Mansoor Alaali *Editor*

COVID-19 Challenges to University Information Technology Governance

Springer

COVID-19 Challenges to University Information Technology Governance

Mansoor Alaali
Editor

COVID-19 Challenges to University Information Technology Governance

Springer

Editor
Mansoor Alaali
Ahlia University
Manama, Bahrain

ISBN 978-3-031-13350-3 ISBN 978-3-031-13351-0 (eBook)
https://doi.org/10.1007/978-3-031-13351-0

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Foreword

The book has tackled a very important topic that will help humanity avoid future pandemics. Prof. Mansoor has edited the book to make sure that only high-quality book chapters are authored by well-known researchers in the field. Readers of this book will find outstanding benefits that give them an awareness of the pandemic governance and give them an opportunity to further work on pandemic governance research.

The book starts in chapter "Evaluation of the Governance of IT at Universities: How to Assess their IT Governance Maturity" by addressing governance evaluation of IT at universities. Many approaches have been conducted for the assessment, criteria, shreds of evidence, as well the way to determine the maturity of governance of IT in Universities. It also gives the awareness to the board of trustees of the universities about the responsibilities they have regarding IT governance and the IT-related actions in the Universities.

Chapter "Sustainable Information Technology Governance for Higher Education Institutions (HEIs) – A Systematic Literature Review" demonstrates a proposed model for Sustainable Information Technology Governance that is developed based on best practices and extensive literature. The proposed model will be useful for Higher Education Institutes (HEIs) leading to digital transformation and sustainable HEIs performance. That will provide insights for leaders in HEIs and IT practitioners to identify a full-fledged model to improve efficiency and HEI performance toward sustainable education.

Chapter "Digital Transformation in Higher Education: A Framework for Maturity Assessment" discusses the digital transformation in higher education by the establishment of a framework for maturity assessment. The research findings show significant variance between the respondents' perception of digital transformation maturity levels and the core requirements of digital transformation maturity. The findings also show the lack of holistic vision, digital transformation competency, and data structure and processing as the leading challenges of digital transformation.

Chapter "Rethinking Education in Arab Countries: The Case of COVID-19" sheds light on some of the challenges facing education in the era of COVID-19. It

concludes that Investing in digital infrastructure empowers teaching and learning by providing new opportunities for all learners to communicate and formulate effective strategies to enable students to acquire the skills they need to engage in productive activities and contribute to national development.

Chapter "Strategies for Developing a Culturally Inclusive Online Learning Environment During the COVID-19 Pandemic in Australian Universities: A Case Study" presents a qualitative case study in Australian universities on the effective strategies for creating a culturally inclusive online learning environment with the use of IT governance. The findings of this study are useful for university management, teaching, and learning unit, and IT resources auditing and steering committees to utilize IT resources to attain the learning goals of university students and the organizational goals of the universities in maintaining academic excellence and embracing cultural diversity.

Chapter "Refusing the Implementation of Information Technology Governance and Information Technology Development in Higher Education Institutions: Voices from Senior Leaders" carried out a study that may provide a point of reference for IT department leaders, university administrators, and government leaders to understand the challenges and problems facing South Korean universities at the practical level. Although the study only focused on the opinions of the senior leaders, the outcomes of this study will fill the research and practical gaps in the fields, particularly the reasons why rural South Korean colleges and universities refuse the implementation of IT governance.

Chapter "Making the Business IT Alignment Evaluation Models Accessible: A Revisit of Luftman's Strategic Alignment Maturity Model and a Guide Towards Its Operationalization and Applicability Within Organizations" discusses Luftman's Strategic Alignment Maturity Model And A Guide Towards Its Operationalization And Applicability Within Organizations. The authors perform an exploratory case study negotiating the conduct of in-depth semi-structured interviews within three companies operating in Belgium, to investigate the need for an operationalized version of the alignment-measuring model, created by Luftman. The development of a methodology for an operationalized version of such a model could facilitate the swift determinization of the overall strategic alignment maturity level for every organization, regardless of its size, location, context, or business domain. The emphasis that these practices are sustainable post COVID-19.

Chapter "Digitizing Education During COVID-19 Pandemic in Bahrain Higher Education Context" studies the effect of using digital transformation during the covid 19 pandemic in Bahrain. The results revealed that digitizing education and shifting to online learning, would facilitate the accreditation of academic degrees in Bahrain. This result is very important as recently the accreditation process is lengthy, and it is not coinciding with aim of digital transformation that needs to speed all processes including accreditation.

Chapter "Adopting COBIT 2019 for Information Technology Risks in University Online Learning During COVID-19" shows that by using the case study in Diponegoro University to assess the risk to employees by adopting COBIT 2019 risk profile for identifying the IT risks in the University Online learning Environment

During Covid 19. The result shows four risk factors that fit after constructing the COBIT 2019 risk profile are End-user, Technological, Infrastructure, and Financial.

Chapter "The Impact of Cloud Computing on the Development of Accounting Education in Light of the Corona Pandemic" evaluate the impact of the experience of using cloud computing on the development of accounting education in the Gulf Cooperation Council countries considering the Corona pandemic. To achieve this goal, the researchers relied on reviewing previous literature and conducting interviews with several accounting professors and students in universities in the Gulf Cooperation Council countries in order to develop a proposed framework for developing accounting education programs using both traditional education and cloud-based education.

Chapter "Business Alignment of Information Technology Governance Planning at a Professional Council in South Africa" used one of the three Control Objective for Information and Related Technology (COBIT) concepts - align, plan, and organize - to explore the business alignment of information technology governance planning at a professional council in South Africa. From a business perspective, the COBIT framework provides an integrated, top-to-bottom approach to I&T governance. Participatory Action Research (PAR) was used as the research method in this critical emancipatory study because the project required collaboration between the researchers and study participants in defining and solving the problem.

Chapter "E-Readiness of the Universities During the COVID-19 Pandemic: Evidence from Bahrain" examines the E-readiness of the Universities during the Covid-19 pandemic in the kingdom of Bahrain. The interesting result concerning faculty is that the Covid-19 pandemic has a positive impact on; their responsibility toward students; the dire need to upgrade their technical skills and learn new ones; and their efforts to cope with the new challenges to meet the organization's objective, in addition, to perform well to meet their schedule and pedagogical objective.

Chapter "The Use of Artificial Intelligence in Higher Education – Systematic Review" studied the use of Artificial Intelligence in Higher Education. The conclusions of this study showed that there is a need to have clear standards for the use of AI in education that secures users' data and privacy. In some countries, there is a need to establish clear quality assurance standards to support HEIs to use AI in different operations. A call for future researchers to investigate the use of AI in teaching and learning in terms of assessing the students' performance, faculty utilization, and the use of AI in facilitating decision-making.

Chapter "IS Risks Governance for Cloud Computing Service" focuses on using cloud computing in e-learning and the importance of governance while using cloud computing services in E-learning, as it is the only way of continuing delivering lectures during pandemics. The big challenges facing cloud computing services like security and awareness of how to use these cloud services have been analyzed. Governance assesses cloud computing performance and analyses adherence to agreed-upon goals and objectives.

Chapter "IT Governance vs Information Governance" presents an analysis of IT Governance and Information Governance, their role in virtual teams, and remote working with a focus on higher education institutions. It presents how IT Governance

and Information Governance can contribute to information management. Additionally, it focuses on IT infrastructure, IT services, business processes, roles and policies, and standards that enable effective and efficient use of information in a virtual environment to improve and support organizations to achieve their objectives.

Chapter "Does Poor Governance Compromise Value Delivery of ICT Deployments" discusses the fast-paced developments of emerging technologies alongside the pandemic signals a need for effective IT or technology deployment governance. Systems, processes, standards, and best practice frameworks have been developed to facilitate effective IT governance throughout the last decade. However, a large number of IT initiatives fail to deliver.

Chapter "Adapting IT Governance Policies and Technology to Cope with COVID-19 at Ahlia University" studied the adaptation of IT Governance Policies and Technology to cope with COVID-19 at Ahlia University. It resulted in developing frameworks that enable organizations to manage their IT risk effectively and ensure that their IT processes are well aligned with the overall business objectives. The use of these frameworks by governments and industries will enhance the readiness for future pandemics.

This book is a must-read by everyone, as pandemics will keep attacking humanity and full preparation especially by speeding up the digital transformation and creating a fully digital everything such as government, economy, education, industry, and society, among others. I would like to thank Prof. Mansoor for writing a golden mine book that will help to achieve a digital green society.

Wathiq Mansoor
Dean of the College of Engineering and IT
University of Dubai,
Dubai, United Arab Emirates

Preface

The COVID-19 pandemic has placed Information Technology (IT) in the limelight. During this uncertain period, virtual meetings have replaced onsite gatherings, distance learning has encompassed face-to-face classes, employees had to work remotely, and electronic devices were used to get quick information and to track the cases of COVID-19.

Businesses, such as higher education institutions have become largely dependent upon IT. This has paid attention to IT governance (ITG). IT obviously helps the organizations to cope up with the disruptions brought by the pandemic. IT has gone through plenty of breakthroughs and advancements during this period. However, institutions of higher learning have been experiencing challenges with the alignment of ITG and university governance for their strategic and operational plans, most especially for the institutions with poor Information Communication Technology (ICT) resources. Over-all, there is a lack of clear guidelines for facilitating ICT and business objectives strategic processes in a diverse global educational system.

As the President of a highly-distinguished university, I learned how valuable it is to create and sustain an organizational environment by exhibiting governance in IT which is accessible, dynamic and systematic. IT governance is an element of university governance, a set of processes and structures to ensure efficient and effective use of IT in enabling an organization such as educational institutions to achieve its goals. As technologies have become more prevalent in the pandemic era, they have also appeared to be a double-edge sword: competitive advantage and sustainability, and a risk to manage cyber issues which have continued to flourish and cost-burdened university operations. These major challenges call for a more resilient IT governance model that speaks specifically to adopting ITG and university governance processes as well as to adapt to the evolving strategic environment and manage IT-related risk. The current and post-pandemic crisis has had its fair share in directing ITG "rooms for improvement".

COVID19 Challenges to University Information Technology Governance is written for key persons who are leaders of educational institutions such as chief executives or chief operating officers, university presidents, chancellors, provosts, deans,

chairpersons, IT governors, directors, strategic planning authorities, quality assurance officers, researchers, government officials and policy-makers in education to help them evaluate and compare their current methods of IT governance and systems in relation to the current and post-pandemic effects.

This book is a collection of research and methodically based articles from various internationally recognized authors who utilize their expertise in ITG, including their academic and operational experience as a basis of comparing and adapting previous and future proposed models. Findings from the studies mentioned in the chapters of this book can provide solutions for higher education sectors in planning and allocating ICT and university resources, managing ICT and other business projects, and aligning it with the university strategic and operational objectives which will be valuable for the current and after pandemic.

As you go through the entire book, you will learn about universities or organizations which excel in:

- Educating leaders in IT governance and how their role could be linked to university strategies and objectives.
- Using several assessments/evaluation tools to benchmark the current pandemic and post-pandemic ICT governance and to determine its effectiveness.
- Leveraging accurate assessment data as per the current system of targeted progress in ITG by multiple approaches.
- Precise analysis and understanding of cost-effective strategies and low-risk operations of ICT resources.

The book also contains what I have learned in more than thirty years as an educator, IT specialist and university governor with the support of highly-recognized authors in this field. This book includes several case studies, the best practices, comprehensive and empirical research, practical assessments as well as a variety of concrete models and tools to equip the reader during these times of the pandemic and post-pandemic era. I would like to deliver my knowledge, passion, and skills to readers to become one of the best university leaders, IT governors and policymakers who are acknowledged and well-respected by their peers as critical drivers of operational excellence.

It is evident that IT has played a major role in making this global pandemic a bearable one especially for the educational sector. People and businesses have embraced whatever IT offers and utilizes it to maintain a sense of normality during these uncertain times. Institutions of higher learning became highly dependent upon IT in this period. This is basically the reason why it is important to be accorded to IT governance. With this prevalent dependence on IT, ITG is no longer an option for educational institutions, but a necessity. With the continuously growing investments in technologies, organizations can no longer afford to have a weak IT governance framework. This book is very timely as the contributors of this book will also navigate throughout IT risk management strategies, strategic alignment, compliance, performance, leadership and communication. All of these are valuable frameworks to succeed in IT investments reducing the possibility of poor university performance and business failures.

Upon a thorough reading and understanding of the whole concept of the book, I wish I could provide the necessary knowledge and wisdom to the reader that the IT governance path during the pandemic and post-pandemic situation is reachable and reliable.

COVID19 Challenges to University Information Technology Governance that I feature in this book blends various research with real stories to reveal different mindsets, with measures and actions of the best IT governors and educators – along with the lessons learned during the pandemic collected for you, enthusiastic readers of this book. Whether we feel that we as a person and our institution could adjust with the new normal, whatever it takes, IT is here to stay and forever will be.

Manama, Bahrain Mansoor Alaali

Acknowledgment

I am indebted to so many people for helping to make this book happen.

The journey to imagine, develop, and compile this edited book, *COVID19 Challenges to University Information Technology Governance*, has been full of collaborative efforts. I would like to thank numerous people who have shaped the outcome of this book.

Thanks to all my colleagues at Ahlia University for their diligent support as team players, most especially, Prof. Abdulla Al Hawaj, a leading proponent of excellence in Higher Education in the Middle East and a leading thinker in this field.

I would like also like to acknowledge the extensive support of all the brilliant authors for their contributions and for their time and expertise to write chapters in this book. Many of them also took part in the review process as referees. Without spending their time and skills to write and evaluate, this book would not have become a reality.

Several others helped develop this book in important ways.

I want to give the strongest possible thanks for the foreword writing of Prof. Wathiq Mansoor, who is also an expert in the field of Information Governance.

Moreover, I would like to convey my heartfelt thanks to Dr. Esra Al Dhaen for her last-minute reviews and proofreading.

And lastly, I would like to thank Mr. Dennis Tongko for his systematic follow-up with all the contributors and reviewers and for managing the whole project. Many thanks to Ms. Elham Ahmed for her constant monitoring of the book development.

Ahlia University
Manama, Bahrain

Mansoor Alaali

Contents

Contributors

Satriyo Adhy Computer Science Department, Faculty of Science and Mathematics, Universitas Diiponegoro, Tembalang, Semarang, Indonesia

Elham Ahmed Ahlia University, Manama, Bahrain

Maytha AL-Ali Zayed University, Dubai, United Arab Emirates

Esra AlDhaen Ahlia University, Manama, Bahrain

Fatema AlDhaen University of Bradford, Bradford, UK

Amer Al-Roubaie Ahlia University, Manama, Bahrain

Mehdi Asgarkhani Ara Institute of Canterbury, Christchurch, New Zealand

Tshepo Chauke University of South Africa, Pretoria, South Africa

Weifeng Chen Brunel University London, Uxbridge, UK

Claude Doom Katholieke Universiteit Leuven, Leuven, Belgium

Luis M. Dos Santos Woosong University, Daejeon, South Korea

Sherif Elhennawy IT Auditing Consultant, Giza, Egypt

Hamada Elsaid Elmaasrawy Tanta University, Tanta, Egypt

Mohamed Gamal Faculty of Computers and Artificial Intelligence, Cairo University, Giza, Egypt

Muhamet Gërvalla University for Business and Technology, Pristina, Kosovo

Beatriz Gómez University of the Balearic Islands, Palma, Spain

Edmond Hajrizi University for Business and Technology, Pristina, Kosovo

Iman M. A. Helal Faculty of Computers and Artificial Intelligence, Cairo University, Giza, Egypt

Franz Huber Katholieke Universiteit Leuven, Leuven, Belgium

Carlos Juiz University of the Balearic Islands, Palma, Spain

Ching Ting Tany Kwee The University of New South, Sydney, UK
University of New South Wales, Sydney, NSW, Australia

Mohammed Mahmood Brunel University London, Uxbridge, UK

Adam Marks Higher Colleges of Technology, Abu Dhabi, United Arab Emirates

Dorien Martinet Katholieke Universiteit Leuven, Leuven, Belgium

Sherif A. Mazen Faculty of Computers and Artificial Intelligence, Cairo University, Giza, Egypt

Mpho Ngoepe University of South Africa, Pretoria, South Africa

Beta Noranita Computer Science Department, Faculty of Science and Mathematics, Universitas Diiponegoro, Tembalang, Semarang, Indonesia

Dinar Mutiara Kusumo Nugraheni Computer Science Department, Faculty of Science and Mathematics, Universitas Diiponegoro, Tembalang, Semarang, Indonesia

Andi Kurniawan Nugroho Electrical Engineering, Engineering Faculty, Universitas Semarang, Tlogosari, Semarang, Indonesia

Subhashini Bhaskaran Sailesh Ahlia University, PO, Manama, Kingdom of Bahrain

Luis Miguel Dos Santos Woosong University, Daejeon, South Korea

Adel Sarea Ahlia University, PO, Manama, Kingdom of Bahrain

Ghilan Al-Madhagy Taufiq-Hail University of Buraimi, Al Buraimi, Oman

Omar Ikbal Tawfik Dhofar University, Salalah, Oman

Konstantinos Tsilionis Katholieke Universiteit Leuven, Leuven, Belgium

Yves Wautelet Katholieke Universiteit Leuven, Leuven, Belgium

Evaluation of the Governance of IT at Universities: How to Assess Their IT Governance Maturity

Carlos Juiz and Beatriz Gómez

1 Introduction

Information technology (IT) is becoming an essential part of businesses and organizations and their boards expect to benefit from it. However, the results were not always what was expected and the board recognized the need for governing IT. IT governance[1] is no longer an option because directing and controlling your IT assets is better than ignoring them and fixing problems later. IT governance should be part of the corporate governance of every company including universities but unfortunately adopting practices for implementing good governance is still limited. To better align business needs and strategies with IT several frameworks mean trying to adopt practices to get more value from IT. In the particular case of universities, adoption is still scarce, a situation prominent in universities in developing countries. Although the standardization has provided solutions guidelines and frameworks for implementing IT governance in various fields, some knowledge is required before applying such existing frameworks.

COVID-19 has shown that university is increasingly depending on IT and therefore, changes in organization models, major disruptions of processes, and true digital transformations enabled only by new technologies, must be achieved quickly. For those reasons, IT must not only be managed but governed, i.e., good IT

[1] The terms Governance of IT and IT Governance are used interchangeably in this chapter, although in preference to Governance of IT since it is the one used for standardization.

C. Juiz (✉) · B. Gómez
University of the Balearic Islands, Palma, Spain
e-mail: cjuiz@uib.es

M. Alaali (ed.), *COVID-19 Challenges to University Information Technology Governance*, https://doi.org/10.1007/978-3-031-13351-0_1

governance and good IT management are essential (Piattini & Ruiz, 2020; Van Grembergen & De Haes, 2009).

Today's universities must survive in an environment full of volatility uncertainty complexity and ambiguity. Finding an organization capable of fully functioning in the event of a possible problem with its IT services is a daunting task. As a result, universities strive to invest significant capital in their IT assets to support their staff and other stakeholders to improve the effectiveness and efficiency of their IT operations and resources, as well as maintain corporate sustainability (Nolan & McFarlan, 2005; Van Grembergen et al., 2004; Weill & Ross, 2004).

However, investments in information technology may not have the expected impact on learning outcomes or tangible research benefits. The importance a university places on IT should not be reflected in isolation and cost alone but as an integral part of a university's competitiveness strategy. Universities need to consider whether their IT capabilities improve their competitiveness in their research and learning processes and whether their IT investment goals are seen as a strategic priority, whether they are using IT effectively according to the governing body strategy and board members should be aware of their responsibilities, relating to direction and control of IT or what is delegated to IT managers and if IT projects are sustainable and produce the expected results, among other controls; in short, whether the organization is achieving acceptable value for its IT investments (Fernández et al., 2022).

The purpose of this chapter is to assist boards, rectors, presidents and delegated committees, and other key stakeholders in assessing the capability and maturity of the arrangements for the governance of IT in the universities as Higher Education Institutions (HEIs).

The chapter provides an objective approach for determining whether the university is appropriately governing IT, as well as examples of the practices, pieces of evidence, and beneficial outcomes of the good governance of IT. The results of the assessment[2] can be used to assist the University authorities to determine where and how the governance of IT can be improved in its organization. To summarize, this chapter helps to plan and conduct an evaluation of universities' governance of IT.

The chapter is organized as follows: first, it is reviewed the concepts, definitions and standardization and the benefits of governing IT at any organization or company; second, it is presented the assessment of the governance of IT considering the family of standards ISO/IEC 38500; third, the experiences in IT governance are focused on Universities; fourth, the evaluation of IT governance for universities is presented as an adaptation of the assessment method of the ISO/IEC 38500 standard (this is possible since the corresponding author is also one co-editor of the ISO/IEC 38503 standard) and fifth, some of the IT governance evaluation approaches at Universities are reminded with special attention in the ITG4U projects implemented

[2] The terms *evaluation* and *assessment* and derivates are used interchangeably in this chapter, although in preference to *assessment* since it is the one used for standardization.

in almost 30 universities in Spain, Tunisia and Albania; and finally, the solutions, recommendations, future research and conclusions are presented.

2 Governance of IT: Concepts, Definitions, Standardization and Benefits

According to the governance of IT standard, ISO/IEC 38500 (2015, p. 5), IT governance is a component of corporate/organizational governance, and is a "system by which the current and future use of IT is directed and controlled". Venkatraman et al. (1993, p. 141) indicated that IT governance is the "selection and use of mechanisms for obtaining the required IT competencies." Other authors focused on IT governance on authority and responsibility for IT decisions: "IT governance arrangements refers to the patterns of authority for key IT activities in business firms, including IT infrastructure, IT use, and project management" (Sambamurthy & Zmud, 1999, p. 261), "IT governance extends the board's mission of defining strategic direction and ensuring that objectives are met, risks are managed, and resources are used responsibly" (Guldentops, 2002, p. 116), "IT governance describes the distribution of IT decision-making rights and responsibilities among different stakeholders, and the procedures and mechanisms for making and monitoring strategic decisions regarding IT." (Peterson, 2004, p. 7).

All these definitions indicate that good corporate IT governance has a direct implication in the alignment of business objectives with IT objectives. IT must be oriented to achieve institutional objectives, i.e., a strategic role must be assigned to IT. Because IT is becoming an essential part of the business and the board is expecting to obtain value from it, IT must not be a mere support tool for users. Thus, IT only increases the performance of those organizations that can govern them adequately (Weill & Ross, 2004).

IT governance is no longer an option; The results did not always live up to expectations and the board recognized the need to manage IT y paying more attention to directing and better controlling its IT assets (Juiz & Toomey, 2015).

The concept of IT governance has evolved as has its definition in an attempt to incorporate the new visions and models explained above. The concept of IT governance is not new as it has attracted interest since the 1960s although it was only in the late 1990s that it began to be known by this name (Sambamurthy & Zmud, 1999). Although the different authors have provided solutions guidelines and frameworks for implementing IT governance in different fields the definition of IT governance is generally very complex because there is no consensus on the terminology used. Terms used or their interpretation because it is a topic handled y experts from different fields: auditing strategic planning systems management, security, risk, etc. (Piattini & Ruiz, 2020). Table 1 presents a shortlist of definitions of IT governance.

Table 1 Some IT governance definitions

Authors	Definitions
Henderson & Venkatraman (1993)	IT Governance is the selection and use of mechanisms, e.g., joint ventures with vendors, strategic alliances, joint R&D for new IT capabilities, etc. for obtaining the required IT competencies. All of this is analogous to *business governance* which involves 'make-versus-buy' choices in *business strategy*. Such choices cover a complex array of *inter-firm relationships*, such as strategic alliances, joint ventures, marketing exchange, joint R&D, and technology licensing.
Sambamurthy and Zmud (1999)	IT governance arrangements refer to the *patterns of authority for key IT activities* in business firms, including IT infrastructure, IT use, and project management. Modes of IT governance: Centralized, decentralized, and federal mode. They do not provide an IT governance definition; they assume the concept is known by the lector.
Luftman (2000)	How the *authority* for resources, risk, conflict resolution, and responsibility for IT is *shared* among business partners, IT management, and service providers. Project selection and prioritization issues are also included here. Ensuring that the appropriate business and IT participants formally *discuss and review the priorities and allocation of IT resources* is among the most important enablers/inhibitors of *alignment*. This decision-making authority needs to be clearly defined.
Kearns and Lederer (2003)	The source of competitive advantage is superior management processes and knowledge, not technology per se. Knowledge sharing enhances organizational knowledge. Thus, CIOs engagement in business planning and focus on the *optimal matching of IT resources* will better *support business strategies* and ensure that business strategies properly reflect the IT role. CEOs engagement in IT planning will ensure the *maximum return from IT* and realize its *strategic value*.
Dahlberg and Kivijärvi (2006), ITGI (2003)	IT governance is the responsibility of the board of directors and executive management. It is an integral part of enterprise governance and consists of the leadership and organizational structures and processes that ensure that the organization's IT sustains and extends the organization's strategies and objectives.
Peterson (2004)	IT Governance describes (a) the *distribution of IT decision-making rights and responsibilities* among different stakeholders in the organization, and (b) the rules and procedures for making and *monitoring decisions on strategic IT concerns*. IT Governance thus specifies the *structure and processes* through which the *organization's IT objectives are set*, and the means of attaining those objectives and monitoring performance.
Weill and Ross (2004)	IT governance is the framework for the *specification of decision rights and responsibilities* to promote *desirable behavior in the use of IT*.
Calder (2005)	IT governance is a framework for *leadership, organizational structures and business processes*, standards, and compliance with these standards, which ensures that the organization's IT *supports and enables* it to achieve its *strategies and objectives*.
Nolan and McFarlan (2005)	IT governance is the *responsibility of boards* that set structures like IT committees to *make IT decisions*, assign duties, develop policies considering the organization's operational and *strategic needs*, *avoid risks*, and *improve its competitive position*.

(continued)

Table 1 (continued)

Authors	Definitions
Sledgianowski and Luftman (2005)	IT governance is the choice organizations make when *allocating decision rights* for IT activities such as selecting and prioritizing projects, *assuming ownership* of technology, and *controlling budgets and IT investments*.
Webb et al. (2006)	IT Governance is the *strategic alignment of IT with the business* such that maximum *business value is achieved* through the development and maintenance of *effective IT control* and accountability, performance management and risk management.
Silvius (2007)	The IT governance criteria should include *business strategic planning*, *IT strategic planning*, *reporting* to organization *structures*, *budgetary control*, IT investment management, steering committee(s), and prioritization processes.
Simonsson and Johnson (2008)	Effective IT governance provides *mechanisms* that enable IS/IT management to develop integrated *business and IT plans*, allocate *responsibilities*, and prioritize IT initiatives
Van Grembergen and De Haes (2009)	Enterprise Governance of IT is an *integral part of corporate governance* and addresses the definition and implementation of *processes*, *structures* and *relational mechanisms* in the organization that enable both business and IT people to execute their responsibilities in support of *business-IT alignment* and the creation of *business value from IT-enabled business investments*.
Prasad et al. (2012)	IT governance essentially places structure around how the organization's IT strategy aligns with business strategy. This *IT-business alignment* will ensure that organizations continue to *achieve their strategies* and goals and implement ways to *evaluate their performance*. One special aspect of IT governance is that it considers the *interests of all stakeholders* and ensures that processes provide measurable results
Saetang and Haider (2012)	IT governance provides better IT support to organizations robustly in *achieving business objectives*, optimizing business in IT investment, managing opportunities, and mitigating IT-related risks.
Zarvić et al. (2012)	IT governance steers the use of IT within a company. IT governance is about *controlling the strategic impact of IT* and its *value delivery* to the business.
Vogt and Hales (2013)	IT governance in public organizations is the responsibility of political or public representatives, executive managers, and IT managers of these institutions or political structures. It is an integrated part of their responsibility towards society and political directives to ensure the *reasonable, effective, and efficient use of IT to support public goals and interests*.
Juiz and Toomey (2015)	IT governance is a *board and top-executive responsibility* focusing on *business performance and capability*, not on technical details. A *principles-based approach* to IT governance, as described in the ISO/IEC 38500 standard, is consistent with broader models for the guidance of the governance of organizations and access to business leaders without specific technical skills.

(continued)

Table 1 (continued)

Authors	Definitions
Selig (2016)	IT governance formalizes and clarifies the *allocation of responsibilities and decision rights* for a wide range of IT strategy, integration, resource, and control activities. It is a collection of review policies, practices, and management, planning and performance processes with associated decision rights, which establish authority, sponsorship, controls, a baseline and performance metrics on investments, plans, budget, commitments, services, major changes, security, privacy, business continuity, risk assessment, and compliance with laws and organizational policies.
ISO/IEC 38500 (2015)	IT governance is the system by which the *current and future use of IT is directed and controlled*.
Cervone (2017)	IT governance is a repeatable, rational process to collect ideas, select *projects* and prioritize the implementation of these ideas and projects.
COBIT 2019 (ISACA, 2018)	IT governance is interested in the *delivery of value* derived from digital transformation and the *mitigation of the business damage* that results from such digital transformation.
Parry and Lind (2018)	IT governance is the process organizations utilize to prudently organize their *IT investments* in a way to guarantee that funding of programs, projects or operations is *accomplished most efficiently*. IT governance deals with IT investments as well as *who decides on these investments* in an organization.

According to Table 1, IT governance includes different issues to different experts, e.g., locus of authority, business-IT alignment, IT support business strategy, maximum return from IT and business value creator, decision rights, risks control, prioritization and justification of IT investments, accountability, performance evaluation, etc. Definitions highlight different aspects depending on the researcher's profile, e.g., business, IT, information systems (IS), risks, audit, etc., but most of them are more focused on processes, structure, and strategy than the behavioral part of good governance (Juiz & Toomey, 2015). Fortunately, since 2008 there is an international standard for the governance of IT.

2.1 IT governance Standardization

The IT governance standard ISOIEC 38500 was the first international standard to provide differentiated guidance on IT governance. The standard was introduced in 2008 based on the 2005 Australian standard AS8015 (Toomey, 2009), revised later in 2015, and now ISO plans to prepare the third publication in the next few years. This standard is the development and consolidation of most of the authors and researchers in IT governance shown in Table 1. The standard model is based on the need to standardize best practices and behaviours in governing the current and future use of IT in any organization regardless of its environment, and what mechanisms or frameworks they have adopted. Different organizations may adopt different approaches under ISOIEC 38500 and therefore governance frameworks may

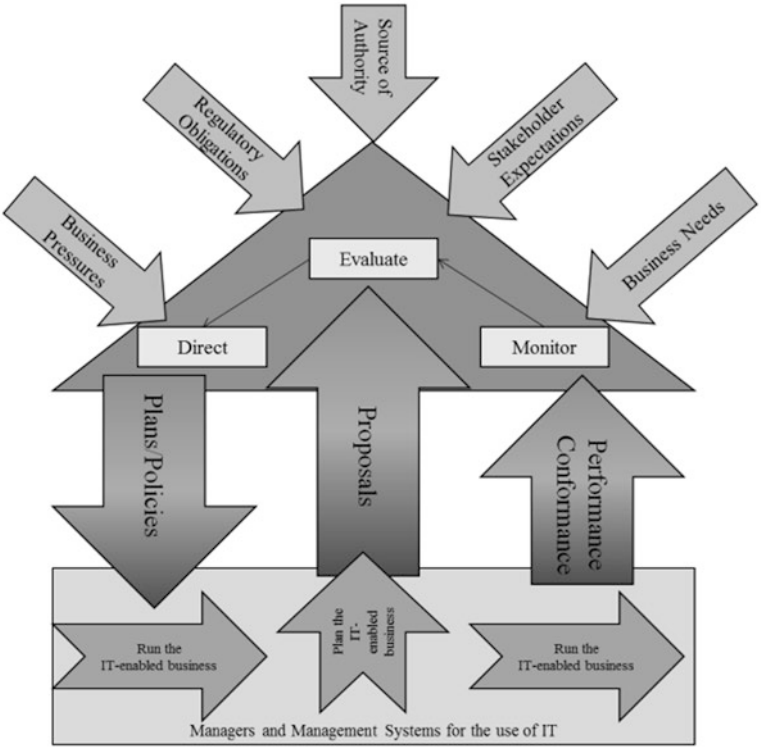


Fig. 1 IT Governance model on the ISO/IEC 38500 standard. (Source: Juiz and Toomey 2015)

differ in design between different organizations (Juiz, 2011). In fact, for a long time, some organizations have confused IT governance with IT management. This error can be attributed to the blurred line between governance and management and has thus caused some de facto IT management standards to attempt to include certain governance mechanisms (Toomey, 2009). The conceptual model of IT governance is shown in Fig. 1.

Therefore ISO/IEC 38500 is built on good governance practices providing a smooth and transparent communication structure between governance and management (Juiz and Gómez, 2021). These practices are based on three main tasks (Toomey, 2009):

- **Evaluate:** to examine and judge the present and future use of IT, including strategies, proposals, and supply agreements (internal and external).
- **Direct:** directing the preparation and implementation of plans and policies and assigning responsibilities to the purpose. Ensure the correct transition of projects to production, considering the impacts on the operation, business, and infrastructure. Promote a culture of good governance of IT in the organization.

- **Monitor:** through measurement systems, monitoring the performance of IT and also the conformance of IT, ensuring that is adjusted to plans, norms, rules and regulations.

The goal of ISO/IEC 38500 is to maintain the flow of communication that forms between the IT management and operations layers when performing these three tasks. The governing board should direct evaluate and monitor IT management concerning the organization's use of IT establish policy and strategy and monitor management implementation and compliance with the rules and regulations. Regulation (Juiz & Toomey, 2015). However, some aspects of these duties are delegated to IT managers while the board ensures that responsibility is properly delegated and dedicates certain aspects such as evaluation, and approving strategy and investment decisions, defining IT usage policies and its formal oversight, ensuring that complete and reliable information is available. Thus, the standard is addressed not only to the governing body and administrators of the organization but also to managers as well as other internal and external partners involved.

In addition, the ISO/IEC 38500 standard defines six general principles of IT governance which represent desirable behaviour to guide IT decision-making.

These six general principles are:

1. **Responsibility:** all members of the organization must understand and accept their responsibilities in both the supply of and demand for IT. Responsibility for actions carries with it the authority to implement those actions.
2. **Strategy:** the business strategy of the organization considers the current and future capabilities of IT. IT strategic plans meet current and projected needs derived from the business strategy.
3. **Acquisition:** IT acquisitions are made for valid reasons based on an appropriate and ongoing analysis, with clear and transparent decisions. There is an appropriate balance among benefits, opportunities, costs, and risks in both the short and long term.
4. **Performance:** IT is dimensioned to support the organization, providing services with adequate quality to meet current and future needs.
5. **Conformance:** IT function complies with all applicable laws and regulations. Policies and practices in this regard are clearly defined, implemented, and required.
6. **Human behavior:** IT policies, practices and decisions demonstrate respect for human behavior, including the current and emerging needs of all people involved.

By following three tasks and six principles the standard applies to any organization i.e. the standard has been designed in such a way that it can be applied by any organization regardless of the type, shape or size of that organization, including universities. For this reason, it does not guide specific processes to be performed, controls to be implemented, or structures or even roles to be defined. Thus, standard presents both opportunities and burdens; the ability to freely apply what works best for each organization assuming that there are mechanisms in place that would facilitate IT governance (if the organization were to follow those mechanisms) and the burden of

setting them up, design and define a specific IT governance approach for each organization.

In this sense the activity of a governance body to direct and control IT activities and to build decision-making models combined with the activity of an IT management structure to develop and support systems processes and procedures reflected in the development of the IT Governance Framework (Holt, 2013). However, as mentioned above, the line between IT governance and IT management are blurred leading to some concepts that share aspects. On the one hand IT governance is the direction and control of IT-related activities in an organization and oversees all IT matters (Juiz, 2011). On the other hand, from an IT governance perspective, IT management is mainly about implementing policies processes and procedures building projects and maintaining services (Juiz et al., 2018).

But the IT management practices in building and supporting IT assets are based on the process approach popularized by Deming i.e. the Plan-Do-Check-Act (PDCA) cycle. As a result management standards and best practices are determined based on this iteration which runs the cycle over and over again and further expands management knowledge.

However, IT governance activities are different as the governing body is responsible and accountable for strategic direction (Direct) evaluation of business-oriented proposals in IT governance (ISO/IEC 38500, 2015). In ISO/IEC 38500 the governing body is supposed to require IT managers to define processes and procedures for planning building and managing an IT-based organization and implement it, perform actions under the direction of the governing body but at the same time under the control of the governing body. This implicit nature of the relationship between IT governance and IT management in standardization can cause misunderstandings about "who is responsible for what" and "why". But IT governance when implemented has got returns not reached with only managing IT.

2.2 Benefits of Governing IT

In all cases, IT governance involves appropriate behaviours on the part of the governance body and management to create and maintain a governance framework for the use of IT that delivers the most lasting value, consistent with stakeholder expectations including (ISO/IEC 38503, 2022):

- continuous innovation in services markets and business;
- clear accountability and responsibility for both IT supply and demand in achieving the organization's strategic goals;
- ensuring business continuity and sustainability through IT;
- realize the expected return of each IT investment;
- comply with relevant obligations (regulatory, legislative, common law, and contractual);
- effectively control IT risk management;

- constructive relationship and effective communication between the business and IT management as well as with external partners.

All of these benefits are realized when the IT governance framework is fully implemented and enforced within the terms of the assessment as further explained in the following assessment section.

3 Assessment of the Governance of IT

Even though there are one *de facto* framework and one *de jure* standard, COBIT 2019 (2018) and ISO/IEC 38500 (2015), respectively, it seems that organizations are still dealing with the implementation of IT governance from the scratch. According to Piattini and Ruiz (2020), the great challenge of IT governance is still the alignment of business processes with IT, and it is not fully solved. The difficulties that organizations have in implementing IT governance may be due to several causes, which are extensible to universities (see Table 1):

- There are many definitions of what IT governance is and how is it different from IT management, each with different approaches (Ko & Fink, 2010; Robb & Parent, 2009).
- It seems that there are more popular topics/concepts in the definitions depending on the interests or needs of the author/researcher, showing no consensus (Robb & Parent, 2009).
- Several empirical studies show the theory-practice gap in implementing IT governance in organizations (Buchwald et al., 2014; De Maere & De Haes, 2017; Smits & Van Hillegersberg, 2018; Teo et al., 2013b).
- Some barriers to the implementation of IT governance are related to social aspects such as lack of communication between IT governance and IT management (Juiz et al., 2019a), lack of understanding and trust, and different executives' perceptions of IT business value (Buchwald et al., 2014; Parry & Lind, 2018; Phiri & Weiguo, 2013; Rahimi et al., 2016; Teo et al., 2013a; Yudatama et al., 2017).

Problems in IT governance are not particular to a given country or continent. IT governance artefacts can be common in almost all countries in the world. Organizations can experience a wide variety of challenges, which can prevent them from achieving the desired outcomes from their efforts at governing IT (ISO/IEC 38503, 2022), including:

- the governing body and executive managers delegating the responsibility for the governance of IT to those responsible for implementing technology;
- the lack of policies and frameworks clarifying the relationship between the governance of IT and management of IT;
- dependence on organizational processes, rather than effective decision making, appropriate behaviours, proper communication and suitable human interactions;

- difficulty monitoring and measuring behaviours and expected outcomes, including:
  - ensuring that IT objectives are aligned to the organization's purpose and objectives;
  - ensuring that IT risks are known and mitigated;
  - stewardship of enterprise assets, resources and continuity planning;
  - conformance by the organization with established and expected norms of behaviour;
  - holding IT accountable for the delivery of services and solutions;
  - evolution of business models through the use of information and the adoption of new technologies.

Therefore, to evaluate the level o maturity of the IT governance in an organization, the governing body shall define the scope and requirements and objectives of the assessment. The governing body shall also identify those stakeholders which require, or might benefit from, the results of an assessment of the governance of IT. For these stakeholders, the needs and expectations shall be taken into consideration when designing the assessment.

In establishing the scope, focus and priority of the assessment, consideration shall be given to evaluating issues of the highest importance to the organization to achieve the greatest benefits and not waste resources. This can take into account the level of operational reliance on IT, the existence of assurance inputs, as well as any specific strategic initiatives of importance and priority to the organization.

Table 2 shows areas related to the implementation of governance of IT, as described in ISO/IEC TS 38501, that shall be considered when defining the scope of the assessment.

Thus, observing the implementation model of the standard, there are three main areas of the implementation of the governance of IT: establishing and sustaining

Table 2 Areas for implementation of the governance of IT

Establishing/Sustain the enabling environment	Govern IT	Continual review
Goals and objectives of governance of IT	governance steering group	Improvement in value derived from IT
Understanding of stakeholders, roles and responsibilities	Internal and external environment	Management of risks associated with IT
Stakeholder engagement	Articulation of current and desired states and beneficial outcomes	Additional governance actions required
Delegation of authority	Monitoring capability and identification of evidence of success	
	Change programme	
	Application of the six principles and EDM model	

Source: ISO/IEC 38503 (2022)

enabling environment, the action of governing IT and finally, reviewing continually the IT governance framework (ISO/IEC 38503, 2022). Eventually, all three areas may be considered by the evaluation process.

It is important, therefore, for organizations to adopt a structured method to assess whether their governance of IT arrangements is achieving the desired outcomes and the key benefits (ISO/IEC 38503, 2022), including:

- assisting with the development of the framework for the governance of IT;
- determining the strengths and weaknesses of the current governance of IT capability;
- helping to determine improvement actions that need to be taken;
- improving the levels of engagement between executive managers and the governing body as regards expectations and outcomes related to the governance of IT;
- creating awareness in the governing body of their roles and responsibilities as regards the governance of IT;
- assisting organizations with IT conformance;
- providing feedback to the governance stakeholders and support staff.

4 IT Governance in Universities

Higher Education Institutions (HEIs) are a key element in the modernization of society for the fundamental teaching and learning process that allows the dissemination of the most advanced knowledge to students and for the research function of the university. It focuses on creating knowledge which is the basis for solving problems of companies and organizations (Brooks, 2005).

IT has long been just a tool in universities, but the role of technology in higher education is focusing on the following aspects: cost management, online learning, financial health, affordability and digital equity, information security, student success, equitable access to education, institutional culture, technology alignment, technology strategy, and enrollment and recruitment (Grajek, 2020).

The higher education sector is not a pioneer in implementing IT governance solutions. Although the first signs of interest in IT governance stem from the strategic alignment model of Henderson and Venkatraman (1993). Although, the use of IT in universities increased their interest was mainly focused on effective management of their technology resources, as a fundamental support for the rest of the university‘s services.

Therefore, in general, universities carried out IT governance implementation initiatives on their own. For example, some American universities used COBIT to implement an IT governance model, such as South Louisiana Community College (Council, 2006). Other universities designed their own IT governance models based on the literature. Thus, the University of California included in its IT Strategic Plan elements of an IT governance model (University XE "Universities" of California, 2008); Ridley (2006) proposed an IT governance model for the University of Guelph

based on Weill and Ross (2004); and in South Africa, Pretorius (2006) designed a model for Petroria University. In Canada, the University XE "Universities" of Calgary (2007) designed their model which only applied to the administration area and included the design of an architecture based on the creation of several committees, the assignment of responsibilities and roles related to IT, risk management, and the use of an excellent methodology for project management. In U.K. Coen and Kelly (2007) designed a benchmark model (JISC, 2007b) and a self-assessment toolkit (JISC, 2007a) that helped universities to clarify the complex tangle of governance-related elements of their information systems. In fact, the JISC model inspired the ITG4U model applied in Spanish universities (Fernández, 2009; Fernández et al., 2011, 2012; Fernández & Llorens, 2009; Llorens & Fernández, 2008). It is worth highlighting the Australian higher education institutions, where several of them have implemented IT corporate governance systems (Bhattacharjya & Chang, 2006, 2007).

Meanwhile, McCredie (2006) proposed starting IT governance implementations by promoting the IT manager (CIO). The CIO had to move from dealing only with technical issues to gaining presence in the strategic planning of the institution. He also stated that if the university did not have an IT manager, they had to create one, and if they did have one already, but did not deal with strategic issues, they had to redefine such a role to do so. Furthermore, according to Yanosky and McCredie (2007) and Yanosky and Borreson Caruso (2008) studies, two-thirds of universities had created a high-level committee (IT Steering Committee) that oversaw the organization's IT policies and initiatives, but only 22% of universities had a subcommittee of the Steering Committee dedicated to designing IT strategy and policies.

