget implications for financial reporting and other non-exchange transactions [14].

Formulate high-quality accounting standards and other publications for use by public sector entities around the world derive their importance from the role they play in achieving international accounting compliance in order to obtain government financial statements that include reliable and transparent accounting information that helps in making economic decisions [15]. In addition to IPSAS require, inter alia, that all expenses and income as well as all assets and liabilities be presented. They ensure that public sector entities and stakeholders have complete information on: financial performance, changes in net assets, budget/actual comparison, financial position, cash flows.

Alshujairi [16] investigated the government accounting system reform and the adoption of IPSAS in Iraq. The research used questionnaire to the accountants in the finance ministry, auditors, supreme audit board and lecturers in Iraqi universities, specialized in government accounting. The results revealed that the main challenge during adoption includes big costs of implementation, poor IT accounting system, shortage of qualified and professional accountants, and shortage of trained human resources being the main challenge. On the other hand, adoption of IPSAS in Iraq had achieved many of benefits such as meeting requirements of international financial

organizations or sponsors and providing financial position and performance, more efficient to make use of the knowledge of IPSASB, assuring a better financial integrity, improving accountability and transparency for resources, being a benchmark for evaluating and improving government accounting, facilitating the consolidation of financial statements, enhancing international comparability of financial information of the Iraqi government with other governments better than the present accounting system and improving public financial management.

In addition, [17] This study examined the potential benefits associated with adopting IPSAS in the domain of Brazilian public accounting. The research employed a questionnaire rooted in five theoretical frameworks. The primary findings of the study revealed a consensus among participants regarding the feasibility of implementing IPSAS. Additionally, the cost–benefit analysis was deemed crucial in reaping the advantages of IPSAS application. Another noteworthy outcome pertained to the educational responsibility for training and implementing IPSAS, with expectations placed on universities to assume this role. The findings also indicated that Brazil displayed a willingness to accept and adapt to the forthcoming changes in the public sector. However, despite these positive tendencies, the study identified resistance towards updating existing concepts and facing new challenges associated with the next phase of public accounting.

Brusca and Martínez [18] investigated the effect of implementing IPSAS on Latin American Countries. The study adopted a method of structural analysis of the data of the reports issued by the legal auditor of the target countries, in addition to personal interviews with specialists. The examination revealed a growing global inclination towards the adoption of IPSASs in Latin-American nations; however, concurrently, significant barriers impeded the attainment of reform objectives. In the context of Colombia, ongoing reforms were observed, making it difficult to assess the extent to which IPSASs contributed to enhancing decision-making processes at the organizational level. There were 6 countries that have adopted the application while 10 countries were still in the transition stage. The results showed that the application of the accrual basis in preparing reports was one of the most important pillars on which to apply the IPSAS. The study recommended the importance of applying the standard and adopting the principle of accrual in preparing reports and focusing on the application of the disclosure standards proposed in IPSAS, as they have an effective role in enhancing transparency.

Abdulkarim [19] study aimed to assess the preparedness of the public sector in Qatar to adopt IPSAS, utilizing the framework of the innovation diffusion theory, while also examining the challenges associated with its implementation. A questionnaire was devised and administered to gather responses from a total of 101 participants, including accountants (preparers) and auditors working in the public sector. The research focused on five dimensions: relative advantage, satisfaction with the existing accounting system, top management support, barriers to IPSAS adoption, and attitudes towards innovation.

The findings indicated that barriers to adopting IPSAS, relative advantage, and satisfaction with the current system emerged as the most significant factors. These variables were found to either impede or facilitate the implementation of IPSAS

within the public sector of Qatar and potentially extend to the broader region. Furthermore, it is crucial to consider higher-level cost–benefit analyses that have been approved when embracing these standards. As a result, policymakers should recognize the necessity for a comprehensive shift in the perception and enhancement of IPSAS, from a top-down perspective, to ensure its successful implementation.

Ahmad and Nassereddine [6] assessed and determined the challenges facing the implementation of IPSASs in Lebanon, and to achieve that, it was carried out using the descriptive analytical method. A questionnaire was distributed to 100 public accountants and financial system managers working in the public governmental sector in Lebanon. The findings indicated that the level of awareness of IPSAS in Lebanon is high among accountants, auditors and system administrators. However, the full implementation of the IPSAS guidelines still faces many challenges, which these include the high cost of implementation, lack of government support, resistance to change, and a lack of a better understanding of the importance and operation of the IPSASs tool.

Al-Kharabsheh [20] examined the effect of adopting IPSAS on financial performance in the Jordanian public sector in order to reform its accounting system to control public money. The study has applied descriptive and inferential approaches, survey designed for this study and was distributed to a sample consist of accountants in the MOF amounting (250) employees 250 questionnaires were distributed to these employees. The results revealed that adopting IPSAS in the public sector in accordance with the accrual basis to achieve transparency, credibility, reliability and full disclosure of financial statements, reform the monitoring system and improve performance through improving the quality of the financial information provided and adopting the IPSAS helps in changing the accounting policies and applying the accrual basis and in improving the efficiency of the performance of the MOF and public sector.

Haija et al. [21] examined and explored the factors that may motivate or limit the effective adoption of IPSAS in Jordan. The study examined training, local legislation, infrastructure, external support and stakeholder engagement. The results of this study showed a positive and significant relationship between training, local legislation, infrastructure, external support, stakeholder engagement and IPSAS. The two most important challenges were local legislation and infrastructure. External support and stakeholder engagement came in the second level. They were needed to share their resources and experience and to enhance the adoption process. Notwithstanding that training came at the bottom of list.

As examined in the previous literature, which are related to IPSAS adopting and implementation in developed and developing countries, researchers paid attention to investigate the impact of IPSAS on accountability, transparency, financial performance and comparability as well as the level of readiness of countries, the requirements to implement IPSAS in addition to assess and determine the challenges that face the implementation of IPSAS. According to the researcher's best knowledge, there are still a real challenges facing the IPSAS implementation especially the fact that the COVID19 crisis helped in slowing the implementation. Moreover, there are many benefits IPSAS implementation can achieve. In this respect, this study adds to

the related literature by identify the current level of IPSAS implementation in Jordan, find out the most important challenges and obstacles facing IPSAS implementation, determine the benefits of IPSAS implementation on governmental agencies within the general budget (ministries and government departments) and independent non-profit bodies (Amman Municipality) in addition to the supervisory body (Jordanian Accounting Bureau), and thus the research included the central government and local government.

3 Methodology and Data

3.1 Population and Sample

The target population for the study is the Jordanian government ministries and their affiliated departments, the Amman Municipality and the Audit Bureau as a supervisory body. The study sample size was 131 respondents from consultants, financial managers, auditors and accountants working in fourteen Jordanian government ministries and their affiliated departments, the Amman Municipality and the Audit Bureau.

For answering the study questions and examining its hypotheses, the required data were collected from its primary source through design and distribution of a questionnaire consisting of two parts as follows: the first one contained questions to obtain general demographic information about the participants in the study, which is (Gender, educational level, scientific specialization, professional field, current job title and professional qualification) in addition to three questions to determine the direction of the study sample, the first is the entity in which he/she works, the second is the number of specialized courses in IPSAS in which the target audience participated, and the third is about the degree of their knowledge of those standards. While the second part contained various questions about the challenges and benefits of implementing IPSAS in Jordan.

3.2 The Framework of the Study

The overall study challenges and benefits in general can be shown as follow:

Challenges

1. Organizational challenges

2. Resistance to changes

3. Accounting system

4. Technological challenges

(continued)

(continued)

5. Financial challenges

6. Time

7. Law and legislation

8. Educational responsibility

Benefits

1. Alignment with best practices

2. Improved stewardship of assets and liabilities

3. Availability of more comprehensive information on costs

4. Improved consistency and comparability

5. Increased transparency and accountability

Source Prepared by researcher

4 Results and Discussions

A method that is employed to test the objective of the study is One Sample T-Test, which aims to investigate the effect of challenges and benefits in implementing IPSAS in Jordan.

4.1 Descriptive Statistics

The questionnaire statements include two sections, the first is the challenges of IPSAS implementation, and the second is the benefits of IPSAS implementation. Table 1 show the descriptive statistics for questionnaire statements challenges axes. Table 2 show the descriptive statistics for questionnaire statements for benefits axes.

Based on standard deviation values the results show that, resistance to changes challenges, time challenges and law and legislation challenges axes have high standard deviation values compared to other challenges axes, which may imply that the respondents have heterogeneous opinions (answers) about these axes. Finally, and in pertain in maximum and minimum values the results show that statement data ranging from 1.00 to 5.00 which mean that the statement answers ranging from strongly agree to strongly disagree.

Table 2 shows that, there is significant homogenous in respondents answers for benefits statements. Since the values of mean to a significant extent are closed, and equal to 4.20 and 4.21. As for standard deviation values it is ranging from 0.61 to 0.70. The results also show that the minimum values are equal to 2.00, while the maximum values are equal to 5.00 which imply that the answers ranging from disagree to strongly agree. That is the choice strongly disagrees is not recorded.

Table 1 Descriptive statistics for challenges axes

Descriptive statistics for challenges axes	N	Mean	STD DEV	Max	Min
Organizational challenges	131	2.57	0.67	5.00	1.00
Resistance to change challenges	131	2.53	1.00	5.00	1.00
Accounting system challenges	131	2.72	0.85	5.00	1.00
Technological challenges	131	2.90	0.80	5.00	1.00
Financial challenges	131	2.76	0.75	5.00	1.00
Time challenges	131	2.47	1.10	5.00	1.00
Law and legislation challenges	131	2.67	1.08	5.00	1.00
Educational challenges	131	2.57	0.67	5.00	1.00
Overall Challenges' Axes Statements	131	2.66	0.63	5.00	1.00

N is number of observations

STD DEV is standard deviation value

Table 2 Descriptive statistics for benefits axes

Benefits axes	N	Mean	STD DEV	Max	Min
Alignment with best practices benefits	131	4.21	0.64	5.0	2.0
Improve stewardship of assets and liabilities benefits	131	4.20	0.62	5.0	2.0
Availability of more comprehensive information on costs benefits	131	4.20	0.70	5.0	2.0
Improved consistency and comparability benefits	131	4.21	0.64	5.0	2.0
Increased transparency and accountability benefits	131	4.21	0.61	5.0	2.0
Overall Benefits' Axes Statements	131	4.21	0.58	5.0	2.0

N is number of observations

STD DEV is standard deviation value

To test of study hypotheses, we use One Sample T-Test. One Sample T-Test is used to investigate the significance of the difference between an assumed population mean and sample mean. The study assumes the mean (Test Value) = 3. This value calculated based on the arithmetic average for multiple-question Likert scale.

Table 3, shows the results of One Sample T-Test for Challenges statement axes, and for overall challenges' statements. If Sig. value is less than 0.05 the result is statically significant. The outputs show that, all challenges axes except technological challenges are statistically significant and represent challenges for IPSAS implementation. The results to some extent are consistent with, [16, 22] and [21]. The respondents strongly agreed that organizational challenges represent the most difficult challenges faced by the Jordanian public sector, and this is agreeing with [23] study in addition to the Law and regulation challenges. As for technological challenges the result is insignificant, which mean that the technological challenges do not

represent a challenge for IPSAS implementation. This result may imply that, respondents believe that the existing technology is already sufficient and sophisticated and capable of implementing IPSAS in terms of their availability.

Table 4, shows the results of One Sample T-Test for Benefits statement axes, and for overall Benefits' statements. If Sig. value is less than 0.05 the result is statically significant. The results document a statistically significant effect for the benefits of implementing IPSAS for public entities. The results are consistent with, [24] who documented that, the adoption of IPSAS will increase the level of accountability and transparency in public sector. Also, comparability and international best practices will enhance. Furthermore, the study found that adoption of IPSAS based standards will provide more meaningful information for decision makers and improve the quality of the financial reporting system.

Table 3 One sample T-Test for challenges statements axes

Variables	T-Test value	Df	Sig.
Organizational challenges	-7.297	130	0.000
Resistance to change challenges	-5.317	130	0.000
Accounting system challenges	-3.858	130	0.000
Technological challenges	-1.385	130	0.168
Financial challenges	-3.609	130	0.000
Time challenges	-5.537	130	0.000
Law and legislation challenges	-3.464	130	0.001
Educational challenges	-5.861	130	0.000
Overall Challenges' Statements	-6.221	130	0.000

T is the value of One Sample T-Test

Df is the degrees of freedom

Sig is two tailed significant

Table 4 One sample T-Test for benefits statements axes

Variables	T-test Value	Df	Sig.
Alignment with best practices benefits	21.857	130	0.000
Improve stewardship of assets and liabilities benefits	22.234	130	0.000
Availability of more comprehensive information on costs benefits	19.652	130	0.000
Improved consistency and comparability benefits	21.796	130	0.000
Increased transparency and accountability benefits	22.786	130	0.000
Overall Benefits' Statement	23.912	130	0.000

T is the value of One Sample T-Test

Df is the degrees of freedom

Sig is two tailed significant

4.2 *Personal Interviews*

The researcher conducted several personal interviews with those in charge of the project to implement IPSAS in the MOF, the Amman Municipality and the Audit Bureau as a supervisory body, and these interviews had a significant impact on enriching the study.