Since then and to date, numerous studies have focused on the concept of IT governance applied to the university and higher education sector, highlighting various aspects, e.g., security issues (Kwon, 2008; Liu et al., 2020), business-IT alignment (Martins et al., 2009; Seman & Salim, 2013) through IT project portfolio (Juiz, 2011; Juiz et al., 2012; Ngqondi & Mauwa, 2020; Valverde-Alulema & Llorens-Largo, 2019) or using BSCs (Jairak & Praneetpolgrang, 2013), best practices guidelines and processes (Caetano Borges & Sanches Miani, 2018; Hicks et al., 2010; Juiz et al., 2014; Knahl, 2013), theory-practice gaps (Ko & Fink, 2010), methods and maturity models (Bianchi & Sousa, 2015; Hontoria et al., 2011; Kosasi et al., 2017; Montenegro & Flores, 2015; Pereira et al., 2018; Putri & Surendro, 2015; Subsermsri et al., 2015; Torres Bermúdez et al., 2014; Valencia-García et al., 2013), standard and frameworks adoption (Erfurth & Erfurth, 2014; Gerl et al., 2021; Gómez et al., 2017; Juiz et al., 2014; Khther & Othman, 2013; Musa et al., 2014; Nugroho, 2014; Nugroho & Surendro, 2013; Rijati et al., 2017; Sabatini et al., 2017; Serrano et al., 2017; Valencia-García et al., 2014; Valverde-Alulema, Mejia-Madrid, & Meza-Bolaños, 2017), and its mechanisms (Bianchi et al. 2017a, b; Bianchi et al., 2021), among others. Furthermore, several systematic literature reviews (SLRs) were developed focusing on some of the abovementioned aspects applied to HEIs.

On the one hand, Khouja et al. (2018) provided an overview of the state of the art of IT governance in HEIs. They analyzed 49 studies about IT governance implementations from 23 countries, where Australia, Indonesia, Malaysia, Thailand, the

U.S., and Canada presented the most results. The literature review showed differences among the IT governance situations: several countries had the support of the top-level government with regulatory frameworks and laws about introducing IT governance in higher education institutions, such as Ecuador, South Africa, or the U.K.; others focused on the spread of IT governance culture, e.g., the U.S., Australia, or Malaysia. The study also showed non-consensus on the IT governance framework or standard used as the institutions implemented solutions based on COBIT, ISO/IEC 38500, or their framework. However, what they had in common as best practices were establishing a committee structure for IT assets, establishing effective communication among IT (Juiz et al., 2019b), the business, and the involved stakeholders, achieving institution-IT strategy alignment, and using a balanced scorecard as a monitoring and measuring model.

On the other hand, Kajo-Meçe et al. (2020) investigated the overall adoption of IT governance frameworks in HEIs, providing a deep insight into the level of integration of IT governance in universities worldwide. They analyzed 40 studies from 23 countries where Australia and Malaysia presented the most results. They noticed that the adoption of IT governance frameworks was still scarce as most universities were evaluating their IT governance maturity level before proposing a framework adoption, while others were facing challenges in implementing them, such as resistance to change and communication issues among parties. Although COBIT was the most adopted framework by the analyzed HEIs, most of them preferred to build their framework. Nevertheless, the benefits reported were improved quality of service and user satisfaction, and better alignment of IT investments with the university‘s business goals.

According to Buchwald et al. (2014) practitioners have difficulties in understanding IT governance and thus managers resist being governed. Such a situation gets worse in developing countries as they are facing several challenges implementing IT solutions. Because they are less mature in IT aspects, they are also less mature regarding IT governance concepts and importance, while they are struggling to be competitive in the higher education sector (Aasi et al., 2017, p. 14).

As explained before, providing a unique definition of IT governance is difficult due to the differences in perceptions of IT governance objectives, properties, and responsibilities. The available IT governance recommendations and guidelines are diversified and, in some cases, based on lengthy and complicated methods (Bin-Abbas & Bakry, 2014). For this reason, among others, specific models in emerging countries have been developed, instead of directly adopting the existing ones. For example, in Thailand, Jairak and Praneetpolgrang (2011) studied the state of IT governance in Thai HEIs revealing their universities were in an initial stage and their IT executives were not familiar with the IT governance principles. Afterwards, they implemented several initiatives to improve their IT governance situation by using BSCs (Jairak & Praneetpolgrang, 2013), and a set of IT governance best practices based on the ISO/IEC 38500 standard (Subsermsri et al., 2015). Similarly, in Malaysia, Seman and Salim (2013) developed a business-IT alignment model for their public universities, while Ahlan et al. provided an IT governance decision-making support framework (Ahlan et al., 2014; Arshad et al., 2014). Furthermore,

Musa et al. (2014) presented their own IT governance framework applied to a Malaysian HEI. More recently, Mukhlas et al. (2017) studied the IT governance maturity in Malaysian HEIs to identify and address areas of improvement, and Liew et al. (2018) identified challenges and barriers faced in IT governance implementations such as lacking IT governance awareness and support from the board.

In Brazil, Bianchi and Sousa proposed an IT governance model and IT governance frameworks adapted to HEIs (Bianchi & Sousa, 2015, 2018), a study about IT governance structures archetypes appropriacy for HEIs (Bianchi, Sousa, Pereira, & Luciano, 2017b), and how culture affects IT governance mechanisms in HEIs (Bianchi et al., 2019). Zaneti-Putz et al. (2017) provided an overview of the IT governance in Brazilian HEIs focusing on its strategic alignment and its developed actions in identifying threats and opportunities. Caetano Borges and Sanches Miani (2018) identified IT governance best practices implemented in Brazilian HEIs while several authors assessed its state showing a lack of business-IT alignment (R. S. Almeida & de Souza, 2019), IT services portfolio not supporting the business (Ceratti et al., 2019), and lack of adoption and communication absence between IT and the organizational management (Franklin Frogeri et al., 2020). Otherwise, in Ecuador, researchers and practitioners focused on IT governance models and frameworks, including its assessment, based on COBIT and the ISO/IEC 38500 standard (Espinoza-Aguirre & Pillo-Guanoluisa, 2018; Montenegro & Flores, 2015; Valverde-Alulema et al., 2017; Zambrano-Vera & Molina-Sabando, 2017), while in Indonesia, researchers assessed their IT governance state using the ISO/IEC 38500 standard (Putri & Surendro, 2015) and COBIT (Kosasi et al., 2017, 2019; Sabatini et al., 2017; Wijayanti et al., 2017), and provided strategy alignment models based on BSCs (Herdiansyah et al., 2014) and on both the ISO/IEC 38500 standard and COBIT (Rijati et al., 2017). Some efforts of alignment and COBIT implementation were developed in Morocco (Ahriz et al. 2018a, b), Egypt (El-Morshedy et al., 2014), and Brunei (Seyal et al., 2016). Furthermore, studies about the IT governance situation were developed in Colombia (Marulanda Echeverry et al., 2017), Ghana (Yaokumah et al., 2015), and Mexico (Castañeda De Leon et al., 2018). Although interest in IT governance in developing countries' HEIs is growing, the state of their practices and frameworks is still in incipient phases, as highlighted by Kajo-Meçe et al. (2020) in their systematic mapping review.

5 Evaluation of IT Governance in Universities

IT is not only a very important aspect for organizations and enterprises as it plays a very important role in business activities but also a competitive element and of wide social impact. In this sense, universities do not fall behind, because, in their three main activities, i.e., teaching, research, and administration, IT is present and most needed. Recently, not only managing but also governing IT is getting attention from the practitioner and research sides, given the need to align the organization's strategy and objectives with IT. IT governance helps to set clear expectations, gain

participation, open communications, establish accountability and provide executive management oversight. Furthermore, IT governance and the alignment with business strategy in HEIs are gaining importance (Khouja et al., 2018).

However, special needs in the deployment of IT governance frameworks are purely local (i.e., dependent on the university teaching portfolio, the ownership of the HEI, the level of knowledge on the topic, the local governance rules, the governance culture, etc.). For this reason, already implemented approaches in IT governance for universities in developed countries can be used as inspiration for a "Glocal" initiative. Previous success case studies and current competence on the topic will lead to a better IT governance setup.

5.1 Early Signs of Not Governing IT at Universities

When governing of IT is not even considered at universities several problems are common in these institutions as observed by several practitioners implementing IT governance frameworks from the scratch (Gómez et al., 2017):

- **No IT governance process, structure, or communication:** Governance of IT does not exist at all and either the board or the IT staff is not aware of its necessity. Thus, no process for controlling the IT staff from the board is ever implemented formally. The result of this absence of a control process means having no regular agenda for directing or controlling the IT management. There is not any structure or committee to communicate the board strategy, either.
- **Outsized power of IT management in IT decision-making:** The consequence of no control over the IT staff is the outsized power of the IT function in the institution, e.g. the IT department negotiates the project portfolio directly with the stakeholders and the IT investments with the CFO.
- **CIO and CTO roles not clarified:** Since IT managers may be acting as CIO and CTO, the creation of the CIO office (as a brand new governing structure) usually provokes fighting in a turf battle between the CIO and the IT managers.
- **Absence of reporting, control and accountability:** Since there is no formal communication for the IT-business alignment from the board, the IT function remains uncontrolled and then there is no motivation for IT staff for building accountability processes, either.
- **Lack of confidence in IT assets and IT staff by the board:** The absence of formal and proper communication between the board and the IT staff always causes low confidence from board members in any situation in which IT assets are involved. Every activity of the IT department is ever under the suspicion of bad performance from the board viewpoint.
- **No strategy for IT, just short-term tactics:** Due to the lack of communication and confidence from the board to the IT department, the latter implements its vision of IT assets, resulting in biased decisions about the IT deployment at the institution.

- **IT investment based on cash-flow availability for infrastructure:** IT management spends most of the time fighting for money with the CFO or other stakeholders with their own IT budget.
- **The architecture of data and processes decisions are based on IT staff knowledge, neither user interests nor institutional strategy is considered:** Architecture decisions are usually delegated to IT managers, but these decisions must be supervised and controlled by superior layers of the organization.
- **No consideration for compliance, just defensive tactics based on technical issues:** IT department may be usually concerned with conformance issues, but only as a defensive argument in new projects or services demanded by the institution stakeholders.
- **No participation by users, business units, board members or any stakeholder in IT-related decisions in strategic project portfolio and prioritization.** The project management and governance methodology are based on ad hoc processes and decisions without using any kind of standardization for the stakeholders' participation in projects. Thus, sponsors of the projects together with IT staff decide on a biased direction of the IT innovation instead of implementing a general strategy.
- **Communication with stakeholders by demand or by claim:** The communication of IT staff with the stakeholders is reactive and defensive. Firefighting activity in the IT department remains the busiest task for the IT function, leaving no time for tactics and even less for strategy issues.
- **Non-IT departments view the IT staff as an obstacle to their mission:** The reactive communication and the absence of control of the IT staff collaborate on seeing them as sidelined employees from the institution's concerns.

These are just some examples of the situations encountered in the author's experience coordinating several EU projects of IT governance for universities in several countries and his own experience as a practitioner and researcher about the governance of IT.

5.2 How to Assess the IT Governance at Universities

To be able to evaluate the governance of IT in Universities, the model foreseen by the ISO/IEC 38500 standard should be followed, adapting it to this type of educational and research organization. The governance of IT practice areas represents the key areas of focus for the organization when effectively governing IT. Seven practice areas have been identified, with the first being derived from ISO/IEC TS 38501 and ISO/IEC TR 38502. The other six practice areas are derived from the six principles in ISO/IEC 38500. The governance of IT practice areas represents the key areas of focus for the organization when effectively governing IT. Thus, seven practice areas have been identified, with the first being derived from ISO/IEC TS 38501

and ISO/IEC TR 38502. Examples of *what* to be evaluated in any practice area should be:

- **Enabling mechanisms**: the governing body at the University monitors those appropriate mechanisms for governance of IT are established and regularly evaluates the organization's internal conformance to its framework for the governance of IT.
- **Responsibility**: the governing body at the University directs that plans should be carried out according to the assigned IT responsibilities, monitors the performance of those given responsibility in the governance of IT (for example, those people serving on steering committees or presenting proposals to the Univerity governing body and evaluates the options for assigning responsibilities in respect of the organization's current and future use of IT.
- **Strategy**: The governing body at the University evaluates options for assuring effective, timely decisions about the use of IT in support of business goals, directs the preparation and use of strategies and policies that ensure the organization benefits from developments in IT and monitors the extent to which IT supports the business.
- **Acquisition**: The governing body at the University evaluates options for providing IT to realize approved proposals, balancing risks and value for the cost of proposed investments, monitors the extent to which allocated resources and budgets are prioritized according to business objectives and directs that IT assets (systems and infrastructure) be acquired appropriately, including the preparation of suitable documentation, while ensuring that required capabilities are provided.
- **Performance**: The governing body at the University evaluates the plans proposed by the managers to ensure that IT will support business processes with the required capability and capacity, evaluates the proposals to address the continuing normal operation of the organization and the treatment of risk associated with the use of IT and also evaluates the risks to the continued operation of the business arising from IT activities.
- **Conformance**: The governing body at the University directs that policies are established and enforced to enable the organization to meet internal obligations in its use of IT, monitors IT activities, e.g. disposal of assets and data, to ensure that relevant obligations are met and regularly evaluates the extent to which IT satisfies obligations (regulatory, legislation, contractual), internal policies, standards and professional guidelines.
- **Human behaviour**: The governing body at the University evaluates IT activities to ensure that human behaviours are identified and appropriately considered, directs that IT activities are consistent with identified human behaviour and monitors IT activities to ensure that identified human behaviours remain relevant and that proper attention is given to them.

These are only some important examples of *what* to consider in the assessment framework for the seven practice areas of the governance of IT at Universities. Evaluators shall engage with the governing body at Universities and senior management to understand their specific governance of IT current situation and then

customize it to suit their particular organizational circumstances and practices. Indicators can be qualitative or quantitative but should aim to be specific, relevant, realistically achievable and measurable.

However, each action, tasks, and practices of these seven areas contain should be deepen evaluated to see whether the governing body of the University is not only establishing and sustaining the mechanisms of governance of IT through these actions, tasks, and practices with the six principles but also if they get *proofs* of them and if they get some beneficial *outcomes*. Therefore each of these areas should be evaluated into three categories of indicators or characteristics, as defined in the core standards, namely: governance tasks and practices (evaluate, direct and monitor), evidence of success (deliverables indicating the achievement of beneficial outcomes), and beneficial outcomes (organizational objectives achieved through IT). The first issue is doing the tasks, then having pieces of evidence and finally getting results. Thus, the contents of Table 3 are implemented from left to right, usually.

In Table 4, an example of enabling mechanism practices is shown. In the example, the governing body monitors that a complete IT governance framework is established and there is at least an IT governance steering group resulting that IT is administered and led. In Table 5, an example of responsibility is also shown, where the governing body at University is directing that planning is carried out for executive university managers (governance directs management) to implement IT solutions producing value, quality, effective and efficient services, including change management in the core processes of the higher education institution business.

5.2.1 Assessment Method of the Governance of IT at Universities

Following the ISO/IEC 38503 standard, the assessment method for the governance of IT is defined by applying a measurement model of governance of IT for each practice area. To simplify the evaluation of the governance of IT, the measurement model is applied to the overall three areas of governance of IT. Thus, the result of measuring the three areas results in a maturity model for the evaluation of the governance of IT at Universities. The implementation of the three areas may be different in several universities to suit their particular organizational circumstances.

The progress and evolution in IT governance expected to be observed in the different Universities to be evaluated should follow these incremental criteria:

Table 3 Areas for assessment of the governance of IT

Direct, evaluate and monitor tasks	Pieces of evidence	Outcomes
Governance of IT practices are present at University.	Deliverables indicate the achievement of beneficial outcomes.	Organizational objectives achieved through IT.
IT Governance framework is implemented.	Proofs of governing IT.	Results are accomplished by governing IT.

Source: Inspired by ISO/IEC 38503 (2022)

Table 4 Example of one enabling mechanism at the University and the three areas of evaluation

Direct, evaluate and monitor tasks	Pieces of evidence	Outcomes
Governing body at University monitors that appropriate mechanisms for governance of IT are established.	An IT governance University framework is established, including strategies, policies, decision-making structures, terms of reference, charter, etc.	Governance of IT addresses relevant aspects at University and IT is effectively administered.
	An IT governance steering group at University is established, including administration and documentation, management of the change programme, etc.	There is effective leadership of the governance of IT at the University.

Source: Inspired by ISO/IEC 38503 (2022)

Table 5 Example of one responsibility practice at the university and the three areas of evaluation

Direct, evaluate and monitor tasks	Pieces of evidence	Outcomes
The governing body at University directs that plans should be carried out according to the assigned IT responsibilities.	Executive university managers lead the core processes, University structure and human change when implementing IT solutions.	The University successfully implements IT-enabled HEI business change.
		IT is generating institutional value.
		The University receives the quality of services it requires most effectively and efficiently possible.

Source: Inspired by ISO/IEC 38503 (2022)

- Not having a formalized governance of IT at the University means a low level of governance of IT maturity;
- To improve the level of maturity, the governing body at the University should first undertake appropriate governance of IT tasks and practices (first column in Table 3);
- Then, this implementation can lead to lead to improved deployment and use of IT in the organization, as demonstrated by pieces of evidence of success (second column in Table 3);
- Therefore, the IT governance implementation can support and enable the achievement of planned and unexpected beneficial outcomes for the organization (third column in Table 3).

ISO/IEC TS 38501 defines a measurement model that is more qualitative than quantitative since principles-based standards focus on the achievement of outcomes, rather than the means of achieving outcomes.

The measurement model from ISO/IEC TS 38501 has been adopted in ISO/IEC 38503 with minor amendments to include the evaluation, direct and monitor (EDM)

Table 6 Measurement rating scale for the assessment of practices areas in IT Governance

Rating	Direct, evaluate and monitor tasks	Pieces of evidence	Outcomes
Unknown applied (U)	IT governance tasks and practices not being performed	No evidence of success	No knowledge of the level of achievement of outcomes
Not applied (N)	Limited performance of IT governance tasks and practices	Little evidence of success	The majority of beneficial outcomes are not being achieved
Somewhat applied (S)	Some evaluate and direct tasks and practices being performed but limited monitoring practices	Some evidence of success is visible with one or more aspects not in place at all	Some beneficial outcomes are achieved to a certain degree with one or more beneficial outcomes not being achieved at all
Largely applied (L)	The majority of evaluation and direct tasks and practices are being performed with a fair degree of monitoring practices	All evidence of success is visible to a large extent with certain aspects being fully in place	All beneficial outcomes are being achieved to a large degree with certain beneficial outcomes being fully achieved
Fully applied (F)	All IT governance tasks and practices being fully performed	All evidence of successfully implemented and working effectively	All beneficial outcomes being fully achieved

Source: ISO/IEC 38503 (2022)

tasks and practices. The standardized rating scale is maintained (left-hand column), with specific measures being defined for each of the three categories of governance of IT.

This is shown in Table 6.

Thus, the evaluation method's goal is to assign different levels of maturity at universities depending on the measurement of the three areas of governance of IT. The contents of Table 7 try to illustrate how increasing deployment of the three areas of practice gives an increasing score in maturity for universities governing IT.

5.3 IT Governance Evaluation Approaches at Universities

Considering that dependence on IT in developing organizations is increasing, in several regions such as the African continent and the Balkans the penetration of IT governance is weak (Kajo-Meçe et al., 2020; Khouja et al., 2018). Thus, in this sense, through the universities, IT governance concepts spreading can be achieved and influence society directly. However, several IT governance-related research tends to focus more on developed countries, and thus the viability of these established IT governance artefacts in developing economies is unclear as they might be

Table 7 Governance of IT maturity model for universities based on ISO/IEC 38503

Governance of IT tasks	Pieces of evidence	Beneficial outcomes	Description of the current situation	Governance of IT level
U	U	U	There is no commitment of the University board or any governing body to the governance of IT	No governance (0)
			Governing body and executive managers at University are not aware of the mechanisms that could be applied to govern IT	
			Lack of internal controls for IT at the University	
			The University is largely unaware of the risks associated with the use of IT	
S	U	U	Governing body and executive managers at University are aware of the purpose and objectives of governing IT	Initial governance (1)
			Implementation of basic governance of IT mechanisms is initiated	
			Some internal controls for IT are in place	
			The University is aware of the risks associated with the use of IT	
L	S	S	Governing body and executive managers at University start demonstrating a commitment to the governance of IT	Applied governance (2)
			Key University stakeholders are identified and engaged	
			Broader implementation of governance of IT mechanisms across the University	
			Broader implementation of internal controls for IT across the University	
			The University is starting to manage IT risk	
			Benefits starting to be achieved from investments in IT	

(continued)

Table 7 (continued)

Governance of IT tasks	Pieces of evidence	Beneficial outcomes	Description of the current situation	Governance of IT level
F	L	S	Enabling environment for the governance of IT is established by the governing body at University, including leadership commitment, awareness and education, stakeholder engagement	Established governance (3)
			Governance of IT framework established, including policies, structures and processes	
			A system of internal control for IT established as part of the university's management systems	
			The University identifies opportunities to improve the governance of IT	
			The University ensures that IT risks are managed	
			Benefits regularly achieved from investments in IT	
F	F	L	Enabling environment for the governance of IT sustained resulting in a behavioural change from governing body and executive managers at the University	Achieved governance (4)
			Governance of IT framework is enhanced, including charter, roles and responsibilities, governance steering group, governing body's reserve powers	
			The system of internal control for IT is enhanced to support the governance of IT, including Responsibility, Strategy, Acquisition, Performance, Conformance, Human behaviour	
			Continual review implemented to ensure improvement of the governance of IT in the University	
			The organization ensures that IT risks are managed and IT investments drive the achievement of business value	

(continued)

Table 7 (continued)

Governance of IT tasks	Pieces of evidence	Beneficial outcomes	Description of the current situation	Governance of IT level
F	F	F	Enabling environment for the governance of IT optimized resulting in behavioural and cultural change across the University	Optimized governance (5)
			Governance of IT framework is optimized to suit institutional and societal requirements	
			The system of internal control for IT is optimized to suit institutional and societal requirements	
			The University consistently leverages IT improvement opportunities from continual review and feedback obtained from all interested parties in the institution and external	
			Continual review is optimized. With feedback loops to all	
			stakeholders, to ensure the improvement of the governance of IT in the University	
			The University ensures that IT risks are managed and IT innovation drives HEI business transformation	

Source: Inspired by ISO/IEC 38503 (2022)

generic and might require considerable effort and cost in customizing to a specific context (Nfuka & Rusu, 2011).

In recent studies, for instance, Subsermsri et al. (2015), the three main obstacles to IT governance implementation in universities are (1) lack of clear IT governance principles, (2) budget limitations and (3) lack of a method for selecting the IT governance framework. Some of these inhibitors are still affecting organizations today: the little relationship between IT and the business, not adequately prioritizing IT investments, IT does not get support or commitments, IT does not understand the business, top management does not support IT, IT managers lack leadership. Aasi et al. (2017, p. 14) studied IT governance in public organizations in developing countries. They interviewed the CIO belonging to a public university who stated that the implementation of IT was slower than in developed countries and therefore they are less mature in terms of IT governance. However, they feel the urge to be competitive quickly. The literature also showed problems when directly implementing existing frameworks and standards, e.g., ISO/IEC 38500 standard and COBIT, in developed countries (Phiri & Weiguo, 2013; Steuperaert, 2016). Dahlberg and Kivijärvi (2006), Pereira and da Silva (2012), and Racz et al. (2010) posed that COBIT and ITIL are too complicated to implement. They also highlighted a lack of process prioritization, addressed also by Steuperaert (2016). Trying to reduce such difficulties, specifically in developing countries, El-Mekawy et al. (2015) focused on

helping and facilitating practitioners' tasks when implementing business-IT alignment in any organization, adapting solutions and frameworks from the literature.

IT governance applies to any type of organization, regardless of its size, age, location, purpose, or public or private nature (ISO/IEC 38500, 2015). Thus, the application of IT governance to the university environment becomes not only a possibility but a necessity, as a mechanism to generate value for the entire university community and the society in which its activity is framed. However, according to Weill and Ross (2004), the managers of non-profit organizations, such as universities and higher education institutions (HEIs), had difficulties when they tried to implement existing frameworks. Those frameworks had been designed to improve organizations with the intention of profit, companies in general, where the measures of performance and both the value of the stakeholders involved and of the company were clear. Thus, non-profit organizations' leaders needed a different governance implementation than the model suggested by the ISO/IEC 38500 standard to better suit their specific situation.

In 2007, the EDUCAUSE Center for Analysis and Research (ECAR) promoted the IT Governance Study 2007, which was based on general concepts of IT governance but surveyed at the university level. 438 IT managers from universities around the world participated in the study (Yanosky & Borreson Caruso, 2008; Yanosky & McCredie, 2007). The respondents stated that the reasons for implementing a formal IT governance system at the university are first, business-IT strategy alignment (73.5%), second, promoting the existence of an institutional vision of IT (50.5%), and third, promoting and collecting common information (38.1%). It should be noted that the reduction in costs and the increase in efficiency ranked fifth out of nine, with 25.1% of the responses. In contrast, the IT governance implementation barriers at the university (Yanosky & McCredie, 2007) were informal/decentralized culture (41.6%), lack of participation of the necessary agents and their subsequent support (40.4%), insufficient government coordination (30.8%), and lack of adequate funding (28.3%).

As discussed in the second chapter, some universities used COBIT to implement an IT governance model, such as South Louisiana Community College (Council, 2006). Other universities designed their own IT governance frameworks and models based on IT governance concepts. Thus, for example, the University of California included an IT Strategic Plan using an IT governance model (University XE "Universities" of California, 2008); Pretorius (2006) designed it for the University of Petroria its model; Ridley (2006) proposed it for the University of Guelph an IT governance model based on Weill and Ross (2004) aspects; and the University XE "Universities" of Calgary (2007) designed a model including the creation of several committees, the assignment of responsibilities and roles related to IT, risk management, and a methodology for project management. Perhaps the university reference framework was the work of Coen and Kelly (2007) who designed the JISC model (JISC, 2007b) with their self-assessment toolkit that helped universities to clarify the complex tangle of elements related to IT governance.

All these past experiences served as a reference for the design of an own solution that was adjusted to the needs of Spanish universities.

The IT governance situation in Spanish universities was not clear because there was no institutional role to support it. In 2003, the CRUE (Spanish acronym for Spanish Universities Rectors Conference) established the commission CRUE-TIC (Spanish acronym for the Sectoral Commission for Information and Communications Technologies) led by a rector, which was born from a working group within the CRUE, concerned and sensitized about the role that these technologies were already playing in the Spanish institutions. In 2008 and 2009, CRUE-TIC surveyed the Spanish universities regarding their IT governance situation whose results were a low IT governance maturity in the Spanish HEIs (Fernández, 2008; Llorens & Fernández, 2008). Thus, to improve the situation they supported the implementation of the IT governance for universities (ITG4U) model, which was crucial to getting the participation of the universities.

The ITG4U model is based on and fully respects the IT governance model proposed by the ISO/IEC 38500 standard. Furthermore, it provides several tools to easily implement it in a university environment. The final goal would be that the university that implements the ITG4U model will also, in the future, easily become certified with the ISO/IEC 38500 standard (Fernández, 2009). Between the years 2010-and 2014, CRUE-TIC promoted the implementation of an IT governance system in Spanish universities. Specifically, 10 IT governance pilot projects were carried out. As a result of this process and based on the obtained experience, CRUE-TIC was able to identify which were the IT governance best practices that these universities satisfied and establish the aspects to consider when determining the desired level of IT governance in universities. Furthermore, they detailed how the participant universities were at an incipient level of maturity, although with a firm commitment to improving in the short term, which served to encourage other universities to participate (Fernández et al., 2014; Hontoria, 2014).

In parallel to the implementation of the pilot projects, other Spanish universities were also implementing their frameworks, e.g., dFogIT: detailed Framework of Governance for Information Technology. dFogIT is an IT governance framework that has also been implemented based on an ISO/IEC 38500 standard model extension (B. Gómez et al., 2017; Juiz, 2011). The framework is a layered model, as known as transformation layers, connected by interlayer connection instruments. The IT governance framework has four layers, the two central layers represent Management and Governance and are equivalent to the standard, and two others have been added: one above, Institutional Strategy, and another below, Operation. The dFogIT framework enables smooth and gradual adoption, without major disruptions to the company's business culture, but solving communication problems and the common lack of IT governance maturity.

One of the aspects highlighted by both the ITG4U and dFogIT models is that IT governance is the responsibility of the board members and top executives of the organization. This is an important issue, stemming from the inclusion of IT governance within corporate governance, and which suggests that the management of an IT department or the simple provision of IT services in organizations is not being

discussed here (Céspedes, 2010). Although JISC (2007b) was one of the first to implement an IT governance model for British universities, they started the project from middle management and failed to move from pilot projects (in their study) as they lacked support from senior management. Because in studies by Weill and Ross (2004), (Van Grembergen and De Haes (2009), Nolan and McFarlan (2005), among others, agree on the importance of gaining top management support, in the ITG4U and dFogIT frameworks the focus is top-down, rather than bottom-up (as it was in the British case). For this reason, the introduction system of these frameworks in Spain was first training senior managers (rector and vice-rectors involved) in the importance and need of having a good IT governance system, so that the support was transmitted to the next layers and a culture of good governance and better fight against change resistance could be promoted. Furthermore, the fact that both frameworks are based on ISO/IEC 38500 shows that the standard is being used as a reference (Fernández et al., 2012).

The knowledge and experience obtained during this period through the pilot projects and the external experiences were the precursor of joining forces to the design, development, and subsequent implementation of specific IT governance frameworks for universities and higher education institutions in developing countries.

5.3.1 The Cases from ITG4U Projects

Under the scope of both European projects Erasmus+ KA2 granted by the European Education and Culture Executive Agency (EACEA), IT Governance for Tunisian Universities (ITG4TU) (2015–2018) and IT Governance for Albanian Universities (ITG4AU) (2017–2020), four European universities from three different countries (Spain, Germany, and Norway) adopted and adapted the ITG4U Spanish framework to four Tunisian and four Albanian universities, respectively (B. Gómez et al., 2018; B. Gómez & Juiz, 2019). After several pieces of training to set a minimum knowledge on IT governance in general, and specifically applied to universities, IT governance frameworks definition, development, and deployment for Tunisian and Albanian HEIs and its monitoring results were performed.

The IT Governance for Universities (ITG4U) project was aimed to gather a set of researchers from four European universities with a wide experience in developing and deploying IT governance activities, best practices, and framework models from three different countries (Spain, Germany, and Norway) to develop, adapt and test a new IT governance framework to be implemented in eight HEIs in developing countries. In previous and recent studies, for instance, Subsermsri et al. (2015), the three main obstacles to implementing IT governance in universities are lack of clear IT governance principles, budget limitations and lack of a method for selecting the IT governance framework. Thus, this project aimed to tackle the three obstacles by providing a set of experts from HEIs with previous experience on the topic, to jointly develop the framework with the destination country consortium.

Results of these projects included: a better governance model for IT in developing countries' HEIs, an overall modernization of the governance processes for HEIs, and a contribution of the cooperation between Europe and each destination country.

Because projects were aimed at HEIs, the main target addressed was IT staff, managerial staff, and governance board at partners HEIs. To improve the IT governance in HEIs, all the direct stakeholders should know the existing standards, methods, techniques, and tools to implement IT governance frameworks.

The projects were divided into three different phases over 3 years and a parallel phase addressed project dissemination, each one with the necessary activities for its completion (see Fig. 2):

- **The first phase** consisted of imparting IT governance training to HEIs partners. Specifically, training was prepared for future trainers (mainly professors and lecturers), IT managers and administrators, and future researchers and professionals.
- **The second phase** consisted of the definition of an IT governance framework, *the assessment of the current level of governance of IT* for each HEI and planning its future implementation.
- **The third phase** consisted of the previously planned IT governance framework deployment and monitoring of its results.

Finally, dissemination and sustainability of both, the project itself and IT governance concepts and the achievement of its results were grouped in a parallel phase, as it was not executed sequentially like the previous three. Thus, throughout the project and beyond it, some dissemination and sustainability activities were and are being performed to sustain the IT governance implementation in time.

As the reader may realize, the first phase is just necessary when the organization does not have a culture of IT governance or even it does not know anything about IT

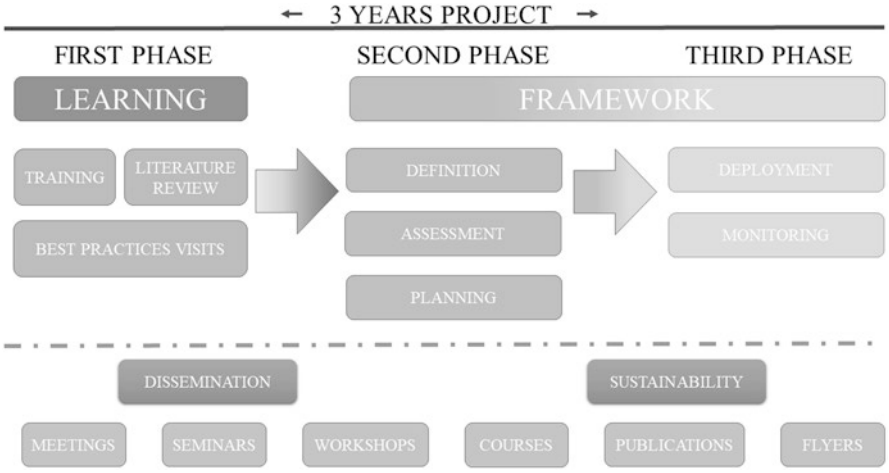


Fig. 2 ITG4U Projects' phases. (Source: Gómez and Juiz 2019)

governance which fortunately is becoming rare in these times. Therefore, once the organization is aware of what is governing IT, is crucial to assess the current situation of the University-related activities regarding its governance of IT, although having an IT governance framework already deployed.

6 Solutions and Recommendations

In the early XXI century, before the standardization of IT governance, some governance of IT frameworks were successfully implemented in other sectors (banking, insurance, industry, etc.) different from HEIs, reaching a maturity of 2.67 out of 5 on the scale proposed by the IT Governance Institute (ITGI, 2003). Universities from all over the world were also joining IT governance, and according to Yanosky and Borreson Caruso (2008), they reached a maturity of 2.30 out of 5, which means that universities were still in a situation incipient and in the process of maturing. Only a few university institutions reported being at a high level of maturity and the remaining majority were at an acceptable level of IT governance, but room for improvement.

For this reason, EDUCAUSE (Golden et al., 2007) presented a list of proposals that may serve universities and higher education institutions (HEIs) as recommendations to improve the implementation of IT governance in their universities:

- Facilitate collaboration between universities in the field of IT governance.
- Develop specific IT governance models for universities.
- Collect and disseminate case studies and good practices and develop IT governance maturity assessment tools.
- Provide opportunities to promote the curriculum of university IT professionals in aspects related to IT governance.

Under the scope of both European projects Erasmus+ KA2 granted by the European Education and Culture Executive Agency (EACEA), IT Governance for Tunisian Universities (ITG4TU) (2015–2018) and IT Governance for Albanian Universities (ITG4AU) (2017–2020), four European universities from three different countries (Spain, Germany, and Norway) adopted and adapted the ITG4U Spanish framework to four Tunisian and four Albanian universities, respectively (B. Gómez et al., 2018; B. Gómez & Juiz, 2019). ITG4U framework is based on the standard ISO/IEC 38500, however, since the assessment standard was not developed (among others by the author) until 2022 (ISO/IEC 38503, 2022), the assessment measurement has only 5 levels (based on the COBIT).

After several pieces of training to set a minimum knowledge on IT governance in general, and specifically applied to universities, IT governance frameworks definition, development, and deployment for Tunisian and Albanian HEIs and its monitoring results were performed.

Particularly, the second phase of the project (see Fig. 2) consisted of the development and validation of a specific IT governance framework for every partner

university. The major milestone in this phase was for each institution to build its own IT governance framework using the competencies and skills previously learnt. Furthermore, the expert assessors defined measurable indicators to monitor the progress of this phase, i.e., people involved in the project, managerial and IT staff integration indicators, and overall positive feedback from internal stakeholders, among others.

Thus, to advance towards this second project phase, evaluators performed initial assessments, which helped to know the current situation of each university. Based on the results of this assessment, they were able to create, their own IT governance framework adapted to their characteristics, needs and situation. Afterwards, the evaluators validated the new framework so that it was in line with the practices learnt in the training, and they plan to deploy it was acceptable in terms of the project.

The following incremental evolution methodology was performed to implement an IT governance framework. The consortium of both projects defined a set of steps to develop the IT governance framework tailored to the specific needs of the universities:

1. IT governance enabling environment: definition of the IT governance steering group and initial assessment (in line with the framework seen in Table 2).
2. IT governance practices: adaptations of the three areas of IT governance practices (similar to the ones seen in Tables 3, 4 and 5), a self-assessment of the organizational IT governance rating in practices and the review of their organizational IT governance rating in those practices (similar to the ones seen in Table 6).
3. IT governance maturity model: the maturity model was established in each university, the maturity level current situation and the maturity goal selection (in line with the ones seen in Table 7).
4. IT governance improvement plan: design and assessment of a plan and the viability of the activities, considering the resources, involved people and calendar.

Once partners had established their IT governance steering group, they were requested to submit a survey running the following procedure:

- They were provided with a document containing an ordered and classified set of practices. They had to meet with their IT governance steering group and answer to each practice whether they have them implemented already in their institutions.
- Once all answered, they had to organize a consensus meeting to discuss the practices with no answer or with no consensus and decide all together with a consensus for each practice.
- The project leader in each institution had to take minutes of the problems faced by members of the group about how to answer the questions about the meaning and the development of any practices not understood.

In both projects, the evaluators used a set of best practices extracted from Spanish universities as a benchmark (Hontoria, 2014). In addition, participants could assess whether the early-stage framework was suited to the special structural

characteristics of their institutions. The self-assessment helped them see which principles were covered, at their discretion, and which ones required attention. This marked a starting point that was later used in the elaboration of the plan. Finally, with the results of their self-assessment, the universities knew their current situation and were able to compare it with that obtained by Spanish universities.

As best practices were classified under the six ISO/IEC 38500 standard principles and the ISO/IEC 38503 standard was still under development in those days, the selected maturity model established a level between 1 and 5 (like ITGI and COBIT) in each principle based on the governance activities: direct, evaluate and monitor (Fernández et al., 2011). To measure the maturity level, the indicators were classified into three categories: (i) maturity indicators, to set each institution's current maturity level; (ii) qualitative evidence indicators, to clarify whether the institution had already implemented the best practice in question; (iii) and quantitative evidence indicators, related to qualitative indicators and specifying how often, how many times, etc. (Fernández & Llorens, 2009). This process was similar to the one suggested in ISO/IEC 38503 (see Table 2) but outcomes were quantified.

Based on this maturity model provided by the evaluators, the universities were asked to adapt it so that they could adopt it in their institutions. Thus, each institution presented its current IT governance maturity level. Furthermore, they selected the goal maturity level that each university wished to be achieved. Each university selected areas to improve based on their available resources and made a realistic IT governance improvement plan considering people, resources, and time.

The IT governance plan was structured in six sections. Initiating was the first section to involve the organization's leaders in their IT governance framework development and deployment. The second section provided a plan with the specification of purposes, goals and outcomes, deliverables, stakeholders, risks, and team. As indicated above, the action plan for the implementation of an IT governance framework in developing countries HEIs followed the methodology of incremental evolution, i.e., continuous improvements were made to each of the elements until it was reached the optimal level according to the characteristics and needs of the entity and midterm goals established previously. Thus, it was necessary to follow the evolution of each one so that through the information obtained, it was possible to take the most successful actions to the level reached.

Seeing the results of the Spanish, Tunisian and Albanian universities'experience (a total of more than 25 universities), the main recommendations should be:

- It is necessary to have the real commitment of the Rector or President of the University for even initiating any governance of IT implementation. The same applies to evaluating the current situation of the IT governance framework if exists.
- A steering committee for IT governance should be created as soon as possible, led by the vice-rector, director or any other person in the governance body. The CIO may lead the committee if he/she sits at the table of governance of the University. When the steering committee is led by middle managers, governance turns out to management.

- The objectives of governance of IT at universities should be ambitious but precise and concrete. There should be specific plans for the development of the framework conducted by managers but monitored by the governance body. The self-assessment should be formal and sincere and compared with benchmarking from other universities. External evaluators are recommended.

7 Future Research Directions

Due to the amazing changes in IT and the evolution of corporate governance over the past decade, ISO plans to prepare the third edition of the ISO/IEC 38500 standard in the coming years. On the one hand, the IT used by businesses has been revolutionized due to considerable changes in the supply and use of technology. IT is now a major business driver for organizations of all sizes, supporting not only their core business but also seamless integration with supply chains and interactions with customers. As cloud-based services have matured, the mechanisms for delivering IT and IT-based services have changed significantly.

In particular, universities must become more involved in the information technology ecosystem than under their direct control to achieve business outcomes. This was exacerbated by the consequences of the COVID-19 lockout due to changing expectations of students and professors who want to easily and smoothly collaborate with universities through IT. On the other hand, the availability of data is exploding and we need to refocus from corporate governance on its use. The university‘s governing body is also responsible and accountable for data governance, so there is no difference. There are also changes in the way IT is delivered and supported within the organization, with internal IT acting as an integrator for externally sourced systems.

All of these changes are reflected not only in the governance of IT standardization but also in the way it is implemented and evaluated. Thus, the IT paradigm as a tool that replaced IT as an asset a few years ago has evolved into IT as a business. In short, IT not only enables business strategy but also drives business strategy. Therefore, the direction of future research depends not only on how IT changes but also on how IT is currently perceived as the core of an organization’s or university‘s business.

8 Conclusion

To be able to digitally transform the University, it is a necessary but not sufficient condition to direct and control IT, i.e. govern IT. Without those basic tasks of assessing, directing and monitoring, IT becomes either a tool or a commodity, in both situations worthless. For this reason, even when there is no IT governance framework, it is necessary to plan what the senior management wants from their IT and how to

control that they are achieving it. That is no different for Universities. The HEIs have to know if they promote enabling mechanisms to govern through principles of good corporate governance since the governing bodies are accountable and responsible for the results of their universities.

In this way, even before defining an IT governance framework, it is necessary to reflect on what practices are going to be carried out, collect evidence and improve until the planned outcomes are obtained. The recently created ISO/IEC 38503 standard, of which the main author is a co-editor, serves for this reflection, even for universities that have been governing themselves for some time. Maturity with IT at the university, attainable at a certain point in time, can be compromised by events such as the COVID-19 pandemic.

This chapter tries to explain where the origins come from, the problems, the benefits and the standards that apply to IT governance. For once, to cite many of the experiences of IT governance in universities, focus on its assessment, its intention and its methodology.

The authors also presented one example of implementation and assessment applied in more than 25 universities, the ITG4U framework. This framework is based on the ISO/IEC 38500 standard and therefore their best practices are classified by its six principles namely Responsibility, Strategy, Acquisition, Performance, Conformance, and Human Behavior. This includes three main steps. The first is the set of adaptations that must be made to this global framework before adopting it in each institution. Second, it is aimed to conduct a self-assessment of the current organizational level regarding the adapted best practices. Finally, and as a step to be taken by developing countries' HEIs, it is aimed to assess both the adaptations and the self-assessment. This real example tested in many universities is very similar to the one that has subsequently been approved by ISO and serves, in this chapter, as a practical reinforcement of what the ISO/IEC 38503 standard is trying to normalize.

What is not measured cannot be improved, it is a well-known statement in the company culture. The IT governance assessment at the university is the lever towards its continuous digital transformation, directed and controlled by its governing body with the invaluable collaboration of IT management and other HEI functions.

Key Terms and Definitions

Beneficial outcome: achievement of a high-level objective of the organization, related to the successful deployment and use of information technology.

Evidence of success: observable and measurable deliverables from information technology functions/processes that support and enable the achievement of beneficial outcomes.

Governance practice: any action or decision taken by the governing body driving the direction and/or the control of the management in organizations.

Higher Education Institutions: The education sector includes only the tertiary institutions, including mainly universities, but also colleges and research institutions.

References

Aasi, P., Rusu, L., & Leidner, D. (2017). IT organizational structure relationship with IT governance performance: Case of a public organization. In *Information Technology Governance in Public Organizations*.

Ahlan, A. R., Arshad, Y., & Ajayi, B. A. (2014). IT governance in a Malaysian public institute of higher learning and intelligent decision making support system solution. In M. Mora, H. J. Marx-Gomez, L. Garrido, & F. C. Pérez (Eds.), *Engineering and management of IT-based service systems. An intelligent decision-making support systems approach* (pp. 19–33). Springer. https://doi.org/10.1007/978-3-642-39928-2_2

Ahriz, S., Benmoussa, N., El Yamami, A., Mansouri, K., & Qbadou, M. (2018a). An elaboration of a strategic alignment model of university information systems based on SAM model. *Engineering, Technology & Applied Science Research, 8*(1), 2471–2476. https://doi.org/10.48084/etasr.1696

Ahriz, S., El Yamami, A., Mansouri, K., & Qbadou, M. (2018b). Cobit 5-based approach for IT project portfolio management: Application to a Moroccan university. *International Journal of Advanced Computer Science and Applications, 9*(4), 88–95.