In MOF, Mr. Wael Mohsen (Head of the IPSAS Unit in the Directorate of Government Financial Management Information System (GFMIS)) affiliated to the MOF, said that the implementation of IPSAS help to effectively control public money and increase transparency and credibility represented in the financial position and thus raise Jordan's level economically and politically. However, there are major obstacles facing the implementation of standards, the most important of which is the difficulty of inventorying and evaluating the assets as it is large and needs experts for evaluation. In addition to that MOF is responsible for the rest of the ministries, and in the event that any standard is applied, it will initially be applied to the MOF and then the rest of the ministries and in stages.

In the Audit Bureau, which is an external control body responsible for financial oversight (accounting and legal) and performance control in accordance with the Audit Bureau Law No. (28) for the year 1952 and its amendments, the basic reference for external control. Mr. Munther Al-Naber and Dr. Bilal Akasha (Internal Control Manager, Director of Directorate of Oversight of Companies and Final Accounts) respectively, they stressed the importance of adopting and implementing IPSAS because of their many benefits in increasing transparency and increase the quality of disclosure. The MOF has gone through many stages since the adoption of standards and developed a plan for 5 years and formed a special unit (GFMIS) for these standards in the MOF, and the Audit Bureau was visited this unit to follow up their work, which is still in the process of implementing, reevaluation, inventory of state assets, requires great effort, high staff efficiency and advanced accounting systems.

Regarding the Municipality of Amman, Dr. Ahmad Al-Amoush, the financial director of the Municipality, said that international accounting standards occupy a high global position among countries and have become an international requirement by many organizations. It was necessary for Jordan, as the Municipality of Amman, which is an independent non-profit governmental body, to start adopting and implementing IPSAS, in 2019, experts from a French company were hired to develop an appropriate action plan for the transformation in order to reach the accrual basis, several steps must be taken. The Transfer to the accrual basis is expected at the end of 2022. At the present time, the financial statements of the Municipality of Amman are audited by Talal Abu-Ghazaleh & Co. International. as an external audit, and it acknowledged in the financial report for the year 2020 that the Municipality of Amman prepares financial reports according to the cash basis of IPSAS.

5 Conclusions

This paper has examined the challenges and benefits of implementing IPSAS in Jordan. The results indicated that, at the aggregate level of the sample, the adoption of IPSAS led to an elevation in accountability and transparency. Furthermore, it fostered enhanced comparability and increased the efficiency of the Ministry of Finance (MOF) and the public sector's performance, thereby fortifying the principles of good governance and improving relationships between the government and the general population. Thus, raising the level of classification of Jordan as one of the first Arab countries to adopt these standards. Conversely, participants in the survey expressed their belief that the implementation of IPSAS is accompanied by numerous challenges that warrant careful attention. The foremost among these challenges, as identified by the respondents, include limited awareness and knowledge regarding the standards, the difficulty of keeping up with frequent updates and revisions to the standards, prolonged duration of time required for implementation, inadequacies in accounting curricula offered by universities, inefficient accounting systems, and organizational resistance to change. While technological challenges do not have a significant impact and this indicates the presence of advanced technology in Jordan, however, the inability to own it or not knowing how to transform this technology to be in line with the technological systems applied at the present time to government systems. We strongly recommend future researchers to examine the best ways to increase the implementation in Jordan. Lastly, we recommend that universities in Jordan to include the IPSAS in the material related to governmental accounting.



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The Emergence of Islamic Fintech and Bahrain: Prospect for Global Financial Sectors



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Abstract It is an exciting to study the future prospects of financial technology in Islamic Finance. Technology and automation have moved to many sectors including the finance sector. In Islamic finance sector it is still developing, and the future of Islamic finance industry looks promising with this innovation. “Artificial intelligence, machine learning, robotic process automation, the Internet of Things, cloud computing, big data, and blockchain” are a few of the technologies employed in the banking industry. In addition to financial results FinTech apps are being used in Islamic finance to offer financial goods and services such as lending, investing, invoicing, risk evaluation, data analytics, and fund management to increase the sustainability and productivity of the sector and society. The Kingdom of Bahrain, is the hoariest and most recognized financial center in GCC, has used its extensive banking expertise to grow a modern fintech ecosystem and promote fintech success, both in the GCC and around the globe. This chapter attempt to highlight new challenges and prospects for Islamic fintech such as offering innovative goods and services, greater regulatory compliance, improved client accessibility, and considerable cost reductions are some of the important areas that Islamic fintech must focus on

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in order to remain sustainable. These obstacles include integrating Fintech and overcoming them. In the digital age clients demand services in digital mode particularly in the banking sector and fintech has been filling up the gaps. Islamic fintech cannot elude the fintech revolt in the digital age. According to the study's findings, fintech could have an impact on the future of Islamic banking and finance by delivering new and creative financial services that are more effective and less expensive.

Keywords Financial technology · Islamic finance · Islamic Fintech-Bahrain

1 Introduction

According to the World Population Review, 1.9 billion Muslims worldwide participate in Islamic finance. Islamic finance is one of the financial sectors with the strongest growth [20], despite making up a relatively small fraction of global finance. The company's total assets have topped \$2 trillion, and \$3.8 trillion is its goal for 2023. Islamic finance dates back to the seventh century, but it was only formalized in the 1960s. Islamic finance is the activity of businesses and people raising money in accordance with Sharia, or Islamic law. Which is a unique method of socially responsible investments [15].

Bahrain is a leader in Islamic finance globally, ranking second globally in terms of development and first in the Middle East and North Africa [19]. Before the global financial crisis of 2008, technological advancements were transforming the nature of financial markets, services, and institutions in unforeseen ways (GFC). FinTech, or financial technology, provides alternative solutions to traditional banking and payment methods by combining technology, consumer-centric services, and flexible business practices. Fintech Bahrain is the world's oldest and most well-established financial center in GCC has created a sophisticated FinTech environment using its substantial banking knowledge [21]. Because it is merely a facilitator, Shariah-compliant Fintech is Shariah-neutral. Certain fintech advances for Islamic financial services, on the other hand, must follow Sharia norms [12].

Financial inclusion indices have improved in recent years as a result of concerted attempts to develop the kingdom into a regional fintech center [24]. Financial inclusion is measured by the number of bank branches, ATMs, POS terminals, bank accounts, online banking users, and debit and credit cards, among other things. These indicators have all shown steady growth in recent years.

FinTech is profoundly altering and transforming how customers and businesses approach financial services all around the world [4]. Young fintech companies have a unique potential to be a part of this change, improving customer financial experiences and ushering in the new millennium for financial institutions. However, in order to do so, they must be free to function in the manner that best meets their needs. Bahrain offers a unique environment for fintech success in the "Gulf Cooperation Council (GCC) and around the world" [1]. Most importantly, because Islamic finance is a new and mostly untouched business, the potential market for fintech in

the sector is enormous. Customers are demanding creative, convenient, efficient, and cost-effective financial services as a result of the digital revolution. Between 2 and 3 billion new users are expected to enter the digital finance market by 2020, according to estimates 80% of these new consumers will be Muslims. Fintech has a huge possibility in Islamic finance because of this. Strong awareness among Islamic finance stakeholders, encouragement from monetary authority senior officials, and favorable regulatory conditions in important Islamic financial markets will all contribute to the growth of fintech in Islamic finance [1, 2].

The data has been collected from various secondary sources like journal, newspaper, internet and reports of Central bank of Bahrain. This chapter's goal is to outline the most recent advancements and future prospects for Bahrain's financial inclusion as well as the FinTech industry. This study emphasizes the initiatives taken in this area by CBB and other business players in the Kingdom. This chapter is divided as follows: section one begins with an introduction, while section two focuses on a literature review on Shariah compliant fintech. Section three provides an overview of Fintech Bahrain's development and potential, Section four covers recent Fintech trends and advancements, and the study's conclusion and the topic of future research are covered in the final part.

2 Literature Review

FinTech is referred to as a "combination of financial technologies" that characterizes financial services in the twenty-first century [23]. FinTech is a term that combines the words "finance" with "information technology". FinTech allows for the development of new services and business models while also posing a threat to established financial service providers. Innovation can improve the financial services industry's "operational effectiveness, customer-centric offerings, and transparency" [25].

Fintech technology integration into Islamic finance, which is governed by Shariah law, has potential benefits. Recent studies have focused on the computability issues with Fintech-based Islamic financial solutions. Aslam et al. [6], Banker [7] and Biancone [8] has examined the computational difficulties associated with Fintech-based Islamic financial solutions. Fintech has several applications in the Islamic banking industry, despite the fact that there are arguments both for and against its Shariah compliance. The application of smart contracts to guarantee Shariah-compliant goods and services in the Islamic banking sector emphasized by [13]. Abojeib and Habib [3] addressed the potential uses of blockchain for good, particularly in the zakat collection process. Fintech might be applied similarly to increase the usefulness of waqf. As a result, the Islamic Fintech sector has experienced rapid growth since 2010. A 7.7% compound annual growth rate (CAGR) is predicted for the sector, which was valued at "USD 2.4 trillion in 2017 and is forecast to reach USD 3.8 trillion in 2023 [8]. Banker [7] underlined how Islamic banks in Malaysia and the UAE can retain their customers, through crowdfunding technology". Biancone et al. [8] investigated the Shariah compliance business models of crowdfunding and Fintech companies,

we draw the conclusion that Shariah-compliant business models are realistic, crowd-funding shares risk, invests in halal goods, and doesn't charge interest. Biancone et al. [8] went on to say that the ban of interest is crucial to the Shariah compliance of Fintech-based business models.

According to [18] fintech can develop a non-bank intermediary platform and become a competitive alternative to IFIs. In order to operate on such principles, crowdfunding platforms are currently collaborating with IFIs. Shaikh et al. [22] may help the Islamic finance industry become more useful against traditional finance without negotiating on benefits, enabling the sector to attract more consumers, enhance productivity, lower costs, and offer a wider range of goods. Najjar et al. [20] suggest that blockchain can enhance suppliers' visibility.

The fourth industrial revolution, or IR4.0, will occur as a result of the digitalization of more than half of the world's GDP by 2022, which will have an impact on every industry [14]. Through the creation of new prospects for the creation of value and income, digitalization is changing the way we conduct business. This digitalization process is being accelerated by new technologies like "blockchain, artificial intelligence (AI), augmented reality (AR), biometrics, the internet of things (IoT), and cloud computing" creating some disruptions that may eventually revolutionize the financial sector [4]. Islamic fintech enables the acceptance and implementation of a risk-sharing model in Islamic financial institutions through tiny creative start-ups that want to support the Islamic finance sector. The ideal Islamic economy's real sector is underleveraged, risk-shared, and asset-backed. should be pretty similar to the Islamic fintech model [4–6]. The IFI might reap significant benefits and achieve a number of its goals by using digitization. The IFI, for example, The IFI can use a variety of existing digital transformation channels, including "crowdfunding, peer-to-peer model and payment platforms, smart contracts and blockchain, cryptocurrencies, cybersecurity" to reach its objectives of inclusive growth, provide financial services that are focused on the needs of the customer, achieve operational excellence, and gain a competitive edge over their rivals [15, 16].