Almeida, R. S., & de Souza, W. A. (2019). Implementação dos mecanismos de governança de tecnologia da informação em uma universidade pública. *Navus – Revista de Gestão e Tecnologia, 9*(1), 136–149. https://doi.org/10.22279/navus.2019.v9n1.p136-149.794

Arshad, Y., Ahlan, A. R., & Ajayi, B. A. (2014). Intelligent IT governance decision-making support framework for a developing country's public university. *Intelligent Decision Technologies, 8*(2), 131–146. https://doi.org/10.3233/IDT-130183

Bhattacharjya, J., & Chang, V. (2006). Adoption and implementation of IT governance: Cases from Australian higher education. *ACIS 2006 Proceedings*.

Bhattacharjya, J., & Chang, V. (2007). The role of IT governance in the evolution of organizations in the digital economy: Cases in australian higher education. In *Proceedings of the 2007 Inaugural IEEE-IES Digital EcoSystems and Technologies Conference, DEST 2007* (pp. 428–433). https://doi.org/10.1109/DEST.2007.372012

Bianchi, I. S., & Sousa, R. D. (2015). *IT governance for public universities : Developing a model* (pp. 1–9). IBIMA.

Bianchi, I. S., & Sousa, R. D. (2018). Frameworks used for IT governance at universities: An exploratory study. In *32nd international business information management association conference, IBIMA 2018 – Vision 2020: Sustainable economic development and application of innovation management from regional expansion to global growth* (pp. 3002–3010).

Bianchi, I. S., Sousa, R. D., & Pereira, R. (2017a). IT governance mechanisms at universities: An exploratory study. *AMCIS 2017 – America's Conference on Information Systems: A Tradition of Innovation, 2017-August*, (351), 1–10.

Bianchi, I. S., Sousa, R. D., Pereira, R., & Luciano, E. (2017b). IT governance structures in Brazilian, Dutch and Portuguese universities. *Procedia Computer Science, 121*(December), 927–933. https://doi.org/10.1016/j.procs.2017.11.120

Bianchi, I. S., Sousa, R. D., Pereira, R., & De Haes, S. (2019). The influence of culture in IT governance implementation: A higher education multi-case study. *International Journal of Human Capital and Information Technology Professionals, 10*(4), 55–68. https://doi.org/10.4018/IJHCITP.2019100104

Bianchi, I. S., Sousa, R. D., & Pereira, R. (2021). Information technology governance for higher education institutions: A multi-country study. *Informatics, 8*(2), 26. https://doi.org/10.3390/informatics8020026

Bin-Abbas, H., & Bakry, S. H. (2014). Assessment of IT governance in organizations: A simple integrated approach. *Computers in Human Behavior, 32*, 261–267. https://doi.org/10.1016/j.chb.2013.12.019

Brooks, R. (2005). Measuring university quality. *The Review of Higher Education, 29*(1), 1–21. https://doi.org/10.1353/RHE.2005.0061

Buchwald, A., Urbach, N., & Ahlemann, F. (2014). Business value through controlled IT: Toward an integrated model of IT governance success and its impact. *Journal of Information Technology, 29*(2), 128–147. https://doi.org/10.1057/jit.2014.3

Caetano Borges, G., & Sanches Miani, R. (2018). On the adoption of ICT best practices in Brazilian federal higher education institutions. *44th Latin American computing conference, CLEI 2018*, 533–541. https://doi.org/10.1109/CLEI.2018.00070

Calder, A. (2005). *IT governance. Guidelines for Directors*. IT Governance Publishing.

Castañeda De Leon, L. M., Herrera Mendoza, A., Chávez Suarez, G. C., & Ojeda Villagomez, F. (2018). Factores críticos de éxito para la implementación del Gobierno de las Tecnologías de la Información en las universidades públicas de México. *Iberian Conference on Information Systems and Technologies, CISTI, 2018-June*, 1–4.

Ceratti, S. A., Bertolini, C., & Silveira, S. R. (2019). Um estudo sobre governança de tecnologia da informação no campus de Frederico Westphalen-RS da Universidade Federal de Santa Maria. *Navus – Revista de Gestão e Tecnologia, 9*(4), 10–29. https://doi.org/10.22279/navus.2019.v9n4.p10-29.862

Cervone, H. F. (2017). Implementing IT governance: A primer for informaticians. In *Digital library perspectives*. https://doi.org/10.1108/DLP-07-2017-0023.

Céspedes, J. J. (2010). ¿Qué es el gobierno de las TI? In A. Fernández & F. Llorens (Eds.), *Gobierno de las TI para universidades* (pp. 33–47). Conferencia de Rectores de las Universidades Españolas (CRUE).

Coen, M., & Kelly, U. (2007). Information management and governance in UK higher education institutions: Bringing IT in from the cold. *Perspectives: Policy and Practice in Higher Education, 11*(1), 7–11. https://doi.org/10.1080/13603100601127915

Council, C. L. (2006). Implementing COBIT in higher education: Practices that work best. *Isaca Journal*.

Dahlberg, T., & Kivijärvi, H. (2006). An integrated framework for IT governance and the development and validation of an assessment instrument. *39th Hawaii International Conference on System Sciences*. https://doi.org/10.1109/HICSS.2006.57

De Maere, K., & De Haes, S. (2017). An investigation of the theory-practice gap in the context of IT governance. *Proceedings of the 13Th European Conference on Management, Leadership and Governance (Ecmlg 2017)*, 530–537.

El-Mekawy, M., Rusu, L., & Perjons, E. (2015). An evaluation framework for comparing business-IT alignment models: A tool for supporting collaborative learning in organizations. *Computers in Human Behavior, 51*, 1229–1247. https://doi.org/10.1016/j.chb.2014.12.016

El-Morshedy, R. M., Mazen, S. A., Hassanein, E., Fahmy, A. A., & Hassanein, M. K. (2014). Information technology governance in Egypt research institutions – A case study. *2nd International Conference on Engineering and Technology*, 1–7. https://doi.org/10.1109/ICEngTechnol.2014.7016795

Erfurth, C., & Erfurth, I. (2014). Towards business alignment of IT services in universities: Challenges in elicitations of requirements for IT services. *IEEE 1st International Workshop on the Interrelations Between Requirements Engineering and Business Process Management, REBPM 2014 – Proceedings*, 11–14. https://doi.org/10.1109/REBPM.2014.6890730

Espinoza-Aguirre, C., & Pillo-Guanoluisa, D. (2018). Modelo de Gobierno de TI para Instituciones Públicas con enfoque en la Educación Superior. *13th Iberian Conference on Information Systems and Technologies (CISTI)*, 1–14.

Fernández, A. (2008). *Encuesta de Satisfacción de UNIVERSITIC y COITIC*. Informe interno de la Comisión Sectorial TIC de la CRUE.

Fernández, A. (2009). *Análisis, Planificación y Gobierno de las Tecnologías de la Información en las Universidades*. Universidad de Almería.

Fernández, A., & Llorens, F. (2009). An IT governance framework for universities in Spain. *EUNIS 2009 Conference*, 1–13.

Fernández, A., Llorens, F., & de Andrés, J. (2011). kTI, A self-assessment IT governance system. *EUNIS 2011 Conference*.

Fernández, A., Barro, S., Llorens, F., & Juiz, C. (2012). Segunda fase del proyecto de arranque del Gobierno de las TI en el SUE. In J. Uceda & S. Píriz (Eds.), *UNIVERSITIC 2012. Descripción, gestión y gobierno de las TI en el Sistema Universitario Español* (pp. 85–115). Conferencia de Rectores de las Universidades Españolas (CRUE).

Fernández, A., Llorens, F., Gumbau Martínez, J. P., & Hontoria, E. (2014). Aspectos a considerar en el Gobierno de las TI. In S. Píriz (Ed.), *UNIVERSITIC 2014. Descripción, gestión y gobierno de las TI en el Sistema Universitario Español* (pp. 100–116). Conferencia de Rectores de las Universidades Españolas (CRUE).

Fernández, A., Llorens, F., Juiz, C., Maciá, F., & Aparicio, J. M. (2022). How to prioritize strategic IT Projects in your university. In *Publicaciones de la Universidad de Alicante*. Publicaciones de la Universidad de Alicante.

Franklin Frogeri, R., Jardim Pardini, D., & Rodrigues Cunha, G. (2020). Information technology governance in a higher education institution: An IT professionals' perception analysis. *International Journal of Human Capital and Information Technology Professionals, 11*(1), 31–46. https://doi.org/10.4018/IJHCITP.2020010103

Gerl, A., von der Heyde, M., Groß, R., Seck, R., & Watkowski, L. (2021). Applying COBIT 2019 to IT governance in higher education. *INFORMATIK 2020 – Gesellschaft Für Informatik*, 517–539.

Golden, C., Holland, N., Luker, M., & Yanosky, R. (2007). *A report on the EDUCAUSE* Information Technology Governance Summit. EDUCAUSE.

Gómez, B., & Juiz, C. (2019). IT governance implementation in developing countries : Applying the Spanish ITG4U framework to four Tunisian HEIs. *EUNIS 2019 conference*, 1–12.

Gómez, B., Bermejo, B., & Juiz, C. (2017). IT governance and its implementation based on a detailed framework of IT governance (dFogIT) in public enterprises. In *Information technology governance in public organizations* (pp. 133–155).

Gómez, B., Juiz, C., Colomo-Palacios, R., & Fernández Martínez, A. (2018). Information Technology Governance for Tunisian Universities (ITG4TU): A real experience of IT governance framework capacity building from European Universities. *EUNIS 2018* Conference, 12.

Grajek, S. (2020). *Top IT issues, 2021: Emerging from the pandemic* (E. I. I. Panel (ed.)). EDUCAUSE.

Guldentops, E. (2002). Governing information technology through CobiT. In *Integrity, internal control and security in information systems*. https://doi.org/10.1007/978-0-387-35583-2_8

Henderson, J. C., & Venkatraman, H. (1993). Strategic alignment: Leveraging information technology for transforming organizations. *IBM Systems Journal, 32*(1), 472–484. https://doi.org/10.1147/sj.382.0472

Herdiansyah, M. I., Kunang, S. O., & Akbar, M. (2014). IT strategy alignment in university using IT balanced scorecard framework. *Advanced Science Letters, 20*(10–11), 2038–2041. https://doi.org/10.1166/asl.2014.5685

Hicks, M., Pervan, G., & Perrin, B. (2010). A case study of improving information technology governance in a university context. *IS Design Science Research*, 89–107.

Holt, A. L. (2013). Governance of IT: An executive guide to ISO/IEC 38500. In *BCS Learning and Development Ltd.* (Vol. 53, issue 9). BCS Learning & Development Limited. https://doi.org/10.1017/CBO9781107415324.004.

Hontoria, E. (2014). *Método para la evaluación y mejora de la madurez del Gobierno Corporativo de las Tecnologías de la Información. Aplicación a la Educación Superior*. Universidad de Almería.

Hontoria, E., Fernández, A., De La Fuente, M. V., & Ros, L. (2011). Método para el gobierno de las tecnologías de la información basado en la modelización empresarial. *Direccion y Organizacion, 45*, 5–10.

ISACA. (2018). *COBIT 2019 framework: Introduction & methodology*.

ISO/IEC 38500. (2015). Information Technology—Governance of IT – For the organization, *2015*, 1–12.

ISO/IEC 38503. (2022). *Information Technology – Governance of IT – Assessment of the governance of IT* (pp. 1–14).

ITGI. (2003). Board briefing on IT governance. In *IT Governance Institute* (2nd ed.).

Jairak, K., & Praneetpolgrang, P. (2011). A holistic survey of IT governance in Thai universities through IT executive perspectives. *Informatics Engineering and Information Science, Part II*, 435–447.

Jairak, K., & Praneetpolgrang, P. (2013). Applying IT governance balanced scorecard and importance-performance analysis for providing IT governance strategy in university. *Information Management & Computer Security, 21*(4), 228–249. https://doi.org/10.1108/IMCS-08-2012-0036

JISC. (2007a). *A framework for information systems management and governance: Self-assessment toolkit*. Joint Information Systems Committee (JISC).

JISC. (2007b). *A framework for information systems management and governance*. Joint Information Systems Committee (JISC)..

Juiz, C. (2011). New engagement model of IT governance and IT management for the communication of the IT value at enterprises. *Communications in Computer and Information Science, 194 CCIS*, 129–143. https://doi.org/10.1007/978-3-642-22603-8_13

Juiz, C., & Gómez, B. (2021). Delving into the IT governance-management communication Interface: A scoping review. *International Journal of Digital Strategy, Governance, and Business Transformation, 11*(1), 1–37. https://doi.org/10.4018/ijdsgbt.291542

Juiz, C., & Toomey, M. (2015). To govern IT, or not to govern IT? *Communications of the ACM, 58*(2), 58–64. https://doi.org/10.1145/2656385

Juiz, C., Gómez, M., & Barceló, M. I. (2012). Business/IT projects alignment through the project portfolio approval process as IT governance instrument. *Procedia-Social and Behavioral Sciences, 65*, 70–75.

Juiz, C., Guerrero, C., & Lera, I. (2014). Implementing good governance principles for the public sector in information technology governance frameworks. *Open Journal of Accounting, 2014*(January), 9–27. https://doi.org/10.4236/ojacct.2014.31003

Juiz, C., Gómez, B., & Rosenmöller, M. (2017). Standardization of IT governance in healthcare institutions. *Proceedings of the 19th International Conference on E-Health Networking, Applications and Services (Healthcom)*.

Juiz, C., Colomo-Palacios, R., & Gómez, B. (2018). Cascading ISO/IEC 38500 based balanced score cards to improve board accountability. *CENTERIS – Conference on ENTERprise Information Systems*.

Juiz, C., Gómez, B., Bermejo, B., Cordero, D., & Mory, A. (2019a). A guide for cascading and scaling up green IT governance indicators through balanced scorecards: The case of datacenter consolidation. *International Conference on Information Technology & Systems (ICITS 19), 918*, 133–142. https://doi.org/10.1007/978-3-030-11890-7_14

Juiz, C., Gómez, B., & Colomo-Palacios, R. (2019b). How to improve board accountability in ISO/IEC 38500 based on IT governance implementations. *International Journal of IT/Business Alignment and Governance, 10*(1), 22–39. https://doi.org/10.4018/ijitbag.2019010102

Kajo-Meçe, E., Sheme, E., Trandafili, E., Juiz, C., Gómez, B., & Colomo-Palacios, R. (2020). Governing IT in HEIs: Systematic mapping review. *Business Systems Research, 11*(3), 93–109. https://doi.org/10.2478/bsrj-2020-0029

Kearns, G. S., & Lederer, A. L. (2003). A resource-based view of strategic IT alignment: How knowledge sharing creates competitive advantage. *Decision Sciences.* https://doi.org/10.1111/1540-5915.02289

Khouja, M., Bouassida Rodriguez, I., Ben Halima, Y., & Moalla, S. (2018). IT governance in higher education institutions: A systematic literature review. *International Journal of Human Capital and Information Technology Professionals (IJHCITP), 9*(2), 52–67. https://doi.org/10.4018/IJHCITP.2018040104

Khther, R. A., & Othman, M. (2013). Cobit framework as a guideline of effective it governance in higher education: A review. *International Journal of Information Technology Convergence and Services, 3*(1), 21–29. https://doi.org/10.5121/ijitcs.2013.3102

Knahl, M. H. (2013). Application of IT management frameworks in higher education institutions. *Lecture Notes in Business Information Processing, 148 LNBIP*, 124–133. https://doi.org/10.1007/978-3-642-38490-5_10

Ko, D., & Fink, D. (2010). Information technology governance: An evaluation of the theory-practice gap. *Corporate Governance, 10*(5), 662–674. https://doi.org/10.1108/14720701011085616

Kosasi, S., Vedyanto, & Yuliani, I. D. A. E. (2017). Maturity levels of academic information services of higher education using IT governance. *4th International Conference on New Media Studies*, 56–61. https://doi.org/10.1109/CONMEDIA.2017.8266031

Kosasi, S., Vedyanto, & Kurniawan, H. (2019). Mediating roles of IT governance effectiveness in e-service quality of higher education. *5th International Conference on New Media Studies*, 14–19. https://doi.org/10.1109/CONMEDIA46929.2019.8981831

Kwon, H. Y. (2008). Security engineering in IT governance for university information system. *Proceedings of the 2nd international conference on information security and assurance, ISA 2008*, 501–504. https://doi.org/10.1109/ISA.2008.93

Liew, C., Aziati, A. H. N., & Abdulla, N. H. (2018). A literature review of information technology governance implementation in higher educations. *Advanced Science Letters, 24*(12), 9299–9302. https://doi.org/10.1166/asl.2018.12259

Liu, C. W., Huang, P., & Lucas, H. C. (2020). Centralized IT decision making and cybersecurity breaches: Evidence from U.S. higher education institutions. *Journal of Management Information Systems, 37*(3), 758–787. https://doi.org/10.1080/07421222.2020.1790190

Llorens, F., & Fernández, A. (2008). Conclusiones del Taller de Gobierno de las TI en las universidades. *Seminario Gobierno de Las TI En Las Universidades Españolas*.

Luftman, J. (2000). Assessing business-it alignment maturity. *Communications of the Association for Information Systems.* https://doi.org/10.1201/1078/43647.20.4.20030901/77287.2

Martins, L., Cunha, P., Figueiredo, A., & Dias, T. (2009). IT alignment through ANT: A case of sustainable decision in the educational sector. *2009 IEEE Toronto International Conference: Science and Technology for Humanity*, 485–490.

Marulanda Echeverry, C. E., López Trujillo, M., & Valencia Duque, F. J. (2017). Gobierno y gestión de ti en las entidades públicas. *AD-Minister, julio-dici(31)*, 75–92. https://doi.org/10.17230/ad-minister.31.5

McCredie, J. W. (2006). Improving IT governance in higher education. *ECAR Research Bulletin, 1*(18).

Montenegro, C. W., & Flores, D. A. (2015). An integrated model for ICT governance and management applied to the Council for Evaluation, accreditation and quality Assurance of Higher Education Institutions in Ecuador (CEAACES). *International Conference on Computing, Communication and Security, ICCCS, 2015*, 1–9. https://doi.org/10.1109/CCCS.2015.7374158

Mukhlas, A., Beh, D., Yin, M., & Sarirah, H. (2017). Information technology governance in Institute of Higher Learning in Malaysia : A systematic mapping study. *ASIA International Multidisciplinary Conference*, 1–12. https://doi.org/10.15405/epsbs.2018.05.23

Musa, N., Abang Ibrahim, D. H., Bolhassan, N. A., Abdullah, J., Kulathuramaiyer, N., & Khairuddin, M. N. (2014). An IT governance framework for achieving the development of academic Programme in higher institutions: A case of university Malaysia Sarawak (UNIMAS). *The 5th International Conference on Information and Communication Technology for The Muslim World (ICT4M)*, 1–6.

Nfuka, E. N., & Rusu, L. (2011). The effect of critical success factors on IT governance performance. *Industrial Management & Data Systems, 111*(9), 1418–1448. https://doi.org/10.1108/02635571111182773

Ngqondi, T., & Mauwa, H. (2020). Information technology governance model for a low resource institution with fragmented IT portfolio. *South African Journal of Higher Education, 34*(3), 246–262. https://doi.org/10.20853/34-3-3326

Nolan, R., & McFarlan, F. W. (2005). Information technology and the board of directors. *Harvard Business Review, 83*(10).

Nugroho, H. (2014). Conceptual model of IT governance for higher education based on COBIT 5 framework. *Journal of Theoretical and Applied Information Technology, 60*(2), 216–221.

Nugroho, H., & Surendro, K. (2013). Proposed model of vocational university governance and measurement model by utilizing the ISO 38500 framework and COBIT 5 enabler. *International Conference on ICT for Smart Society 2013: "Think Ecosystem Act Convergence", ICISS 2013*, 86–90. https://doi.org/10.1109/ICTSS.2013.6588069

Parry, V. K. A., & Lind, M. L. (2018). Alignment of business strategy and information technology considering information technology governance, project portfolio control, and risk management. *International Journal of Information Technology Project Management, 7*(4), 21–37. https://doi.org/10.4018/IJITPM.2016100102

Pereira, R., & da Silva, M. M. (2012). Towards an integrated IT governance and IT management framework. *2012 IEEE 16th International Enterprise Distributed Object Computing Conference*. https://doi.org/10.1109/EDOC.2012.30

Pereira, C., Ferreira, C., & Amaral, L. (2018). An IT value management capability model for Portuguese universities: A Delphi study. *Procedia Computer Science, 138*, 612–620. https://doi.org/10.1016/j.procs.2018.10.082

Peterson, R. (2004). Crafting information technology governance. *Information Systems Management, 21*(October), 7–22. https://doi.org/10.1201/1078/44705.21.4.20040901/84183.2

Phiri, D., & Weiguo, F. (2013). Information technology investment and firm performance in developing economies: The relationship between management practices and performance. In Z. Zhang, J. Zhang, & R. Zhang (Eds.), *2nd International Conference on Logistics, Informatics and Service Science (LISS)*. Springer. https://doi.org/10.1007/978-3-642-32054-5_76

Piattini, M., & Ruiz, F. (2020). *Gobierno y Gestión de las Tecnologías y los Sistemas de Información*. RA-MA Editorial.

Prasad, A., Green, P., & Heales, J. (2012). On IT governance structures and their effectiveness in collaborative organizational structures. *International Journal of Accounting Information Systems, 13*(3), 199–220. https://doi.org/10.1016/j.accinf.2012.06.005

Pretorius, J. (2006). A structured methodology for developing IT strategy. *Proceedings of the Conference on Information Technology in Tertiary Education*.

Putri, R. E., & Surendro, K. (2015). A process capability assessment model of IT governance based on ISO 38500. *International Conference on Information Technology Systems and Innovation, ICITSI 2015*, 0–5. https://doi.org/10.1109/ICITSI.2015.7437673

Racz, N., Weippl, E., & Seufert, A. (2010). A process model for integrated IT governance, risk, and compliance management. *The Ninth Baltic Conference on Databases and Information Systems*.

Rahimi, F., Møller, C., & Hvam, L. (2016). Business process management and IT management: The missing integration. *International Journal of Information Management.* https://doi.org/10.1016/j.ijinfomgt.2015.10.004

Ridley, M. (2006). *Information technology (IT) governance. A position paper.*

Rijati, N., Santoso, D. A., & Widjajanto, B. (2017). Integrated strategy of quality insurance system with information technology process in universities. *International Seminar on Application for Technology of Information and Communication: Empowering Technology for a Better Human Life, ISemantic 2017*, *2018-Janua*, 31–37. https://doi.org/10.1109/ISEMANTIC.2017.8251839.

Robb, A., & Parent, M. (2009). Understanding IT governance: A case of two financial Mutuals. *Journal of Global Information Management (JGIM)*. https://doi.org/10.4018/978-1-60960-605-3.ch003

Sabatini, G., Setyohadi, D. B., & Yohanes Sigit Purnomo, W. P. (2017). Information technology governance assessment in Universitas Atma Jaya Yogyakarta using COBIT 5 framework. *International conference on electrical engineering, computer science and informatics (EECSI)*, 2017-Decem(September), 19–21. https://doi.org/10.1109/EECSI.2017.8239161.

Saetang, S., & Haider, A. (2012). CIO and CTO nexus: Empowering organizations with IT governance. *Picmet `12: Proceedings – Technology Management for Emerging Technologies*.

Sambamurthy, V., & Zmud, R. W. (1999). Arrangements for information technology governance: A theory of multiple contingencies. *MIS Quarterly*. https://doi.org/10.2307/249754

Selig, G. J. (2016). IT governance-an integrated framework and roadmap : How to plan, deploy and sustain for improved effectiveness. *Journal of International Technology and Information Management, 25*(1), 55–77.

Seman, E. A. A., & Salim, J. (2013). A model for business-IT alignment in Malaysian public universities. *Procedia Technology, 11*(Iceei), 1135–1141. https://doi.org/10.1016/j.protcy.2013.12.305

Serrano, A., Gómez, B., & Juiz, C. (2017). Why the governance of projects, programs and portfolios (PPP) cannot be separated from the governance of IT standard. *Proceedings of the 35th National Information Technology Conference (NITC 2017)*, 106–111.

Seyal, A. H., Hung-Poon, S., & Tajuddin, S. (2016). A preliminary evaluation of ICT centers performance using COBIT framework: Evidence from institutions of higher learning in Brunei Darussalam. *Advances in Intelligent Systems and Computing*, 532.

Silvius, A. J. G. (2007). Exploring differences in the perception of business & IT alignment. *Communications of the IIMA*. https://doi.org/10.1007/BF00289625

Simonsson, M., & Johnson, P. (2008). The IT organization modeling and assessment tool: Correlating IT governance maturity with the effect of IT. *Proceedings of the Annual Hawaii International Conference on System Sciences*. https://doi.org/10.1109/HICSS.2008.447

Sledgianowski, D., & Luftman, J. (2005). IT-business strategic alignment maturity. *Journal of Cases on Information Technology.* https://doi.org/10.4018/jcit.2005040107

Smits, D., & Van Hillegersberg, J. (2018). The continuing mismatch between IT governance maturity theory and practice: A new approach. *Procedia Computer Science, 138*, 549–560. https://doi.org/10.1016/j.procs.2018.10.075

Steuperaert, D. (2016). Improving the quality of the COBIT 5 goals Cascade as an IT process prioritisation mechanism. *International Journal of IT/Business Alignment and Governance, 7*(2). https://doi.org/10.4018/ijitbag.2016070104

Subsermsri, P., Jairak, K., & Praneetpolgrang, P. (2015). Information technology governance practices based on sufficiency economy philosophy in the Thai university sector. *Information Technology & People, 28*(1), 195–223. https://doi.org/10.1108/ITP-10-2013-0188

Teo, W. L., Abd Manaf, A., & Choong, P. L. F. (2013a). Perceived effectiveness of information technology governance initiatives among IT practitioners. *International Journal of Engineering Business Management, 5*(1), 1–9. https://doi.org/10.5772/56661

Teo, W. L., Abd Manaf, A., & Choong, P. L. F. (2013b). Practitioner factors influencing participation in information technology governance initiatives. In K. Solimon (Ed.), *20th international-business-information-management-Assoc Conf on entrepreneurship vision 2020: Innovation, development sustainability, and economic growth* (p. 696). INT Business Information Management Assoc-IBIMA.

Toomey, M. (2009). *Waltzing with the elephant*. Infonomics Pty Ltd..

Torres Bermúdez, A. A., Arboleda, H., & Lucumí Sanchéz, W. (2014). Modelo de gestión y gobierno de Tecnologías de Información en Instituciones de Educación Superior. *Campus Virtuales, III*(2), 96–107.

University of Calgary. (2007). *IT governance model*. University of Calgary.

University of California, Berkeley. (2008). *Campuswide strategic information technology plan, 2008–2009*. University of California.

Valencia-García, V., Fernández-Vicente, E. J., & Usero-Aragonés, L. (2013). Maturity model for IT service outsourcing in higher education institutions. *International Journal of Advanced Computer Science and Applications*, *4*(10), 39–45. 10.14569/ijacsa.2013.041007.

Valencia-García, V., Fernández-Vicente, E. J., & Usero-Aragonés, L. (2014). Applicability of the maturity model for IT service outsourcing in higher education institutions. *International Journal of Advanced Computer Science and Applications*, *5*(7), 41–50. 10.14569/ijacsa.2014.050707.

Valverde-Alulema, F., & Llorens-Largo, F. (2019). Strategic portfolio of it projects at universities: A systematic and non-conventional literature review. *Ingenieria e Investigacion, 39*(2), 46–57. https://doi.org/10.15446/ing.investig.v39n2.72431

Valverde-Alulema, F., Mejia-Madrid, G., & Meza-Bolaños, D. (2017). Análisis de la gobernanza de las Tecnologías de la Información y Comunicación al servicio del buen vivir en las universidades públicas del Ecuador. *Publica, 4*(11), 208–227.

Van Grembergen, W., & De Haes, S. (2009). Enterprise governance of information technology: Achieving strategic alignment and value. In *Enterprise Governance of Information Technology:* Achieving Strategic Alignment and Value. https://doi.org/10.1007/978-0-387-84882-2.

Van Grembergen, W., De Haes, S., & Guldentops, E. (2004). Structures, processes and relational mechanisms for IT governance. *IGI Global*, 1–36. https://doi.org/10.4018/978-1-59140-140-7.ch001

Venkatraman, N., Henderson, J. C., & Oldach, S. (1993). Continuous strategic alignment: Exploiting information technology capabilities for competitive success. *European Management Journal.* https://doi.org/10.1016/0263-2373(93)90037-I

Vogt, M., & Hales, K. (2013). Alignment of IT projects and investments to community values. In *From government to e-governance: Public Administration in the Digital age* (pp. 93–113). IGI Global. https://doi.org/10.4018/978-1-4666-1909-8.ch007.

Webb, P., Pollard, C., & Ridley, G. (2006). Attempting to define IT governance: Wisdom or folly? *Proceedings of the Annual Hawaii International Conference on System Sciences*. https://doi.org/10.1109/HICSS.2006.68

Weill, P., & Ross, J. W. (2004). IT governance: How top performers manage IT decision rights for superior results. In *IT Governance*. Harvard Business Press. https://doi.org/10.2139/ssrn.664612

Wijayanti, N. Y., Setiawan, W., & Sukamto, R. A. (2017). Performance assessment of IT governance with balanced score card and COBIT 4.1 of Universitas Pendidikan Indonesia. *Journal of Physics: Conference Series, 812*(1), 1–7. https://doi.org/10.1088/1742-6596/755/1/011001

Yanosky, R., & Borreson Caruso, J. (2008). Process and politics: IT governance in higher education. In *ECAR key findings* (pp. 1–10). EDUCAUSE.

Yanosky, R., & McCredie, J. W. (2007). IT governance: Solid structures and practical politics. In *Presentation at the ECAR Symposium* (pp. 1–15). EDUCAUSE.

Yaokumah, W., Brown, S., & Okang-Mensah Adjei, P. (2015). Information technology governance barriers, drivers, IT/business alignment, and maturity in Ghanaian universities. *International Journal of Information Systems in the Service Sector, 7*(4), 66–83.

Yudatama, U., Nazief, B. A. A., Hidayanto, A. N., & Mishbah, M. (2017). Factors affecting awareness and attitude of IT governance implementation in the higher education institution: A literature review. *3rd International Conference on Science in Information Technology: Theory and Application of IT for Education, Industry and Society in Big Data Era, ICSITech 2017*, 588–592. https://doi.org/10.1109/ICSITech.2017.8257181.

Zambrano-Vera, M. F., & Molina-Sabando, L. (2017). Diagnóstico situacional del Gobierno de las Tecnologías de Información. Caso Universidad Laica Eloy Alfaro de Manabí. *Ciencia Unemi, 10, 111*(25). https://doi.org/10.29076/issn.2528-7737vol10iss25.2017pp111-122p

Zaneti-Putz, R. B., Rasoto, V. I., & Ishikawa, E. (2017). Governança de Tecnologia da Informação nas Universidades Federais Brasileiras: Uma Análise da Dimensão Alinhamento Estratégico. *Iberian Conference on Information Systems and Technologies, CISTI*. https://doi.org/10.23919/CISTI.2017.7975955.

Zarvić, N., Stolze, C., Boehm, M., & Thomas, O. (2012). Dependency-based IT governance practices in inter-organisational collaborations: A graph-driven elaboration. *International Journal of Information Management*. https://doi.org/10.1016/j.ijinfomgt.2012.03.004

Carlos Juiz is a Professor of Computer Architecture and Technology of the University of the Balearic Islands (UIB), Spain. Before joining the Department of Computer Science at UIB, he had several positions related to the computer systems industry. He was visiting researcher at the Department for Computer Science and Business Informatics, University of Vienna, in 2003 and Visiting Associate Professor at Biomedical Informatics Research, in 2011, at Stanford University. Carlos Juiz is heading the ACSIC research group (http://acsic.uib.es) and his research interest mainly focuses on performance engineering, Green IT and IT governance. He has participated in more than 500 international conferences, workshops and congresses and is co-author of more than 200 international papers and two university textbooks. Carlos Juiz is a senior member of the IEEE and also a senior member of the ACM. He was Sub-director of the Polytechnic School, Director of the Office of Planning and Prospective, President's Delegate of New Technologies and Vice-rector for Information Technologies at UIB. He was the Director of the Chair from Telefónica at UIB and currently, he is one executive vice-president at the TURISTEC cluster and also a board member of the Balears.T cluster. He is the coordinator of the work-group of Governance of IT at UNE, the Spanish body in ISO and co-editor of the ISO/IEC 38503 standard.

Beatriz Gómez is an Assistant Lecturer at the University of the Balearic Islands (UIB) where she teaches various courses including Systems Administration. She received her B.Sc. and M.Sc. degrees in Informatics in 2011 and 2013 respectively from the University of the Balearic Islands, Spain. Before joining the Department of Computer Sciences of the UIB she served for two years as an analyst and programmer in the technical department and software development of the company Emergency Management of the Balearic Islands (GEIBSAU) and thereafter participated as an engineer and researcher at the Chair Telefónica – UIB: Digital Health and Sustainable Tourism. She belongs to http://acsic.uib.eu research group which currently performs its functions about R+D in various projects who has written several articles and has participated in several conferences internationally. Her research covers various topics such as IT Governance, e-health, m-health, ICT and tourism, and energy efficiency.

Sustainable Information Technology Governance for Higher Education Institutions (HEIs) – A Systematic Literature Review

Esra AlDhaen, Elham Ahmed, Mohammed Mahmood, and Weifeng Chen

1 Introduction

Information Technology was one of the major drivers for performance sustainability during COVID-19. Higher Education Institutions (HEIs) relayed tremendously on Information Technology for multiple activities including teaching, operations, registration and other related functions. According to Webb et al. (2006) there is lack of definition in terms of IT governance, IT governance includes a set of elements that assures efficiency and effectiveness of the organizations. In addition, Johl et al. (2013) stated that HEIs are not yet matured in terms of applying nor implementing IT governance and this is due to multiple aspects including setting clear strategy or adapting a framework such as COBIT. Similarly Ajayi and Hussin (2018) stated that there is no consensus in terms of IT governance in HEIs as some of HEIs consider the use of IT infrastructure as IT governance. During COVID-19 pandemic HEIs were developing new practices to continue operating however; the practices were identified to cater with the situation and most of the HEIs did not have a solid IT infrastructure to support all the operations.

In similar context, Fattah et al. (2021) investigated the usefulness of IT governance frameworks for HEIs performance and proposed a number of key aspects to drive the implementation of IT governance including policies, processes and strategies. Furthermore; Moon et al. (2018) investigated HEIs commitment to United Nations Sustainable Development Goals (UNSDGs) and raised a concern with regard to the HEIs commitment in terms of digital transformation. Bauer et al.

E. AlDhaen (✉) · E. Ahmed
Ahlia University, Manama, Bahrain
e-mail: esaldhaen@ahlia.edu.bh; eahmed@ahlia.edu.bh

M. Mahmood · W. Chen
Brunel University London, Uxbridge, UK
e-mail: 1341291@alumni.brunel.ac.uk; weifeng.chen@brunel.ac.uk

M. Alaali (ed.), *COVID-19 Challenges to University Information Technology Governance*, https://doi.org/10.1007/978-3-031-13351-0_2

(2021) also argued that HEIs must go through a digital transformation in order to sustainable operations. It is clear from the above arguments that there is a lack of clarity in terms of IT governance at HEIs which is not sufficiently applied nor utilized effectively for sustainable operations. Therefore; this chapter will demonstrate a clear definition of IT governance model that is suitable for HEIs to support sustainable operations.

2 Literature Review

As stated by Ford (2017) and Bebbington (2011) reviewed the evolution of the sector in the United States and Europe, respectively. Both confirmed that HE evolved through multiple stages; the first and the last (current) stages in both contexts were the same. The first satge focused on theological enlightment support, while the last/current stage was affected by cultural modernism and focus on the varying role and objectives of HEIs. Despite differences in their evolution journey, the core functions of HEIs continue to be the same, with teaching, research and community engagement at the heart of their missions, and employability and public good as reflected in sustainability development gaining an increasing attention during the twenty-first century. With the repaid and dynamic challenges Digital Transformation has become essential in HEIs Abad-Segura et al. (2020), HEIs are considering digital transformation of multiple processes to support business continuity and sustainability. Subsequent COVID-19 pandemic a number of research studies were published highlighting the HEIs initiatives to transform teaching and learning into virtual learning (Alaali, 2022).

Countries worldwide have implemented various measure to ensure the continuity of HE services; with income imposing impacts on the type of tool to be implemented for distance learning (i.e., radio, television or online). Despite this, none of the offered solutions provided learning for all (40% of low- and lower-middle-income countries did not implement measures in support of learners at risk of exclusion from learning during the pandemic). The learning solutions offered could not substitute for classroom instruction. Universities closure interrupted support mechanisms given to many disadvantaged learners and the impact of lockdowns on income will cause individuals to make decisions about their resources' reallocation and priorities.

Although universities have established a substantial understanding of different technological practices to support teaching, learning and assessment. Researchers are still raising concerns in terms of the quality of education and recommending setting strategies at governance level to sustain quality standards AlDhaen et al. (2022). HEIs considered revisiting its strategic plans by integrating a number of technological operations which is restricted to teaching and learning, a number of drivers were used to support HEIs to revisit their strategies including United Nations Sustainable Development Goals (UNSDGs), UK Professional Standards Framework

(PSF), Organisation for Economic Co-operation and Development (OECD) (Shiel et al., 2020).

An in-depth review of the recent changes in the HE sector reveals that unprecedented developments have been occurring in HEI sector; one of the main challenges is development and implementing IT governance framework at HEI that is designed to serve the HEI strategy and objective Adel et al. (2021). This research was conducted based on a systematic literature review covering different data bases. Table 1 provides an analysis defined the keywords used as categories for publications, although since 2021 a number of research papers were published related to IT Governance, most of the papers were more towards IT adoption and e-governance rather than Sustainable IT Governance. In addition, more of the research papers were describing experiences of implementing IT governance frameworks in different sectors such as banking, healthcare etc. few research papers tackled catered IT governance frameworks for Higher Education Sector.

In this context, the following sections will describe the status of HEIs in terms of defining, understanding and implementing IT governance and propose a sustainable IT governance that is catered for HE sector.

2.1 IT Governance in HEI Context

According to Fernández and Llorens (2009), HEIs are required to implement IT governance to support the overall performance of the HEIs. In similar context, Ngqondi and Mauwa (2020) highlighted the need of establishing a full-fledged IT governance frameworks in HEIs, as currently HEIs does not have a systematic governance and described as fragmented. In terms of sustainability, COVID-19 pandemic has demonstrated the requirements of well- established ICT infrastructures specifically in the education sector AlDhaen et al. (2022). HEIs located in countries in the Gulf Region such as Kingdom of Bahrain, Saudi Arabia, United Arab Emirates and Oman are evaluated systematically by quality assurance bodies that assesses the IT infrastructure and capacity building, these quality assurance bodies evaluates the HEIs to assure that they are adequate and sustainable. The role of quality assurance is vital for sustainability of operations for instance Sofyani et al. (2020) highlighted the need for IT governance to support service quality at HEIs. In similar context,

Table 1 Keywords used as categories for Systematic Literature Review Published 2021

Categories	Research paper
IT Governance Frameworks	63 research papers
IT Governance Frameworks in Education sector	38 research papers
IT Governance for sustainable performance	20 papers

Adel et al. (2021) elaborated on the importance of HEIs Quality Assurance responsibility which covers a number of IT governance requirements that lead to sustainable performance.

According to Shi and Hoskisson (2021), understating and managing governance in HEIs requires a number of dimensions including rational decisions, involvement of stakeholders in decisions, innovative decisions and clear understanding of the objectives. In this context, Divjak (2016) stated that governance in HEIs is becoming more complex and demands a number of characteristics to be implemented including digital transformation. Fattah et al. (2021) stated that in order to develop an effective IT governance structure, alignment with the HEI strategy must be considered, in similar context; researchers highlighted that one of the main challenges of the HEIs while developing strategies is lack of information management and knowledge sharing Stone et al. (2018) which does not align the main strategies with the stakeholders needs including policy-makers and governance. Furthermore; De Freitas Langrafe et al., 2020) investigated the need to develop HEIs strategies in line with stakeholders needs through engaging stakeholders in the process of development which is vital for activating the actual strategy. In HEIs identification of stakeholders are normally restricted to alumni, students, parents and employers of the graduates, however; there is no clear focus on the internal stakeholders including faculty, staff and practitioners including system developers who manage IT governance. Therefore; it is serious area to be considered by HEIs leaders while setting or revising their strategies. A number of research studies stated that HEIs required innovative decisions activated by IT governance, these decisions are normally supported by transformative leaders practicing decentralized decision making Owusu-Agyeman (2021). Similarly, Lašáková et al. (2017) stated that disengagement of relevant stakeholders in the development process such as policy makers and members from the industry leads to lack of innovation in decision making that could not be transformed or digitalized.

Leal Filho et al. (2021) reflected the importance of leadership and clear organizational structure guided by a number of automated policies and procedures to support sustainable governance. It is clear that there is a relationship between strategy development and IT governance to support effective and sustainable IT governance leading to effective HEI performance. Furthermore; a number of research papers were published urging HEIs to reconsider a number HEIs strategies to be sustainable and tackles environmental changes AlDhaen and Mahmood (2020) including UNESCO stated that HEIs needs to re-consider a number of actions to assure sustainability which includes IT infrastructure and governance.

United Nations strategies are emphasised on the provision of lifelong learning for all goes hand in hand with emphasis on assuring individuals' access to quality education. The need for better trained educators, access to improved learning materials, time for onsite active engagement in learning activities between learners and their educators, pedagogical renewal, inclusive and well-designed curricula, nurturing learning environments and better governance was identified as necessary for quality education in schools (UNESCO, 2015). HEIs need to revisit its strategies

Table 2 Summary of Research Studies relates strategy with IT Governance for Sustainable Performance

Author(s)	Key aspects
Lašáková et al. (2017) Owusu-Agyeman (2021) Shi and Hoskisson (2021)	Innovative strategic decisions
Leal Filho et al. (2021) AlDhaen et al. (2022) Alaali (2022)	Leadership
Stone et al. (2018) AlDhaen et al. (2022)	Information and knowledge management
Lašáková et al. (2017) Shi and Hoskisson (2021) De Freitas Langrafe et al. (2020)	Stakeholders engagement
Leal Filho et al. (2021) Fattah et al. (2021)	Policies and organizational structure
AlDhaen et al. (2022) AlDhaen and Mahmood (2020)	Digital transformation and sustainability

with IT inclusion in order to be able to achieve UN strategies. Table 2 illustrate a summary of areas research studies relates strategy to IT governance.

2.2 Definition of IT Governance

According to Webb et al. (2006) there is still lack of clarity of IT governance, across the years the definition of IT governance developed by researchers however; it is still unclear to some of the context such as HEIs. Ajayi and Hussin (2018) stated that HEIs are still unable to have a clear definitions of IT governance and in most cases it is the use of IT infrastructure or tools rather that a governance framework that governed the strategy supported by policies and procedures. Fattah et al. (2021) argued HEIs to have a full-fledged IT governance that supports the implementation of its planned strategies. Based on the current literature, multiple definitions were identified with regard to IT governance however; the question that is a raised if these definitions are clear and suitable for HEIs considering the dynamic nature of HEIs. Therefore; the following table identifies the published definitions in relations to IT governance by scientific authors as well as professional standards Table 3.

2.3 IT Governance Frameworks

Across the years, a number of researchers identified theoretical IT governance frameworks that was applied by HEIs and found effectively (Peterson, 2004; Van Grembergen, 2000; Weill & Ross, 2004). In the business world, IT governance

Table 3 Definition of IT Governance (Authors and Professional Standards)

Author/Standards	Definition
Van Grembergen (2000)	IT governance is identified as structure of relationships between a number of processes and procedures within the organization to support generating reports to direct the organization towards assessing its performance
Weill and Ross (2004)	IT governance is identified as specifying right decisions with accountability to encourage desirable behaviour in the use of IT
Peterson (2004)	IT governance identified as distribution of roles and responsibilities among various stakeholders as per the organizational structure, supported by rules and regulations to support IT decision making
ISO/IEC 38500 (2008)	IT governance is identified as cooperate governance of Information Technology that supports communication and decision making. The framework involves evaluating IT to support the organization performance
De Haes and Van Grembergen (2009)	IT governance is identified as set of processes, structures and governance rational mechanisms aligned with IT to support the organization to generate reporting for decision making
Higher Education Authority (2015)	IT governance is identified as a framework sets out policies and procedures, supported by governing body responsibility and overseen in terms of compliance by working with the HEI to resolve governance issues
Huda et al. (2018).	IT governance is identified as a framework covering IT Steering Committee with involvement of leadership in setting strategies and clear measures for organizational performance supported by communication mechanisms.
IT Governance Institute (2021)	IT governance is identified as an element of corporate governance with a main objective is to support the overall business to perform effectively by aligning the organization strategies with the IT governance

frameworks were developed and commonly used for business sector. Despite the number of IT governance frameworks in place HEIs are still facing a risk of failure in terms of reacting to environmental changes such as COVID-19 and was not able to overcome a number of challenges due to lack of rationality leading to decision making. According to Meçe et al. (2020) IT governance framework could be only effective if the HEIs are mature and; therefore, there is a need to assess HEIs level of maturity against the adapted framework prior to implementation. Table 4 illustrates IT governance frameworks and its elements that are commonly used in the Business section and adapted by HEIs.