3 FinTech Developments and Vision 2030 of Bahrain

2014	Non-bank enterprises' entry into banking services. Bahrain's Central Bank provides payment and card processing services (CBB)
2015	By tying together regional banks and significant billers, CBB and "Benefit Company" created the Electronic Financial Transfer System (EFTS) for payment via the Fawri + service, which enables close to real-time financial transfers up to 1,000 BD
2016	To increase the effectiveness of financial transfers, the Bahraini Central Bank has developed a "ground breaking Electronic Fund Transfer System (EFTS) that links all retail banks in the Kingdom with one another and with major billers"

(continued)

(continued)

2017	The Central Bank of Bahrain (CBB) has announced “National electronic wallet to transfer funds using the wallet for Fawri, Fawri Plus, and online bill payment,” in addition to opening the first phase of the regulatory sandbox for fintech start-ups as well as opening its regulatory sandbox framework to provide companies with a virtual space. Bahrain’s Information and eGovernment Authority established a Cloud First Policy to decrease government ICT costs and improve security. Sharia-compliant financing-based crowdfunding sites now have to meet an additional criterion, according to the CBB
2018	A secure private network was established to link all retail banks and act as the main communication hub for “real-time Inter-Bank payments settlement (RTGS)”. The CBB approved three “Regulatory Sandbox applicants (Wahed, Inc., BitArabia, and Belfrics)”, allowing them to experiment their solutions in the Kingdom alongside three prior applicants—“Tramonex Limited UK, Norwex WLL, and Rain Financial”
2019	Alliance between “CBB and Information and eGovernment Authority and BENEFIT” developed the first Electronic Know Your Customer (eKYC) project in the Arab region. The first Crypto-Asset Module license was given to Rain, a Bahraini cryptocurrency exchange, and the Kingdom also got its first property technology company, Estater, which offers a user-friendly platform for listing, sharing, locating, or managing a property
2020	FinHub 973, of CBB the first comprehensive digital fintech lab in Bahrain and the first cross-border project to create a collective network for investigating, testing, and prototyping on a centralized digital sandbox
2021	Bahrain Supernova Fintech Challenges on FinHub 973, promotes open innovation in the financial sector, towards the growth of fintech
Vision 2030	Bahrain’s Economic Vision 2030 includes digital transformation as one of its pillars, towards “sustainability, competitiveness, and fairness”. The emphasis of the Digital Government Strategy 2022 is on the use of emerging technology to transform services. To attain Vision 2030 goals for smart cities, Internet of Things (IoT), and Machine-to-Machine (M2M) connectivity, the Information and eGovernment Authority (iGA) has assigned frequency bands to government organizations

3.1 *Islamic Finance and Fintech*

According to many, the Kingdom of Bahrain is the region that leads the world in Islamic finance, placing first worldwide in the growth of Islamic banking and second in the Middle East and North Africa [12]. Through a constant focus on innovation and client satisfaction, Bahrain Islamic Bank, which was created in 1978, was the first to set the benchmark for Islamic banking management. Bahrain has become a leading destination for Islamic finance growth, developing Shariah banking compliance principles, norms, and standards in the industry, making “Bahrain a top destination for Islamic finance development” such as:

- Expertise ranges in this intricately entwined context from wealth management and Sukuk issuance to takaful and re-takaful (Islamic insurance and reinsurance).
- Implementation of the new Takaful model, which allows for a more accurate assessment of these businesses’ solvency. A new “Takaful model and a Shariah-compliant Wakalah investment instrument” were recently introduced.
- To boost Bahrain’s position in Islamic finance, the Central Bank of Bahrain is introducing new initiatives and policy tools.

Zakat, Qardh-Al-Hasan, Awaqaf, sadaqa, and Islamic microfinance are only a few of the ethical and social financial services offered by the Islamic financial system. These services are geared toward the underprivileged and disadvantaged members of society. Islamic financial services based on fintech that can be used to offer clients effective, dependable, affordable, and creative financial services (Fig. 1).

Financial Services	Islamic Financial Services	Islamic Fintech Examples
Funding	<p><i>Includes:</i></p> <ul style="list-style-type: none"> • Custody-based deposits (can also be based on <i>Qard</i>) • Investment accounts • <i>Shari'a</i>-compliant payment, collection, and liquidity management 	<ul style="list-style-type: none"> • PayHalal (Souqa Fintech Sdn Bhd, Malaysia) • AmalPay (Malaysia) • Investment Accounts Platform (IAP - Malaysia)
Trade Finance	<p><i>Includes:</i></p> <ul style="list-style-type: none"> • <i>Murabaha</i> working capital • <i>Murabaha/Wakala/Mudaraba</i>/Letter of Credit 	<ul style="list-style-type: none"> • Waqfe - Bahrain (Digital banking platform provider)
Financing	<p><i>Includes:</i></p> <ul style="list-style-type: none"> • <i>Murabahah/Mudaraba/Musharaka/Salam/Istisna'/Ijara</i> Financing • Islamic Microfinance 	<ul style="list-style-type: none"> • Ethis Crowd - Singapore, Indonesia, Malaysia, Australia • Blossom Finance
Capital Market	<p><i>Includes:</i></p> <ul style="list-style-type: none"> • Islamic Bank Treasury • <i>Sukuk</i> (Islamic Bonds) 	<ul style="list-style-type: none"> • Adab Solution (Crypto exchange)
Wealth Management	<p><i>Includes:</i></p> <ul style="list-style-type: none"> • <i>Shari'a</i>-compliant wealth management for retail and HNWIs 	<ul style="list-style-type: none"> • Wahed - US (Robo-advisory investment platform) • HelloGold (blockchain-based gold investment)
Insurance	<p><i>Includes:</i></p> <ul style="list-style-type: none"> • <i>Takaful</i> 	<ul style="list-style-type: none"> • Uplift Mutuals • Insure Halal

Fig. 1 Islamic global fintech and type of financial services: *Source* World Bank 2020

3.2 Prospects of Fintech in Islamic Finance

Islamic FinTech solutions through Shariah compliant procedures providing more prospects in the market and choices to customer which are more aligned to individual needs [10]. Islamic financial organizations can use blockchain technology to improve transaction transparency. Smart contracts can be used to conveniently execute substantial contractual duties in Islamic contracts, which are governed by Shariah regulations (Fig. 2).

The Islamic finance sector benefits from fintech’s contribution to the innovation and evolution of financial goods and services. Due to the removal of credit intermediaries, prices have decreased and/or potential profits have increased. Additionally, peer-to-peer lending and crowdfunding provide a platform for equity financing based

Islamic finance technology enablers	Islamic finance opportunities to increase financial inclusion
AI and Data Analytics	<p>Data analytics can be utilized to assess creditworthiness despite very limited credit histories in developing countries. Data points could be collected from different sources such as internet online activities, social media interaction, application usage behavior, call activities, phone camera, and location tagging.</p> <p>AI could then analyze the data using predictive analytic algorithms to decide on creditworthiness, amount of financing, and repayment maturity.</p>
Mobile Payment, P2P Finance, and Open Banking	<p>Payments using apps in smartphones or USSD in ordinary feature phones are able to reach even the most isolated areas, provided they have phone or internet connectivity. Complemented by P2P financing, everyone in the community could fund viable individual or SME candidates.</p> <p>Open banking supports the end-user experience by enabling customers of mobile payments and P2P financing data companies to access data concerning their financial institutions directly without opening banking apps or accessing the bank’s website. Transferring money or making payments can be directly performed through the app without using any bank-based platform. The potential impact in improving the financial system’s accessibility to remotely located populations can be immense.</p>
Distributed Ledgers	<p>Every financing transaction can be recorded on a blockchain ledger for verification, and security purposes. This also creates a record of all transactions and improves predictive capabilities in relation to repayments. Ultimately this enables risk to be better priced in terms of the financing provided and its related fees. Timely repayments will increase credit scores which in turn will result in lower return requirements and processing fees.</p>
Cloud	<p>Cloud technology will enable financial institutions or fintech companies offering Islamic finance to run their operations using cloud-based software managed by third parties without the need to have on-site servers. This will enable startups to immediately commence operations without incurring the cost of creating a technology platform.</p>
Cybersecurity	<p>Fintech advancement requires robust cybersecurity technology to manage the risk of cybercrime such as data breaches, identity theft, fraudulent transactions, and server crashes. Cybersecurity also supports Islamic finance providers to comply with regulations relating to sanctions, AML, CFT, bribery, and corruption.</p>

Fig. 2 Prospects to leverage fintech for Islamic finance. Source World Bank 2020

on Musharakah and Mudarabah, which hasn't historically been very successful. Global Islamic and Sustainable FinTech Center (GISFC), the leading platform in the Middle East and Africa focused on Islamic and sustainable FinTech established by Bahrain Fintech Bay in collaboration with local, regional, and global financiers, pioneers, industry participants, and standard-setting bodies.

This industry is driven by sustainability in areas like:

- Increasing knowledge of Islamic FinTech by launching pioneering ideas.
- Adopting Fintech for the growth phase of Islamic Finance.
- Operating in a neutral platform and FinTech space towards the advancement and collaboration of Islamic and viable FinTech locally, regionally and globally.
- Initiating an improvement that promotes sustainability and SDG in the Islamic financial industry.

“The Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI), the Islamic Corporation for the Development of the Private Sector (ICD), the South–East Asia’s Islamic Fintech Alliance, Ethis Ventures, an Islamic crowdfunding platform operating in Malaysia, Indonesia, and Singapore, Al Baraka Banking Group, the largest Islamic banking network in the world, Al Salam Bank, Arab Financial Services, Arcapita, and the Bahrain Institute of Business” are among the launch associates of the GISFC.

The fundamental principle of Islamic principles is through various non-profit applications of Islamic finance, such as Zakat and Sadaqah with Waqf (obligatory and voluntary charity with Islamic endowments), to support the least fortunate participants of humanity. This social component to fintech in Shariah finance is vital to highlight the need to come up with Shariah compliant resolutions which can be supported through Shariah financing to encourage sustainable development [11]. Both “voluntary and involuntary unbanked” are catered to by Islamic fintech. The unbanked and the underprivileged can obtain financial services thanks to Islamic finance’s profit and loss distribution methods. Islamic social finance [7] and Shariah contracts accelerate financial inclusion and accomplishment of numerous SDGs. The entire mechanism of acquisition, allocation, and mediation of funds to the better recognition of recipients with the revolution of Fintech. Financial technology can also step up to bring more donors to the network, such as Sobatku is a smartphone app that was developed by Indonesia’s “National Zakat Board (BAZNAS) to facilitate collections and payments. An integrated portal (BukaZakat) for endowment, philanthropy, and Zakat payment was also created by online marketplace Bukalapak”. There is collaboration between Zakat collection organizations with fintech companies to provide networks for circulation. Islamic social finance and the innovation of fintech in this sector possibly promotes financial inclusion, hence the wise use of technology is a game-changer in Islamic banking business [17].

Even though Islamic fintech is growing, it still trails the standard fintech industry, which now controls the majority of the global fintech market. Islamic fintech has a lot of potential and room to grow, yet there is indeed a long way to go [19] (Fig. 3).

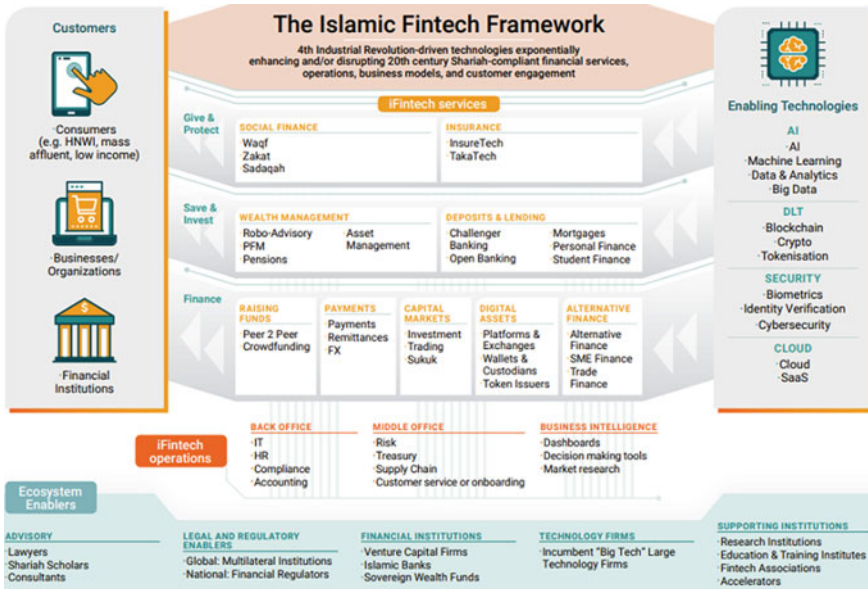


Fig. 3 The Islamic Fintech framework. Source Global Islamic Fintech Report 2021

3.3 The Developments of Islamic Fintech Industry in 21st Century

- Using “Artificial Intelligence (AI) and Machine Learning” for autonomous finance in the business decision-making process.
- Using Application Programming Interfaces (APIs), Open Banking gives third-party financial service providers access to client account credentials, and makes high-income investments more flexible.
- Physical contact restrictions until the pandemic hits through digital-only banking services; modern fintech solutions for financial literacy aimed at educating customers on how to make sound financial decisions.
- For accessibility and ease of performing financial chores, AI-powered fintech is moving toward voice-based technologies in online interactions.