3 Proposed Sustainable IT Governance Model Catered for HEIs

Dey and Sobhan (2011) called for development of e-governance framework for HEIs that is catered to support HEIs to achieve their strategies and maintain efficient and effective performance. The e-governance framework was developed taking into account stakeholders feedback and digitalizing a number of procedures and process towards quality education. It is clear from the previous studies that HEIs requires a

Table 4 IT Governance Frameworks

IT governance frameworks	Framework elements
Committee of Sponsoring Organizations of the Treadway Commission (COSO) (1985)	The framework is designed covering governance and cultural, integrity and ethics, strategic objectives performance measures, review mechanism and quality of information generated.
Software Capability Maturity Model (CMM) (1986)	The framework is designed covering initial, repeatable, defined, managed and optimising stages
Information Technology Infrastructure Library (ITIL) (2000)	Th framework is designed with a focus on IT service strategy, design, transition, operations and fundamental business improvements
Factor Analysis of Information Risk (FAIR) (2005)	The framework is design with a focus to assist the organization in quantifying the level of cybersecurity and risk mitigation
COBIT (ITGI, 2007)	The framework is focused on people, policies and frameworks, processes, organisational structure, culture, ethics and behaviour, information, services, infrastructure and applications and people, skills and competencies
Governance, Risk and Compliance (GRC) (2007)	The framework is designed covering governance, aligning processes, risk mitigation and compliance
ISO/IEC 38500 (2008)	The framework is designed with principles including defined responsibilities, make acquisitions for valid reasons, assess performance and ensures compliance
King Code of Governance Principles (King III) (2009)	The framework is designed covering leadership, sustainability and good corporate citizenship

unique or customized IT governance framework to support HEIs. As stated by Meçe et al. (2020) that IT governance in HEIs is vital however; it required HEIs to be mature in order to be able to implement an effective IT governance. A key element for maturity is to ensure that the HEIs is having a clear strategy guided by governing policies and procedures with clear channels for monitoring its implementation.

In the similar context, Waema and Mitullah (2007) stated that e-governance and the utilization of IT governance in HEIs supports identification potential risks that is related to financial risks, which was one of the major challenges faced by HEIs during COVID-19. Therefore; HEIs are urged to establish and implement IT governance frameworks that will guide sustainable operations. One of the major challenges faced for implementing e-governance is lack of information and information management Alam et al. (2008), which is one of the common challenge in HEIs, information management and knowledge sharing is one of the key challenges in HEIs that is usually impacts on multiple operations including strategic decision making Stone et al. (2018).

Studies were published investigating IT governance in HEIs by applying common frameworks such as COBIT Julianti et al. (2021). All the studies are calling for alignment between the IT governance with the HEIs strategies, performance measures, policies and procedures that should be guided by effective academic leadership with clear levels of accountability and engagement of different stakeholders.

COVID-19 pandemic is the wake-up call for HEIs, universities around the world are required to transform and consider digitalization. Hueske and Pontoppidan

(2020) highlighted that HEIs are required to embed sustainability in management education which includes all governing strategic directions. Therefore; the proposed IT governance model, propose to anchor sustainability as part of strategic directions and governing policies and procedures.

3.1 Sustainable Strategy and Performance Measurement

Alignment between HEIs strategies and IT strategies is vital, a number of researchers called for digital transformation for sustainable education Goni et al. (2013). In similar context, De Oliveira et al. (2020) stated that UNSDGs commitment supports HEIs strategies and ensures that there is sustainable performance therefore; HEIs are urged to consider aligning their strategies with UNSDGs. Furthermore; Fuchs et al., 2020) investigated the relationship between alignment of UNSDGs and HEIs strategy development and concluded that detailed performance measurements need to be set with clear identification of monitoring bodies to assure effective and systematic implementation, the use of Balance Scorecard was found useful as aligns key processes and defines accountability.

In other hand, Findler et al. (2019) stated that HEIs sustainability requires universities to reconsider the strategies to be focused on Green Plan, which requires the digital transformation with clear and systematic measures. In similar context; AlDhaen and Mahmood (2020) proposed a set of clear performance measures towards sustainable strategic decision making for HEIs covering the three core functions of HEIs teaching, research and community.

Merchan-Lima et al. (2021) stated that Information Security Management (ISM) was considered one of the main challenges to HEIs in the United Kingdom, therefore it was suggested that HEIs revisit their strategies with considering IT governance frameworks such as ISO, COBIT and ITIL to support HEIs sustainable performance. In addition, Addo et al. (2021) investigated risk management is HEIs, and stated that HEIs that were able to overcome COVID-19 had a well-established sustainable strategies guided by IT governance frameworks such as ISO to enable accuracy of reporting that enabled efficient decision making. Furthermore, Mourad (2017) highlighted the need to integrate quality assurance as part of the implementation and stated that QA acts as a driver for the implementation of the strategy by quality assuring the data and information which leads for efficient decision making. Therefore,HEIs need to re-visit their strategies with alignment with UNSDGs to ensure sustainability and impact to the society with clear measurement that is systematic. This chapter propose sustainable strategy and performance measurement to be part of the IT governance for HEIs are it is expected to lead to systematic reporting, accuracy of data that will lead to sustainable strategic decision making.

3.2 Leadership and Organizational Effectiveness

Leadership is one of the most important aspects for transformation specifically for organizations that are going through transformational phase Al-Ghanem et al., 2020) . According to Waheed et al. (2018) leadership behaviour is found crucial for maintaining effective IT governance framework. Leadership support of digital transformation is important. It was proven that HEIs normally takes decisions at centralized manner rather than decentralized, however; with the requirements of quality assurance bodies and accreditation reflection of ownership and accountability is required; therefore, IT governance framework allows allocation of authorities to support staff engagement in the process to facilitate leaders decision making.

Stone et al. (2020) highlighted the need that more academic research need to be conducted in relation to the use of information technology and information managements in HEIs that could be useful to engage faculty and practitioners in the process of taught leadership. In similar context, Parnell et al. (2017) emphasised on the importance of leaders in supporting practitioners in order to generate reliable and quality assured reports leading to decision making. Furthermore; Ali and Anwar (2021) stated that strategic leadership is important for establishing a clear structure And Drive Motivation To The Employees Which leads to sustainable competitive advantage.

Various research studies were conducted calling for distributed leadership Van Ameijde et al. (2009), distributed leadership could be simply identified through clear IT governance framework that supports providing restricted approval channels and authorities that is considered accountable leadership. From the above mentioned research studies it is clear that leadership and organizational effectiveness is it vital and supports the implementation of the IT governance framework and hence it is expected to lead to sustainable performance.

3.3 Stakeholder Engagement

Shi and Hoskisson (2021) emphasised on the need to involve stakeholders while developing strategy and hence IT governance. Once of the major challenge that was identified in the literature that HEIs does not align the IT governance to the strategy and therefore they are not streamlined to serve the same objective. In similar context; Pham (2019) highlighted the need to have deep engagement with stakeholders and identify the needs of the users in order to set a clear strategy and IT governance framework that is sustainable and effective.

During COVID-19 multiple research studies were published calling for engaging stakeholders to revisit the HEI strategies. For instance Gonzalez-Perez et al. (2021) stated that HEI must have a clear process to manage stakeholders. Furthermore; Ramganesh et al. (2017) investigated the importance of development mobile-governance (m-governance) in HEIs based on stakeholders needs, the study

concluded that stakeholders demonstrated satisfaction with the HEI decisions taken based on the stakeholders engagement.

According to Cheng et al. (2021) most of HEIs focus on external stakeholders such as employers, alumni and industry-partners. However, the internal stakeholders are normally restricted to executive management or faculty members, the administrative staff or IT practitioners in most of the cases are not part of the strategy development or IT governance framework team. Therefore,streamlining the HEI strategy with IT governance framework may not be effectively applied as the stakeholders were not effectively engaged at initial stage.

From a quality assurance point of view, stakeholder input is important to support quality evaluation and decision making. Quality assurance, international accreditation standards and ranking requirements appreciates stakeholders' engagement in the review and planning processes including re-engineering of processes to be digitally transformed. In this regard, it is clear that stakeholder engagement is considered one of the proposed major component of IT governance framework for HEIs with consideration of all relevant stakeholders including practitioners, faculty, IT staff, administration, student, alumni and employers as well as any external collaboration which will support capturing stakeholder needs and designing governing policies, procedures and processes to serve the stakeholders needs and maintain sustainable satisfaction of stakeholders.

3.4 Quality Assurance and Risk Management

During COVID-19 pandemic several research studies were published to discuss challenges to maintain quality education. For instance, Rashid and Yadav (2020) highlighted that HEIs need to reconsider their strategies to maintain the transformative educational standards to maintain quality of education. Similarly, AlDhaen et al. (2022) stated that a number of policies and procedures need to be established or revisited to maintain ethical standards in HEIs. In addition, García-Peñalvo (2021) stated that despite HEIs included digital transformation in their strategies plans prior COVID-19, it was evident that digital transformation was compromised and unmatured. In similar context, Kang (2021) stated that COVID-19 has helped to reshape the education sector and recommended to apply quality assurance processes to assess the learning experience and stakeholder satisfaction.

Furthermore, Kagoya stated that HEIs needs to revisit their strategies to consider digital transformation to be sustainable with clear identification accommodating quality assurance processes to maintain quality education standards. In the other hand, risk management was one of the main challenges faced by HEIs during COVID-19, the risk is associated with number of student intake, drop out, financial stability . For instance, Gotangco et al. (2020) highlighted that HEIs are facing a number of factors that causes risks and; therefore, HEIs must have an established governance supported by clear strategy and quality management system to support sustainable HEI performance.

In similar context, Kryvytska et al. (2021) declared that HEIs need to consider communication strategy followed by multiple policies and procedures that is quality assured. The communication strategy should communicate operations and budget to support sustainable management. In other hand, Soobaroyen et al. (2019) stated that quality audits support mitigating risks and maintain sustainable performance. Ntim (2017) proposed a clear governance framework to support identification of risk to maintain sustainable management which includes systematic audits, revisiting strategies, governing policies and procedures with clear and systematic quality measurements to ensure smooth implementation.

From the above-mentioned literature, it could be seen that there is a clear relationship between quality assurance and risk management which is a major challenge in HEIs appeared during COVID-19 pandemic. Therefore, it is proposed to include clear quality assurance mechanisms and risk management actions associated with planned strategies to ensure that strategies are well-implemented and transformed as part of the IT governance framework. The quality assurance mechanisms need to be transformed with multiple layers of audit and compliance to maintain sustainable HEI performance.

4 Conclusion

This chapter, we suggest that it is time to shift from disruptive to transformative by proposing a new IT governance framework that is catered for HEIs. Considering the nature of operations governed in HEIs, the current business models of IT governance framework need to be more supportive. It requires HEIs to be matured in terms of digitalization of its operations. This is the major challenge in HEIs, this is due the focus of HEIs to be mission-driven and delivering the three core functions related to Teaching, Research and Community Engagement. HEIs tends to equip all its resources to fulfil their missions with neglecting the planned strategies or considering other priorities apart from digital transformation and setting IT governance.

The main challenge our research reveals is that HEIs lacks a refined IT governance framework. There is a mixed understanding of the use of technology in teaching and learning to be part of IT governance. Normally ICT infrastructure in HEIs is built only to meet the demand of teaching and learning.

The second challenge shows that some of HEIs establish clear IT governance frameworks but they were not utilized effectively. This is due lack of designing the framework to serve the HEI strategy and engagement of stakeholder (end-users) and therefore it does not serve the stakeholders needs therefore it is not utilized effectively in decision making including strategic decisions or identification of risks.

The third challenge is lack of streaming of IT Governance Framework and governing policies which includes identified structure, authority and approval channels. The nature of HEIs are normally designed with a multiple layers of approval channels with centralized decisions rather than decentralized. This is a major challenge

as HEIs need to provide a level of autonomy and accountability which IT governance framework is expected to resolve this matter for sustainable performance.

Another challenge that HEIs need to consider while developing a sustainable IT governance framework is to ensure that there is a regular and systematic professional development activities. It is essential that the activities need to consider all the elements to ensure effective utilization of the governance framework including technical professional development sessions and leadership related activities that guides leaders to use the sustainable IT governance framework as rational mechanism for measurement, identification of risk and strategic decision making. Indeed, organizational cultural and context need to be taken into account while developing/customizing a sustainable IT governance framework and setting priorities for activation and implementation phases is vital for sustainable performance.

5 Limitation of This Study

Unfortunately, this chapter propose a Sustainable IT governance framework drawn from the literature review and not a tested model. For future work, this model will be tested in HEIs and assessed in terms of sustainable performance and effectiveness.

6 Future Research Direction

This chapter demonstrated a systematic literature review highlighting various IT governance frameworks and determined new elements that could be considered in the Higher Education context. This chapter provided basis for future researchers to develop a conceptual model that could be investigated further in Higher Education with specific elements/dimensions as proposed in this chapter. It is important that the authors must consider mission-driven alignment to the proposed IT governance model to ensure sustainable performance as well as internal and external environmental factors that may have direct impact on the overall implementation.

References

Abad-Segura, E., González-Zamar, M. D., Infante-Moro, J. C., & Ruipérez García, G. (2020). Sustainable management of digital transformation in higher education: Global research trends. *Sustainability, 12*(5), 2107.

Addo, P. K., Asamoah, R. A., Adusei, A., & Djampim, J. K. (2021). Risk management in higher education: The role of educational leaders in translating policy into practice in the Ghanaian context. *International Studies in Educational Administration (Commonwealth Council for Educational Administration & Management (CCEAM)), 49*(2).

Adel, H. M., Zeinhom, G. A., & Younis, R. A. A. (2021). From university social-responsibility to social-innovation strategy for quality accreditation and sustainable competitive advantage during COVID-19 pandemic. *Journal of Humanities and Applied Social Sciences*.

Ajayi, B. A., & Hussin, H. (2018). Conceptualizing information technology governance model for higher education: An absorptive capacity approach. *Bulletin of Electrical Engineering and Informatics, 7*(1), 117–124.

Alaali, M. A. (2022). COVID-19: Overview of current and future online university teaching. *Assessing university governance and policies in relation to the COVID-19 Pandemic*, pp. 1–17.

Alam, M., Ahmed, K., & Islam, M. A. (2008, December). E-governance: Challenges and opportunities. In *Proceedings of the 2nd International Conference on theory and Practice of Electronic Governance* (pp. 264–267).

AlDhaen, E. S., & Mahmood, M. (2020). HEIs practices and strategic decisions toward planning for delivering academic programs for a sustainable future. In *Sustainable development and social responsibility—Volume 2* (pp. 89–93). Springer.

AlDhaen, E., Stone, M. D., & Mahmood, M. (2022). Higher education institutional strategies to sustain quality education: COVID-19 practices and lessons. In *Assessing university governance and policies in relation to the COVID-19 pandemic* (pp. 37–48). IGI Global.

Al-Ghanem, N. H., Braganza, A., & Aldhean, E. (2020). Distributed leadership: An effective leadership approach for organisations undergoing radical organisational transformational initiatives. *Journal of Talent Development and Excellence, 12*(2s), 2265–2279.

Ali, B. J., & Anwar, G. (2021). Strategic leadership effectiveness and its influence on organizational effectiveness. *International Journal of Electrical, Electronics and Computers, 6*(2).

Bauer, M., Rieckmann, M., Niedlich, S., & Bormann, I. (2021). Sustainability governance at higher education institutions: Equipped to transform? *Frontiers in Sustainability, 2*, 24.

Bebbington, D. W. (2011). Christian higher education in Europe: A historical analysis. *Christian Higher Education, 10*(1), 10–24.

Cheng, M., Adekola, O., Albia, J., & Cai, S. (2021). *Employability in higher education: A review of key stakeholders' perspectives*. Higher Education Evaluation and Development.

De Freitas Langrafe, T., Barakat, S. R., Stocker, F., & Boaventura, J. M. G. (2020). A stakeholder theory approach to creating value in higher education institutions. *The Bottom Line*.

De Haes, S., & Van Grembergen, W. (2009). An exploratory study into IT governance implementations and its impact on business/IT alignment. *Information Systems Management, 26*(2), 123–137.

De Oliveira, R., Leitão, J., & Alves, H. (2020). Corporate governance and sustainability in HEIs. In *Introduction to sustainable development leadership and strategies in higher education*. Emerald Publishing Limited.

Dey, S. K., & Sobhan, M. A. (2011, December). E-governance framework for higher education institutes using grid: Digital Bangladesh perspective. In *14th international conference on computer and information technology (ICCIT 2011)* (pp. 463–468). IEEE.

Divjak, B. (2016). Challenges of strategic decision-making within higher education and evaluation of the strategic decisions. In *Central European conference on information and intelligent systems* (p. 41). Faculty of Organization and Informatics Varazdin.

Fattah, A., Saragih, H., & Setyadi, R. (2021). Determinants effectiveness of information technology governance and IT performance in higher education institution (HEI): A conceptual framework. *International Journal of Science, Technology & Management, 2*(1), 36–47.

Fernández, A., & Llorens, F. (2009). An IT governance framework for universities in Spain. In *Proceedings of the EUNIS 2009 Conference* (pp. 1–13).

Findler, F., Schönherr, N., Lozano, R., & Stacherl, B. (2019). Assessing the impacts of higher education institutions on sustainable development—An analysis of tools and indicators. *Sustainability, 11*(1), 59.

Ford, M. (2017). The functions of higher education. *American Journal of Economics and Sociology, 76*(3).

Fuchs, P., Raulino, C., Conceicao, D., Neiva, S., de Amorim, W. S., Soares, T. C., et al. (2020). Promoting sustainable development in higher education institutions: The use of the balanced scorecard as a strategic management system in support of green marketing. *International Journal of Sustainability in Higher Education*.

García-Peñalvo, F. J. (2021). *Digital transformation in the universities: Implications of the COVID-19 pandemic*.

Goni, F. A., Sahran, S., Mukhtar, M., Shukor, S. A., & Chofreh, A. G. (2013, November). Aligning an information system strategy with sustainability strategy towards sustainable campus. In *2013 International Conference on Research and Innovation in Information Systems (ICRIIS)* (pp. 245–250). IEEE.

Gonzalez-Perez, M. A., Cordova, M., Hermans, M., Nava-Aguirre, K. M., Monje-Cueto, F., Mingo, S., & Floriani, D. E. (2021). Crises conducting stakeholder salience: Shifts in the evolution of private universities' governance in Latin America. *Corporate Governance: The International Journal of Business in Society*.

Gotangco, C. K., Jardeleza, J. M., Lopez, C., Labaria, E. C., Wickert, J., & Shadiya, F. (2020). Factors influencing disaster risk and resilience education in Asian HEIs. *International Journal of Disaster Resilience in the Built Environment*.

Huda, M. Q., Utami, M. C., Hidayah, N. A., & Aini, Q. (2018). Effective IT governance in higher education institutions: The conceptual model. *Advances in Intelligent System Research (AISR), 149*, 148–151.

Hueske, A. K., & Pontoppidan, C. A. (2020). GEROCO: A model for integrating sustainability in management education at HEIs. In *Leadership strategies for promoting social responsibility in higher education*. Emerald Publishing Limited.

Johl, C., Flowerday, S., & Von Solms, R. (2013). Information technology governance process maturity in higher education institutions in South Africa. *South African Journal of Higher Education, 27*(3), 627–644.

Julianti, M. R., Gaol, F. L., Ranti, B., & Supangkat, S. H. (2021, August). IT governance framework for academic information system at higher education institutions: A systematic literature review. In *2021 International Conference on ICT for Smart Society (ICISS)* (pp. 1–6). IEEE.

Kang, B. (2021). How the COVID-19 pandemic is reshaping the education service. *The future of service post-COVID-19 pandemic, 1*, 15.

Kryvytska, O., Doroshenko, H., Babych, D., Krykun, O., & Kovalchuk, V. (2021). The financial component of the communication management strategy in higher education institutions. *Financial and credit activity: problems of theory and practice, 1*(36), 462–470.

Lašáková, A., Bajzíková, Ľ., & Dedze, I. (2017). Barriers and drivers of innovation in higher education: Case study-based evidence across ten European universities. *International Journal of Educational Development, 55*, 69–79.

Leal Filho, W., Salvia, A. L., Frankenberger, F., Akib, N. A. M., Sen, S. K., Sivapalan, S., et al. (2021). Governance and sustainable development at higher education institutions. *Environment, Development and Sustainability, 23*(4), 6002–6020.

Meçe, E. K., Sheme, E., Trandafili, E., Juiz, C., Gómez, B., & Colomo-Palacios, R. (2020). Governing IT in HEIs: Systematic mapping review. *Business Systems Research: International Journal of the Society for Advancing Innovation and Research in Economy, 11*(3), 93–109.

Merchan-Lima, J., Astudillo-Salinas, F., Tello-Oquendo, L., Sanchez, F., Lopez-Fonseca, G., & Quiroz, D. (2021). Information security management frameworks and strategies in higher education institutions: A systematic review. *Annals of Telecommunications, 76*(3), 255–270.

Moon, C. J., Walmsley, A., & Apostolopoulos, N. (2018). Governance implications of the UN higher education sustainability initiative. *Corporate Governance: The International Journal of Business in Society*.

Mourad, M. (2017). Quality assurance as a driver of information management strategy: Stakeholders' perspectives in higher education. *Journal of Enterprise Information Management*.

Ngqondi, T., & Mauwa, H. (2020). Information technology governance model for a low resource institution with fragmented IT portfolio. *South African Journal of Higher Education, 34*(3), 246–262.

Ntim, C. G. (2017). *A simple best practice guide for making governance and risk management disclosures by governing boards and senior managers*.

Owusu-Agyeman, Y. (2021). Transformational leadership and innovation in higher education: A participative process approach. *International Journal of Leadership in Education, 24*(5), 694–716.

Parnell, B. D., Stott, R., Stone, M., Aravopoulou, E., & Timms, L. (2017). Business model innovation, strategic information and the role of analyst firms. *The Bottom Line*.

Peterson, R. R. (2004). Integration strategies and tactics for information technology governance. In *Strategies for information technology governance* (pp. 37–80). Igi Global.

Pham, H. T. (2019). Stakeholders' engagement in quality assurance in Vietnam. In *Quality assurance in Vietnamese higher education* (pp. 137–161). Palgrave Macmillan.

Ramganesh, E., Kirubakaran, E., Ravindran, D., & Gobi, R. (2017). Effectiveness of transformation from e-Governance to m-Governance of a HEI on its communication services to the stakeholders. *IOSR Journal of Computer Engineering (IOSR-JCE), 19*(3), 1–8.

Rashid, S., & Yadav, S. S. (2020). Impact of Covid-19 pandemic on higher education and research. *Indian Journal of Human Development, 14*(2), 340–343.

Shi, W., & Hoskisson, R. E. (2021). *Understanding and managing strategic governance*. Wiley.

Shiel, C., Smith, N., & Cantarello, E. (2020). Aligning campus strategy with the SDGs: An institutional case study. In *Universities as living labs for sustainable development* (pp. 11–27). Springer.

Sofyani, H., Riyadh, H. A., & Fahlevi, H. (2020). Improving service quality, accountability and transparency of local government: The intervening role of information technology governance. *Cogent Business & Management, 7*(1), 1735690.

Soobaroyen, T., Ntim, C. G., Broad, M. J., Agrizzi, D., & Vithana, K. (2019, October). Exploring the oversight of risk management in UK higher education institutions: The case of audit committees. In *Accounting forum* (Vol. 43, no. 4, pp. 404–425). Routledge.

Stone, M., Aravopoulou, E., Evans, G., Aldhaen, E., & Parnell, B. D. (2018). From information mismanagement to misinformation–the dark side of information management. *The Bottom Line*.

Stone, M., Kosack, E., & Aravopoulou, E. (2020). Relevance of academic research in information technology and information management. *The Bottom Line*.

Van Ameijde, J. D., Nelson, P. C., Billsberry, J., & Van Meurs, N. (2009). Improving leadership in higher education institutions: A distributed perspective. *Higher Education, 58*(6), 763.

Van Grembergen, W. (2000, May). The balanced scorecard and IT governance. In *Proceedings of the 2000 information resources management association international conference on challenges of information technology management in the 21st century* (pp. 1123–1124).

Waema, T. M., & Mitullah, W. (2007, December). E-governance and governance: A case study of the assessment of the effects of integrated financial management system on good governance in two municipal councils in Kenya. In *Proceedings of the 1st international conference on Theory and practice of electronic governance* (pp. 263–268).

Waheed, H., Hussin, H., & Jalaldeen, M. R. M. (2018, July). The influence of IT leaders' leadership behaviour on IT governance performance in higher education: A literature review. In *2018 International Conference on Information and Communication Technology for the Muslim World (ICT4M)* (pp. 254–259). IEEE.

Webb, P., Pollard, C., & Ridley, G. (2006, January). Attempting to define IT governance: Wisdom or folly?. In *proceedings of the 39th annual Hawaii international conference on system sciences (HICSS'06)* (Vol. 8, pp. 194a–194a). IEEE.

Weill, P., & Ross, J. W. (2004). *IT governance: How top performers manage IT decision rights for superior results*. Harvard Business Press.

Esra AlDhaen holds a Doctorate from Brunel University London, in the area of Strategic decisions and quality in the context of Higher Education, currently an Executive Director of Quality Assurance and Accreditation as well as Assistant Professor at Ahlia University Bahrain. Appointed external reviewer and conducted various QA reviews as part of Oman Academic Accreditation Authority (OAAA), Bahrain Education and Training Quality Authority (BQA) for National Qualification Framework validation and National Commission for Academic Accreditation and Assessment (NCAAA) KSA. As HEA Principle fellow and expert in curriculum review, design and mapping to the National Qualification Framework as well as alignment of cross boarder qualifications was able to set Assurance of Learning (AOL) framework to evaluate and assess student direct and indirect learning and chaired the AOL committee at College level. Highly experienced in HEIs in various counties such as United Kingdom, Kingdom of Bahrain, KSA, UAE and Oman, along with the gained diverse background enable to transfer and share knowledge and experience from multiple aspects. In particular to institutionalize and streamline various adapted QA standards into one quality management system supporting all the HEI targets such as international accreditation and ranking. This area was activated through becoming an active member at governance level which enable revising, implementation, assessing and further planning for the university strategic plan towards achieving the mission and vision of the university that includes setting targets and Key Performance indicators (KPIs) have also been practiced and highly performed focused on Teaching and Learning Excellence, Research Impact and Societal Contribution. An expert in strategic planning, measurement and evaluation for higher education including assessment of internal and external environment. Leading Sustainable Development Initiatives in collaboration with United Nations for promising future and a member of multiple national and international society tackling sustainable development and quality improvements. Published and awarded best papers by Emerald Publishing in various research areas including strategy, sustainable quality management teaching and learning.

Elham Ahmed is a lecturer in the field of Management Information Systems and currently the Director of the President Office at Ahlia University Bahrain. She is a PhD Researcher with Brunel University London and currently investigating topics related to Governance in Higher Education. She holds a Master of Business Administration and a Bachelor in Computer Science, both from University of Bahrain and being on the University first honour list. Upon completing her undergraduate studies, Ms. Elham joined University of Bahrain as Lab Demonstrator in the Department of Computer Engineering. After gaining seven years academic and administrative experience in the University of Bahrain, she successfully joined Ahlia University.

Mohammed Mahmood is an independent consultant in the areas of Strategic Planning, Excellence, Quality and ICT. Moreover, he is a senior consultant at Envision Associates, based in London. He is a leading innovator in the regulatory and management of telecommunications and related information technology fields and he has achieved notable success in both the academic arena as well as professionally during his experience with the Ahlia University and his 10+ year tenure with the Telecommunications Regulatory Authority (TRA) and previous 8+ years with the Pension Fund Commission and the University of Bahrain. He specializes in wide-scale management of projects, resources and teams of personnel. As part of his consultancy services, Mohamed was responsible for the overall strategic plan and lately compiling the framework to achieve the plan at Ahlia University. This encompasses establishing appropriate metrics and utilizing his leadership and communication talents to implement the plan. Additionally, Dr. Mahmood collaborated with others on identifying new initiatives that are being developed internationally and advised the President on potential enhancements. Prior to his consultancy work, Mohamed Mahmood served in multiple managerial and executive positions for TRA. Moreover, he has been at the forefront of rapid changes in the industry. While serving as an executive, he oversaw strategies and projects for TRA through participating in planning and managing several projects which enhanced the information, communication and technology infrastructure capacity and quality for all of Bahrain. In addition to his professional accomplishments, Dr. Mahmood received several technical

certifications as well as a Bachelors Degree in Computer Science from the University of Bahrain and a Masters Degree in Internet Technology from Aston University in Birmingham, UK. In 2017, he earned a Ph.D. from the Brunel University Business School (UK).

Weifeng Chen is a specialist in technology adoption, business models innovation, digitalisation and social transformation, and statistical modelling. His current research focuses on the impact of disruptive technologies such as Artificial Intelligence and Blockchain Technology on innovation related to new business models and ecosystem co-creation in global value chains. Additionally, he studied contemporary problems in international strategic innovation management and international talents management for new products, services and applications. He had collaborated on joint research projects (e.g. EU, British Council) with various industries, public sector organisations in the UK and internationally. He had also provided consultancy on business model innovation and optimisation. He had published in high impact journals such as Journal of Business Research, Production Planning and Control, International Review of Administrative Sciences, Technological Forecasting & Social Change, Information Technology for Development and Regional Studies among others. 11 doctoral students have successfully completed their PhD under his direct supervision. He completed his PhD on Business Management and Innovation Strategy in 2008 and since then, he has been working as an academe at Brunel University London.

Digital Transformation in Higher Education: A Framework for Maturity Assessment

Adam Marks and Maytha AL-Ali

Organizations today are operating in a massive, digitally connected world, and their stakeholders expect seamless and personalized digital services (Bayler & Oz, 2018). Producing and acquiring knowledge has a great importance today. The success of organizations and nations highly depends on producing and using information successfully. The increased use and production of knowledge places organizations into a necessary digital transformation. This digital transformation impacts the core components of an organization - from its operating model to its infrastructure. Organizations usually do not transform by choice, more often when they fail to evolve and keep up with market changes and technology disruptions (Thompson, 2013).

Terms like digitization, digitalization, and digital transformation can be confusing, especially if used interchangeably, however they refer to distinct concepts. While digitization is concerned with transforming analog objects into digital representations, digitalization is concerned with improving processes by use of digitized data and programs, also known as automation. Digital transformation is concerned with transforming organizational processes; build new competencies and models through digital technologies in a profound and strategic way (Mahlow & Hediger, 2019). Digital transformation refers to an organizational change realized by means of digital technologies and business models with the aim to improve organization's operational performance. It involves much more than implementing a well-chosen technology solution, it is a close alignment between information technology and business processes that will lead to a substantial outcome for the organization, keeping in mind organizational readiness, change management, and managing key stakeholders (Norton et al., 2020).

A. Marks (✉)
Higher Colleges of Technology, Abu Dhabi, United Arab Emirates

M. AL-Ali
Zayed University, Dubai, United Arab Emirates

M. Alaali (ed.), *COVID-19 Challenges to University Information Technology Governance*, https://doi.org/10.1007/978-3-031-13351-0_3

Chaurasiya, 2020 states "Digital transformation is not only the transformation of tool, technologies and process but it is transformation of entire business model. It changes the way a business operates and interacts within itself and with external world. Business transformation is a change in mind set that business is evolving faster than we are adapting". Digital transformation should have a strategic objective defined in an operational architecture with business use cases (Chaurasiya, 2020).

Similar to other industries, higher education institutions need to make informed decisions, and at times quick decisions to streamline operations, understand their customers, service delivery, product development, asset utilization or other operational areas. Data should be used to discover hidden patterns, and underlying performance in specific areas, and influence decisions that yield maximum impact for the organization. Legacy systems can result in significant cost and strain budgets. Moreover, threats to higher institutions, both online and on campus, present an urgent need for security and intelligence about students and staff more than ever before. Those challenges cannot be addressed using manual forms and processes. Higher education institutions today must integrate digital technologies into their business to a much greater extent than before (Marks et al., 2016; Seres et al., 2018).

The impact and magnitude of the COVID-19 pandemic forced many sectors to attempt to do business online. Education and higher education institutions across the globe had to make quick and important digital transformation adjustments to sustain operations. Questions about course delivery, virtual classrooms, seats, capacity, conducting exams and assessments, academic integrity, use of web cams, capacity and quality of video conferencing, and many other questions were raised. Many universities signed up with Zoom, MS Teams, Respondus, and other software systems to sustain operations.

Literature in digital transformation maturity and challenges, specifically within higher education, and more specifically within developing nations is scarce. This study aims to address those identified gaps. Given the importance of higher education in today's information society and knowledge economy, this study is significant to higher education institutions, as well as to other stakeholders involved in the hierarchy of higher education, including students, educators, researchers, institutions, and government agencies. Digital transformation in higher education, especially after COVID-19 is seen as inevitable not only to compete, but also to survive and sustain key operations.

This research explores digital transformation maturity and challenges within United Arab Emirates "UAE", one of the advanced developing nations in terms of IT infrastructure and digital transformation plans. The significance of the study does not only stem from the critical role higher education is responsible in educating and training future leaders, workers, and citizens; but also from the key role digital transformation plays in today's knowledge economy, which became more evident after the COVID-19 pandemic.

The next section of this paper presents some of the literature related to the main topic of this study, followed by the research methodology, the discussion, conclusion, and recommendation.

1 Related Work

Digital transformation is a key element of the fourth industrial revolution. Klaus Schwab, the founder of the World Economic Forum (WEF), describes the emergence of the fourth industrial revolution by linking three fundamental factors. These are: "Speed: New technologies that are connected to each other and are very versatile move quickly at an exponential speed, triggering each other. Width and Depth: Digitization speeds up the industry 4.0. However, the increase in technology diversity in the industry has brought about the change. System Impact: Industry 4.0 is expected to undergo a total change as digital industries, companies, and even countries" (Schwab, 2016).

Digital McKinsey breaks digital transformation into three attributes: creating value, optimizing the processes that execute a vision of customer experiences, and building foundational capabilities that support the entire structure (Digital McKinsey, 2016). Figure 1 shows the three attributes of digital transformation with more details.

There are several reasons why organizations undergo digital transformation; however, the main reasons are related to the issues of competitive advantage and survival. Digital transformation of an organization represents an objective process capable at responding to disruption in critical functions and changing organizations environments (Schwertner, 2017; Solis, 2017). As in other industries, four elements are driving digital transformation in education: customer experience, competitiveness, profitability, and agility (Clark, 2018).

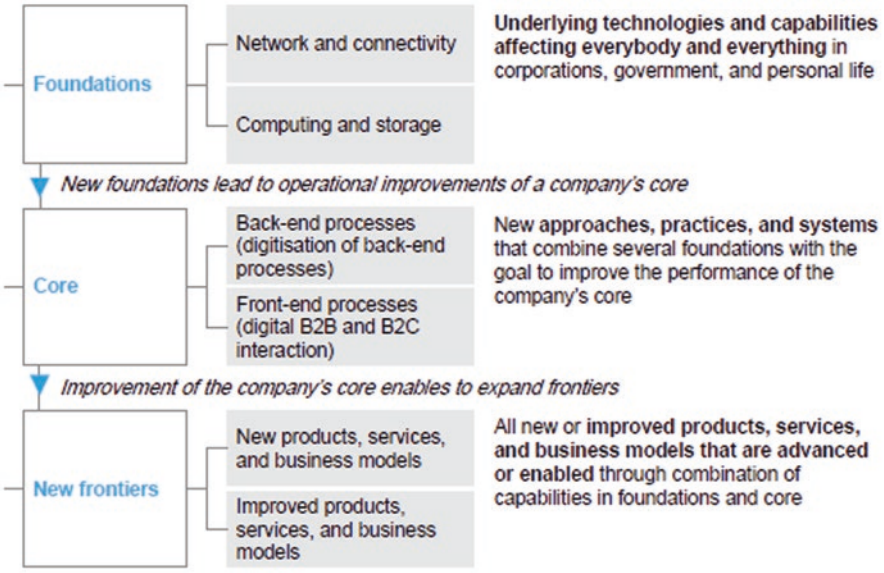


Fig. 1 Digital transformation attributes. (Source: Digital McKinsey, 2016)

The impact of digital transformation transcends technology. Through the process of digital transformation, organizations use multiple new digital technologies, with the intent to achieve superior performance and sustained competitive advantage. In such way, they transform different dimensions of business, such as the business model, the customer experience and operations, and simultaneously impacting people and networks (Mahlow & Hediger, 2019; Ismail et al., 2017).

Ismail et al. (2017) presents six dimensions to digital transformation, they are: Established and accepted organizational digital strategy, Organized agile, and adaptable collaborative processes in modern business models; Complete automation of business processes; Detailed analysis and research of customers' decision making; Information technology supporting all organizational business processes; Usable and relevant data, use of data analytics as a basis for decision making in line with the organization's goals and strategy (Ismail et al., 2017).

Bounfour (2020) talks about four dimensions of digital transformation, namely "the purpose", "degree of strategy", "speed of strategy", and "the value source". Table 1 shows those dimensions in more details.

Figure 2 outlines the main sectors that have been disrupted by digital transformation. Public Sector related entities, including education, are being disrupted now by digital transformation. The opportunity for the Public Sector is to learn from the previous experiences of other sectors.

In the Middle East and North Africa "MENA" region, the trends of information and communications technologies (ICT) are very diverse due to different levels of development both between and within countries. This gap can be attributed to different aspects including infrastructure, economic conditions, job market, and lack of adequate governance. Nevertheless, nearly all countries in the region are pursuing policies supporting digitalization to further development.

Countries – such as the United Arab Emirates (UAE), and Saudi Arabia, are well equipped for further technological development (Göll & Zwiers, 2018). However,

Table 1 Digital transformation: dimensions, issues, and implications

Dimension of digital transformation	Questions for manager (Strategy, organization, and business models)	Main topics
The purpose of digitation strategy	Which analytical methods will be selected in the company What are the spaces for development and value creation	Determining and analyzing the value creation space
Degree of digitization strategy	What is the relative importance of platforms? What kind of typology? Which governance structure promotes innovation?	Defining and analyzing the idea of creating new platforms
The speed of digitization strategy	How to define innovation offers	Fast and systematic phenomena
Value sources, creation based on digital strategy	What are the sources of value creation in digital space	Define the proposed values of the digital space

Source: (Bounfour, 2020)

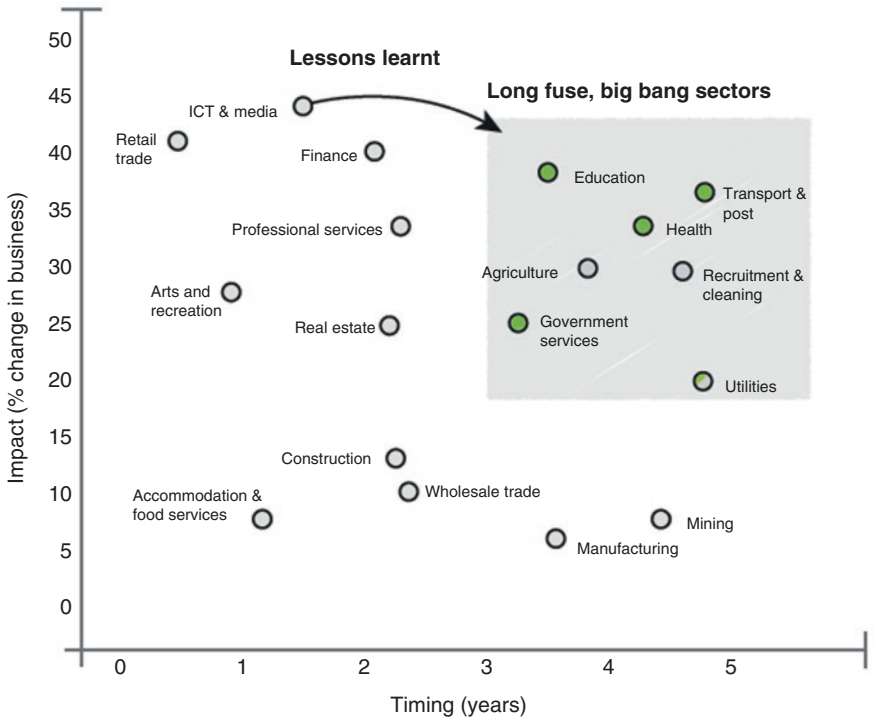


Fig. 2 Sectors affected by digital transformation. (Source: Deloitte, 2019)

the National ICT Index still shows that those countries still lag behind other developed economies in terms of Digital Government capabilities (Deloitte, 2019; Parlak, 2017).

To address their own economic, social and environmental challenges, several governments in the MENA region have launched national transformation plans with a focus on enabling ICT and Digital Transformation technologies. Integrating digital technologies to develop smarter cities and become smarter nations is a key outcome of their national visions (Deloitte, 2019; Limani et al., 2019).

Globally, higher education digital transformation is highly influenced by government policies and institutional development strategies (Walker et al., 2016). The aim of the digital transformation process in higher education is to redefine educational services and redevelop operational processes. This can be achieved using three possible approaches. The first approach involves service-first transformation. It focuses on changing and redefining services before making key improvements and changes to operations. The second approach is the operation-first transformation. In this approach, the higher education institution identifies new and amends current digital processes, activities and operations. The third approach is service-operation combination, involves integrated transformation through systematic interrelation of both previous approaches (Sandkuhl & Lehmann, 2017).

As shown in Table 2, (Petkovics et al., 2014) maps higher education business processes into four hierarchical levels: mega processes, major processes, sub-processes, activities and tasks. The mega processes include the learning and teaching process, the research process, the enabling process, and the planning and governance process (Petkovics et al., 2014).

The Organization for Economic Co-operation and Development "OECD", 2016 study provide a similar presentation of higher education business processes and example of new digital trends, as shown in Table 3.

- Deloitte presents a Digital Maturity Assessment Framework, using five key criteria:
- Does the organization have the right vision and strategy for digital, and the leadership, communications and focus required to support this vision?
- Does the organization have the right talent, skills and knowledge to support its vision, products, and services?
- Does the organization have the right processes, controls and digital technologies to support the operations of the organization?
- Does the organization have the right technologies and infrastructure as well as the ability to develop, manage and deliver?
- Does the organization have the right approach to understanding and communicating with its customers to succeed in a digital environment? (Deloitte, 2019)

Figure 3 visualizes results from Gartner's (2017) CIO Survey, shows where higher education intuitions are in terms of digital transformation. Organizational mind-set is what separates the No digital initiative institutions from those with Desire/Ambition. This transformation requires a framework that is effectively communicated to key stakeholders and decision makers. If employed correctly, digital transformation can play a major role in today's higher education including in the

Table 2 Overview of mega and major processes in higher education institutions

Learning and teaching process	Research process
Study program accreditation	Research planning
Teaching process preparation and realization	Research preparation
Teaching process outcomes monitoring	Research conduct
Teaching process assessment	Research outcomes monitoring
Student and teacher mobility realization	Research evaluation
Enabling process	Planning and governance process
Student administration services	Organization management services
Library services	Change and business process management
Staff provision and development services	Plan development
Finance and accounting services	Budget ad funds planning
Marketing, sales, and distribution services	Performance assessment
Procurement services	

Source: (Petkovics et al., 2014)

Table 3 Categories of educational services and new digital trends

Categories of educational services	Examples of new digital trends
Administration	Application for enrollments, enrollments for exams, grade generation, class schedule
Communication	Collaboration platforms, online communication
Teaching and preparing lessons	Electronic books, online learning resources
Teaching and learning	Online learning
Reviews and examinations	Reviewing test and exams, Exam grading

Source: (OECD, 2016)

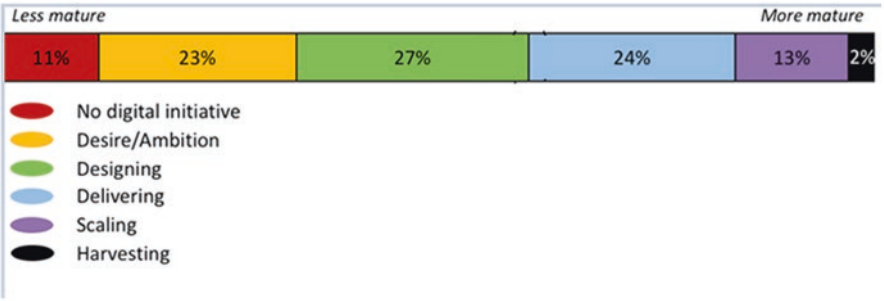


Fig. 3 Digital transformation maturity in higher education. (Source: Gartner, 2017)

areas of admission tracking, enrollment optimization, and academic advising (Gartner, 2017).