4 Results and Discussion

4.1 A Global Islamic Fintech Pioneer

The earliest, FinTech 1.0, lasted from 1866 to 1967, and was characterized by a predominantly analogue financial services business despite being tightly intertwined with technology. From 1968 to 2008, FinTech 2.0 saw the advancement of digital technology for communications and transactions, resulting in the expanding digitization of finance. Since 2009, during the time known as FinTech 3.0, numerous companies and businesses have emerged. Stores at USD 108 billion (4%), and Takaful at USD 46 billion (2%).

Shariah finance includes all the financial sectors like “banking, capital markets, *Takaful*, and other Islamic financial institutions”. According to “ICD-Refinitiv in 2018, 1,447 Islamic financial institutions were operating businesses in 72 countries and expected to increase from USD 2.5 trillion in 2018 into forecasted number of USD 3.5 trillion in 2024”. Among all banking is the primary service with ‘USD 1.72 trillion (70% share) in 2017, followed by *Sukuk* at USD 470 billion (18%), other financial services at USD 140 billion (6%), Islamic funds at USD 108 billion (4%), and *Takaful* at USD 46 billion (2%)’ (Fig. 4).

With total assets held by Islamic banks reaching USD35.7 billion at the end of 2020, or almost 106% of Bahrain’s GDP, the sector is still quite important. From 35.4% in 2015, Islamic banks’ domestic market share has been continuously increasing. Bahrain Islamic Bank’s National Bank of Bahrain boosted its holding stake from 29% to 78.8% in 2020. Islamic banks had similar levels of capitalization to those of regular banks. Bahrain continues to be a major international center for Islamic banking since it is home to organizations that set standards around the world, like AAOIFI and the International Islamic Financial Market (Fig. 5).

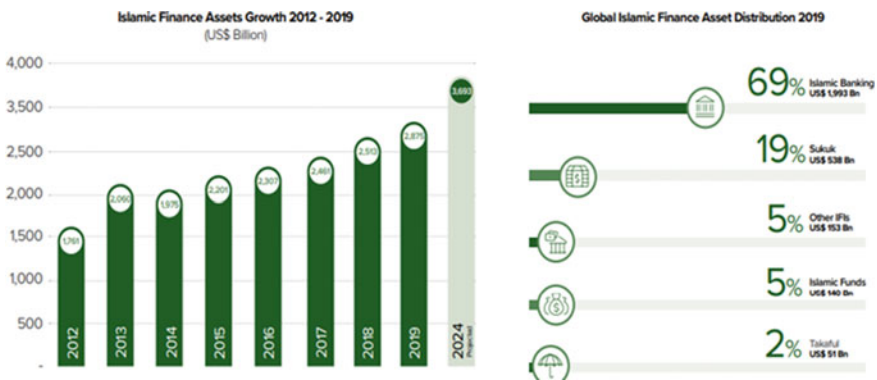


Fig. 4 Global Islamic finance industry landscape. Source ICD-Refinitiv IFDI Report 2020

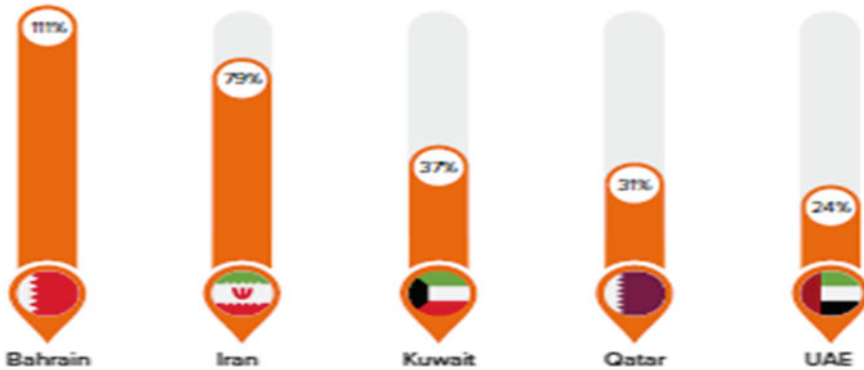


Fig. 5 Countries with highest share of Islamic Banking assets to GDP 2019. *Source* ICD-Refnitiv IFDI Report 2020

4.2 Electronic Fund Transfer System (EFTS)

The Kingdom of Bahrain implemented global electronic fund transfers and developed the trend of going cashless electronic fund transfers through 3 customer services—“Fawri + Fawri, and Fawateer”. Both individuals and businesses can send money using Fawri+ and Fawri, and general public can pay their bills in real time using Fawateer with simpler access, quicker transactions, and less expensive costs. A general upward movement in the regular transmissions for “Fawri+, Fawri, and Fawateer” is depicted in Fig. 6. Fawri+ transfers increased in value from 1,971.5 million BD in 2021 to 2,491.1 million BD in between H1 and H2 of 2021, a rise of 26.36%.

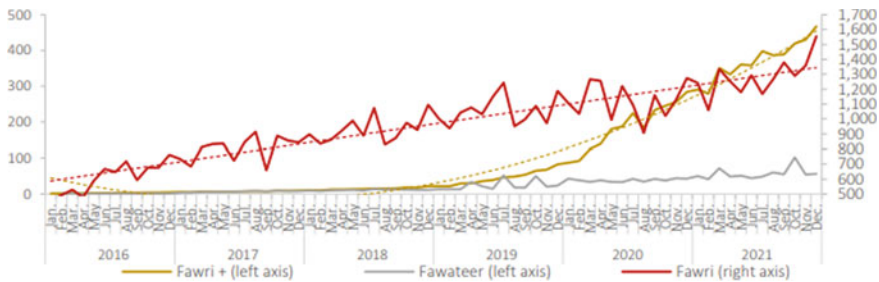


Fig. 6 EFTS Value (BD million) “Fawri, Fawri+ , and Fawateer”. *Source* “Central bank of Bahrain (CBB) financial Stability report March 2022”

	Volume of transactions (million)			Value of transactions (BD million)			
	Cards issued in Bahrain	Cards issued outside Bahrain	Total	Cards issued in Bahrain	Cards issued outside Bahrain	Total	
2018	49.0	15.4	64.5	1,524.1	453.2	1,977.2	
2019	58.4	15.2	73.7	1,877.2	557.2	2,434.4	
2020	77.3	6.4	83.8	2,124.9	217.0	2,341.9	
2021	109.5	16.0	125.5	2,707.2	444.0	3,151.2	
2020	Q1	17.2	3.4	20.6	502.3	111.8	614.1
	Q2	15.9	0.8	16.6	447.3	25.0	472.3
	Q3	20.5	0.9	21.4	554.9	33.2	588.1
	Q4	23.8	1.4	25.1	620.5	46.9	667.4
2021	Q1	25.2	1.6	26.8	639.4	53.6	693.0
	Q2	24.9	1.8	26.7	615.3	59.0	674.3
	Q3	29.1	4.9	34.0	698.4	138.4	836.9
	Q4	30.4	7.7	38.0	754.1	193.0	947.0

Fig. 7 “Point of Sale (POS) transactions in Bahrain”. Source Financial Stability report March 2022,CBB

4.3 Point of Sale (POS)

POS devices allow a variety of payment methods, the most common of which are debit and credit cards. Financial inclusion requires the use of point-of-sale terminals. Increased use of POS machines and their associated services, as well as mobile POS and new age payment technologies, contribute to greater financial inclusion. There were 24,702 POS terminals in Q4 2020 (Fig. 7).

The number and value of Kingdom’s transactions have been rising over time at the point of sale. g POS machines in Bahrain were 38.0 million, up 12.0% from Q2 2021 and up 51.5% YoY from Q4 2020. The total value of transactions made in Bahrain utilizing POS devices in the fourth quarter of 2021 was BD 947.0 million, up 13.2% from the second quarter and 41.9% YoY from the fourth quarter of 2020. The increase in POS transaction volume and value, compared to 2020, shows the rise in consumer expenditure.

4.4 Digital Wallets

The desire for digital wallets in the Kingdom of Bahrain is growing, and considerable strides have been made in realizing the goal of the Kingdom to lead in technology. The total volume in the fourth quarter of 2021 was 50.0 million transactions, up from 21.7 million in the fourth quarter of 2020 and up 130.2% year over year from the 41.6 million transactions in the third quarter. In Q4 2021, there were 1.5 million transactions worth BD 1,320.5 million, a 13.5% rise from Q3 and a 74.1% rise from Q4 2020. (860.9 million BD) (Fig. 8).

Bahrain is rebranding itself as the region’s “Financial Technology (FinTech) hotspot,” combining traditional and Shariah-compliant FinTech products. FinTech, which “offers low-cost, convenient, and quick payments,” has piqued the interest of regulators who have been tasked with regulating, controlling, and assuring the

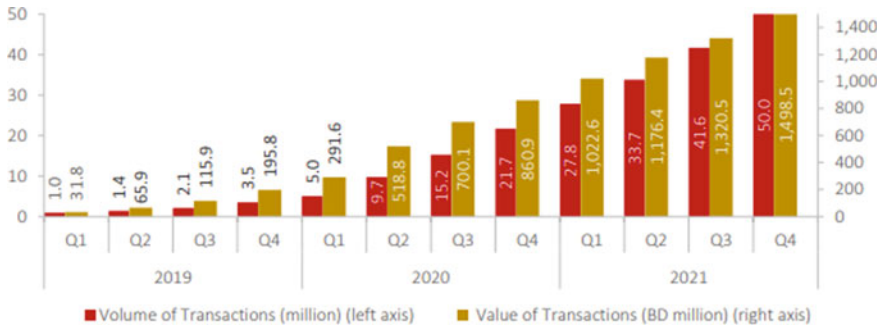


Fig. 8 “e-Wallet and mobile payments: volume and value of transactions”. *Source* “Central bank of Bahrain (CBB) financial Stability report March 2022”

security and productivity of these recent payment techniques. The digital revolution, of Kingdom with the goal of increasing financial inclusion building value to the financial services sector [9].

5 Conclusion and Future Work

Any industry, financial or otherwise, cannot ignore fintech as it represents an inevitable progression of the financial sector. As the world becomes more digitalized, every financial institution and business will essentially be a fintech institution or business. Because innovation lives on ever-evolving technology, the prospects in Islamic fintech are limitless. Fintech solutions are rising to the challenge of wealthy consumers and Shariah believers who want to do more with their money. Fintech trends are quickly becoming the industry standard, with a track record of “providing important financial information payment security, speedy and transparent transactions”, among others. The IFI may benefit greatly from Islamic fintech’s promotion of the essential ideals of Islamic economics and finance, including risk-sharing, justice, equity, and ethical norms. The IFI cannot ignore this trend either because it is a part of the global financial sector. In fact, the IFIs should totally strengthen it and encourage all market players towards transformation. Regardless of the fact that a number of Islamic fintech innovation have been satisfactorily created and adopted, the Islamic fintech industry is lagging behind the global digital economy. Digital wallets, biometrics, and smart contracts are among the most developed developments, while distributed ledger and machine learning are developing financial technology advances in Bahrain’s Islamic institutions. Regulating agencies, Islamic banks, and policymakers should adopt the financial innovations in their companies in light of the findings.

This chapter concludes that the emergence of Fintech based financial technologies offers prospects to the Islamic finance industry to adopt and thrive. It offers the

prospect to enter the new market, do experiments in terms of the product innovations and increase its market share. The study is anticipated to assist financial institutions, investors, and regulators in developing the best plan of action for embracing this upheaval and reaping its full benefits. The chapter is intended to help academic practitioners and academics better comprehend the idea of new financial services based on fintech, which will be essential in altering the Islamic finance sector.

Fintech adoption in Islamic finance is still in its early stages. There is an immediate need for financial and regulatory support. Delivering Shariah-compliant goods for the global market holds a lot of promise for Islamic Fintech, which might help the sector compete and broaden its product offering. However, correct Shariah standards must be developed by relevant regulatory agencies in order for Islamic fintech to expand. Furthermore, Islamic fintech companies can increase their operational transparency and efficiency by complying with reporting and governance regulations. The Central Bank of Bahrain has taken steps to set required standards for effectively regulating Islamic fintech businesses, as have other countries like Malaysia and Indonesia. This prospect goes beyond the historical hubs of Islamic finance. In fact, Islamic finance is rapidly expanding to a global scale. Sharia compliant based investments are emerging in Europe, more notably in the UK. These investments are no longer restricted to the Middle East and are sought after due to their ethical foundation.

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