The literature shows that digital transformation is usually faced with a number of challenges. More often than not, those challenges are not listed in any specific order based on criticality, and they are not attached to a specific industry. Challenges reported include: the changing customer experience/expectations, resistance to change, resistance to technology, lack of leadership support, lack of competency and digital transformation skills, failing or poor analytics, lagging and legacy business models and systems, poor planning, misalignment with business strategy, technology and data challenges, lack of clear vision, and digital literacy of stakeholders (Maltese, 2018; NV, 2017; Chaurasiya, 2020).

If implemented correctly, digital transformation tools and technologies such as Artificial Intelligence (AI), Internet of Things (IoT), big data, block chain, social analytics, and cloud services can enhance and change educational system practices, especially in a world where students are constantly interacting with technology in all other aspects of their everyday lives, digital transformation clearly offers opportunities for student engagement that are not always available in the fixed environment of the classroom (Al Tamimi & Company, 2019; Xiao, 2019).

Seres et al. (2018) discuss four ways where digital transformation may change how education looks in the future, namely smart content, differentiated and personalized learning, global and remote learning, and administrative efficiencies.

In the area of "Smart Content", digital transformation can be attained through e-books, new learning platforms, virtual content such as video lectures and conferences, electronic curricula, distributed educative information across devices. Similarly, in the area of "Differentiated and Personalized Learning", digital transformation can be attained through personalized electronic tutoring customized to the learning styles and particular needs of the student. The traditional curriculum is designed to suit as many students as possible. For students in the top 10 percent and the bottom 10 percent, AI for example can be used to provide testing and feedback to those students to give them challenges they are ready for, identify gaps in knowledge and re-direct them to new topics when appropriate.

In the area of "Global and Remote Learning", digital transformation can facilitate learning from anywhere and at any time. Furthermore, it can be used to support students with homework and exam preparation remotely with advanced tutoring and study programs.

Last, in the area of "Administrative Efficiencies", digital transformation can support higher education to shift from wondering about the future into predicting, forecasting, and shaping the future; making proactive and informed decisions and taking action based on that information. Digital transformation can support universities in using conventional and unconventional (unstructured), internal and external data to discover hidden patterns underlying performance in different areas, track admissions, optimize enrolment, manage grants, enhance academic advising etc. Digital transformation can help higher education institutions to know what is happening (descriptive analytics), what is likely to happen in the future (predictive analytics) and to examine trends, causes and likely forecasts and use that information to make decisions (prescriptive analytics) (Seres et al., 2018).

2 Methodology

While the importance of digital transformation is recognized, data about digital transformation maturity and challenges is scarce, especially in developing nations, and specifically within higher education. This study explores digital transformation maturity level in Higher Education Institutions in UAE higher education. The study uses a new framework that is based on the Petkovic's 2014 mega and major processes mapping, and-maturity assessment framework. The researchers believe that Petkovic provides a balanced and comprehensive classification of higher education business processes using four hierarchical levels: mega processes, major processes, sub-processes, activities and tasks. Unlike other classifications, the Petkovic's classification does not contain overlapping, ambiguous, and repetitive processes. The researchers also believe that digital transformation maturity criteria listed in the maturity assessment framework by Deloitte are comprehensive, tangible, easy to

understand and reflective. Based on the above, the combination of both models provides a good starting point for higher education institution to assess their digital transformation maturity level, and identify areas that need improvements. The proposed framework in this study is flexible, customizable, and can support further more detailed analysis as required.

The study examines public and private higher education institutions in the UAE. It ranks the criticality of digital transformation challenges using identified pattern codes such as the regulatory and business environment, IT infrastructure, data governance, affordability and budget constraints, personnel competency and IT skills, etc. We consider that the problem identification and related key issues are very important in order to achieve successful implementation of digital transformation.

The goal of this study is achieved throughout several objectives, beginning from the literature study of the state of the art, continuing with the wide-distributed survey, in-depth semi-structured interviews, direct observation of the researchers, and case study. The literature study provided the possibility of identifying and analyzing trends related to the topic, while the survey, interviews, direct observation, and case study provided the possibility of identification and analysis of trends in the field of digital transformation at the national level in public and private higher education institutions. This study is a phenomenological research to determine the views of IT director and senior academicians on the maturity and challenges of digital transformation. Phenomenological researches may not reveal generalizable situations, but they can provide examples, explanations and experiences that will help to a phenomenon identified and understood better (Yıldırım & Şimşek, 2013; Limani et al., 2019).

The survey was conducted in both public and private higher education institutions, targeting IT directors, chief information officers, and senior academicians concerned with digital transformation. The survey was sent to 61 individuals. Response was received from 52. The questionnaire design and construction consist of 15 Likert Scale closed-ended multiple-choice-five-pointer questions. Respondents were required to complete the questionnaire indicating the extent to which they agree or disagree with the questions. A room for comments for each question was also available. The survey questions were divided into three sections; the first section measures the respondent's view on the institution's level of digital transformation maturity; the second section verifies the existence/non-existence of key elements of digital transformation maturity; and the third section ask about the respondents rating of the challenges faced.

Six in-depth, semi-structured interviews were held with IT directors, and another four interviews were held with senior academic administrators to gain deeper understanding of expected value and the challenges faced during digital transformation; direct observation was used to verify what people do, rather than what people say they do, lastly, a case study was conducted at one of the public universities to validate and triangulate the results of the survey, direct observation, and the interviews.

The importance and the rationale of this research lie in the identification and analyses of the readiness of higher education institutions in the UAE to embrace a

meaningful and mature level of digital transformation in higher education academic processes post COVID-19.

The research results can be used as an important input to the design of new academic processes that would be more effective, aligned, efficient, and cost-effective. Moreover, this study points to the key challenges faced by higher education institutions in the UAE in achieving mature digital transformation, turning data into a valuable asset that could be used for prescriptive, corrective and predictive decision-making, using a proposed framework to measure digital transformation maturity, and pinpoint areas of concern and areas of strength. The research also provides the practitioners from the field of digital technologies with the information and knowledge related to their potential market and the related trends.

3 Discussion

In this section, we present the findings of this study, responding directly to the two key research questions.

What Is the Level of Digital Transformation Maturity in the Examined UAE Higher Education Institutions?

The data collected in this study shows a significant variance between digital transformations maturity level perception reported by the respondents, and the core requirements of digital transformation maturity. While more than 80 percent of the examined institutions reported a digital transformation maturity level between "delivering or harvesting" as seen in Fig. 4, none of them had a comprehensive digital transformation plan.

A few reported a list of digital transformation initiatives. However, those list of initiatives were more aligned with automation not digital transformation, and they were mostly initiated to comply with external regulatory requirements by the Telecommunication Regulatory Authority TRA. In almost all cases, digital transformation initiatives had no connection to a return on investment, gained value, or a real transformation of a business process. The great majority of cases were concerned with the automation of electronic forms, adding workflow and approvals.

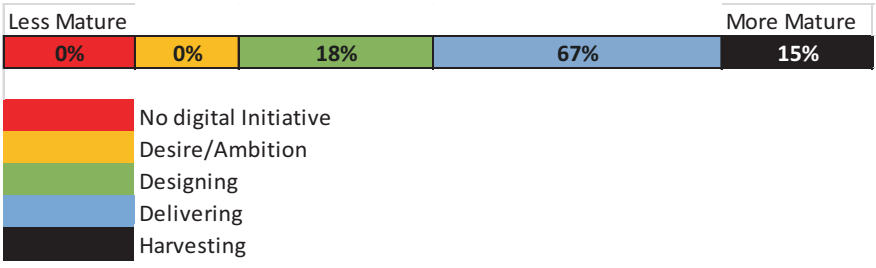


Fig. 4 Digital transformation maturity reported

None of the initiatives reported was concerned with analytics, machine learning, artificial intelligence, big data and other more-advanced digital transformation technologies.

Based on the proposed higher education digital transformation maturity assessment model, it was noticed that most institution focused their digital transformation effort in the area of enabling processes, while much less in planning and governance, learning and teaching, and research respectively (see Table 2). Respondents attributed this to the availability of third party systems supporting student administration, library services, finance an accounting, etc. Ellucian and Oracle are among the main contenders in this area. Systems supporting accreditation, research, and curriculum management are relatively new in the market, compared to systems supporting enabling processes. Finally, the data findings shows clearly how critical is the role of IT governance in ensuring that all mega and major processes receive the needed support. A segmented structure of data ownership can deliver a segmented vision that can directly affect digital transformation completeness, effectiveness, and alignment.

What Are the Key Digital Transformation Challenges Facing the UAE Examined Higher Education Institutions?

The data findings of this study reveals a number of digital transformation challenges. While some of the reported challenges are consistent with some of the challenges reported in literature, some of the challenges listed were specific to the UAE higher education (Table 4). Table 5 lists digital transformation challenges in UAE higher education, as reported by the respondents.

3.1 Holistic Vision

The data supported findings of this study show that the most critical challenge facing digital transformation in UAE higher education is the lack of a holistic digital transformation vision. The data reveal that none of the examined institutions had a stand-alone digital transformation vision or plan. Two public universities had list of key performance indicators to satisfy TRA requirements. Most of the other institutions worked on a list of ad-hoc automation initiatives, mainly driven by IT personnel. In several cases, redundant processes and shadow systems were identified. Some of the respondents reported confusion about digital transformation ownership. Several IT directors, chief information officers, and academic administrators did not believe that they are responsible for digital transformation. IT directors and chief information officers expected academic administrators to identify, initiate, and prioritize what processes should be digitally transformed, while academic administrators viewed digital transformation as a technical process that should be driven, initiated, and prioritized by IT directors and the chief information officers. Some of the respondents viewed digital transformation as a joint responsibility that lacks proper monitoring, initiation, and management.

Table 4 DT maturity reported by mega and major process

Higher education mega and major processes	DT maturity
Learning and teaching processes	
Study program accreditation	32%
Teaching processes preparation and realization	74%
Teaching process assessment	22%
Student and teacher mobility realization	38%
Enabling processes	
Student administration services	92%
Library Services	86%
Staff provision and development services	65%
Finance and accounting services	83%
Marketing, sales, and distribution services	56%
Procurement services	83%
Research processes	
Research planning	36%
Research preparation	32%
research conduct	18%
Research outcome monitoring	18%
Research evaluation	24%
Planning and governance processes	
Organization management services	54%
Change and business process management	42%
Plan development	64%
Budget and fund planning	88%
Performance assets	36%

Table 5 DT challenges in UAE higher education

Digital transformation challenge	
Wholistic vision	76%
Personnel competency and IT skills	54%
Data structure, data processing, and data reporting	52%
Redundant systems	42%
Third party reporting systems	42%
Manual entries (middle man)	38%
Potential use by customers	28%
Regulatory and business environment	16%
Social and economic impact	12%
Privacy and security concerns	4%
IT infrastructure	3%
Affordability and budget constraints	2%
Other capability constraints	1%

3.2 Personnel Competency and IT Skills

The second critical challenge of digital transformation reported was the lack of critical IT skills. IT Personnel in the UAE are mainly comprised of Asian expatriates. IT personnel lack previous experience in the higher education sector, and support English-based systems, English-based curricula, and operations. Similarly, many IT managers and directors did not have prior higher education or technical experience, which is critical in establishing a holistic digital transformation vision and plan.

Respondents reported systems that were not used, while annual license is regularly paid; in-house developed systems that were redundant; IT governance, that was not established, requests for new systems driven by individuals based on familiarity; segmentally initiated digital transformation decisions; poor and underdeveloped automation efforts that did not create any real value for the institution or provide services with customer –centric view.

Given the profile of the workforce in the UAE, this digital transformation challenge is more specific to the UAE higher education environment. Experience with systems such as Banner, people soft, campus solution, etc. is more difficult to attract in the MENA region compared to the US and Europe. With few exceptions, many universities are supporting critical operations, including admission, registration, advising, scheduling, and graduation with personnel that have had no prior experience with those systems or higher education.

3.3 Data Structure, Data Processing, and Data Reporting

The Third critical challenge reported was data structure, processing, and reporting (input-process-output). This challenge can be linked to the second reported challenge, as it is also more pertinent to the UAE higher education environment.

Because of the lack of fundamentals such as an IT strategy, IT governance, and/or data governance, data structures and key codes were not setup correctly, and key modules were not utilized. For instance, one institution used Banner Student Information Systems “SIS”, but did not utilize Banner workload module. Instead built a stand-alone system to manage faculty workload. No one knew that a small number of forms need to be populated and a fully integrated module will be available in a more efficient way.

Inconsistent college codes, program codes, major codes, etc. used across different creating inconsistent data outputs that is very difficult to verify. Business rule codes were also not well defined, organizations ended up with problems in critical academic, business, and financial areas, including major out of balance issues. Data reporting relied heavily on data extraction and ad-hoc (backend) queries and reporting. System built-in reports were limited or short of customer’s specific needs; keeping in mind that most systems are made to align with the US higher education environment including Ellucian, Blackboard, Leepfrog, CurriCUNET, Taskstream,

Oracle, etc. This variance in input-processing-output created a major hurdle for integration, consistency, and reporting, resulting in failure to create value and enable an effective digital transformation strategy.

3.4 Redundant Systems

The fourth challenge facing higher education institutions in UAE was the existence of redundant systems. As referred to earlier, due to the lack of proper IT and data governance, several organizations did not have a proper system/software acquisition process in place, subsequently resulting in systems, functions, and data overlap and redundancy, creating major challenges for integration and data consistency, reliability, integrity, availability, timeliness, and confidentiality.

3.5 Third-Part Reporting Systems

The fifth challenges cited by higher education institutions attempting to digitally transform their processes was the existence of several external reporting agencies/systems that require different data sets, formats, and requirements, including different accreditation reporting systems, and other compliance reporting systems.

Several institutions felt that need to manually extract the required data from different internal systems, then format the data sets as required for reporting purposes. Microsoft Excel formatted files are widely used to support this function.

3.6 Manual Entries (Middle Man)

Because institutions were required to report to multiple external entities using third-party reporting systems, a lot of data extraction, data manipulation, data formatting, and data entry was taking place; in several cases the people responsible for data extractions from the organization's different systems, were completely different from those making manual entries into third party systems, potentially leading to system and data and submission errors.

3.7 Potential Use by Customer (Adoption)

The seventh challenge facing higher education institutions in UAE was the potential use by customers. Several respondents cited resistant to change, resistant to technology, buy-in, awareness, and training as leading causes for adoption challenges.

Some of the respondents stated that processes were detached from systems causing loopholes, delays, redundancy, and errors. Other respondents cited off-the shelf systems as generic, while others did not support in-house developed system by IT personnel, and viewed them as temp-cheap solutions, driven by the insecurity of IT personnel to guarantee their jobs.

3.8 Regulatory & Business Envirnment

The eighth challenge extracted from the data set was the regulatory and the business environment. Private institutions felt more at liberty than government institutions in this category. This is natural, given that government institutions receive full funding from the government, and the government audits their books. In addition, the Telecommunication Regulatory Agency TRA has its own protocols and requirements that must be observed, including what data can or cannot be on the cloud. The purchasing process in government institutions also has its own special requirements that may linger or hinder the process of acquiring certain IT assets that would support digital transformation.

3.9 Social and Economic Impact

Although was only cited by 12% of the respondents, the ninth challenge of digital transformation was concerned with the social and economic impact. Some higher education institutions reported that some of the digital transformation initiatives were not rolled out due to social concerns about how the institution will be viewed, including cases where different genders may have direct communications or use of web cams. Many institutions stressed the importance of showing respect of the UAE culture and norms as one of the main factors for attracting UAE national students.

3.10 Privacy & Security Concerns

Only cited by 4% of the respondents, privacy and security concerns was cited as the tenth challenge to digital transformation. Some universities did not feel that their hardware, security, and network was not ready to manage potential security threats that could come with the expansion of their digital infrastructure.

3.11 IT Infrastructure

While the majority of respondents viewed their universities IT infrastructure as mature and ready to support digital transformation, 3% of the respondents expressed concerns about the full readiness of their IT infrastructure in its entirety, and reported it as the eleventh challenge.

3.12 Afforability and Budget Constraints

Surprisingly only 2% of the respondents reported affordability and budget constraints as the twelfth challenge facing digital transformation in their organizations. Understandably, those were from small private universities, not government universities.

3.13 Other Capability Consraints

The final and the thirteenth challenge reported was reported by only 1%, and it was concerned with random capability reasons that were not directly identified, but simply reported as capability constraints.

The Proposed Higher Education Digital Transformation Maturity Assessment Framework

The data findings of this study shows a significant variance between the respondents' digital transformation maturity perception, and the core criteria of digital transformation maturity. Moreover, higher education is faced with a number of digital transformation challenges. A higher education digital transformation maturity assessment framework can provide higher education institutions with guidance, criteria, and an assessment of strength and weakness areas, mapped to mega and major process.

The framework proposed in this study combines the mapping of higher education processes with the digital maturity assessment framework to create an assessment framework to measure digital transformation maturity in higher education. For the sake of illustration, Fig. 5 shows an example where the framework is used with equal weight assigned to each mega process and each major processes. Institution may choose to assign different weights. The framework acts similar to a scorecard, pinpointing areas of strength and areas of weakness across each mega and major processes, and across each maturity criterion. Using the example below, it is easy to see that the research process and the teaching and learning process are the weakest in digital transformation. Users can drill down further to see that research monitoring and evaluation are among the lowest scores. Similarly, one can also see looking at the maturity requirements that vision, strategy, and processes, and controls are

Digital Transformation Maturity Framework for Higher Education						
Higher Education Mega and Major Processes	DT Vision, strategy, leadership, and communication (1)	DT Talent, skills, and knowledge (1)	DT Processes, controls, and digital technologies (1)	DT Technology Infrastructure (1)	Approach to understand and communciate with customers (1)	Total by Process
Learningh and Teaching Processes (20)	2	3	1	3	1.5	10.5
Study Program Accreditation (5)	0	0.5	0	1	0	1.5
Teaching processes preperation and reliazition (5)	1	1	0.5	1	0.5	4
Teaching process Assessment (5)	1	1	0.5	1	1	4.5
Student and Teacher Mobility Realization (5)	0	0.5	0	0	0	0.5
Enabling Processes (30)	4.25	4.75	4	5.5	5.5	24
Student Administration Services (5)	0.5	1	0.5	1	1	4
Library Services (5)	1	1	1	1	1	5
Staff provosion and development services (5)	1	1	1	1	1	5
Finance and accounting services (5)	1	1	1	1	1	5
Marketing, sales, and distribution services (5)	0.25	0.25	0	1	0.5	2
Procurement services (5)	0.5	0.5	0.5	0.5	1	3
Research Processes (25)	1	1	1	2	3	8
Research planning (5)	0	0	0	1	1	2
Research preperation (5)	0.5	0.5	0.5	0.5	1	3
research conduct (5)	0.5	0.5	0.5	0.5	1	3
Research outcome monitoring (5)	0	0	0	0	0	0
Research evaluation (5)	0	0	0	0	0	0
Planning and governance processes (25)	3.5	3.5	3.5	3.5	5	19
Organziation management services (5)	1	1	1	1	1	5
Change and business process management (5)	0.5	0.5	0.5	0.5	1	3
Plan development (5)	0.5	0.5	0.5	0.5	1	3
Budget and fund planning (5)	1	1	1	1	1	5
Performance assets (5)	0.5	0.5	0.5	0.5	1	3
Total by DT Requirement	10.75/20	12.25/20	9.5/20	14/20	15/20	61.5/100

Criteria and Score guidelines	
Desire/Ambition	0
Planning and Designing	0.25- .49
Delivering	0.50.74
Harvesting	.75-100

Fig. 5 Higher education digital transformation maturity framework

among the lowest criteria. The framework can help higher education institutions track their digital transformation progress and benchmark it regularly. Institution can choose to go from mega and major processes into tasks and activities if they wish to add more details.

4 Conclusion

Digital transformation is one of the biggest catalysts of the business environment today, and higher education is not excluded from this evolution. It is a move that goes beyond the scope of systems and new technologies, while also representing the modernization of organization philosophy, purpose, competition, and patterns that change with emerging audiences. As the business environment, students, and employees change, they do so at an accelerated speed that often exceed an organization's ability to adapt. This disruption causes critical business functions and processes to inevitably be exposed within and outside the organization; subsequently requiring the restoring of new investments in technology, business models and processes to more effectively compete in a continual digital economy shift. Digital transformation is an inevitable choice for higher education institutions everywhere, especially after COVID-19.

Digital transformation is a process that can hardly be historically compared to any other process, as it does not exclude the development levels of different countries.

In other words, all countries, regardless of their development level must undergo some level of digital transformation; and while in the developed world, the need for digital transformation has been reinforced and installed, and organizations and governments have developed sophisticated methods for applying digital technology to create products or to deliver certain services, and add value, some developing countries are still attempting to move from desire and ambition to planning, delivering and harvesting.

Despite all the talk about digital transformation in developed and developing countries, and across all industries, the reality is that digital transformation is only as useful as its rate of true implementation and return on investment. Otherwise, organizations will not benefit in terms of efficiency, effectiveness, cost-savings, competitive advantage, and decision-making.

For a number of decades, higher education institutions globally claimed digital transformation maturity, citing students' information systems, learning management systems, etc. The COVID-19 pandemic forced many institutions to use remote teaching, disrupting the regular and normal business environment and operations, subsequently exposing critical functions and their true level of digital transformation maturity and challenges.

The UAE is one of the leading developing nations in terms of IT infrastructure, and the adoption of new technologies. The UAE government has made significant leaps in e-government, e-commerce, e-business, and e-services in general. There are several agencies contributing to this advancement, including the Ministry of Artificial Intelligence, Smart Dubai, and the Telecommunication Regulatory Authority.

Given the importance of digital transformation, higher education, and the role they both play in today's digital/knowledge economy, the aim of this study is to examine the digital transformation maturity level and challenges in UAE higher

education institutions in the after math of COVID-19, and the need to provide remote e-service to students, employees, and other customers and stakeholders.

The first research question is concerned with measuring the level of digital transformation maturity in UAE higher education institution using Deloitte's digital maturity assessment framework, and Pekovitcs mega and major processes mapping. The data findings reveal a major variance between the perception and the requirements of digital transformation maturity. The examined institutions did not have a digital transformation vision, leadership, strategy, plan, champions, processes, controls, approach, communication, or proper return on investment. Many of the examined institutions viewed their maturity level at delivering and harvesting, when in fact they were at either designing or ambition.

In addition, digital transformation was more evident in enabling processes such as student administration services, library services, finance and accounting, but not as much in learning and teaching, research processes, and planning and governance processes.

The second research question is concerned with the digital transformation challenges. Leading challenges reported included challenges with holistic vision; personnel competency and IT skills; data structure, data processing, and data reporting; redundant systems; third party reporting systems; manual entries; and potential use by customers.

The challenges cited by the respondents in this study are not mutual exclusive; in fact, they are interrelated in multiple ways. While some of the challenges are more critical than others, the combination of those challenges create an environment that hinders digital transformation and business success by creating dependency, timeliness, integrity, availability, cost, efficiency, effectiveness, and integration issues.

5 Recommendations

Digital transformation in education is inevitable. Higher education institutions should establish a clear vision, policies, strategies, and plans to support mature digital transformation. Institutions should communicate such policies, strategies, and vision, and receive feedback from internal and external customers and stakeholders about business process engineering and return on investment. Such plans should regularly be evaluated. Institutions should hire digital transformation experts in order to align the business strategy with digital transformation. Digital transformation should not be just another task handed down to IT personnel, or segmented among data owners. The difference between automation and digital transformation should be communicated, and training and awareness should be provided. A corner stone to all of this is to show solid management support to combat resistance to change and resistance to technology, and communicate the long term value gained from digital transformation. Digital transformation should be extended beyond the enabling processes to teaching and learning, governance, and research. Specifically, the areas of course, program, and student assessment and evaluation. The proposed

framework of this study can be used as a scorecard to assess the digital transformation maturity in higher education, assisting institutions in pinpointing processes and criteria that require further attention.

References

Al Tamimi & Company. (2019). Report on "Digital transformation in the education space: A review of the impact of new technologies on middle east education".

Bayler, A., & Oz, O. (2018). Academicians' views on digital transformation in education. *International Online Journal of Education and Teaching (IOJET), 5*(4), 809–830.

Bounfour, A. (2020). From IT to digital transformation: A long term perspective. *Digital Future and Digital Transformation*.

Chaurasiya, D. (2020). Digital transformation: A case study. Retrieved from https://www.researchgate.net/publication/340385414_Digital_Transformation?enrichId=rgreq-e65c791fef4fde3c103a4370994ad74e-XXX&enrichSource=Y292ZXJQYWdlOzM0MDM4NTQxNDtBUzo4NzU4ODQyMzE3OTA1OTNAMTU4NTgzODQ4MjI1MA%3D%3D&el=1_x_2&_esc=publicationCoverPdf

Clark, E. (2018). *Digital transformation: What is it?* Educause.

Deloitte. (2019). National Transformation in the Middle East, a Digital Journey

Gartner. Inc.'s free "Creating Digital Value at Scale" webinar is a special report based on the opening keynote of the 2017 Gartner Symposium.

Göll, E., & Zwiers, J. (2018). *Technological trends in the Mena region: The cases of digitalization and information and communications technology (Ict)*. MENARA.

Ismail, M. H., Khater, M., & Zaki, M. (2017). Digital business transformation and strategy: What do we know so far?. Retrived from https://cambridgeservicealliance.eng.cam.ac.uk/resources/Downloads/Monthly%20Papers/2017 NovPaper_Mariam.pdf

Limani, Y., Hajrizi, E., Stapleton, L., & Retkoceri, M. (2019). Digital transformation readiness in higher education institutions (HEI): The case of Kosovo. *Science Direct, IFAC PapersOnLine, 52*, 52–25.

Mahlow, C., & Hediger, A. (2019). *Digital transformation in higher education—Buzzword or opportunity?* Special Issue: Paradigm Shifts in Global Higher Education and eLearning.

Maltese, V. (2018). Digital transformation challenges for universities: Ensuring information consistency across digital services. *Journal of Cataloging and Classification Quarterly, 56*(7), 2018.

Marks, A., Alali, M., & Reitesema, K. (2016). Learning management systems: A shift toward learning and academic analytics. *International Journal on Emerging Technologies in Learning, 11(04)*. pp. 77–82.

McKinsey, D. (2016). *Digital middle East: Transforming the region into a leading digital economy*. Mckinsey.

Norton, A., Shroff, S., & Edwards, N. (2020). *Digital trasnformation: An enterprise architecture prespective*. Publish Nation Limited, UK.

NV. (2017). Digital transformation in higher education. (Online) Navitas Ventures. Available: https://www.navitasventures.com/wp-content/uploads/2017/08/HE-Digital-Transformation-Navitas_Ventures_-EN.pdf

Parlak, B. (2017). Dijital çağda eğitim: Olanaklar ve uygulamalar üzerine bir analiz (education in digital age: An analysis on opportunities and practices), Süleyman Demirel University. *Journal of Faculty of Economics and Administrative Sciences, 22*(15), 1741–1759.

Petkovics, I., Tumbas, P., Matkovic, P., & Baracskai, Z. (2014). Cloud computing support to university business processes in external collaboration. *Acta Polytechnica Hungarica, 11*(3), 181–200.

Sandkuhl, K., & Lehmann, H. (2017). Digital transformation in higher education – The role of enterprise architectures and portals. *Digital Enterprise Computing (DEC 2017), 49*. 4–60

Schwab, K. (2016). *K. Dördüncü sanayi devrimi (fourth industrial revolution)*. Optimist Publications.

Schwertner, K. (2017). Digital transformation of business. *Trakia Journal of Science, 15*(Suppl.1), 388–393.

L. Seres, V. Pavlicevic, P. Tumbas, 2018Proceedings of INTED2018 Conference, .

Solis, B. (2017). "8 Success Factors of Digital Transformation" Altimeter. Prophet Thinking (online). https://www.prophet.com/thinking/2016/02/brief-the-opposite-approach-8-success-factors-of-digital-transformation/

The Organisation for Economic Co-operation and Development OECD. (2016). Digital government strategies for transforming public services in the welfare areas (Online). http://www.oecd.org/gov/digital-government/Digital-Government-Strategies-Welfare-Service.pdf

Thompson, J. (2013). *Books in the digital age*. John Wiley & Sons.

Walker, R., Voce, J., & Jenkins, M. (2016). "Charting the development of technology-enhanced learning developments across the UK higher education sector: A longitudinal perspective" (2001–2012). *Interactive Learning Environments, 24*(3), 438–455. https://doi.org/10.1080/10494820.2013.867888

Xiao, J. (2019). Digital transformation in higher education: critiquing the five-year development plans (2016–2020) of 75 Chinese universities. *Distance Education, 40*(4), 515–533. https://doi.org/10.1080/01587919.2019.1680272

Yıldırım, A., & Şimşek, H. (2013). *Sosyal bilimlerde nitel araştırma yöntemleri qualitative research methods in the social sciences*. Seçkin Publishing.

Adam Marks currently serves as the Director of Education Technology and Intelligent Learning Systems with the Higher Colleges of Technology (HCT) in the UAE. Prior to HCT, Prof. Marks held positions as an academic dean, associate provost, department chair, and IT director with the American University, Zayed University, Embry-Riddle University, and University of North Carolina respectively. He has extensive experience in higher education administration, strategic planning, performance management, institutional effectives, academic technology, and digital transformation. A passionate researcher and practitioner in the areas of educational technology management and leadership. He received his Ph.D. degree in Higher Education Technology from the University of Salford, and his Master's degree in Management of Information Systems, from the University of Central Florida. He serves as a member of the Academic Advisory council with Microsoft, Ellucian, and Blackboard. He is also an external reviewer with MSCHE, and ABET.

Maytha Al-Ali is an Assistant Professor in the College of Business, with Zayed University. Dr. Al-Ali is the founding executive director of the strategic planning and institutional effectiveness department in Zayed University. She is a government expert in innovation, future foresight, strategic management, design thinking, and strategic management. She has served in the UAE higher education areas for more than twenty years.

Rethinking Education in Arab Countries: The Case of COVID-19

Amer Al-Roubaie

1 Introduction

As a key component of human development, education empowers society with knowledge and skills that are fundamental for fostering economic growth and sustaining development. Education contributes to the stock of human capital and enhances capabilities for building scientific and technological capacity for development. The digital economy, driven by the Fourth Industrial Revolution, entails specialized skills and knowledge workers not only to adopt and upgrade technologies relevant for the business environment, but also to tap effectively to the global knowledge systems through collaboration and joint research. By unleashing the creative power of young people, education enlarges the ability of the economy to create high value-added goods and services. To this end, education increases the society welfare by promoting understanding, alleviating poverty, reducing inequality, and strengthening the principles of justice, equity and freedom.

In most Arab countries, the quality of education remains low to increase productivity and support rapid socio-economic of transformation. The average income per person in the Arab world is half of the world average reflecting the failure of macroeconomic policies to strengthen the economic fundamentals and diversify productivity. Investment in education is critical for improving the economy capabilities to absorb knowledge, acquire technology, disseminate information, and diffuse innovation. Achieving these objectives entail Arab countries pursue new model for learning not only to improve the quality of education, but also to link to the global educational system so that to encourage knowledge transfer and prepare students for joining the twenty-first century economy. The model should focus on building digital infrastructure as well as set up monitoring and evaluation system to ensure

A. Al-Roubaie (✉)
Ahlia University, Manama, Bahrain
e-mail: aalroubaie@ahlia.edu.bh

M. Alaali (ed.), *COVID-19 Challenges to University Information Technology Governance*, https://doi.org/10.1007/978-3-031-13351-0_4

quality and efficiency of the educational outcome. Awareness that education is critical for economic growth and sustainable development underlines the need for government support of educational institutions to increase the knowledge capabilities and accelerate scientific and technological progress.

Educational institutions are at the heart of the new economy for being the main providers of the inputs needed for technological learning and scientific applications. In doing so, universities increase capabilities to adopt to market changes and empower the country ability to produce goods and services for both local and global markets. Thus, for Arab countries, education is an opportunity to close the knowledge gap and speed up the process of development. Poor countries suffer from low productivity largely because they have less knowledge and low level of skills to create linkages and diversify output. Low quality graduates, weak governance, and inadequate infrastructure are among the important challenges that contribute to underdevelopment. Private-public partnership could facilitate the integration of the educational system into the national strategy to accelerate the process of knowledge creation, innovation diffusion and economic diversification.

The aim of this paper is to shed light on the educational system in Arab countries in the aftermath of COVID-19 pandemic. Arab countries allocate large percentage of their public expenditures to education; however, the quality of graduates remains low to meet market demand for skills and facilitate integration in the digital economy. In most Arab countries, education is managed and financed by the government leaving universities with little autonomy to make independent decisions. Not having autonomy imposes constraints on the ability of the university to pursue policies and introduce programs that respond to market needs. COVID-19 should be regarded as an opportunity to reform the educational system and build capacity for digital literacy. Investment in ICT technologies is critical for rapid transformation into the digital world, and therefore, Arab countries need to develop well-defined strategy aimed at increasing connectivity and benefiting from the existing knowledge elsewhere. Good governance plays a major role in improving the efficiency and transparency of the educational system.

2 Impact of COVID-19

Worldwide, COVID-19 pandemic has disrupted human activities forcing millions of people to work from homes, school children to study online, travelers to cancel their trips, and businesses to close. The cost of the pandemic has gone far beyond the disruption of market activities to include the outcome of the educational system and the negative impact on teaching and learning. Governments around the world struggled to cope with budget deficits and financial support for individuals and businesses aiming at minimizing the impact of the pandemic on market activities and people well beings. The pandemic has undermined efforts to respond to such mega challenges as poverty alleviation, income inequality, digital divides, and sustainable development. Worldwide, governments introduced radical fiscal measures to

counter the negative impact of the pandemic on their economies and protect individuals and business from job losses and financial bankruptcies. The coronavirus originated in China in December 2019 and has spread across the world infecting millions of people in more than two hundred countries.

COVID-19 pandemic has been responsible for unprecedented impact on education across the world causing substantial damage to the quality of education, student enrollment, governance, and human development. The pandemic has disrupted teaching and learning by forcing millions of students worldwide to study online from home. Remote education is likely to weaken students' ability acquiring adequate knowledge and skills needed for harnessing the opportunities of the modern technologies and contributing to national development. This has prompted policy makers, educators, business leaders, and parents to call for urgent action to address the impact of COVID-19 and build back resilient educational system. In low-income countries, COVID-19 pandemic has widened the digital divides by forcing millions from gaining adequate access to quality education and building capacity for development. To protect children health and reduce the risk of the pandemic, countries replaced face-to-face teaching with online learning closing in the process educational institutions. More than 90% of student population worldwide have adopted distance teaching and learning to ensure continuity of education and provide students with the instruction they need to maintain the quality of learning. However, millions of students, mainly in developing countries were not lucky to have access to online education due to the lack of connectivity and high cost of electronic devisees, including computers and smart phones. It is estimated that two-thirds of the world's school-age children lack internet access in their homes (United Nations, 2022, P. 13).

In the Arab world, in addition to the 13 million children are already out of the school system due to conflict, the COVID-19 pandemic affected more than 100 million learners across the region in 2020. Under such circumstances, COVID-19 could offer new opportunity for restructuring the educational system and strengthening governance to enhance the quality of education and increase labor market flexibility. These countries can take advantage of the power of technology to support both teachers and students communicate and discuss urgent matters arising from students need for help with their studies. Failure not to act now and realize the benefit of technology could have lasting impact on the coming generations. Technology transforms all society's productive sectors including education to increase the stock of human capital by helping students acquiring adequate knowledge and skills for labor market.

In the aftermath of COVID-19 and in respond to technological change, the educational systems in Arab countries need to undergo radical reforms for the existing curriculum and teaching pedagogy to ensure that the outcome of education is relevant to pathway of the society's need for integration into the twenty-first century economy. Capacity for ICT-supported technologies and connectivity networks should be built to overcome the recent limitations of COVID-19 on teaching and learning in the school systems. In countries, where digital infrastructure is not adequate to help student access to the school system, distance learning has caused

considerable damage to student learning capabilities. Not only the internet and electricity needed for connectivity and distance learning, but also the cost of electronic devices, including laptops and smartphones are beyond many poor students' financial ability to acquire them. Lack of adequate facilities, including electricity, internet and electronic computers limit student connectivity to the school system and acquire the knowledge fundamentals they need to increase learning capabilities. School closures expect to worsen the system of teaching and learning, which may force large number of students never returning to schools. Such trends increase social and economic vulnerabilities, especially in poor countries where the need for dynamic and efficient educational system is essential for the creation of new job opportunities, absorption new knowledge, and acquiring new skills.

Educational institutions require paradigm shift that involves modifying the curricula, changing pedagogy, introducing programs of local relevance, and adapting new teaching methods. Universities need to undergo reform and embrace new models to address the challenges posed by COVID-19 as well as explore new methods that can improve the quality of education. Achieving these objectives will require universities develop new set of management procedures to strengthen transparency mechanisms, review of curricula, diffusion of new technologies, admission criteria, and faculty development. In other words, universities need to build capacity for greater flexibility not only to respond to the challenges of COVID-19 pandemic, but also to solve the managerial, financial, technological, and quality assurance related-problems.

3 Digital Technologies

In the digital age, communication and access to external knowledge and information has become available for all users. Taking advantage of the information age requires nations increase readiness by building ICT infrastructure and improve digital literacy for strengthening global linkages and providing access to global markets. ICT technologies offer new opportunities for nations to enhance educational capabilities and foster technological learning. Furthermore, ICT networks can be used as a powerful public relation apparatus for health and the fight against COVID-19. E-health services have been widely used in the management and delivery of medical services across many countries worldwide. In this regard, students become an important channel for knowledge transfer and information dissemination into their communities. Thus, poor communities should take advantage of the new technologies as a public relation policy to educate the public about the risk of COVID-19 pandemic and its impact on people's health. In the coming decades, rapid increase in population, especially in Arab countries and Africa, and Latin America, is expected to increase the demand for higher education. Technology could provide an opportunity for large number of students in these countries to access to global education and build capacity for development in their home countries. One important advantage of ICT technologies is being able to connect large

number of people across large geographical areas. In early 2020, for example, just weeks after the novel coronavirus was first observed, a group of leading public health experts and epidemiologists at the Jameel Institute launched an online COVID-19 course. The course enrolled more than 140,000 people around the world as they learned how to gain a deeper understanding of COVID-19 and its spread (World Economic Forum, 2022a).

Despite of the fact that technology has been used in other sectors of the economy, its impact on teaching and learning was very limited. Technology can help schools to scale up standardized instructions, provide students with new opportunities for practice, and increase student engagement. Furthermore, in today changing circumstances where COVID-19, rapid population growth, climate change, and factor mobility are likely to affect learners access to schools in different locations. Technology bridges the distance gaps, which allow students to interact with their schools without loss in quality due to unexpected circumstances. Implementing such projects entails investment in ICT infrastructure to increase connectivity and support student access to educational services both at home and abroad. Technology has been changing the methods of teaching and learning by providing online access to teachers and students to communicate, collaborate, and discuss problems. However, technology is a tool for facilitating communication but cannot be a substitute for face-to-face teaching. Unlike class attendance, online teaching does not provide fair assessment of student efforts and contribution to class outcome. As a supplement, online teaching can be of great benefit for those students who are interested to expand their knowledge-based learning.

Building capacity for ICT infrastructure is critical for overcoming the challenges facing the educational system worldwide in the aftermath of COVID-19 pandemic. ICT provides access to teaching learning through various electronic devices so that to ensure connectivity and protect students against school closure and health hazards. Linkages to the library system, external sources and communication among students and their teachers are among the important advantage of ICT. These technologies have the capacity to empower students through access to resources they need to improve their quality of learning as well as allow them to communicate with students across the globe. In other words, they are enablers of human development by enhancing all forms of information, exchanging ideas, and discussing issues of common interest for finding solutions to solve them. Digital technologies have the capacity to help the citizen of the world exchanging ideas and communicating information so that to increase awareness about the challenges facing all of us living on this planet. Learning about climate changes, population growth, food security, renewable energy, health hazards and human rights enhances understanding for collective initiatives to solve problems and sustain development. Learning how to adapt to change in the new economy is critical for rapid socio-economic transformation driven by the frontier technologies (Al-Roubaie, 2019).

The future labor market, driven by such technologies as artificial intelligence, robotics, automation, nanotechnology, and fusion will require students with digital literacy, creative thinking, and strong cognitive skills. It will be difficult for nations to participate in the Fourth Industrial Revolution and benefit from the new economy

without building flexible environment that enables them to adapt quickly to market changes. In many countries, access to digital and electronic devices remains limited to big cities and the elites leaving millions of school children unable to access to online education. This hinders the nations' ability to build capacity for development and speed up the process of transformation into the digital economy. The loss of young people talent and creative ideas make nations ill-equipped with adequate knowledge and skills to respond to the challenges of the twenty-first century. To this end, poor quality educational services weaken student capabilities acquiring relevant skills to compete in the digital economy.

ICT technologies empower students to acquire knowledge and develop skills that are necessary for promoting innovation and supporting creative activities. Digital divides exist among and within countries, impacting basic connectivity to provide students the access they need to continue their teaching and learnings. According to the World Economic Forum, two-thirds of the world's school-age children do not have an internet connection in their homes (O'Halloran, 2021). Access to learning varies among countries depending on the affordability of electronic devices, access to the internet and availability of electricity. Students in low-income countries suffer from high costs of computers and low connectivity to acquire the quality of education needed for their future endeavors.

4 Quality of Education

Education is a key pillar of modern economies, and therefore, nations need to invest in education to increase the economy capabilities producing goods and services, acquiring new skills, promoting research and development, and creating new knowledge. School closure due to COVID-19 resulted in over 100 million children falling below the minimum reading proficiency level (World Economic Forum, 2022b). The UNESCO and UNICEF estimates that the economic costs of learning losses of the present generation account for $17 trillion in life earnings, or equivalent to 14% of today's global GDP. This cost will be even more devastating on children in poor countries where the share of children living in learning-poverty accounts for 53% of the student population. If the school closure continues for longer period, this number to increase to 70% of the total student population. Such lost opportunities for teaching and learning widen skills and knowledge gaps among and within nations leaving countries far behind (World Economic Forum, 2022c).

More than 200 countries converted their school systems into distance learning by forcing students to stay home and use technology as an alternative for face-to-face teaching. The closure of the school system by governments is to prevent the spread of COVID-19 and to protect the health of children against the pandemic. More than 90% of educational institutions worldwide adopted distance learning that involved computers, smart phones, television, and radio. However, access to technology may not be available and affordable to students, especially those in low-income countries. Access to the internet services and electricity are available for certain hours of

the day which may not allow students to follow school schedules. Distance learning has shifted education from schools to families and individuals forcing people to rely on computers and other electronic devices as an alternative means for learning. The World Bank estimate that this generation is likely to lose at least $10 trillion in lifetime earnings due to school closure, (World Bank Group, 2021).

Along with the deterioration in quality of education for numerous students worldwide, COVID-19 has contributed to various social, economic, and mental problems, especially on disadvantaged children, rural population, women, and underprivileged groups. Beyond that, however, online technologies may serve privileged students as substantial number of them can afford to have access to the internet and pay for electronic computers. In low-income countries, home to 650 million, mobile broadband is 18 times more expensive than in developed countries. It is estimated that there are 2.2 billion, or two-thirds of children and young aged 25 years or less -do not have internet at home (UNICEF, 2020). Investment in education increases readiness and enhances people capabilities to contribute to human welfare and sustainable development. Education creates new opportunities by allowing people to think in many ways as of how to make decisions, communicate, behave, and contribute to the well-being of others. Economic growth and shared prosperity are also linked to educational achievement allowing people to enhance understanding and discuss issues of common interest. Information and knowledge are fundamentals for social tolerance, sharing ideas, alleviating poverty, and reducing inequality.

Students in the Middle East and North Africa have already lost 0.6 years of education and that 10% of students have fallen below the minimum proficiency thresholds due to COVID-19, according to the World Bank. The UNESCO estimates that in the Arab region out of a total 87 million students 15 million out of school and another ten million were at risk of dropping out due to poverty, migration, and social marginalization (Al-Fanar Media, 2021). Students in Arab poor countries are lagging in teaching and learning, inadequate teaching tools and low-quality teachers. Countries in the region devote a large share of their public expenditures for education, but most of the money is not used efficiently. Large percentage of the money spend on education ends in paying salaries to teachers with little spend on building educational facilities to improve the quality of education and create suitable study environment for students. In addition, weak management system often led to inefficient use of resources and reduce the ability of the public sector to set policies and regulations for providing high-quality education.

In addition to the empowerment of people to diversify output and compete in the marketplace, education alleviates poverty, reduces inequality, and strengthens the fundamentals for peace and security. Educated people have the means to influence decision makers and pursue effective strategies that support the fundamentals of human rights including equity and justice for all. In this regard, educational institutions are key actors in helping the society achieving its ultimate goals to share prosperity and improve the quality of life. “Education contributes to peaceful and sustainable societies that provide citizens with the knowledge, attitude and skills required for dynamic participation in social development. Learners, including those

with vulnerabilities and disabilities, need twenty-first century skills for social transformation that lead towards a more just, peaceful, tolerant, inclusive, secure and sustainable world" (UNESCO, 2016, P. 24). Education is a key driver of economic growth, and therefore, it is not possible for nations to make progress without an effective educational system.

Universities need to change their curricula to ensure consistent levels of change in technology and improve quality of teaching and learning across the social divide. An inclusive curriculum could empower teachers and students to improve communication and strengthen the creativity of learners. Today, students need relevant skills not only to increase labor market flexibility, but also to satisfy demand for global markets. Global access to education facilitates greater collaboration and cooperation with educational institutions in other countries. Educational institutions, including universities and research centers, are key players in knowledge creation and innovation diffusion, and therefore, networks and building channels of communications among different universities are critical for knowledge transfer and information dissemination. Unfortunately, most universities in the Arab world are lacking to autonomy. This has impacted the outcome of education by having universities run according to the requirements of the governing political logic, and not a plan or a wise educational policy (United Nations, 2003, P. 56).

Universities can play an important role in promoting technological development and manufacturing production. Universities in most Arab countries are not adequately equipped to provide students with the skills and scientific knowledge they need to meet the challenges posed by the frontier technologies. Despite of the fact that women have received recognition in several social, political, and economic forums in the past few decades, science and engineering programs continue to be unattractive for their enrollment in universities. Enhancing human capabilities to participate in development must be inclusive to strengthen support for development by all groups in society including women. Building capacity for training and skills acquisition has become even more acute in recent decades due to the advancement in technological and scientific development. Universities contributes to readiness by empowering the economy to create production linkages and diversify productivity.

While online teaching provides students the time to review and solve problems, however, it will not replace face-to-face teaching methods which require direct communication between teachers and students in classroom. Face-to-face teaching enables both teachers and students exchange ideas and discuss issues that encourage students to think critically and find solutions to problems. Direct dialogue also assists teachers identifying student learning ability and try to help them working out these problems. In the new model, change in thinking provides students with different methods of learning so that to expand learning opportunities and give students more choices to select from different topics. The new economy, driven by changing technology, is increasing the demand for diversified learning opportunities, which require educational institutions offering a wide range of subjects. In this regard, universities need to adopt flexible curricula to ensure that the labor market absorb any disruption caused by technological change. The model currently employed in most educational institutions, especially in developing countries, exhibits twentieth

and nineteenth century methods, which are no longer applicable for the twenty-first century frontier technologies.

Educational programs need to consider the demand for lifelong learning to support labor market flexibility and adopt to market disruption due to technological change. Digital technologies and digital transformation are bound to change significantly as new models for lifelong learning will be employed in the school systems across the world. Smart technologies provide new learning opportunities for people across geographical boundaries by sharing knowledge and commutating information so that to enhance collaboration and find solutions to the challenges facing people worldwide. Access to external markets increase the prospects for knowledge absorption, technology transfer, and job creation. Outlook for education must change to focus more on providing students with skills required for employability in the new economy and not degrees. The traditional model of education based on rewarding graduates with degrees is no longer applicable in the new economy.

The contribution of human capital to the national economy represents an important indicator of the quality of the school system and its impact on student capabilities to acquire adequate knowledge and skills for development. Human Capital is defined as "the knowledge and skill that people obtain from education, on-the-job training, and work experience" (Bade & Parkin, 2009, P. 37). In another definition by the World Bank human capital "consists of the knowledge, skills, and health that people accumulate over their lives. In addition to its intrinsic importance, human capital is a key driver of sustainable growth and poverty reduction" (World Bank Group, 2021, P. 145).

The twenty-first century technological and business requirements underscore the need for educational system capable of providing technical and managerial skills to engage in solving complex problems that require critical thinking, creative ideas, and scientific and technological enhanced learning. The Fourth Industrial Revolution entails new models of education to strengthen the knowledge and skills foundation for adoption and adaptation the modern technologies to build capacity for future education. Higher education (HE) brings about economic and social benefits, as it often improves national social welfare and contributes to economic growth. Numerous studies have shown that HE increases the skills necessary to participate in the global economy, encourages innovation, bolsters social mobility, and creates democratic and innovative leadership and citizenry (World Bank, 2009. Innovation, which contributes to the creation of new knowledge, new methods and modern technologies is a product of people's mind, and therefore, early education should prepare students to engage in productive activities through the acquisition of new ideas, and new knowledge. Even though governments play a key role in promoting science and technology, it is unfortunate that the role of governments in Arab countries has not been supportive to accelerate the process of innovation and build capacity for scientific and technological development. This reflects the failure of educational policies to encourage research and development and recognize the benefits from investments in science and technology. "The hijacking of science by politics is indeed one of the reasons for the decline of the knowledge system in Arab countries" (United Nations, 2003, p. 166).

5 Education in Arab Countries

Undertaking educational reform in Arab countries requires the creation of new types of universities, new forms of programs, new regulatory systems, and new initiatives to encourage science and engineering not only to meet market demand for skilled workers, but also to build capacity for knowledge absorption and technological learning. Universities must improve management and strengthen governance to enhance quality, and increase student scientific, technical and managerial capabilities. Universities should be integrated into the productive sectors by conducting R&D for industries and creating production linkages to stimulate economic growth and encourage entrepreneurship. In Arab countries, where unemployment among young people is relatively high compared to other world's regions, universities can introduce entrepreneurial training into its curricula to ensure that students are acquainted with problems in doing business in the economy.

The degrees and certificates awarded by universities in Arab countries exhibit no adequate skills to help thousands of young people compete in the market and obtain jobs. In the new economy, driven by the frontier technologies, universities cannot be separated from the development process, and therefore, cooperation and collaboration of universities with the productive sectors become vital for shaping future development. Increasing productivity is one of the major challenges facing Arab economies, especially in manufacturing production. Science, technology, and innovation are important pillars of industrial production. It is imperative that universities in Arab countries revise their programs to build industrial capabilities by offering courses in science, engineering, and mathematics. Except for oil producing countries, the average income per person in Arab countries is less than half of the world average reflecting the failure of the educational systems to increase skills capabilities and foster productivity growth.

A critical concern facing education in most Arab countries is whether can reinvent the educational system to provide students with the necessary skills to meet market demand for labor. At present, the demand for labor focuses on workers with cognitive, social, and behavioral skills so that to increase capabilities for creation of new knowledge, generation of new ideas, development of new technologies and production of new products. Universities need to be integrated into the national development strategy to ensure that graduates are equipped with adequate technical, scientific, and managerial skills needed to encourage both local and foreign enterprises investing in the economy. There is a need for greater linkages between universities and private sector to coordinate policies and design programs to improve the quality of educational output and meet market demand for labor.

Except for a few, most Arab universities are yet to offer adequate educational programs and provide sound research facilities for increasing readiness and preparing students to respond to the emerging scientific and technological challenges facing Arab countries in the twenty-first century. "Political obstacles to knowledge acquisition … are even more severe in Arab countries than those posed by their socio-economic structures, which are in turn seen to be more obstructive than any

features of culture" (United Nations, 2003, p. 10). High unemployment in the Arab world, especially among the youth and women, is attributed to lack of skills and poor-quality education. Thus, governments in the region need to reconsider changing the school curricula and update programs to improve the quality of teaching and learning as well as to enhance student capabilities in scientific and technological fields for harnessing the benefits of frontier technologies and overcoming the challenges of the Fourth Industrial Revolution. Building adequate infrastructure is vital for reforming the educational system and providing a foundation for enrolling students in science and technology.

Universities are relevant institutions in promoting economic growth and civil society participation, not only for their capacity to create and disseminate knowledge, but also as organizations that attract talented people, inject new ideas, enrich cultural life, and encompass the whole social fabric of which they are a part. Unfortunately, in the context of the MENA region, the social and private returns to higher education may not be very high, as evidenced by unemployment rates as high as 40 percent for university graduates in some countries. High unemployment, especially among the youth, reflect the failure of the educational system to meet market demand for graduates with adequate skills for employability and adoptability to technological change.

Although, the role of government is important in building capacity for dynamic educational system, however, government alone may not be able to achieve the desired objective of high- quality education. Until recently, most educational institutions in Arab countries are government- funded with little or no contribution from the private sector to education. Given recent changes in technology, COVID-19 pandemic, and due to increasing pressure for global competitiveness, there is a need for restructuring the educational system to include the private sector as a participant in the outcome of education. In the new digital economy, the demand for labor requires special technical skills and specialized workers, not only to adopt and upgrade the new the technologies, but also to improve labor market flexibility and facilities integration into the global economy. The contribution of the private sector can increase the stock of human capital to overcome skill shortages and enable local enterprises compete in the global economy.

Educational institutions in Arab countries need to make initiatives towards knowledge-intensive programs to produce students equipped with skills aligned with rapid advancement in frontier technologies. Participation in the new economy requires flexible labor market to respond to the rapid changes in technology and the demand for new skills to meet business needs. Universal access to education connects students worldwide to work together for ending poverty, meeting a range of social needs, and establishing peace and security for all. Universities and other learning institutions can take the lead for solving the important challenges facing people everywhere and thus to strengthen the capacity for a peaceful and sustainable world. "Education is a basic human right, and it is central to unlocking human capabilities. It also has tremendous instrumental value. Education raises human capital, productivity, incomes, employability, and economic growth. But its benefits go far beyond these monetary gains: education also makes people healthier and

gives them more control over their lives. And it generates trust, boost social capital, and create institutions that promote inclusion and shared prosperity" (World Bank, 2018 P. 38).

The Fourth Industrial Revolution is changing the business model by focusing on specialized skills and creative workers. Not only such programs such as basic education, digital literacy, cognitive skills, and lifelong learning, are essential for labor market flexibility, but also for upgrading and adopting frontier technologies into the local environment. The need for "appropriate supporting institutions" becomes necessary for increasing linkages between academia, government, and industry. These supporting institutions could empower universities to increase the pathways of collaboration and cooperation with foreign educational institutions (MillenniumProject, 2005),

It is important that universities meet international standards and technical specifications to attract foreign students, increase collaboration, and gain access to global knowledge systems. There is no single model for education in Arab countries. Education is still dominated by the public sector, and therefore, decisions concerning education remain in control by governments. Although, recent years have witnessed the opening of private universities across the Arab world, their roles remained constrained by lack of financing, adequate infrastructure, and low-quality skills to help students compete in the marketplace. Government can support private university by improving teaching and learning via investment in digital infrastructure, human capital resource development, and research and development. Arab countries allocate 0.4% of their GDP for scientific research, the lowest among all world's regions. Research and development are key drivers of innovation and discovery of new methods more applicable for the local development. Although more females are enrolled in educational institutions across the Arab world in recent decades, yet very few women are attracted to scientific and engineering subjects. Enrollment of more women in these subjects provides women new opportunities to participate in the new economy and contribute to building capacity for development.

Universities are producers of human capital representing the most valuable resources that a nation needs to create new knowledge, develop new technologies, increase production linkages, and promote competitiveness. In this age of global interconnectivity, human capital strengthens access to external knowledge, technology and information that are essential for building capacity for development. To benefit from the new economy requires an educational system that permits teaching and learning, lifelong learning, digital literacy, and critical thinking. The system must encourage different methods of teaching and learning to harness the creative minds of young people and increase the economy capabilities to create knowledge. Thus, government intervention should increase funding to enable the educational system achieving high quality services, ensuring equity, promoting inclusion, and developing good governance. Universities should be encouraged to produce skills and knowledge that are aligned with market demand for labor.

Policymakers in Arab countries should invest in education to promote equity and reduce inequality among and within nations and regions. Education provides nations with new opportunities to gain access to external knowledge and information for

building indigenous capacity for development. Government can facilitate knowledge absorption and technology transfer by improving digital literacy and encouraging universities to increase collaboration and cooperation with foreign universities. In other words, education strengthens access to global markets and encourages local enterprises to adopt modern technologies for market conditions. In this regard, investment in ICT technologies enhances the country capabilities to absorb knowledge, acquire skills and communicate information so that to encourage local firms engage in market activities and contribute to economic growth. Education equips people with the skills and knowledge needed for supporting productivity growth and promoting innovation. In this age of globalization, education also facilitates integration into the global economy providing nations, especially developing countries, access to technology and know-how for development.

6 Need for It Governance

Governance comprises a set of rules that define the responsibilities and duties of organizations toward their stockholders and constitute social, ethical, moral, and environmental guidelines. The objectives of these procedures and policies are to ensure that organizations contribute to the efficient and effective use of IT technologies not only to enable organizations perform and compete in the marketplace, but also to enhance the society's capabilities achieving its goals. Corporate governance, which is an integral element of corporate responsibility, enables organizations making use of IT in a productive manner to increase the value of stockholders and to manage the risk that is associated with the use of IT. In other words, management of IT requires organizations to comply with the legal and regulatory procedures that provide the public the confidence in use of IT services. Governance influences decision making that strengthens good management practices not only to address the IT risk, but also to support organizations achieving their objectives.

Governments need to introduce new rules and new regulations to govern the new technologies that are currently in use, especially in educational institutions. Smart technologies could help students gaining access to broad-based learning materials to support their studies and improve their skill capabilities. Currently, these technologies are mostly used for non-productive purposes, mainly for social networking and personal issues instead of learning and teaching. Despite of the fact that technology creates lots of positive opportunities for society to solve social, economic, and environmental problems, technology also generates negative and undesirable externalities. Thus, "A faster, more agile approach to governance is needed to effectively respond and adapt to the ways these technologies are changing business models and social interaction structures –both seen and unforeseen" (World Economic Forum, 2020, P. 6–7). The creation of new technologies is to work with minimum human inputs leading to much greater risk and unpredictable consequences of the impact of these technologies. To minimize the risk and increase agility in decision

making, there is a need for innovative governance and regulatory frameworks that address the unexpected outcome of the new technology.

In education, good governance is important for managing and monitoring teaching and learning to enable the educational institutions contribute to the stock of human knowledge and strengthen the society ability to foster development. Good governance is defined as a "set of responsibilities and procedures to ensure educational objectives are achieved through effective and efficient use of resources, accountability, and participation of people in decision-making" (Abdullahi, 2019, P. 2). The need for governance has become more urgent due to COVID-19 disruption in the educational system. Distance learning has reduced face-to-face meetings with students to provide the necessary instructions and respond to student urgent questions. Governance ensures that online teaching continuous to offer quality services and provide students the relevant skills for market need. "Complex systems and limited management capacity are obstacles to orienting all parts of an education system toward learning" (World Bank, 2018, P. 12).

Flexibility of the educational system is essential for helping students adopt to technological change and labor market demand for skills. Through collaboration and cooperation with global educational systems, universities will be able to update their curricula and connect students with the rest of the world. ICT technologies have increased connectivity enabling millions of students communicate with each other's and gain knowledge and understanding about issues of common interest. However, in developing countries there are still large number of students with limited access to the internet or cannot afford to pay for electronic devices.

Teacher's delivery is another important step for reforming the educational system. Teacher-student interaction increase student understanding and encourage critical thinking to facilitate problem-solving. It is the outcome of education or learning what is important for society, and therefore, management and governance must assess the performance of the educational system in relation to the quality of graduates. In other words, how much time students spend in the school or schooling is secondary compared to the gain that students acquire through schooling. In the Arab world, governments allocate large share of their public expenditures for education, but the outcome measured by student performance remains low to meet the challenges facing these countries. The current model based on traditional methods of teaching is no longer adequate to provide students the critical thinking, technological learning, and problem-solving techniques needed for digital transformation. "Education policies in many Arab countries lack an integrated vision of the education process and its objectives" (Arab human development, 2003, P. 54). The vision and mission of educational institutions should focus on graduating students with adequate skills and knowledge to increase the economy readiness for digital transformation and benefit from the Fourth Industrial Revolution. Unlike business enterprises, educational institutions should not be structured to maximize profit. Their aim should focus on producing high-quality graduates capable of formulating strategic thinking and producing creative ideas to support continuity and growth.

Governments should encourage scientific research and technological development by providing universities the incentive needed to strengthen capabilities for

research and development, ICT infrastructure, collaboration with global educational institutions, free access to information, and partnership. Regulations could hinder the ability of universities to provide students with adequate programs to safeguard their employability, and to promote the society integration into the new economy. "The continued responsibility of the state should be affirmed and recast such that higher education is liberated from the domination of both government and the unregulated profit motive" (United Nations, 2003, p. 68).

Good education system needs good governance to ensure that quality, equity and inclusiveness are implemented in a manner aligned with the society strategy to create knowledge, acquire skills, and disseminate information. It seems that the management of the educational system in the Arab world is still lacking to vision and clear strategy about the challenges posed by technologies of the twenty-first century and the need for highly skilled workers to strengthen the process of transformation. Decisions concerning education remains highly centralized with little authority given to educators outside the minister of education office. The change in government strategy should focus on making the educational system more transparent as well as to increase the availability of educational decision making to the private sector. To this end, management and governance of the educational system must integrate into the country vision and its aspiration to foster productivity, share prosperity, and sustain development. Whether the society can fulfill these objectives will depend on the skills and knowledge that students acquire in schools. "The effective management of schools relies on capacity and autonomy for decision making at the school level, which are often lacking" (World Development Report, 2018, P. 81).

Reforming the educational system in the Arab world should involve the collective efforts of all stakeholders to maintain equity in the system using funding, scholarship, infrastructure, and efficient strategy that shape societies and economies in the future. Investment in education empowers people with skills and values that encourage social and moral responsibility and provide students with new opportunities to participate in decision makings and contribute to the wellbeing of the society. The United Nations point out that "The main challenge facing Arab countries is that of devising an alternative education system that can provide good education at the right cost" (United Nations, 2002, P. 56). Building capacity for development across the Arab world will require greater cooperation among member states to enhance human capabilities and strengthen the scientific and technological applications. These objectives can be realized through rethinking the educational system so that to harness the benefits of science, technology, and innovation. The global challenges facing Arab countries call for collective effort to reform the educational system and build the human and technological abilities of the young people so that to foster economic growth and deepen integration into the twenty-first century economy.

The World Economic Forum points out that "Schools of the Future" must adapt to enhance student capabilities with skills to create a more inclusive, cohesive, and productive world. The study "Schools of the Future: Defining New Models of Education for the Fourth Industrial Revolution", outlines new approach for defining education focuses on the need for "mobilizing a broad and innovative coalition of relevant stakeholders around new models, new standards and a new momentum for

action to transform the future of education" (World Economic Forum, 2020, p.4). Currently, most models used in educational institutions exhibit features do not meet the demand for creative and innovative skills that satisfy the need of the modern technologies, driven by the Fourth Industrial Revolution. Frontier technologies such as automation, robotics, artificial intelligence, and fusion, are creating large shift in the skills required to meet the demand for labor in the new economy. On their part, educational institutions must review their programs and change their curricula to provide the required skills and keep pace with these changes. "Creating future citizens that enable a more cohesive world will require school systems to focus on helping children develop a general awareness about the wider world, an understanding of the interconnectedness of global issues, and their duty and agency in playing an active role in the global community" (World Economic Forum, 2020, P. 7–8). According to the World Economic Forum skills of the twenty-first century can be classified into three categories: (1) foundational literacies including literacy, numeracy, scientific literacy, ICT literacy, financial literacy, and cultural and civic literacy; (2) competencies such as critical thinking, creativity, communication and collaboration; and (3) character qualities comprising curiosity, initiative, adaptability, leadership and social and cultural awareness (World Economic Forum, 2015). Employability in the new economy requires students acquiring these skills not only to be employed, but also to increase labor market flexibility to adopt and upgrade the technologies for the local environment.

7 Conclusion

Without investment in education, nations will have little or no prospect for building capacity for development and participate in the twenty-first century economy. Education is the principal driver of modern economies serving to bridge the social, economic, racial, and geographical divides aiming at building capacity for equity, justice, and freedom for all. Education empowers people with knowledge and skills that are essential for fostering economic growth and improving the quality of life. As a major factor in building the country stock of human capital, education increases the country's capabilities to promote innovation and create new opportunities for job creation, poverty alleviation, income distribution, and inclusive society.

Models currently used in teaching and learning in most Arab universities are still rooted in practices of the first and second industrial revolutions. These models are no longer relevant to the present business environment, driven by frontier technologies and knowledge-based applications. Educational institutions need to replace these models to empower students with skills applicable for harnessing the benefits of the new digital economy. Communication, creativity, and critical thinking are important skills that students must acquire to support rapid advancement in scientific and technological development.

Investment in people is critical if a nation to pursue an effective policy for leapfrogging and speeding up the process of development. It is unfortunate, we live in an uneven world dominated by illiteracy, inequality, and injustice. Correcting these conditions underline the need for greater global cooperation to reinvent the existing model for education and replace it with a dynamic system that interconnect capabilities, including governance, education, institutions, advice, and collaboration (P. 21 UN Millennium project). To this end, reshaping education to contribute to the new economy requires modifications in pedagogy, changes in curricula, good governance, greater autonomy, and new linkages between universities, industry, and government.

However, in this era of coronavirus pandemic, the educational system is subjected to adverse consequences forcing 1.6 billion students worldwide to study online instead of face-to-face teaching and learning. This model of learning could have negative impact on the quality of education, especially in developing countries where online teaching remains inadequate to help students acquire the skills and knowledge, they need to achieve their goals in life. The new technologies, driving the Fourth Industrial Revolution, require highly skilled labor and knowledge workers to increase labor market flexibility and adopt modern technologies to local environment. Arab countries should consider COVID-19 as an opportunity for restructuring the educational system to overcome the shortcoming of the old model and equip young people with knowledge and skills applicable for the twenty-first century economy.

Education can play a key role in bridging the social, cultural, income, ethnic, and gender divides among and within nations by providing equal opportunity for all people to participate in development. Improving communication among individuals and groups across the social divides enhance understanding and promote cooperation for the common good. To this end, there is a need for rethinking the educational system to include 'both the technical and human-centric skills' so that to strengthen building capacity for digital economy and align the outcome of learning to support achieving such objectives. Education Contributes to bridging the gap between local and global environments as well as empowers the country efforts to build capacity for creative and innovative society. Providing students with scientific, technical, and managerial skills strengthen human capital capabilities and reshape development.

Worldwide, governments and global institutions need to realize the scope of the crisis and invest in ICT technology to provide access to students and reduce the risk of exclusion. COVID-19 crisis should be translated into an opportunity to build resilient educational institutions that ensure effective learning capabilities and support development. Investing in digital infrastructure empowers teaching and learning by providing new opportunities for all learners to communicate and formulate effective strategies to enable students acquiring the skills they need to engage in productive activities and contribute to national development.

References

Abdullahi Nimota Jibola Kadir. (2019). Good governance issues in education system and management of secondary schools in Kwara state, Nigeria, eJEP e. *Journal of Education Policy*. https://files.eric.ed.gov/fulltext/EJ1234494.pdf, 2–14.

Al-Roubaie, A. (2019). Building capacity for digital development in the Arab world: The role of education. *International Journal of Engineering and Advanced Technology (IJEAT) ISSN, 8*(5C), 2249–8958.

Bade, R., & Parkin, M. (2009). *Foundation of Economics* (4th ed.). PEARSON Education.

Media, A.-F. (2021). *Post-Covid-19, Arab countries need new approaches to education*. U.N. Official Says - Al-Fanar Media.

MillenniumProject. (2005). *Innovation: Applying knowledge in development*. Erthscan.

O'Halloran, D. (2021). Take the 1 Billion Lives Challenge to Close the Digital Divide. https://www.weforum.org/agenda/2021/09/take-the-1-billion-lives-challenge-to-close-thedigital-divide-edison-alliance-inclusion-internet-connectivity/

UNESCO. (2016). *Arab Regional Education Support Strategy 2016–2021*. UNESCO Regional Burau, Beirut. https://en.unesco.org/sites/default/files/unaress.pdf

UNICEF. (2020). *How many children and young people have internet access at home?* UNICEF DATA.

United Nations. (2002). *Arab human development report 2002*. United Nations.

United Nations Development Programme (2022). New Threats to Human Security in the Anthropocene: Demanding Greater Solidarity (New York, 2022, Humansecurity HDR (1). Pdf.

United Nations Development Programme. (2003). *Arab human development report 2003*. United Nations.

World Bank. (2009). Accelerating Catch-Up Tertiary Education for Growth in Sub-Saharan Africa (The World Bank, Washington DC) https://openknowledge.worldbank.org/bitstream/handle/10986/2589/462750Revised017808213773830Revised.pdf?sequence=1&isAllowed=y

World Bank Group. (2018). World Development Report 2018, Learning to Realize Education's Promise https://openknowledge.worldbank.org/handle/10986/28340#:~:text=Every%20year%2C%20the%20World%20Bank%27s%20World%20Development%20Report,economic%20change.%20The%20Report%20explores%20four%20main%20themes.

World Bank Group. (2021). *The Changing Wealth of Nations 2021: Managing Assets for the Future* (worldbank.org).

World Economic Forum. (2020). Schools of the future: Defining new models of education for the fourth industrial revolution. https://www3.weforum.org/docs/WEF_Schools_of_the_Future_Report_2019.pdf

World Economic Forum. (2022a). Four ways universities can future-proof education. https://www.weforum.org/agenda/2022/01/four-ways-universities-can-future-proof-education

World Economic Forum. (2022b). COVID-19's impact on jobs and education: Using data to cushion the blow. How data can soften the pandemic's blow on school and work | World Economic Forum (weforum.org).

World Economic Forum. (2022c). The global education crisis is even worse than we thought. Here's what needs to happen. https://www.weforum.org/agenda/2022/01/global-education-crisis-children-students-covid19/

World Economic Forum. (2015). The Global Competitiveness Report 2015-2016 (World Economic Forum: Geneva) https://www3.weforum.org/docs/gcr/2015-2016/Global_Competitiveness_Report_2015-2016.pdf

Amer Al-Roubaie is a professor/advisor for Capacity Building and Academic Collaboration at Ahlia University, Kingdom of Bahrain, and is engaged in teaching Economics at both undergraduate and postgraduate levels. He received his Doctorate in Economics from McGill University in Montreal, Canada. Before joining Ahlia, Al-Roubaie taught Economics at universities in Canada, The United States, and Malaysia. He has written and conducted research in diverse fields including Energy, international development, globalization, Islamic banking and finance, the Fourth Industrial Revolution, sustainable development, and the Digital economy among others. Along with Professor Shafic Alvi of Concordia University, Professor Al-Roubaie edited 8-volune set in Islamic Banking and Finance and Islamic Economics. He is also one of the authors of Principles of Managerial Finance: Arab World Edition. The book is published by PEARSON and widely used in teaching finance at both undergraduate and graduate levels. Professor al-Roubaie has attended many international conferences in several countries.

Strategies for Developing a Culturally Inclusive Online Learning Environment During the COVID-19 Pandemic in Australian Universities: A Case Study

Ching Ting Tany Kwee and Luis Miguel Dos Santos

1 Introduction

The COVID-19 pandemic has drastically disrupted the progression of Sustainable Development Goals, especially in attaining one of the targets of SDG 4 Quality Education - the appreciation of cultural diversity among learners (Iivari et al., 2020; The United Nations, 2020). The incapability of learners returning to campus creates the physical absence of peers and teachers, hampering effective communication and meaningful engagement with both verbal and nonverbal cues and bringing challenges to creating a culturally inclusive learning environment (Hastings & Bham, 2003; Iivari et al., 2020). In the past two decades, scholars (Kosasi et al., 2020; Yanosky & Caruso, 2008) have endeavoured effort in probing into the possibilities of developing and adopting various IT governance models, tools and frameworks to foster the desirable behaviours in using IT resources in teaching, learning and research in higher education. However, there is still a little discussion on specifically how IT governance can foster a culturally inclusive learning community. Due to the increasing trend of international student intake among universities and the increasingly diverse backgrounds of the domestic students in western countries like Australia, Canada, the United Kingdom and the United States, alongside the possibility of online learning becoming a new normal (Asanov et al., 2021; Thatcher et al., 2020), this issue has drawn the attention of the university management on how to utilise IT resources in creating a culturally inclusive online learning environment, whereby learners from a diverse linguistic and cultural backgrounds feel respected while attaining their learning goals.

C. T. T. Kwee (✉)
The University of New South Wales, Sydney, UK
e-mail: c.kwee@unsw.edu.au

L. M. D. Santos
Woosong University, Daejeon, South Korea

M. Alaali (ed.), *COVID-19 Challenges to University Information Technology Governance*, https://doi.org/10.1007/978-3-031-13351-0_5

1.1 Purpose of the Study

This study aims to identify the delivery and support in university IT governance to foster a culturally inclusive online learning environment by examining the online learning experiences of undergraduate students pursuing their studies in Australian universities during the COVID-19 pandemic. With the aim stated above, this study is guided by two research questions:

1. How do university students experience online learning within a culturally diverse online learning community during the COVID-19 pandemic?
2. What strategies can be implemented for designing a culturally inclusive online learning environment?

Guided by the research questions, this book chapter first outlines what the previous scholarly literature on IT government has discussed to provide the background and highlight the research gap of the current study. Then, the researchers move onto the research context, allowing the reader to pertain an understanding of the cultural diversity issue in Australian society and Australian universities. Then the theoretical framework and methodology of this study are delineated, followed by the discussion of findings, future research direction and significance of this study.

2 Literature Review

This section aims at setting the scope and providing a clear overview of the key concepts related to this study. It begins by a discussion of IT governance on higher education and culturally inclusive online learning environment, allowing the readers to permit a gaze into the current research gap and posit the current study within the existing literature.

2.1 IT Governance on Higher Education

IT governance refers to the specification of decision rights and accountability to encourage desired behaviours and maximise the benefits of an organisation in using Information Technology, whereby including the planning, implementation, delivery and evaluation of the IT policies and solutions (Bianchi et al., 2021; Yanosky & Caruso, 2008). The current studies on IT governance in higher education focussed on investigating the mechanisms, models, frameworks and tools in supporting university administration, student enrolment, teaching and learning and research-related support (Bianchi et al., 2021; Bianchi & Sousa, 2016; De Haes et al., 2013; De Haes & Van Grembergen, 2015; Tawafak et al., 2020). Some studies (Bianchi & Sousa, 2016; Coen & Kelly, 2007; De Haes et al., 2013) investigated how IT

support, such as software, cloud application, wireless network and e-learning platforms, facilitates myriad teaching, learning and research activities while some studies (Sadikin et al., 2014; Sutadji et al., 2020) investigated and evaluated the implementation of various IT governance frameworks, such as ITIL, COBIT and COBRA, taking the processes and relational mechanisms are taken into consideration. For example, some suggestions included setting up IT steering and audit committees to assign people to be responsible for the decision making of the related IT governance policies and resources management (De Haes & Van Grembergen, 2015; Sadikin et al., 2014). On the other hand, some studies (Bianchi et al., 2017; Sadikin et al., 2014) probed into the possibilities of incorporating some new mechanisms into the existing frameworks to ensure that IT resources have been used and managed effectively and efficiently to align with the organisational goals of universities, thereby maintaining the cutting edge in increasingly keen competitions in academic excellence, rankings and student enrolment in both the pandemic and post-pandemic periods (Bamberger et al., 2020; Bianchi et al., 2021). It is inevitable that COVID-19 disrupted the learning of university students drastically, whereby the migration to online learning platforms has been abrupt and in some cases, similar to crisis or emergency due to the rapid transmission of the contagious virus (Adedoyin & Soykan, 2020; Adnan & Anwar, 2020; García-Morales et al., 2021). Issues like logistical challenges, educators' and learners' competency and attitudes, alongside previous exposure to the instructional delivery approaches and tools of online learning had to be taken into consideration by the university management in such digital transformation process (Adedoyin & Soykan, 2020; García-Morales et al., 2021). Nevertheless, universities adopted an active approach to cope with such unfavourable situation. For instance, in some disciplines like STEM, universities probed into the possibilities of the virtual laboratories and using VR technology to assist in the acquisition of practical knowledge and fill the gap between theories and practices (Adedoyin & Soykan, 2020). Another forceful example is universities' reconsideration on the IT resources available in providing options for synchronous and asynchronous learnings, whereby tools like Moodle, Google Meet, Zoom, Microsoft Teams or Office have been adopted in universities worldwide to cope with the new scenario of learning (Adedoyin & Soykan, 2020; García-Morales et al., 2021). Such evidence permits a gaze into the responsive manner of university management in providing a favourable learning environment in the midst of challenges.

2.2 Culturally Inclusive Online Learning Environment

Regardless of online or face-to-face learning, it is of utmost importance to foster a culturally inclusive learning environment (Hannon & D'Netto, 2007; McLoughlin, 2001). Embracing cultural diversity is more than merely putting learners from different linguistic and cultural backgrounds under the same roof, measures and awareness have to be developed to ensure such diverse groups of learners feel their cultural

beliefs, values and practices have been addressed (Germain-Rutherford & Kerr, 2008;Hannon & D'Netto, 2007 ; Tapanes et al., 2009). Scholars (McLoughlin, 2001; Tapanes et al., 2009) generally agreed that learners' motivation for learning is strongly influenced by the cultural awareness among their peers and the instructors in an online learning environment. In the face of the culturally diverse cohort of students, some universities have developed a framework for e-learning, allowing students to engage with organisational, technological and pedagogical components of online learning, whereby their language proficiency, lesson materials and learning evaluation methods are taken into consideration to cater for their multicultural values and perspectives (Germain-Rutherford & Kerr, 2008; Hannon & D'Netto, 2007). However, in reality, studies (Hannon & D'Netto, 2007; Tapanes et al., 2009) reflected that the cultural and linguistic differences among the university students are not always explicitly taken into consideration or might have been mistaken while designing the curriculum, activities and assessments. For example, some instructors may think that maintaining culturally neutral or colour-blind can be a pedagogical strategy to create a culturally inclusive learning environment; however, university students, especially those from Non-English Speaking backgrounds (NESB) generally believe that they may not gain fair access to language resources to pertain to an understanding of the lesson materials in other cultural contexts (Hannon & D'Netto, 2007; Tapanes et al., 2009). It hampers them from competing fairly with their majority peers, leading to a non-attainment of learning goals and a decrease in learning motivation and satisfaction (McLoughlin, 2001; Tapanes et al., 2009). Specifically, such powerless situation can be reflected in the reducing participation rate in online learning, whereby the prevailing feeling of not being respected among such cohort of students generates negative affections and alienation to the university community, leading to the thought of early attrition (Arcidiacono & Di Martino, 2016; Hammell & Iwama, 2012).

2.3 Current Literature Gap

While the previous studies (Hannon & D'Netto, 2007; Tapanes et al., 2009) have identified the hurdles of fostering a culturally inclusive online learning environment, very few studies shed light on the effective strategies to embrace cultural diversity in an online learning environment. While IT resources are a cornerstone to the successful attainment of the university organisational goals (Bianchi et al., 2021; Sadikin et al., 2014), there are limited discussions on how IT governance can bring support in fostering a culturally inclusive online learning environment. Moreover, the majority of the discussion in current literature (Bianchi & Sousa, 2016; Coen & Kelly, 2007) centred on the stakeholders like university management, teaching and research staff, very rare did the scholars examine the experiences of university students, who are also important stakeholders as end-users of the university IT resources. Therefore, to identify how the support by IT governance fosters a culturally inclusive online environment, it is important to examine how the university

students' learning motivations and interests develop and persist in their experiences of online learning by taking their values and perceptions into consideration (De Haes & Van Grembergen, 2009, 2015).

3 Theoretical Framework: The Social Cognitive Career Theory

To understand how university students' academic interests and learning motivations develop in relation to their learning goals in their online experiences, the Social Cognitive Career Theory (SCCT) was selected as the theoretical framework of this study.

There were two reasons for the researchers to adopt the SCCT in this study. First, Social Cognitive Career Theory is a specifically designed theory to investigate how career or academic interests develop into actions and goals with the triadic relationship between three key constructs, namely, self-efficacy, outcome expectation and performance goal attainment (Brown & Lent, 2019; Lent et al., 1994). Putting it simple, self-efficacy is defined as people's beliefs about their capabilities to reach a specific performance; Outcome expectations are a set of personal beliefs about the possible outcomes that constitute another key component in SCCT; Performance goals in SCCT include meeting the individual needs in achieving specific intrinsic or extrinsic ends and actualising one's self-objectives (Bandura, 1986; Brown & Lent, 2019; Lent et al., 1994). The SCCT scholars (Brown & Lent, 2019; Lent et al., 1994) advocate that an individual who has their performance goal attained will turn into a successful past experience boosting their self-efficacy. A higher self-efficacy in turn leads to a positive postulation of the learning outcome and the attainment of the future performance goal. Specifically, SCCT looks into the mental representation of the decision-making process in relation to the above-mentioned three constructs. It gives an advantage to this study that the researchers could look into how the university students' self-efficacy developed in relation to their previous experiences of engaging in the online learning activities with groups of culturally and linguistically diverse students and how such experiences influenced their perception of their attainment of learning goals (Brown & Lent, 2019; Lent et al., 1994).

Second, SCCT allowed the researchers to identify the effective proximal supports in IT governance by examining the decision-making processes of the university students holistically. An individual's perception and decision-making process involve a complex web of personal and environmental factors, whereby academic interests and persistence develop in an ebb of events during the university students' online learning goals (Brown & Lent, 2019; Lent et al., 1994). Scholars (Fouad et al., 2016; Wang, 2013) credited the power of the SCCT in scaffolding such intertwining relationships of variables, allowing them to examine how a specific variable influences the participants' academic and career progression experiences. By adopting SCCT in this study, the researchers were able to identify how various proximal

contextual factors in IT governance serve as support to cultivate a culturally inclusive online environment and lead to the persistence of the university students' participation of online learning activities, together with the attainment of organisational goals of the universities and the learning goals of the students (Brown & Lent, 2019; Lent et al., 1994).

4 Methodology

4.1 Research Design

This study employed a qualitative case study approach to examine the online learning experiences of undergraduate students in a culturally diverse online learning community while pursuing their studies in Australian universities during the COVID-19 pandemic (Creswell, 2012; Yin, 2009). A qualitative case study is appropriate because it intends to investigate a specific issue of online learning among a group of culturally and linguistically diverse university students, particularly how their self-efficacy develops in accordance with their perception of cultural diversity and cultural inclusiveness in the online learning environment, alongside the supports offered by the IT governance in an online environment (Stake, 1995; Yin, 2009). Adopting a qualitative case study design enables the lived experiences of the participants to emerge in their natural and real-life settings, thereby generating rich and thick data for the researchers to identify the strategies for fostering a culturally inclusive online learning environment (Creswell, 2012; Stake, 1995; Yin, 2009).

Another reason for choosing a case study design is that the case the researchers selected is an information-rich case, which is ideal for understanding the phenomenon of how culturally and linguistically diverse university students learn in an online environment (Creswell, 2012; Yin, 2009). Australia has a large population of migrants, whereby overseas-born Australia comprises almost 30% of its total population, with over 7.6 million migrants living in Australia (Australian Bureau of Statistics, 2021). Moreover, Australia also embraces a huge cohort of international students (Ferguson & Sherrell, 2019; Thatcher et al., 2020). In 2022, there are about 420,000 international students pursuing their studies in Australia (Australian Government Department of Education Skills and Employment, 2022). The diverse backgrounds of both the domestic and international students provide the various potential for the researchers to investigate the effectiveness of the online learning support in relation to the perceptions of participants from various racial, familial and educational backgrounds.

4.2 Participants

Fifty university students who are currently enrolled in one of the Australian universities were invited and agreed to participate in this study. The researchers employed a purposive sampling strategy to recruit the participants, which can reflect the characteristics of the diverse student population in Australian universities (Creswell, 2012; Lavrakas, 2011; Merriam & Tisdell, 2016). Table 1 summarises the demography of the participants.

Table 1 Demography of the participants

Participant	Gender	Campus location (State/territory)	Country of origin	Student status	School/faculty
1	M	New south wales	China	Domestic	Business
2	F	Victoria	The United Kingdom	Domestic	Nursing
3	M	New south wales	Hong Kong	International	Science
4	M	New south wales	Canada	International	Arts and design
5	F	Victoria	India	Domestic	Education
6	M	Victoria	Indonesia	International	Engineering
7	F	Queensland	Canada	International	Business
8	M	New south wales	Indonesia	International	Business
9	F	Queensland	Australia	Domestic	Science
10	M	Western Australia	Malaysia	Domestic	Accounting
11	F	Western Australia	Chile	International	Finance
12	F	Victoria	Brazil	International	Engineering
13	M	New south wales	Indonesia	International	Education
14	F	New South Wales	Hong Kong	Domestic	Medical science
15	M	New south wales	Indonesia	International	Architecture
16	F	New South Wales	India	Domestic	Arts and design
17	M	Victoria	China	International	Education
18	M	Victoria	Pakistan	International	Accounting
19	M	New south wales	Vietnam	International	Computer science
20	F	New South Wales	India	International	Arts and design
21	M	Tasmania	Australia	Domestic	Business
22	F	New South Wales	India	International	Arts and design
23	M	Queensland	Thailand	International	Engineering
24	M	New south wales	Nepal	International	Business
25	F	Queensland	The Philippines	Domestic	Business
26	F	Victoria	Brazil	International	Business
27	M	Southern Australia	Taiwan	International	Engineering
28	M	New south wales	India	Domestic	Science
29	M	Austrian capital territory	China	International	Business

(continued)

Table 1 (continued)

Participant	Gender	Campus location (State/territory)	Country of origin	Student status	School/faculty
30	F	New South Wales	Singapore	International	Business
31	F	Western Australia	China	Domestic	Business
32	F	Queensland	India	Domestic	Engineering
33	M	Victoria	China	Domestic	Accounting
34	F	Victoria	Canada	Domestic	Engineering
35	M	Victoria	India	Domestic	Science
36	F	Queensland	Thailand	Domestic	Business
37	M	Queensland	Australia	Domestic	Science
38	F	New South Wales	China	International	Accounting
39	M	New south wales	The United Kingdom	International	Education
40	M	New south wales	Indonesia	International	Business
41	F	New South Wales	Pakistan	International	Education
42	F	New South Wales	Hong Kong	Domestic	Arts and design
43	M	Victoria	Malaysia	Domestic	Education
44	M	Victoria	China	Domestic	Business
45	F	New South Wales	Malaysia	Domestic	Business
46	F	New South Wales	Australia	Domestic	Business
47	F	Queensland	China	Domestic	Engineering
48	M	Queensland	Malaysia	International	Engineering
49	F	Western Australia	China	International	Science
50	F	South Australia	Hong Kong	International	Science

4.3 Data Collection

The primary sources of data of this study are the semi-structured interviews and focus group activities. Three one-on-one semi-structured online interviews and two focus group activities were conducted with each participant on Zoom, with each interview lasted from 53 to 89 min. One-on-one semi-structured interviews are appropriate because it allows the participants to share such experiences without stress in a comfortable environment (Patton, 2002; Seidman, 2006). Since the participants' perception of cultural diversity and cultural inclusiveness during their interactions in their online learning experiences might contain private and sensitive information, a private and comfortable environment allows the researchers to explore how different elements in IT governance, specifically supports in IT resources, influence the university students' self-efficacy and learning goal attainment (Brown & Lent, 2019; Lent et al., 1994). Upon finishing the one-on-one semi-structured interviews, participants were invited to focus group activities to share their experiences collectively and the collected data, alongside the shared correspondence and course work on their online learning platform, enhanced the credibility of this study (Creswell, 2012; Merriam & Tisdell, 2016).

4.4 Data Analysis

General inductive approach was adopted to reduce the data into meaningful themes and subthemes for reporting (Creswell, 2012; Merriam & Tisdell, 2016). First, all the recordings were transcribed verbatim. Then the researchers reduced the data chunks into first-level themes by employing an open-coding technique. At this level, eight themes and 17 subthemes were identified. Then the researchers employed axial coding to further reduce the number of themes and subthemes for standard reporting (Merriam & Tisdell, 2016; Yin, 2009). After open and axial coding, two themes and six subthemes were identified.

4.5 Human Subject Protection

This study was conducted in accordance with the Declaration of Helsinki, and the portal was approved and supported by Woosong University Academic Research Funding Department 2022. The researchers have taken necessary measures to ensure the human subjects of this study were well protected, and the research was conducted ethically (Creswell, 2012; Merriam & Tisdell, 2016). First, the participants were assigned with pseudonyms and all of their recognisable personal details were masked (Merriam & Tisdell, 2016; Patton, 2002). Second, the researchers explained the procedures, benefits and potential risks of the study to the participants prior to the start of the interviews. Third, both written and verbal consents of the participants were obtained prior to the start of the interviews. Fourth, the researchers also reminded the participants that their participation was voluntary and could withdraw anytime. Fifth, all the consent forms and paper-based materials were stored in a password-locked cabinet and all the recordings and transcripts were stored in a separate electronic device with the sole access of the researchers. All the materials were destroyed upon the completion of the study (Creswell, 2012; Merriam & Tisdell, 2016).

5 Findings and Discussion

While reporting the findings, the researcher put the quotes alongside the analysis to offer an authentic description of the participants' experience, alongside presenting the correlation between evidence and findings (Anderson, 2010; Okamura & Miller, 2010). To answer the research questions, the researchers categorised the findings into two themes and four subthemes. Table 2 summarises the themes and subthemes for this study.

Table 2 Themes and subthemes

		Themes and subthemes
1.		Language support on online learning platforms
	1.1	Embedded language tools on asynchronous learning platforms
	1.2	Live transcription on synchronous learning platforms
2.		Clear correlation between learning contents and online learning activities
	2.1	Meaningful activities during synchronised learning
	2.2	Well-scheduled online learning activities

5.1 Language Support on Online Learning Platforms

This study reflected that language support provided by the online learning platforms facilitated both synchronous and asynchronous learning, allowing university students to overcome the barriers and negative emotions arising from their concerns and perception of their language mastery. They perceived such tool as a consideration to their cultural and linguistic backgrounds, offering equal access to language resources to achieve fairness and equity in learning opportunities. Such positive affection for equity and respect affirmed that offering language support on online learning platforms is an effective strategy to cultivate a culturally inclusive online learning environment.

5.1.1 Embedded Language Tools on Asynchronous Learning Platforms

While non-verbal cues in communication may not be significant owing to the physical absence in an online learning environment, verbal cues become increasing important in online communication, whereby lexicons and expressions in professional and colloquial language facilitate effective communication in an online learning community (Bamberg, 1997; Pavlenko, 2017). This study reflected that effective IT governance in applying the IT resources in an optimal way, whereby language support features on asynchronous online learning platforms are utilised to provide adequate support to culturally and linguistically diverse students, allowing them to become more confident and motivated in completing the online learning activities (Bianchi & Sousa, 2016; Deci & Ryan, 2008). One said,

> We had to reply to the questions on the online forum and participate in the Moodle discussion… It counted as a part of the assessment scores... Even I was taking HSC [Higher-school Certificate, a university entrance examination in New South Wales, Australia], I was doing EAL/D [English as an Alternative Language or Dialect]. I sometimes felt confused… expressing it 'right'. I need some suggestions on word choices. I was freaking out… my expression… was not academic or formal… and would affect my scores. I felt safer when I reckoned the implemented spelling check and expression suggestions. I knew more about whether I was using the right word, right tone on the discussion forums to 'post right' (Participant #42).

Previous studies (McLoughlin, 2001; Tapanes et al., 2009) suggested that culturally diverse students are more concerned with the learning outcome evaluation methods of the asynchronous online discussion tasks. For instance, international students generally felt more vulnerable in their online learning, whereby feeling their postings on online forums negatively affected their final grades in the course, leading to prevailing dissatisfaction and frustration among the NESB students (Tapanes et al., 2009; Villalpando, 2003) This study extended further into the concerns among the domestic students from culturally diverse backgrounds by probing into their source of concern and emotional status in relation to their perception of their language mastery, whereby their ethnic backgrounds directly influence their confidence in expressing in a language they may not feel too familiar or comfortable with. However, such feeling of uncanniness may not be directly related to their actual language competency. While language support is provided as an accessible resource on the online learning platforms, university students' negative emotions, such as stress, anxiety and embarrassment, have been alleviated, thereby feeling more comfortable in the learning environment. Another participant said,

> Sense of shame is kinda important in my culture. We are just afraid of making mistakes... It is embarrassing… It's kind of disgrace… showing you are incompetent… When you are in a foreign country, that is not just about yourself, but about your family, race and nation… We are expected to show our best outside… Even on online forums no one is really 'watching' you, you still feel that stress… I have to make sure I use a formal tone and professional language… The embedded language tool allows us to check the tone and offer us some suggestions on expressions… Complex and complicated sentences, relative clauses, participle phrases… Those terms we already chucked from our minds since Year 5… It's not just spelling check… It's about suggested expressions with the appropriate tones and in appropriate contexts… There will be a smiley face if all things look right, like accuracy and clarity. I feel safer and more comfortable to express my views and comments (Participant #29).

In the computer-mediated online discussions or forums, some online learning activities centre around their critiques and views on some social issues, artwork or literature work. It requires university students not only to formulate sound arguments, but also to express an abstraction of their feelings and emotions (Bamberg, 1997; Pavlenko, 2017). When university students are provided with the resources to distillate and conceptualise their thoughts into lexicons and expressions, such as suggestions on using nominalising nouns and relative clauses, a sense of security is then developed while expressing themselves in a public realm. 90% of the participants agreed that such language support is a good initiative from the universities that they put the culturally and linguistically diverse background of the students into consideration. Another participant said,

> Some people just think that the language support is just like ordinary spelling check... Grammarly or those spelling checks in Microsoft Word. But it means a lot to us. We feel that this tool in the textbox [on the discussion forums] reflects the university's intention of bringing equal learning opportunities to all… We are not native speakers… We feel different… and somehow we feel such difference may affect our grades. It's not okay… cos we're international students, language may impede our expressions… then we got poor grades… That's not fair… I want more, not just Pass, but Distinction or even High Distinction… Of course I can pay for the software… but I feel better if uni provides us the

> tool… I feel okay to reply the online postings… Somehow I like that more and more… For a course I really liked, I checked the forum postings three times each day… At the beginning of my uni life, I don't like posting…and now I like more and more (Participant #48).

This study reflected that if university students are able to access instantly on the language support while working on their asynchronous learning activities such as online forum postings, their self-efficacy is boosted by overcoming the negative emotions aroused from the uncertainty of their cultural diverse backgrounds and their negative perception of their language proficiency. According to the SCCT, such positive self-efficacy, alongside the proximal language support on the online learning platform, allows the university students to attain their learning goals, such as completing the assessment tasks and achieving their desired grades in the courses (Brown & Lent, 2019; Lent et al., 1994). Such performance goal attainment later becomes the background experience reinforcing their self-efficacy, leading to the postulation of their future learning goals and their later success in their online learning.

5.1.2 Live Transcription in Synchronous Learning

Anxiety is a pressing issue for all students in real-time conversation, whereby students' family backgrounds have a direct impact on their emotional responses in spoken discourses (Butler, 2007; Jin et al., 2014). While previous literature (Butler, 2007; Jin et al., 2014) focussed on the speaking and productive component of communication, this study shed light on the impact of the listening component and receptive component of online communication. Specifically, this study identified that while universities utilise the live transcription feature on the video-conferencing platforms during synchronous online learning, it enhances university students' self-efficacy by catering for their learning needs and masking the stereotypes stemming from their linguistic and cultural backgrounds. 94% of the participants in the study reflected that the transcription feature on the video-conferencing platforms, such as Zoom and Teams, allows them to get a more accurate comprehension of the slangs and idioms in a professional discourse, thereby pertaining to a more thorough understanding of the lecture contents. One participant said,

> I thought they [universities] didn't really care about language…did care about us… They cared about our tuition fees… Australia is an English-speaking country… Sometimes people are unaware they are speaking too fast. Even for face-to-face communication, it is super hard to capture what they said…. Especially Aussie slangs… Avro, PJ, cuppa… It's so Straya… Not more than two syllables… As an international student, when I first started to attend lectures. Aussie accent was quite a challenge to me... In my hometown we used to listen to speakers with British or American accents... Of course, I still understood the contents. It's just a bit ...awkward…and weird… The live transcription translated from speech to text. It just gave me some reassurance and confidence to affirm that I actual know the language and I can understand what the speaker means (Participant #6).

This study affirmed that the live transcription feature not only benefits learning or understanding the lesson content in general, but also boosts university students' confidence in their ability to master the language. Moreover, international university

students perceive it as a measure of showing respect to their culturally and linguistically diverse backgrounds by addressing their educational needs, whereby they cast away their negative perception of the universities merely protecting their profits and revenues (Steinberg & Kincheloe, 2010; Villalpando, 2003). Such perception is also reflected in the domestic students. Another participant said,

> I guess it's more than just subtitles, isn't it? It masks all details and makes people feel safe to do something more to satisfy their learning needs… My parents are first-generation migrants. We speak Cantonese at home… People always have the misconception that local means we speak perfect English. I would only say my English is ABC [Australian-born Chinese] style... It is still a bit different from the other students who speak English at home. At schools, I used to be really shy to address this… cos It's real odd. People assume you know all… Now during online learning, I felt alright that I can switch on the transcription during lectures. No one knows that… I'm glad I moved on such self-discovery… to explore what I don't know or something I need more. I can capture the contents without missing a tiny teeny bit of any thingies (Participant #14).

Unlike previous studies (Kohnke & Moorhouse, 2020; Liyanagunawardena, 2021) showing diverse opinions on the benefits of transcriptions in synchronous online learning, this study affirmed such transcription feature shows a positive impact on the university students' perception of learning and the learning community. This study also extended the discussion between the correlation between IT resources and the perception of language proficiency to the effectiveness of learning and developing a safe and comfortable culturally inclusive learning community for both NESB and English-speaking international and domestic students. Another participant said,

> It's pretty challenging to do online [mode of learning]. But our uni made it… I don't think live transcription on Zoom is just for international students. Somehow I understand how they feel in an online learning environment... It [live transcription feature on Zoom] benefits the whole learning community. When we said we are multicultural, the white are also a part of it... But sometimes we got neglected. I'm a native English speaker… My role is as a student in an online lecture and discussion... Sometimes I also feel difficult in acquiring those subject-specific new terms... I would feel confused as other students. Live transcription takes away those assumptions of native speakers (Participant #9).

Previous studies (Hannon & D'Netto, 2007; Tapanes et al., 2009) suggested that online learning platforms allow the instructors and peers to maintain culturally neutral by putting away the university students' linguistic and cultural backgrounds, whereby creating a false impression of students' abilities and cultures. Although this study also reflected that online learning platforms can help put away the stereotypical lens on students' linguistic and cultural backgrounds, this study reflected the motivations behind the university management, in the university students' points of view, is not being culturally neutral; instead, it is to do with cultural sensitivity. Specifically, the live transcription of the video conferencing platforms brings a sense of comfort and security alongside putting away the preconceptions of the learners, thereby fostering an effective culturally inclusive learning community which is evident in their attainment of learning outcomes. The findings align with the SCCT hypothesis that the university students' positive affections toward the online learning community and the attainment of the learning goal of obtaining a good understanding of the lesson

contents increase their self-efficacy in postulating success in learning on online platforms (Brown & Lent, 2019; Lent et al., 1994). Such sense of satisfaction extends to the university's IT governance in designing and implementing effective learning tools to facilitate learning during the COVID-19 pandemic.

5.2 Clear Correlation Between Learning Contents and Online Learning Activities

Previous studies (Hannon & D'Netto, 2007; Tapanes et al., 2009) suggested that an unstructured and open-ended online learning environment can facilitate the learning of NESB students. Unlike previous literature (Hannon & D'Netto, 2007; Tapanes et al., 2009), this study reflected that well-designed and structured activities with utilisation of IT resources on e-learning platforms can increase students' self-efficacy and sense of satisfaction in learning owing to their capabilities of allowing their voices to be heard, thereby fostering a culturally inclusive learning community.

5.2.1 Meaningful Activities During Synchronous Online Learning

This study reflected that when university teaching staff utilises the IT resources on both online platforms and on the Internet, it can create an immersive learning environment. Better structure in online learning activities with cultural sensitivity to foster higher self-efficacy among university students in obtaining success in the online learning environment, whereby connecting their discipline knowledge with the wider context of humanity and allowing them to appreciate cultural diversity within the learning community (Castro-Calviño et al., 2020; Ott & Pozzi, 2011). One participant said,

> While learning the cultural significance of some UNESCO heritage buildings, our professor used some digitised models, rotating and zooming into the details of the heritage buildings. I know due to the restrictions, we can't really go to visit those places… He also used Google Earth to show the real street view of the building now… I felt I was in that place and walking in the building to feel the culture and history inside. I felt great to connect with the greater humanity again… Respecting human history and civilisations (Partcipant #15).

Such simulation and inclusion experiences arouse a sense of belonging and the positive affection towards the inclusion of cultural awareness in the students' learning, thereby broadening their horizons and attaining learning goals (Konstantinov et al., 2018; Vidal et al., 2020). Furthermore, extended from previous literature (Castro-Calviño et al., 2020; Ott & Pozzi, 2011) that using digitised buildings creates a visual learning space and allows the lecturers to re-present the original, natural and historical contexts of the architectural buildings, this study affirmed that such interdisciplinary approach is made possible by the use of IT resources, thereby allowing the university students to connect to their learning to an appreciation of cultural diversity by pertaining to a broader understanding of the global issues in local contexts. Another participant echoed,

> I guess these days unis [universities] are getting more 'sustainable'… I meant they wanna put the concept of sustainability into different courses… It's not a bad thing… One interesting thing I found is, when the lecturer uses interactive whiteboard and Jamboard and reorganises the ideas volunteered by my classmates and asked them to explain… I felt we got respected… We have chances to express our views... I remembered once we talked about water resources management... I mentioned water scarcity in Taiwan. My classmates were shocked because they felt this only happens in developing countries. I had chance to share my views with my peers… An issue in my home… I feel great about that (Participant #27).

88% of the participants in this study reflected that the use of interactive whiteboard deepens the discussion to touch on global issues like sustainable development are like in local contexts. It encourages a good discussion with a free flow of thoughts and the development of critical thinking and higher-order cognitive skills within the scope of study (Blizak et al., 2020; Grant & Lee, 2014). The opportunities to share their views by utilising interactive features on online learning platforms make university students feel that their cultural backgrounds have been honoured and respected whilst producing some significant contributions to the discussions. Another participant said,

> Some lectures are really just chalk talk... Some are great… I got a course on film techniques. The lecturer uses short video clips and polls at the same time to let us identify the techniques. Then the discussion goes further into how the audience's background can influence the perception of the effects of techniques. I found it interesting that people from different backgrounds could focus on different techniques... They perceived the motif and symbols differently… I reckon there is no right or wrong answer or model answer. The whole lecture, though it is online, it is really fruitful… I enjoyed that... I wanna take the advanced course next year (Participant #20).

This study affirmed that utilising the polling functions on video-conferencing platforms allows the voices of culturally and linguistically diverse students to be heard, thereby fostering a culturally inclusive online learning community. Unlike previous studies (Hannon & D'Netto, 2007; Tapanes et al., 2009), this study reflected that when students' cultural backgrounds are taken into consideration, alongside using IT resources to elicit their viewpoints and let their voices heard, it positively influences university students' self-efficacy in the attainment of their learning goals and their contribution to the online community. According to the SCCT, IT resources provides a proximal contextual support to positively influence university students' expectations of attaining their learning goals, making them more likely to persist and pursue further learning in their learning areas and disciplines (Brown & Lent, 2019; Lent et al., 1994).

5.2.2 Well-Scheduled Online Learning

During the COVID-19 pandemic, many of the international students were staying in their home countries to continue their studies owing to the public health concerns and travel restrictions during the COVID-19 pandemic (Ferguson & Sherrell, 2019; Thatcher et al., 2020). Previous studies (Hattam & Smyth, 2015; Morfin et al., 2006) suggested that the difference in time zones has drastically influenced international

students learning progress, whereby hampering their participation and quality discussion on the e-learning platform. This study reflected that IT governance in scheduling and structuring the coursework, lecture and tutorial time take a crucial role in bringing equity in accessing the learning resources and ensuring learning efficiency. One participant said,

> There are both synchronous and asynchronous learning… At first, I thought, 'Phew! Shame on them!' Asynchronous learning is just an excuse for the lecturers and tutors… It's just about self-directed learning… I didn't really know their role in my learning. Then I reckoned that organising it in such way helps with my learning efficiency. Particularly to those who are in different time zones or even have some other religious and family commitments… catching up with live lectures can be really challenging... making the learning curve really steep... Perhaps it [scheduling both synchronous and asynchronous learning] is just a small step. But a small step can lead to a great leap... At least we felt that we were valued and they [the universities] are not caring about our money (Participant #36).

Previous studies (Hattam & Smyth, 2015; Morfin et al., 2006) mentioned online lectures deprive the chances of international students to strive for academic excellence due to the difference in time zone. This study, on the other hand, drew on the insights on how IT resources on online learning can bring opportunities to succeed. 90% of the participants reflected that a change in structuring the learning schedule by considering the learning needs, geographical locations and cultural practices of university students makes them feel respected in the online learning environment. Another participant said,

> I can't come to Australia during COVID [the pandemic]… The time difference is 10 hours. It's really hard to attend mid-day lectures... That's midnight here… We all complained… My classmates in Canada are even worse… Attending tutorials at 1 am. They [The university] didn't really do anything at the beginning. The typical 'you will be fine' attitude... Later they made some changes in the next semester…changes in the lecture time to fit the schedule of international students… They also provide different time slots for tutorials, so we got the same chances to complete the discussion tasks and group works with students from similar time zones… We don't have to just post on forums and wait two days for replies…. or sending emails and waiting for another two days for a consent from the group. It's not just about a change in the administrative arrangement… It also means that they care for our needs and believe that we can succeed even the pandemic (Participant #39).

This study reflected that a change in the structure of the programme allows university students to overcome the challenges in the difference in time zones, facilitating their communications and effective learning. Such utilisation of IT resource management brings in timely proximal contextual support in breaking the barriers not only related to the boundaries set by borders and timezones, but also in communication across cultures. The realisation of their rights in engaging in effective discussion and excelling in their studies makes individuals feel empowered with a sense of satisfaction in utilising the social recourses in a just and fair manner (Arcidiacono & Di Martino, 2016; Hammell & Iwama, 2012). Another participant said,

> Cultural diversity, inclusiveness, effective communication, active listening… Flowery terms! It is easier said than done... Personally, I think active listening is not just about 'Oh, I know what you meant.'… or 'Oh, I feel so sorry." It needs some actions... And in reality it's just 'I'm copying you to whoever'… Scheduling a tutorial not at the Muslim prayer

> time… organising informal meet-up activities not on Good Friday are also actions to show respect to different cultures and religions… no virtual catch-up lunch or dinner during Ramadan [A month of fasting and prayer in the Islamic calendar]… We have tutorials at different times… One of these fits students in South East Asia. It's between 1-2 pm... Not on Fridays… I can attend the tutorials and live lecturers. Somehow I'm quite happy that our uni is doing a pretty good job (Participant #13).

A crucial point of developing cultural awareness is through effective communication and interactions, whereby active listening is a vital skill (Tyagi, 2013; Winter & Lavis, 2020). In this study, the participants reflected that listening does not only mean their voices are being heard in lectures and tutorials, but also how practically the implementation of the IT policies allows them to be empowered with a balance between their studies and their personal life. Cultural awareness includes an awareness of individual learners' linguistic, cultural and religious beliefs and practices (Bense, 2015; Collins & Reid, 2012). When students' needs based on their cultural beliefs and practices are fulfilled by appropriate scheduling of the online learning activities by universities, such proximal contextual support yield a sense of respect and satisfaction in their online learning experiences. According to the SCCT, such positive affection boosts their self-efficacy and thus more likely to persist in active participation and involvement, thereby fostering an active and culturally inclusive community (Brown & Lent, 2019; Lent et al., 1994).

6 Solutions and Recommendations

As mentioned in the previous section, in an effective IT governance framework, stakeholders' values and experiences have to be taken into consideration in planning, designing, implementing and evaluating the policies related to IT resources (De Haes & Van Grembergen, 2009, 2015). While online learning is one of the key areas in using IT resources at universities, this study identified the following strategies to utilise IT resources on online learning platforms more effectively to attain the learning goals of students and the organisational goal of creating a culturally inclusive online learning environment. Figure 1 visualises the recommendations to attain cultural inclusiveness.

First, embedded language support, such as spelling checks and expression suggestions, on asynchronous learning platforms is recommended because language support, as reflected in the findings of this study, is a need to both domestic and international students in attaining fairness while evaluating their learning outcomes. The benefit brought by this strategy is that it can boost students' confidence and overcome their fear and anxiety in expressions, thereby allowing them to open up in forum discussion to express their own voices more precisely and accurately, thereby creating an open and culturally inclusive learning environment.

Second, real-time language support in synchronous learning platforms, such as live transcription, is also recommended as it can help break the stereotypical prejudgments of the learning needs of students from both the native and non-native

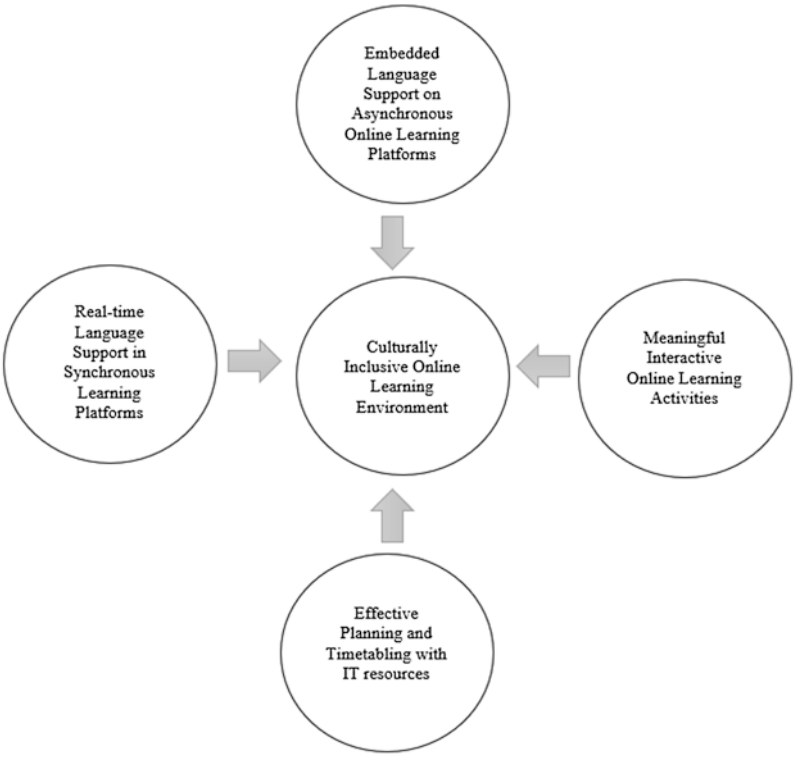


Fig. 1 Recommendations to attain a culturally inclusive online learning environment

English-speaking backgrounds, thereby offering a safe and comfortable online learning environment for grasping the course contents while catering for the diverse backgrounds of the university students.

Third, it is advised that university teaching staff should arrange meaningful interactive activities during online learning by utilising IT resources, such as interactive whiteboard, Google Earth, Jamboard and polling features on video-conferencing or other synchoronous e-learning platforms. By utilising various IT resources with an interdisciplinary pedagogical approach, university students gain satisfaction and sense of achievement on pertaining a thorough understanding of the course contents, a global perspective, higher-order thinking skills and the greater contexts related to topics in their discipline. Such understanding fosters a respectful and reflective online learning community embracing cultural diversity.

Fourth, utilising IT resources in planning lectures and tutorials, timetabling and scheduling with a consideration of university students' cultural and religious beliefs, alongside their geographical locations is ideal as it is not only a decision in administration and management, but university students also consider such decision is a respectful manner in fostering cultural awareness within universities.

7 Limitations and Future Research Directions

Although this study has provided insights into the strategies for creating a culturally inclusive online learning environment with the use of IT resources on synchronous and asynchronous e-learning platforms, it shows several limitations. First, this case study only limits to one country, which leads to a limitation in understanding the related IT policies and cultural awareness in a broader national context. Therefore, this study can be expanded to different countries with an implementation of an international multiple case study, thereby capturing the experiences of university students in different countries and how the broader social contexts influence their perception of university IT governance and multiculturalism (Bianchi et al., 2021; Creswell, 2012). Second, this case study also showed a limitation in the number of participants and the mere inclusion of qualitative data. Further research can be done with a more significant amount of participants and by implementing a mixed-method study, such as including surveys to investigate the university students' learning online experiences (Almeida et al., 2017; Biasutti et al., 2018). Third, this case study focussed on proposing the strategies for effective culturally inclusive online learning environment. Since management, decision rights and accountability are also important facets of successful IT governance (De Haes & Van Grembergen, 2015; Sadikin et al., 2014), further research can be done on the decision rights and accountability while implementing these strategies to add significant insights to the field of study.

8 Conclusion

Despite the limitations, this qualitative study is unique in examining one of the important stakeholders', i.e. university students', online learning experiences to devise strategies to raise cultural awareness within an online community. When multiculturalism and cultural diversity have become increasingly important in all walks of life, alongside the internationalisation of universities, it is not difficult to see that the university organisational goals have to address such issue directly with a holistic approach (Kim et al., 2020; Parker, 2012). This study brings insights for planning and designing online learning at universities with effective use of IT resources on synchronous and asynchronous e-learning platforms to raise the positive affections and sense of satisfaction and achievement among culturally and linguistically diverse university students. Therefore, the findings in this study can be useful for the university management, teaching and learning unit and the IT resources audit and steering committees to consider utilising IT resources to attain both the learning goals of students while aligning with the university's organisational goal of developing a culturally inclusive learning community.

Acknowledgments This research was supported by the Woosong University Academic Research Funding 2022.

References

Adedoyin, O. B., & Soykan, E. (2020). Covid-19 pandemic and online learning: The challenges and opportunities. *Interactive Learning Environments, 0*(0), 1–13. https://doi.org/10.1080/10494820.2020.1813180

Adnan, M., & Anwar, K. (2020). Online learning amid the COVID-19 pandemic: Students perspectives. *Journal of Pedagogical Sociology and Psychology, 1*(2), 45–51. https://doi.org/10.33902/jpsp.2020261309

Almeida, F., Superior, I., Gaya, P., Queirós, A., & Faria, D. (2017). Strengths and limitations of qualitative and quantitative research methods. *European Journal of Education Studies, 3*(9), 369–387. https://doi.org/10.5281/zenodo.887089

Anderson, C. (2010). Presenting and evaluating qualitative research. *American Journal of Pharmaceutical Education, 74*(8), 141. https://doi.org/10.5688/aj7408141

Arcidiacono, C., & Di Martino, S. (2016). A critical analysis of happiness and Well-being. Where we stand now, where we need to go. *Community Psychology in Global Perspective, 2*(1), 6–35. https://doi.org/10.1285/i24212113v2i1p6

Asanov, I., Flores, F., McKenzie, D., Mensmann, M., & Schulte, M. (2021). Remote-learning, time-use, and mental health of Ecuadorian high-school students during the COVID-19 quarantine. *World Development, 138*, 105225. https://doi.org/10.1016/j.worlddev.2020.105225

Australian Bureau of Statistics. (2021). *Migration, Australia*. https://www.abs.gov.au/statistics/people/population/migration-australia/latest-release#:~:text=Mediareleases-. Key statistics, due to net overseas migration.

Australian Government Department of Education Skills and Employment. (2022). International student numbers. https://www.dese.gov.au/international-data/data-visualisation-international-student-numbers

Bamberg, M. (1997). Language, concept and emotion. *Language Sciences, 19*(4), 309–340.

Bamberger, A., Bronshtein, Y., & Yemini, M. (2020). Marketing universities and targeting international students: A comparative analysis of social media data trails. *Teaching in Higher Education, 25*(4), 476–492. https://doi.org/10.1080/13562517.2020.1712353

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall.

Bense, K. (2015). German migrant teachers in Australia: Insights into the largest cohort of non-English speaking background teachers. *Issues in Educational Research, 25*(4), 381–396.

Bianchi, I. S., & Sousa, R. D. (2016). IT governance mechanisms in higher education. *Procedia Computer Science, 100*, 941–946. https://doi.org/10.1016/j.procs.2016.09.253

Bianchi, I. S., Pereira, R., & Sousa, R. D. (2017). IT governance mechanisms at universities: An exploratory study. In *23rd America's Conference on Information Systems*, *August*, p. 351.

Bianchi, I. S., Sousa, R. D., & Pereira, R. (2021). Information technology governance for higher education institutions: A multi-country study. *Informatics, 8*(2), 1–28. https://doi.org/10.3390/informatics8020026

Biasutti, M., Makrakis, V., Concina, E., & Frate, S. (2018). Educating academic staff to reorient curricula in ESD. *International Journal of Sustainability in Higher Education, 19*(1), 179–196. https://doi.org/10.1108/IJSHE-11-2016-0214

Blizak, D., Blizak, S., Bouchenak, O., & Yahiaoui, K. (2020). Students' perceptions regarding the abrupt transition to online learning during the covid-19 pandemic: Case of faculty of chemistry and hydrocarbons at the university of boumerdes-Algeria. *Journal of Chemical Education, 97*(9), 2466–2471. https://doi.org/10.1021/acs.jchemed.0c00668

Brown, S. D., & Lent, R. W. (2019). Social cognitive career theory at 25: Progress in studying the domain satisfaction and career self-management models. *Journal of Career Assessment, 27*(4), 563–578. https://doi.org/10.1177/1069072719852736

Butler, R. (2007). Teachers' achievement goal orientations and associations with teachers' help seeking: Examination of a novel approach to teacher motivation. *Journal of Educational Psychology, 99*(2), 241–252. https://doi.org/10.1037/0022-0663.99.2.241

Castro-Calviño, L., Rodríguez-Medina, J., & López-Facal, R. (2020). Heritage education under evaluation: The usefulness, efficiency and effectiveness of heritage education programmes. *Humanities and Social Sciences Communications, 7*(1), 1–12. https://doi.org/10.1057/s41599-020-00639-z

Coen, M., & Kelly, U. (2007). Information management and governance in UK higher education institutions: Bringing IT in from the cold. *Perspectives: Policy and Practice in Higher Education, 11*(1), 7–11. https://doi.org/10.1080/13603100601127915

Collins, J., & Reid, C. (2012). Immigrant teachers in Australia. *Cosmopolitan Civil Societies: An Interdisciplinary Journal, 4*(2), 38–61. https://doi.org/10.5130/ccs.v4i2.2553

Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (4th ed.). Pearson.

De Haes, S., & Van Grembergen, W. (2009). Enterprise governance of information technology. *Enterprise Governance of Information Technology*. https://doi.org/10.1007/978-0-387-84882-2

De Haes, S., & Van Grembergen, W. (2015). *COBIT as a Framework for Enterprise Governance of IT* (Issue January). https://doi.org/10.1007/978-3-319-14547-1_5

De Haes, S., Van Grembergen, W., & Debreceny, R. S. (2013). COBIT 5 and enterprise governance of information technology: Building blocks and research opportunities. *Journal of Information Systems, 27*(1), 307–324. https://doi.org/10.2308/isys-50422

Deci, E. L., & Ryan, R. M. (2008). Self-determination theory: A macrotheory of human motivation, development, and health. *Canadian Psychology, 49*(3), 182–185. https://doi.org/10.1037/a0012801

Ferguson, H., & Sherrell, H. (2019). Overseas students in Australian higher education: A quick guide. In *Parliamentary library, Australia, Research paper series, 2018–2019*. https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/rp/rp1819/Quick_Guides/OverseasStudents

Fouad, N. A., Singh, R., Cappaert, K., Chang, W., & Wan, M. (2016). Comparison of women engineers who persist in or depart from engineering. *Journal of Vocational Behavior, 92*, 79–93. https://doi.org/10.1016/j.jvb.2015.11.002

García-Morales, V. J., Garrido-Moreno, A., & Martín-Rojas, R. (2021). The transformation of higher education after the COVID disruption: Emerging challenges in an online learning scenario. *Frontiers in Psychology, 12*(February), 1–6. https://doi.org/10.3389/fpsyg.2021.616059

Germain-Rutherford, A., & Kerr, B. (2008). An inclusive approach to online learning environments: Models and resources. *Turkish Online Journal of Distance Education, 9*(2), 64–85.

Grant, K. S. L., & Lee, V. J. (2014). Wrestling with issues of diversity in online courses. *Qualitative Report, 19*(12), 1–25.

Hammell, K. R. W., & Iwama, M. K. (2012). Well-being and occupational rights: An imperative for critical occupational therapy. *Scandinavian Journal of Occupational Therapy, 19*(5), 385–394. https://doi.org/10.3109/11038128.2011.611821

Hannon, J., & D'Netto, B. (2007). Cultural diversity online: Student engagement with learning technologies. *International Journal of Educational Management, 21*(5), 418–432. https://doi.org/10.1108/09513540710760192

Hattam, R., & Smyth, J. (2015). Thinking past educational disadvantage, and theories of reproduction. *Sociology, 49*(2), 270–286. https://doi.org/10.1177/0038038514540578

Hastings, R. P., & Bham, M. S. (2003). The relationship between student behaviour patterns and teacher burnout. *School Psychology International, 24*(1), 115–127.

Iivari, N., Sharma, S., & Ventä-Olkkonen, L. (2020). Digital transformation of everyday life – How COVID-19 pandemic transformed the basic education of the young generation and why information management research should care? *International Journal of Information Management, 55*(June), 102183. https://doi.org/10.1016/j.ijinfomgt.2020.102183

Jin, L., Jiang, C., Zhang, J., Yuan, Y., Liang, X., & Xie, Q. (2014). Motivations and expectations of English language learning among primary school children and parents in China. *ELT Research*

Papers, 14(1), 1–33. https://www.teachingenglish.org.uk/sites/teacheng/files/E202MEEL-ELTRA.FINAL.v2.pdf

Kim, H., Krishnan, C., Law, J., & Rounsaville, T. (2020). COVID-19 and US higher education enrollment: Preparing leaders for fall. *McKinsey & Company, Social Sector Practice*, 1–10. https://www.mckinsey.com/industries/public-and-social-sector/our-insights/covid-19-and-us-higher-education-enrollment-preparing-leaders-for-fall#

Kohnke, L., & Moorhouse, B. L. (2020). Facilitating synchronous online language learning through zoom. *RELC Journal.* https://doi.org/10.1177/0033688220937235

Konstantinov, O., Kovatcheva, E., & Palikova, N. (2018). Gamification in cultural and historical heritage education. *INTED2018 Proceedings, 1*(March), 8443–8451. https://doi.org/10.21125/inted.2018.2043

Kosasi, S., Sukmana, H. T., Yuliani, I. D. A. E., Susilo, B., & Fitriani, D. (2020). IT Governance: A Determining Factor Ensuring Online Learning Mechanisms. 2020 8th International Conference on Cyber and IT Service Management, CITSM 2020. https://doi.org/10.1109/CITSM50537.2020.9268881

Lavrakas, P. J. (2011). Purposive sample. In *Encyclopedia of survey research methods* (pp. 645–647). Sage Publications. https://doi.org/10.4135/9781412963947

Lent, R. W., Brown, S. D., & Hackett, G. (1994). Toward a unifying social cognitive theory of career and academic interest, choice and performance. *Journal of Vocational Behavior, 45*(1), 79–122. https://doi.org/10.1006/jvbe.1994.1027

Liyanagunawardena, T. R. (2021). Transcripts and accessibility: Student views from using webinars in built environment education. *European Journal of Open, Distance and E-Learning, 23*(2), 37–50. https://doi.org/10.2478/eurodl-2020-0009

McLoughlin, C. (2001). Inclusivity and alignment: Principles of pedagogy, task and assessment design for effective cross-cultural online learning. *Distance Education, 22*(1), 7–29. https://doi.org/10.1080/0158791010220102

Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative research: A guide to design and implementation*. John Wiley & Sons. https://doi.org/10.1097/NCI.0b013e3181edd9b1

Morfin, O. J., Perez, V. H., Parker, L., Lynn, M., & Arrona, J. (2006). Hiding the politically obvious. *Educational Policy, 20*(1), 249–270. https://doi.org/10.1177/0895904805285785

Okamura, Y., & Miller, J. (2010). Career development strategies for Japanese immigrant teachers. *Australian Journal of Career Development, 19*(3), 33–42. https://doi.org/10.1177/103841621001900306

Ott, M., & Pozzi, F. (2011). Towards a new era for cultural heritage education: Discussing the role of ICT. *Computers in Human Behavior, 27*(4), 1365–1371. https://doi.org/10.1016/j.chb.2010.07.031

Parker, L. D. (2012). From privatised to hybrid corporatised higher education: A global financial management discourse. *Financial Accountability and Management, 28*(3), 247–268. https://doi.org/10.1111/j.1468-0408.2012.00544.x

Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3rd ed.). Sage Publications. https://doi.org/10.2307/330063

Pavlenko, A. (2017). Do you wish to waive your rights? Affect and decision-making in multilingual speakers. *Current Opinion in Psychology, 17*, 74–78. https://doi.org/10.1016/j.copsyc.2017.06.005

Sadikin, M., Hardi, H., & Haji, W. H. (2014). IT governance self assessment in higher education based on COBIT case study: University of Mercu Buana. *Journal of Advanced Management Science, 2*(1), 83–87. https://doi.org/10.12720/joams.2.2.83-87

Seidman, I. (2006). *Interviewing as qualitative research: A guide for researchers in education and the social sciences* (3rd ed.). Teacher College Press.

Stake, R. E. (1995). *The art of case study research: Perspectives on practice*. Sage.

Steinberg, S. R., & Kincheloe, J. L. (2010). Power, emancipation, and complexity: Employing critical theory. *Power and Education, 2*(2), 140–151. https://doi.org/10.2304/power.2010.2.2.140

Sutadji, E., Hidayat, W. N., Patmanthara, S., Sulton, S., Jabari, N. A. M., & Irsyad, M. (2020). Analysis of information technology governance in the planning and organization of e-learning at Universitas Negeri Malang. *IOP Conference Series: Materials Science and Engineering, 732*(1). https://doi.org/10.1088/1757-899X/732/1/012114

Tapanes, M. A., Smith, G. G., & White, J. A. (2009). Cultural diversity in online learning: A study of the perceived effects of dissonance in levels of individualism/collectivism and tolerance of ambiguity. *Internet and Higher Education, 12*(1), 26–34. https://doi.org/10.1016/j.iheduc.2008.12.001

Tawafak, R. M., Romli, A., Malik, S. I., & Shakir, M. (2020). IT governance impact on academic performance development. *International Journal of Emerging Technologies in Learning, 15*(18), 73–85. https://doi.org/10.3991/ijet.v15i18.15367

Thatcher, A., Zhang, M., Todoroski, H., Chau, A., Wang, J., & Liang, G. (2020). Predicting the impact of COVID-19 on Australian universities. *Journal of Risk and Financial Management, 13*(9), 188. https://doi.org/10.3390/jrfm13090188

The United Nations. (2020). Policy Brief: Education during COVID-19 and beyond. https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2020/08/sg_policy_brief_covid-19_and_education_august_2020.pdf

Tyagi, B. (2013). Listening: An important skill and its various aspects. *The Criterion: An International Journal in English, 12*(1), 1–8.

Vidal, E., Castro, E., Montoya, S., & Payihuanca, K. (2020). Closing the gender gap in engineering: Students role model program. In *2020 43rd International convention on information, communication and electronic technology, MIPRO 2020 - proceedings* (pp. 1493–1496). https://doi.org/10.23919/MIPRO48935.2020.9245186

Villalpando, O. (2003). Self-segregation or self-preservation? A critical race theory and Latina/o critical theory analysis of a study of Chicana/o college students. *International Journal of Qualitative Studies in Education, 16*(5), 619–646. https://doi.org/10.1080/0951839032000142922

Wang, X. (2013). Why students choose STEM majors: Motivation, high school learning, and postsecondary context of support. *American Educational Research Journal, 50*(5), 1081–1121. https://doi.org/10.3102/0002831213488622

Winter, R., & Lavis, A. (2020). Looking, but not listening? Theorizing the practice and ethics of online ethnography. *Journal of Empirical Research on Human Research Ethics, 15*(1–2), 55–62. https://doi.org/10.1177/1556264619857529

Yanosky, R., & Caruso, J. B. (2008). Process and politics : IT governance in higher education. *Educause Center for Applied Research, 5*(July), 1–10.

Yin, R. K. (2009). *Case study research: Design and methods* (4th ed.). Sage. https://doi.org/10.33524/cjar.v14i1.73

Ching Ting Tany Kwee is a Casual Academic at the University of New South Wales, Sydney, Australia. Her research interests include vocational motivations and behaviours, training and professional development, online and remote learning, STEM education and education for sustainable development. Her publications can be seen in various journals and conference proceedings.

Luis Miguel Dos Santos is an Assistant Professor at Woosong University, South Korea. He has a professional doctorate in education from Northeastern University, United States. He has published more than 100 academic works, including peer-reviewed journals, book chapters, conference proceedings, and monographs. His research interests include career decision, career development, Chinese studies, educational leadership, foreign language teaching and learning, Hong Kong studies, human resources management, human resources shortage, international student, internship, lived stories, Macau studies, oral history, qualitative studies, secondary education, social identity, social stigma, student experience, and teachers' professional development.

Refusing the Implementation of Information Technology Governance and Information Technology Development in Higher Education Institutions: Voices from Senior Leaders

Luis M. Dos Santos and Ching Ting Tany Kwee

1 Introduction

Information Technology (IT) is one of the most important topics and developments in the twenty-first century. Many professions and industries have been upgraded with IT development and management in almost all parts of their operation and administration. Many previous studies (Khther & Othman, 2013; Tiwana et al., 2013) have indicated that the development of IT governance plans might help organisations to link their structures, processes, and operations with IT and technologically-enhanced systems (Jairak et al., 2015), particularly in university environments. In the education sector, IT is a technological development that helps enterprises and universities to accomplish their missions more effectively and to promote their plans in new directions, whilst IT governance is the procedure by which the missions of universities that offer a positive influence on IT are managed, agreed, and controlled. Organisations and universities with successful IT governance plans may enhance their administrative and operation management, student enrolment, teaching and learning platforms, and student management with effective IT supports (Van Grembergen & Haes, 2009).

Although IT governance plans and IT developments are essential for almost all organisations, regardless of profit orientation, size, and operational background, not all organisations use and employ the same levels, backgrounds, and applications of IT governance plans and IT developments (Weill & Ross, 2004). In the educational sector, small vocational training centres and schools may not require advanced-level IT governance plans or IT developments due to their teaching and learning

L. M. Dos Santos (✉)
Woosong University, Daejeon, South Korea

C. T. T. Kwee
The University of New South Wales, Sydney, UK
e-mail: c.kwee@unsw.edu.au

M. Alaali (ed.), *COVID-19 Challenges to University Information Technology Governance*, https://doi.org/10.1007/978-3-031-13351-0_6

backgrounds, methodologies, student bodies, and limited financial resources. Also, schools in remote regions may not require IT governance plans or IT developments due to the serving bodies and limited student populations, particularly as some schools tend to focus on hands-on experiences and achievements for local communities (Khouja et al., 2018). However, for colleges and universities in urban communities with a significant student population and enrolment, IT governance plans and IT developments may be useful, as they could significantly enhance operational and administrative management (Khther & Othman, 2013).

In university environments, due to different factors, such as university orientation, student enrolment, student backgrounds, funding bodies, financial resources, and opinions of the managerial board, the willingness to upgrade and employ IT governance plans and IT developments can differ (Waheed et al., 2018). Therefore, there is no single solution and set of recommendations for all colleges and universities. However, leaders in colleges and universities usually recognise the importance of and need for IT governance plans and IT developments (Khouja et al., 2018).

Higher education is one of the sectors which should employ advanced technology and technologically enhanced management, regardless of background. Many studies have indicated that IT governance plans and IT developments are amongst potential solutions for overcoming the challenges and difficulties posed by manual errors in operations and administrative management. More importantly, the employment of IT governance plans may enhance the overall development, student enrolment, and teaching and learning platforms of colleges and universities. However, many university leaders do not believe IT governance plans and IT developments are the solution (Waheed et al., 2018). In some cases, university leaders refuse to upgrade the IT governance plans and IT developments of any of the departments and schools under their leadership due to their personal preferences.

South Korea is a region of higher education development. Like many western countries and regions, South Korea has become a popular destination for international students who want to study abroad and achieve their educational qualifications in a foreign location, particularly for IT and Science, Technology, Engineering, and Mathematics (STEM) students and researchers. As argued by previous studies, IT governance plans and IT developments are amongst the key methods for enhancing student enrolment and teaching activities; such developments may be essential for many South Korean colleges and universities, particularly for research-oriented universities with high-level research activities and government projects. Although IT governance plans and IT developments are useful for colleges and universities, not all university leaders and board members believe in such developments. This study investigates university leaders' motivations and reasons for not believing in IT governance plans and IT developments in their university environment, specifically in the South Korean environment.

1.1 Purpose of the Study

Based on the social cognitive career and motivation theory (Dos Santos, 2021a, b), two purposes are categorised. First, this study aims to investigate and understand the obstacles to proper IT governance in the South Korean university environment, particularly during the COVID-19 pandemic. Second, the study intends to understand university leaders' motivations and reasons for not wanting to enhance IT governance plans and IT developments in their universities. In short, two research questions guide this study:

1. What are the obstacles to proper IT governance in the South Korean university environment, particularly during the COVID-19 pandemic? Why?
2. What are university leaders' motivations and reasons for not wanting to enhance IT governance plans and IT developments in their universities? Why?

1.2 Significance of the Study

First, IT governance plans and IT developments have become important topics in the education sector, particularly for colleges and universities. However, many previous studies have focused on the application and employment of IT governance plans and IT developments in private and for-profit organisations and businesses, with only a few studies focusing on non-profit organisations and higher education institutions. The results of this study will fill the research and practical gaps in this area.

Second, current research on IT governance plans and IT developments usually focuses on successful case studies and applications for organisations and businesses. Only a few studies focus on unsuccessful stories and cases. In other words, there is a need to understand the backgrounds of and reasons for unsuccessful applications. The results of this study will fill the gaps in this area.

Third, much current research mainly focuses on cases in western communities, with only a few focusing on social problems, IT governance plans, and IT developments in East Asia. Although IT governance plans and IT developments do not have any geographic limitations or restrictions, higher education leaders' perspectives and concepts could be different in different regions. The results of this study will fill the gaps in this area, particularly for higher education institutions in East Asia.

2 Theoretical Framework and Literature Review

2.1 Social Cognitive Career and Motivation Theory

The social cognitive career and motivation theory (Dos Santos, 2021a, b) served as the theoretical framework to guide this study. The social cognitive career and motivation theory was developed based on social cognitive career theory (Lent et al., 1994) and self-efficacy theory (Bandura, 1989). The social cognitive career and motivation theory (Dos Santos, 2021a, b) is useful for understanding the motivations and reasons why individuals and groups exercise behaviours, decisions, and decision-making processes in particular ways. In fact, individuals and groups do not conduct their behaviours, actions, and movements without any personal perceptions or understanding. In other words, individuals and groups usually exercise their behaviours based on their understanding and motivations for achievements and end results. Under the guidelines of the social cognitive career and motivation theory (Dos Santos, 2021a, b), the current study may reveal university leaders' motivations and reasons for not wanting to enhance IT governance plans and IT developments in their universities.

The social cognitive career and motivation theory (Dos Santos, 2021a, b) argues that individuals' and groups' motivations and decision-making processes are influenced by internal and external factors. First, the psychological and internal factors of self-efficacy indicate that individuals' academic interests, personal considerations, and achievements of education and career goals could impact their motivations and decision-making processes. Second, the social and external factors indicate that individual's interests in career development, financial considerations, and surrounding environments and individuals could impact motivations and decision-making processes (Kwee, 2021a, b; Kwee & Dos Santos, 2021). Given this, the social cognitive career and motivation theory served as the theoretical framework to investigate the current social problems regarding IT governance plans and IT developments in South Korean university environments. Figure 1 outlines the social cognitive career and motivation theory (Dos Santos, 2021a, b).

2.2 IT Governance Plans in Higher Education: Challenges

Almost all universities have employed different types of IT developments and technologically-enhanced operational, administrative, and teaching management strategies, particularly research-oriented colleges and universities with high-level research activities (Khther & Othman, 2013). Due to various challenges and limitations, not all universities are greatly supported by IT developments. However, it is not uncommon for IT developments to be involved in many aspects of university management.

Although many colleges and universities are supported by IT developments and technologies, many leaders and board members do not understand the objectives

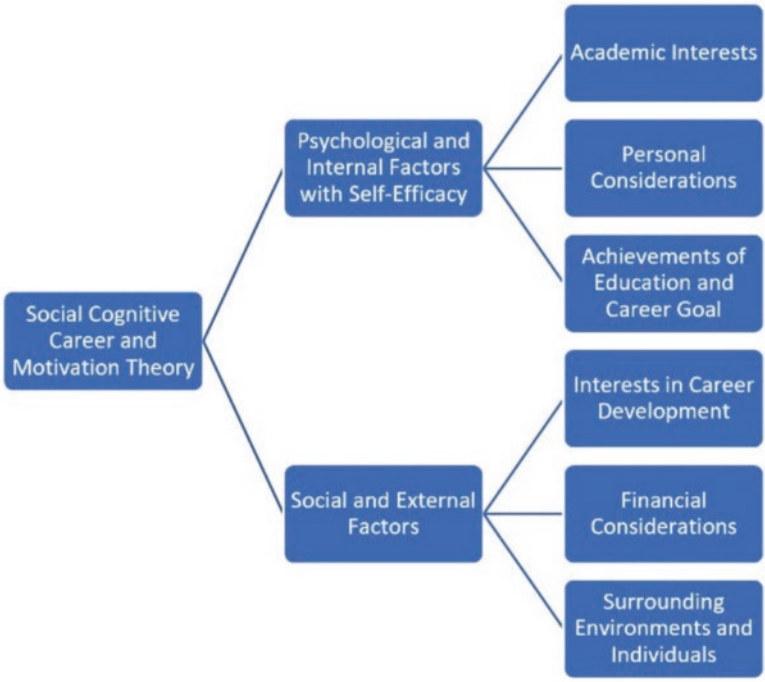


Fig. 1 Social cognitive career and motivation theory (Dos Santos, 2021a, b)

and goals of IT governance and IT development, particularly in remote colleges and universities with limited financial resources. As a result, institutional processes could be negatively impacted due to disorganised planning and strategies of IT departments, university leaders, and board members (Ghost, 2018).

Some previous studies (Ghost, 2018; Khouja et al., 2018; Waheed et al., 2018) have indicated some potential challenges impeding colleges' and universities' effective employment of IT governance plans and IT developments. First, not all university leaders and board members are fully aware of the advantages and benefits of IT governance. Second, the development and application of any IT system and its promotion are costly and may not have immediate results for board members and shareholders. Third, colleges and universities need to spend additional financial resources on IT departments and related supports. Fourth, IT developments may require long-term support, which may cost additional resources on top of current budgets (Ghost, 2018). In fact, IT governance plans and IT developments may not be the first priority for university leaders and board members. Therefore, many colleges and universities may not want to upgrade the IT systems, although the long-term results could benefit university development, particularly for colleges and universities in remote and rural communities (Jairak et al., 2015).

The perspectives and management of IT departments could play roles in IT governance plans and IT developments in university environments. Although IT governance plans and IT developments are not novel concepts for many IT leaders and

department heads, some external professionals do not understand how to manage such plans and strategies for non-profit sectors, particularly in university environments (Webb et al., 2006). An earlier study (Wilkin & Riddett, 2009) argued that IT governance plans and IT developments could be different between the for-profit and non-profit sectors, as the goals and achievements of these two sectors are dissimilar. Another study (Ajayi & Hussin, 2014) also argued that public and private colleges and universities could have different concepts of and perspectives on IT governance plans and IT developments due to their different missions and goals. One study (Tjong et al., 2017) further argued that IT governance plans and IT developments could significantly upgrade technology applications and practices on campus. Currently, IT application, employment, and training could significantly limit overall IT development and usage, as many departments, faculty members, staff, university leaders, board members, and students are not well-prepared for advanced-level technology and computer application.

3 Methodology

3.1 Research Design: General Inductive Approach

A general inductive approach (Thomas, 2006) was employed to collect qualitative data from a group of university department heads and senior leaders from five rural and privately-funded colleges and universities in South Korea. The general inductive approach is useful because this qualitative methodology is not limited to any sites, targets, groups, and backgrounds. The researchers could collect qualitative data based on the nature and need of the study. Unlike case study methodology (Yin, 2012), the researchers need to collect data, study the social problem, and understand the research problem in a targeted location and group of people. The general inductive approach sets up the wider border for the researchers to understand and collect data exclusively for the research study without any limitations. In this case, although the researchers tended to collect data from a private university in the rural community, qualitative data from a single site could not represent the social problem, particularly the problems of IT governance plans and IT developments in the South Korean environment. Therefore, the general inductive approach (Dos Santos, 2021c; Thomas, 2006) was employed in order to collect qualitative data from a wider perspective and population, particularly in the rural communities in South Korea.

3.2 Participants

Ten participants were recruited based on the purposive sampling strategy (Merriam, 2009). In this case, the researchers tended to collect qualitative data from a group of college and university leaders who may have the decision-making powers,

particularly in the area of IT governance plans and IT developments. Although department heads and college deans could join the discussion on the IT governance plans and IT developments, their positions and comments may not impact the decision-making processes of the university development. Therefore, contacting the right people for this study was important. Therefore, based on some personal networks and referrals, the researchers contacted ten senior leaders and university board members who are willing to share their understanding and comments about the applications and employments of the IT governance plans and IT developments for their colleges and university, particularly in the rural communities in South Korea.

Qualitative data from a group of senior leaders and board members of the college and university is useful to understand the decisions and decision-making processes of the IT governance plans and IT developments. Unlike the opinions and comments from the frontline workers and mid-level professionals, senior leaders and board members are the ones who can make the decisions of the college and university. Therefore, these groups of participants were the appropriate people for the study. Based on the nature of the study, the participants should meet all the following criteria:

1. Currently serving on the board members' committee
2. Have been serving as one of the board members for at least 3 years
3. Have the decision-making powers for the IT governance plans and IT developments
4. Willing to share their opinions and comments about the IT governance plans and IT developments for their college and university

3.3 Recruitment

First, the researchers contacted 15 potential participants initially. The researchers emailed the purpose of the study, interview protocol, risk statement, and unsigned agreement to the potential participants. If the potential participants want to join the study, they might contact the researchers by email. Second, ten participants agreed to join the study and share their opinions and comments about the IT governance plans and IT developments for their college and university. Third, due to the COVID-19 pandemic, the government discouraged in-person contact. Therefore, the researchers sent the link to the participants for the online discussion and interview session.

3.4 Data Collection

An interview session was employed to collect qualitative data from the participants (Clandnin & Connelly, 2000; Connelly & Clandinin, 1990; Merriam, 2009; Tang & Dos Santos, 2017). First, the researchers sent the interview protocol to the potential participants during the invitation stage. Therefore, the participants should understand the questions and concepts before the interview sessions. In addition, once the participants agreed to join the study, the researchers offered at least ten business days for the participants, particularly preparation and thinking. Second, the researchers contacted the participants for the online interview sessions (Dos Santos, 2022b, c) at least 2 weeks after the acceptance. The researchers sent the online interview platform link to the participants individually.

In this case, individual, private, and semi-structured interview sessions were used to collect qualitative data from the participants. During the interview session, the researcher asked some interview questions to the participants, such as the understanding of the IT governance plans and IT developments and how IT governance plans and IT developments could improve their university mission. As for the interview session, each session lasted from 65 to 89 minutes. The researchers used a digital recorder to record the voices between the participants and the researchers. Only voiced messages were marked. The participants agreed with the arrangement.

The focus group activity (Morgan, 1998) is one of the useful qualitative data collection tool. However, it is not applicable in this study. Although the participants should know each other from academic and managerial conferences and meetings, some participants might not want to share sensitive information with their counterparts, particularly all colleges and universities are competing in student enrolment and recruitment. Therefore, only interview sessions were used to collect qualitative data from the participants.

After the researchers collected the qualitative data from the participants, the researchers categorised the data into the participant's individual files. The researchers transcribed the voiced messages into the written transcript. Then, the researchers sent the written transcripts to each participant for member checking confirmation. Once the participants confirmed their own written transcripts, the researchers could continue to analyse the data. Please note, if the participants want to add or remove any information from their written transcript, they are welcome to do so.

3.5 Data Analysis

The two-step data analysis procedure was employed (Strauss & Corbin, 1990). First, the researcher re-read and re-visited the written transcripts and saw the potential connections and groups from the qualitative data. The researchers employed the open-coding technique to study and analyse the massive data to meaningful themes and subthemes. From this stage, 20 themes and 22 subthemes were merged, such as financial sources, enrolment management, international student population etc. From this stage, the data were categorised as the first-level themes and subthemes.

However, based on the guidelines from the qualitative research handbook (Merriam, 2009), further studies and analyses should be made for the findings and discussion chapter. Therefore, the researchers employed the axial-coding technique to study the first-level themes and subthemes further. Under the technique, the researchers narrowed and categorised the qualitative data to the next level. As a result, three themes and three subthemes were yielded as the second-level themes and subthemes. More importantly, the researchers would use the second-level themes and subthemes for the findings and discussion chapter.

3.6 Language Use

The participants were encouraged to use English and Korean languages for the stories. Therefore, the researchers did not limit the applications of the language. During the data collection procedure, the participants used English as the main language for sharing, whilst Korean was the supplementary language. If the participants used Korean for the answers, the researchers translated Korean to English for this study. The translations were sent to the participants for confirmation as well. The participants agreed with their translated parts and approved the studies.

3.7 Human Subject Protection

Privacy is the most important factor in this study, particularly this study may contain some sensitive information and data from the participants' college and university missions and goals. Therefore, the researchers stored the signed agreements, study protocol, voiced messages, written transcripts, personal contacts, contact information, and computer to a password-protected cabinet. Only the researchers could read the information. After the study was completed, the researchers immediately destroyed and deleted the information to protect privacy from all parties. The current study was supported by Woosong University Academic Research Fundings 2022.

4 Findings and Discussion

Although all the participants' colleges and universities employ some IT governance plans and IT developments, all participants disagreed with and refused further developments. Table 1 outlines the themes and subthemes based on the qualitative data collection procedure.

Table 1 Themes and subthemes

A.		Do not understand the benefits of IT governance plans and IT Developments
	1.	Do not see the need for IT and computer technology: IT departments are costly
B.		Focus on the teaching and Learning platform
	2.	Faculty members and students expressed no interest in IT governance plans and IT developments
C.		Rural colleges and universities: IT governance plans and IT developments are not the priority
	3.	International student enrolment and recruitment: priority of rural colleges and universities after the COVID-19 pandemic

4.1 Do Not Understand the Benefits of IT Governance Plans and IT Developments

> *…when we were in the university 30 years ago…we did not need to have computers…we could use the application form and paper-based system for the administrative affairs…yes, we have a good computer system today…but we do not need to have advance technology…for super great things…isn't the basic or mid-level computer system is good already?... this is a university…this is not an online business organisation…we are not developing any cellphone or laptop systems…*(Participant #10)

All participants were in their late 50s or early 60s. Many had completed their undergraduate education nearly 40 years previously, without advanced IT or a technologically enhanced system. Although the current education sector is upgraded with advanced technology, many continue to believe that basic technology would allow sufficient operational and administrative management of their universities and departments. Some participants also do not fully understand the benefits of IT governance plans and IT developments and how they could promote their university's performance:

> *…I have heard the development of computer technology…and how could the technology help our university and organisation…but no board members and shareholders…in the senior meeting…understand the technology…we are focusing on the student enrolment…and the applications for international students…we could not focus on more than two plans at once…we need to focus on enrolment management after the pandemic…*(Participant #9)
>
> *…no shareholders in our board meeting expressed the need for the IT development or else…we have good technology already…I am not an expert in technology…and I mainly focus on the student enrolment…we received good applications from international students…and we also used good computer system for the online application…we do not need any advanced level technology…we have our own system already…why to bother additional funding…*(Participant #7)

In line with the social cognitive career and motivation theory (Dos Santos, 2021a, b), the participants expressed no interest in the development of their IT governance plans and IT developments, as many did not recognise and understand the benefits. More importantly, almost all refused to upgrade the computer systems and relevant IT systems, as the current operations already met the needs and goals regarding admissions, student enrolment, and teaching platforms (Brown et al., 2015; Cipher et al., 2017). Although the COVID-19 pandemic allowed many colleges and

universities to upgrade their teaching and learning platforms (Dhawan, 2020; Ma et al., 2021; Moorhouse, 2020), the participants expressed no interest in further development, particularly in IT governance plans and IT developments. In this case, personal considerations played significant roles in the decisions and decision-making processes of university leaders regarding IT governance plans and IT developments. Although previous studies (Khther & Othman, 2013; Tiwana et al., 2013; Tjong et al., 2017) have argued that IT governance plans and IT developments successfully and effectively help the overall performance and development of universities, the participants, board members, and shareholders tended not to invest in them due to their personal considerations and understanding.

1) Do Not See the Need for IT and Computer Technology: IT Departments are Costly

…what is the point of having the IT governance and IT technology in our school system?...we do not need that IT stuff in our university…people in the urban cities…always call for the IT development…but our school does not…seem like we need to have heavy IT technology and system…we only need to have the basic and workable items…for good operation…(Participant #3)

Based on the sharing of one of the senior leaders at a rural university, many senior university leaders do not believe in IT governance plans or IT developments. More importantly, they do not believe IT developments could upgrade the overall achievement and performance of their universities' operational and administrative management. Although many studies (Khouja et al., 2018; Khther & Othman, 2013) have argued that IT governance plans and IT developments may significantly improve the performance of higher education institutions, many senior leaders do not agree, and refuse any further investment in such developments. Another group of participants also indicated that they might actually cut IT departments for budgetary reasons:

…due to the COVID-19 pandemic, many colleges and universities do not have enough enrolment…university does not have enough money to support some expensive departments…the IT department should be cut because department heads and managers can handle the IT affairs…my university does not need to have additional IT department for some advanced technologies…(Participant #4).

…we do not have enough cash flow for many affairs already…not to mention any additional IT development or else…the IT department costs almost 20% of the annual budget because of the computer, software system, and the technology support…if we do not have enough funding or student enrolment…and tuition fees to support…we need to think about some ways to cancel the IT department or so…this department is too expensive… (Participant #2)

Besides concerns about annual budgets, some participants also believe that central IT departments play a relatively insignificant role in university operations; many believe that each department should have its own managers or professionals for technology management and operation. Central IT departments, particularly directors of IT departments, are seen as costly, as many do not believe in technology. Some opinions were captured:

…my university is not a public university…we need to spend our budget for all the departments…we have already managed at least one or two computer profession(s) in each school and department…we do not need to have a central IT department…otherwise, we are employing more than 30 computer professionals for a small college…(Participant #1).

> *…what is the point of a central IT department?...the government suggested we have the online teaching platform and some technology enhancements already…but who will support us for the IT governance and IT development?...my board members and I do not believe in IT and advanced technology…we have enough IT people in our university…no one in the committee expressed any needs for the IT development…*(Participant #5)

In line with the social cognitive career and motivation theory (Dos Santos, 2021a, b), financial considerations played significant roles in decisions and decision-making processes, particularly regarding IT governance plans and IT developments during and after the COVID-19 pandemic. The participants argued that IT governance plans and IT developments cost nearly 30% of their universities' annual budgets. Due to the COVID-19 pandemic, many rural colleges and universities suffer from student shortages and limited financial resources, particularly in international student enrolment. Many private colleges and universities highly rely on tuition fees and donations from alumni, and the participants indicated that there had not been enough financial resources for at least two academic years. Therefore, further investment in IT governance plans and IT developments is not the priority for the coming few academic years. Based on the findings, the COVID-19 pandemic changed the overall planning and mission for many colleges and universities, regardless of IT governance plans and IT developments.

4.2 Focus on the Teaching and Learning Platform

> *…we have already purchased the online teaching and learning platform…students and teachers are doing well…why should we develop further items?...the COVID-19 pandemic will be gone eventually…students and teachers will come back to the physical classroom…why do we still need to spend money for some retiring items and technology…we need to focus on the student enrolment…*(Participant #).

Almost all participants expressed their focus on and concern for student enrolment management (So, 2020; *South Korea: Record Growth in International Student Enrolment*, 2018; *South Korea Reporting Big Gains in Foreign Enrolment*, 2019). Although many believed that the application system should be enhanced with advanced technology, many argued that the current technology and development are sufficient to ensure good experiences for students, teachers, and professional staff. No further investments in IT governance plans and IT developments are required. According to two earlier studies (Webb et al., 2006; Weill & Ross, 2004), the decisions and decision-making processes of senior leaders played significant roles in IT governance plans and IT developments. In this case, many do not believe in advanced-level IT developments and technologies due to their personal preferences and the opinions of board members. Many argued that the board members and committees might eventually remove online teaching and learning platforms, as many of the courses will return to offline teaching formats (Stewart & Lowenthal, 2022). Two stories were captured:

…the committee group was upset…because the university purchased the license for the online learning system…the online learning system is very expensive…and the university needs to pay the license and registration fees every month…for the usage…the committee wants to cancel the license and return to the free version immediately after the government announced the offline teaching requirement…(Participant #6)

…not to mention the IT governance plans…at least the board members and I do not believe in online learning and online system…we did not have any online teaching and learning 20 years ago…we learnt the same knowledge…online learning is poison…we can have the online platform…but we should have continued with the online system or any IT development…(Participant #8)

In line with the social cognitive career and motivation theory (Dos Santos, 2021a, b), some agreed that the online teaching and learning platform offered unique online learning experiences and opportunities to faculty members and students. However, some believed that the online teaching and learning platform should be cancelled after the government announced the offline teaching requirements. Although mixed comments were captured from the participants, all participants believed that further IT governance plans and IT developments are not essential at the current stage. Reflecting the findings of previous studies (Waheed et al., 2018; Webb et al., 2006; Weill & Ross, 2004; Wilkin & Riddett, 2009), the behaviours and understanding of the senior leaders played significant roles in their decisions and decision-making processes. Based on the findings of this study, South Korean university leaders intend to maintain the current online teaching and learning platforms but to release no support for any further IT governance plans or IT developments.

2) Faculty Members and Students Expressed no Interest in IT Governance Plans and IT Developments

…during the COVID-19 pandemic, our university sent out surveys and questionnaires to faculty members, students, professional staff, and parents for any IT developments or advanced-level technologically-enhanced items…the survey expressed no concerns for any IT governance plans and IT development…many were concerned about the teaching and learning platform…the board members do not see any urgent needs for…the IT governance plan or so…(Participant #2)

…we asked our teachers and students already…no one mentioned the IT governance or any super technology plan…we all did not see any need for the IT governance plans that you mentioned…as we do not have any needs or demands…it is better to save our funding for some real items and real problems…such as student enrolment management and international student recruitment…the board members also do not believe in IT governance… (Participant #7)

In line with the social cognitive career and motivation theory (Dos Santos, 2021a, b), interest in career development and teaching and learning platforms outweighed the need for long-term IT governance plans and IT developments. The participants argued that the board members and senior leaders do not believe IT governance plans and IT developments are the priority for the university's performance and achievements. Due to the COVID-19 pandemic, many South Korean colleges and universities needed to move their courses and lessons online due to social distancing recommendations (Baber, 2021; Stewart & Lowenthal, 2022). As the online teaching and learning platforms were introduced for virtual teaching, immediate or short-term technological problems were solved. However, IT governance plans and IT developments should be continued for long-term achievement and development

(Khouja et al., 2018; Tjong et al., 2017; Waheed et al., 2018). In this case, many do not believe IT governance plans and IT developments should be continued, as the immediate and short-term problems have been solved. Furthermore, the surveys that the participants mentioned were mainly focused on problems for frontline personnel, such as faculty members and students. IT professionals' and experts' voices were not included in the statistics. Therefore, the surveys could not capture the statistics from the right professionals and departments for further IT governance plans and IT developments.

4.3 Rural Colleges and Universities: IT Governance Plans Are IT Developments Are Not the Priority

First of all, all participants argued that student enrolment management and international student recruitment are the first priority for their universities, particularly during and after the COVID-19 pandemic (Ayhan et al., 2021; Dos Santos, 2022a; *South Korea: Record Growth in International Student Enrolment*, 2018). Several participants indicated that they had already discussed IT governance plans and IT development issues with other university senior leaders, particularly during the COVID-19 pandemic. The participants argued that other colleges and universities have no plans to upgrade or enhance their IT governance plans or IT developments during and after the COVID-19 pandemic (Waheed et al., 2018). Therefore, no immediate or long-term needs and demands were shown based on discussions with other senior leaders in South Korea. Two comments were captured:

> *…other college leaders and board members do not have any problems for the IT governance and IT developments…why should our college…be the first groups for the IT governance and IT developments…our college is not…a very large…and research-based university…our college only focused on some local students and some international student enrolment…our college has no additional powers and energies…for the IT governance plans…we have no funding…*(Participant #5)
>
> *…I do not think colleges and universities in the rural areas… concerned with the IT governance plans and IT developments as their first priority…it is the plan for the research-based universities in the capital city…but in the countryside…we tended to focus on the ideas for student enrolment and student' learning experiences…IT or technology…we do not want to spend…time for this development…*(Participant #4)

In line with the social cognitive career and motivation theory (Dos Santos, 2021a, b), the surrounding environments and individuals played significant roles in the decisions and decision-making processes regarding IT governance plans and IT developments. In this case, many participants argued that almost all rural colleges and universities do not have immediate plans for IT governance plans and IT developments. Although IT governance plans and IT developments are encouraged by government agencies and departments, many participants and their universities tend not to be among the first groups to engage in such development (Waheed et al., 2018). More importantly, many believe the priority, particularly during and after the COVID-19 pandemic, should be student enrolment, financial health, and student

recruitment. Therefore, the participants tend to focus on student enrolment and management instead of IT governance plans and IT developments (Alemu & Cordier, 2017; Ayhan et al., 2021; *Education of International Students*, 2020).

3) International Student Enrolment and Recruitment: Priority of Rural Colleges and Universities after the COVID-19 Pandemic.

Many South Korean university leaders, particularly leaders at rural colleges and universities, tend to focus on student enrolment management and international student recruitment (Ayhan et al., 2021; Dos Santos, 2022a; *Education of International Students*, 2020; *South Korea: Record Growth in International Student Enrolment*, 2018). IT governance plans and IT developments are not the priority, particularly during and after the COVID-19 pandemic. The researcher further asked about the short-term and mid-term goals and priorities of the participants' colleges and universities. The participants argued that developing international exchange programmes with other foreign colleges and universities should be the main focus (Ayhan et al., 2021; Dos Santos, 2020). However, the participants argued that these international exchange programmes should be conducted as offline programmes without any online opportunities or technologically enhanced options:

…South Korean colleges and universities have highly relied on international student enrolment…without international students…many colleges cannot survive…because many rural colleges and universities do not have enough enrolment for domestic students…many great students do not want to stay in the rural communities because there are no opportunities and internships in the rural…they have to go back to the city for any jobs…therefore, international students from other countries…may receive good scholarship and funding because no one will compete with the scholarship…(Participant #8)

Many participants also argued that Chinese students had become one of the main sources of enrolment in the last decade (Dos Santos, 2022a; *Education of International Students*, 2020; *South Korea: Record Growth in International Student Enrolment*, 2018). In other words, many rural colleges and universities enrol more than 30% Chinese students to maintain their financial health and enrolment levels. However, during the COVID-19 pandemic, many Chinese students decided to return to China due to health concerns. Therefore, many rural colleges and universities face challenges with tuition fees and student enrolment, particularly due to the lack of Chinese international students. Based on this concern, student enrolment management outweighs the immediate needs for IT governance plans and IT developments. Some comments were captured:

…the higher education sector in South Korea…is highly relied on the Chinese international students…two decades ago, Chinese students came to South Korea for university…first…they came to the capital city…but some low-tier students…could only come to rural colleges and universities…for the enrolment…and for good scholarship…this is the way…how the rural colleges survive…but the COVID-19 pandemic changed the maps…we did not have enough international students…no tuition fees and no supports from the international students…we cannot focus on the IT governance plans or else…we need to focus on the international student enrolment…(Participant #6)

…I do not think any rural college leaders would have any rooms to discuss any issues of IT governance plans and IT development…all rural colleges are working on the Chinese student recruitment…if we cannot survive from the COVID-19 pandemic…not to mention

> *the IT developments…the college will close after several years…some schools are closed already…without enough international students from China…*(Participant #9)

In line with the social cognitive career and motivation theory (Dos Santos, 2021a, b), surrounding environments and individuals, financial considerations, and student enrolment played significant roles in the decisions and decision-making processes. In fact, the COVID-19 pandemic changed universities' planning and performance, regardless of geographic location or financial background. For nearly three decades, South Korean colleges and universities highly relied on international student enrolment, contributions, and tuition fees, relying particularly heavily on Chinese international students. However, due to the COVID-19 pandemic, international students, particularly Chinese international students, decided to return home and complete their education via online teaching and learning platforms (Betts, 2017; Dos Santos, 2022a, c). Also, some international students could not return to South Korea for on-campus education. Therefore, many South Korean colleges and universities, particularly rural schools with limited career opportunities and internships, could not attract enough students. Therefore, the participants argued that their universities could not secure student enrolment for the coming academic years, and no one in their universities is concerned about IT governance plans and IT developments (Alemu & Cordier, 2017; Ayhan et al., 2021; *Education of International Students*, 2020). With limited financial resources and student enrolment, rural colleges and universities can only pay special attention in the immediate term to their student enrolment. Otherwise, these colleges and universities will fail due to student enrolment shortages (*South Korea Reporting Big Gains in Foreign Enrolment*, 2019).

5 Limitations and Future Research Directions

First, IT governance plans and IT developments must be one of the priority plans for many colleges and universities internationally. However, the current study only collected qualitative data from South Korean colleges and universities. Therefore, future research studies may further expand the scope from the South Korean perspective to the international conceptions.

Second, due to the limited population, only board members' qualitative data was collected. However, deans, presidents, vice presidents, and shareholders' qualitative data could be useful, particularly for the improvement of IT governance plans and IT developments. Therefore, future research studies may further expand the populations to other parties and personnel in order to collect a wider picture in this area.

Third, the current study only focused on the situations of the colleges and universities in rural communities. Although urban colleges and universities may have different challenges and difficulties, which rural college and university leaders do not have, it is important to understand the plans from the urban university leaders' perspectives. Therefore, future research studies may also collect qualitative data from college and university leaders in urban and suburban environments.

Fourth, this study only employed the qualitative methodology as the means to collect data from a group of board members of the South Korean colleges and universities in rural communities. However, a wider perspective with the quantitative methodology could be useful. Therefore, future research studies may also employ quantitative and mixed methods to collect useful information from university leaders.

6 Contributions to the Practice

First, IT governance plans and IT developments is one of the most important developments for many schools, non-profit organisations, businesses, and government departments. However, many current studies and literature tended to focus on the for-profit sectors. Therefore, the current results and study will fill the gaps in the fields of IT governance plans and IT developments for higher education, particularly in the South Korean environment.

Second, unlike other urban colleges and universities with solid domestic and international student enrolments, many rural colleges and universities face challenges and difficulties in financial resources and enrolment management. Therefore, many colleges and universities did not set the improvements of IT governance plans and IT developments as their priority, particularly during and after the COVID-19 pandemic. Therefore, the findings from this study outlined the voices and comments of a group of board members, which may reflect the contemporary demands and mid-term plans for many colleges and universities, particularly in the rural communities in South Korea.

Third, many of the current studies of IT governance plans and IT developments tended to focus on the applicable developments and plans, which mainly focused on the applications and usages for improvements. However, no current studies collected data from the perspectives of senior leaders and board members, particularly in the South Korean environment. Therefore, the results of this study will fill the research and practical gaps in this area.

Fourth, it is not uncommon that colleges and universities may face challenges and limitations when they want to upgrade their IT governance plans and IT developments. However, many of the studies focused on the technological challenges and limitations of the backgrounds, such as geographic locations. The results of this study tended to focus on the problems and limitations of board members and senior leaders. Therefore, the findings may provide some reflections and recommendations for scholars and government leaders to help colleges and universities to upgrade their IT governance plans and IT developments based on the voices of the university leaders.

Acknowledgments This research was supported by the Woosong University Academic Research Funding 2022.

References

Ajayi, B. A., & Hussin, H. (2014). Exploring information technology governance in a Malaysian public university: Providers' perspectives. In *The 5th International Conference on Information and Communication Technology for the Muslim World (ICT4M)* (pp. 1–6). https://doi.org/10.1109/ICT4M.2014.7020627

Alemu, A. M., & Cordier, J. (2017). Factors influencing international student satisfaction in Korean universities. *International Journal of Educational Development, 57*(1), 54–64. https://doi.org/10.1016/j.ijedudev.2017.08.006

Ayhan, K. J., Gouda, M., & Lee, H. (2021). Exploring global Korea scholarship as a public diplomacy tool. *Journal of Asian and African Studies*, 002190962110358. https://doi.org/10.1177/00219096211035800

Baber, H. (2021). Modelling the acceptance of e-learning during the pandemic of COVID-19-a study of South Korea. *The International Journal of Management Education, 19*(2), 100503. https://doi.org/10.1016/j.ijme.2021.100503

Bandura, A. (1989). Perceived self-efficacy in the exercise of personal agency. *The Psychologist: Bulletin of the British Psychological Society, 2*, 411–424.

Betts, B. (2017, November). *The Chinese students who come to South Korea*. https://thediplomat.com/2017/11/the-chinese-students-who-come-to-south-korea/

Brown, M., Hughes, H., Keppell, M., Hard, N., & Smith, L. (2015). Stories from students in their first semester of distance learning. *The International Review of Research in Open and Distributed Learning, 16*(4), 1–17. https://doi.org/10.19173/irrodl.v16i4.1647

Cipher, D. J., Shrestha, S., & Mancini, M. E. (2017). Demographic and academic factors associated with enrollment in online MSN programs. *Journal of Nursing Education, 56*(11), 670–674. https://doi.org/10.3928/01484834-20171020-06

Clandnin, D., & Connelly, F. (2000). *Narrative inquiry: Experience and story in qualitative research*. Jossey-Bass.

Connelly, F. M., & Clandinin, D. J. (1990). Stories of experience and narrative inquiry. *Educational Researcher, 19*(5), 2–14. https://doi.org/10.3102/0013189X019005002

Dhawan, S. (2020). Online learning: A panacea in the time of COVID-19 crisis. *Journal of Educational Technology Systems, 49*(1), 5–22. https://doi.org/10.1177/0047239520934018

Dos Santos, L. M. (2020). The challenging experiences of international students in South Korea: The neo-racism perspective. *Universal Journal of Educational Research, 8*(12B), 8102–8109. https://doi.org/10.13189/ujer.2020.082612

Dos Santos, L. M. (2021a). Developing bilingualism in nursing students: Learning foreign languages beyond the nursing curriculum. *Healthcare, 9*(3), 326. https://doi.org/10.3390/healthcare9030326

Dos Santos, L. M. (2021b). Motivations and career decisions in occupational therapy course: A qualitative inquiry of Asia-Pacific international students in Australia. *Advances in Medical Education and Practice, 12*, 825–834. https://doi.org/10.2147/AMEP.S288885

Dos Santos, L. M. (2021c). I want to teach in the regional areas: A qualitative study about teachers' career experiences and decisions in regional Australia. *Journal of Educational and Social Research, 11*(5), 32–42. https://doi.org/10.36941/jesr-2021-0103

Dos Santos, L. M. (2022a). Study abroad and student exchange experiences of international students: The sociocultural and psychological racism perspective. *Academic Journal of Interdisciplinary Studies, 11*(1), 15. https://doi.org/10.36941/ajis-2022-0002

Dos Santos, L. M. (2022b). The attitudes and experiences of marriage and family counselors for same-sex couple and family clients: A qualitative study. *Journal of Educational and Social Research, 12*(1), 24. https://doi.org/10.36941/jesr-2022-0004

Dos Santos, L. M. (2022c). Social challenges and experiences of Chinese international university students: The sociocultural and psychological racism perspective. *Journal of Educational and Social Research, 12*(2), 1–14. https://doi.org/10.36941/jesr-2022-0030

Education of International Students. (2020). Ministry of Education National Institute for International Education. https://www.studyinkorea.go.kr/en/sub/overseas_info/korea_edu/edu_student.do

Ghost, S. (2018). An exploration of IT governance in university: Its drivers, how it maps to theoretical frameworks, and the committee structure characteristics. *International Journal of Business and Applied Social Science, 4*(11), 45–71.

Jairak, K., Praneetpolgrang, P., & Subsermsri, P. (2015). Information technology governance practices based on sufficiency economy philosophy in the Thai university sector. *Information Technology & People, 28*(1), 195–223. https://doi.org/10.1108/ITP-10-2013-0188

Khouja, M., Rodriguez, I. B., Ben Halima, Y., & Moalla, S. (2018). IT governance in higher education institutions: A systematic literature review. *International Journal of Human Capital and Information Technology Professionals, 9*(2), 52–67. https://doi.org/10.4018/IJHCITP.2018040104

Khther, R. A., & Othman, M. (2013). Cobit framework as a guideline of effective it governance in higher education: A review. *International Journal of Information Technology Convergence and Services, 3*(1), 21–29. https://doi.org/10.5121/ijitcs.2013.3102

Kwee, C. (2021a). Will I continue online teaching? Language teachers' experience during the COVID-19 pandemic. 2(Csedu), 23–34. https://doi.org/10.5220/0010396600230034.

Kwee, C. (2021b). I want to teach sustainable development in my English classroom: A case study of incorporating sustainable development goals in English teaching. *Sustainability, 13*(8), 4195. https://doi.org/10.3390/su13084195

Kwee, C., & Dos Santos, L. M. (2021). Will I continue teaching sustainable development online? An international study of teachers' experiences during the COVID-19 pandemic. In *Proceedings of the 2021 International Conference on Open and Innovative Education* (pp. 340–359).

Lent, R., Brown, S., & Hackett, G. (1994). Toward a unifying social cognitive theory of career and academic interest, choice, and performance. *Journal of Vocational Behavior, 45*(1), 79–122. https://doi.org/10.1006/jvbe.1994.1027

Ma, K., Chutiyami, M., Zhang, Y., & Nicoll, S. (2021). Online teaching self-efficacy during COVID-19: Changes, its associated factors and moderators. *Education and Information Technologies, 26*(6), 6675–6697. https://doi.org/10.1007/s10639-021-10486-3

Merriam, S. B. (2009). Qualitative research: A guide to design and implementation. Jossey Bass.

Moorhouse, B. (2020). Adaptations to a face-to-face initial teacher education course 'forced' online due to the COVID-19 pandemic. *Journal of Education for Teaching, 46*(4), 609–611. https://doi.org/10.1080/02607476.2020.1755205

Morgan, D. (1998). The focus group guidebook. *SAGE Publications, Inc.* https://doi.org/10.4135/9781483328164

So, W. (2020). *Number of enrolled university students in South Korea 2011–2019*. https://www.statista.com/statistics/710612/south-korea-enrolled-university-students-number/

South Korea reporting big gains in foreign enrolment. (2019). ICEF Monitor. https://doi.org/https://monitor.icef.com/2019/09/south-korea-reporting-big-gains-in-foreign-enrolment/

South Korea: Record growth in international student enrolment. (2018). https://monitor.icef.com/2018/02/south-korea-record-growth-international-student-enrolment/

Stewart, W. H., & Lowenthal, P. R. (2022). Distance education under duress: A case study of exchange students' experience with online learning during the COVID-19 pandemic in the Republic of Korea. *Journal of Research on Technology in Education, 54*(sup1), S273–S287. https://doi.org/10.1080/15391523.2021.1891996

Strauss, A., & Corbin, J. M. (1990). *Basics of qualitative research: Grounded theory procedures and techniques*. SAGE Publications.

Tang, K. H., & Dos Santos, L. M. (2017). A brief discussion and application of interpretative phenomenological analysis in the field of health science and public health. *International Journal of Learning and Development, 7*(3), 123–132. https://doi.org/10.5296/ijld.v7i3.11494

Thomas, D. R. (2006). A general inductive approach for analyzing qualitative evaluation data. *American Journal of Evaluation, 27*(2), 237–246. https://doi.org/10.1177/1098214005283748

Tiwana, A., Konsynski, B., & Venkatraman, N. (2013). Special issue: Information technology and organizational governance: The IT governance cube. *Journal of Management Information Systems, 30*(3), 7–12. https://doi.org/10.2753/MIS0742-1222300301

Tjong, Y., Adi, S., Prabowo, H., & Kosala, R. (2017). Benefits to implementing IT governance in higher education: (systematic literature review). In *2017 International Conference on Information Management and Technology (ICIMTech)* (pp. 35–38). https://doi.org/10.1109/ICIMTech.2017.8273507

Van Grembergen, W., & Haes, S. (2009). *Enterprise governance of information technology: Achieving strategic alignment and value*. Springer.

Waheed, H., Hussin, H., & Mohamed Jalaldeen, M. R. (2018). The influence of IT leaders' leadership behaviour on IT governance performance in higher education: A literature review. In *2018 international conference on information and communication Technology for the Muslim World (ICT4M)* (pp. 254–259). https://doi.org/10.1109/ICT4M.2018.00054

Webb, P., Pollard, C., & Ridley, G. (2006). Attempting to define IT governance: Wisdom or folly? *Proceedings of the 39th Annual Hawaii International Conference on System Sciences (HICSS'06)*, 194a-194a. https://doi.org/10.1109/HICSS.2006.68.

Weill, P., & Ross, J. W. (2004). *IT governance: How top performers manage IT decision rights for superior results*. Harvard Business School Press.

Wilkin, C. L., & Riddett, J. (2009). IT governance challenges in a large not-for-profit healthcare organization: The role of intranets. *Electronic Commerce Research, 9*(4), 351–374. https://doi.org/10.1007/s10660-009-9038-0

Yin, R. K. (2012). *Applications of case study research* (3rd ed.). SAGE Publications.

Luis M. Dos Santos is an Assistant Professor at Woosong University, South Korea. He has a professional doctorate in education from Northeastern University, United States. He has published more than 100 academic works, including peer-reviewed journals, book chapters, conference proceedings, and monographs. His research interests include career decision, career development, Chinese studies, educational leadership, foreign language teaching and learning, Hong Kong studies, human resources management, human resources shortage, international student, internship, lived stories, Macau studies, oral history, qualitative studies, secondary education, social identity, social stigma, student experience, and teachers' professional development.

Ching Ting Tany Kwee is a Casual Academic at the University of New South Wales, Sydney, Australia. Her research interests include vocational motivations and behaviours, training and professional development, online and remote learning, STEM education and education for sustainable development. Her publications can be seen in various journals and conference proceedings.

Making the Business IT Alignment Evaluation Models Accessible: A Revisit of Luftman's Strategic Alignment Maturity Model and a Guide Towards Its Operationalization and Applicability Within Organizations

Franz Huber, Konstantinos Tsilionis, Yves Wautelet, Claude Doom, and Dorien Martinet

1 Introduction

Over the last decade, the global economy and the status-quo of established commercialized organizational activities (i.e., managing successful business-customer relationships) have been challenged by the emergence of unexpected worldly events. For example, we can cite (i) the emergence of social media and their capacity to strongly influence consumer behaviors and shape customer expectations, (ii) the manifestation of financial crises imposing further budgetary constraints and rendering the financial management of organizations all the more complex, (iii) the surge of terrorist attacks suppressing citizens' fundamental freedom and ability to commute and work. However, one of the most disrupting events that have been recently materialized is the spread of the COVID-19 pandemic.

Other than the pathological and mental afflictions to a significant part of the global population, the pandemic is also being considered as the cause of manifestation of several externalities in the business modalities of organizations (Verbeke & Yuan, 2021; Carracedo et al., 2021; Amankwah-Amoaha et al., 2021). For example, we can mention the switch to remote-working norms for many enterprises; this sudden paradigm shift in the way of working seems to have had a significant impact on the mental capacities of the global workforce. In particular, the study of Zito et al. (2021) asserts that, during the pandemic, a large part of the working population has often experienced multiple stress symptoms when using some form of a technological constituent (i.e., on-location or cloud-based software applications etc). The

F. Huber · K. Tsilionis (✉) · Y. Wautelet · C. Doom · D. Martinet
Katholieke Universiteit Leuven, Leuven, Belgium
e-mail: franz.huber@kuleuven.be; konstantinos.tsilionis@kuleuven.be; yves.wautelet@kuleuven.be; claude.doom@kuleuven.be; dorien.martinet@kuleuven.be

M. Alaali (ed.), *COVID-19 Challenges to University Information Technology Governance*, https://doi.org/10.1007/978-3-031-13351-0_7

authors report that, besides the frequent communication of the strategic vision of the business, companies need to provide the necessary IT tools and trainings so that their employees can fully progress towards the attainment of organizational strategic objectives. Additionally, the pandemic has forced many senior-level executives to rethink and/or reconstruct their companies' service-offerings so they can survive the overextended lockdown regimes in many countries. Nonetheless, a complete revisualization of business configurations seems inadequate without an increase in the company's business-IT interconnectedness and communication (Seetharaman, 2020; Liebowitz, 2020; Verma & Gustafsson, 2020; Zito et al., 2021).

The aforementioned examples demonstrate that the pandemic has only reverberated the significance and enduring nature of the Business and IT Alignment (BITA) thematic within the organizational setting. BITA (also referred to as 'strategic alignment'[1]) can be defined and explained using multiple definitions; for example, Luftman (2000) perceives it as the formal, appropriate, and timely application of IT in order to harmonize it with the attainment of business strategies, goals, and enterprise needs. Dairo et al. (2021) describe it as a complex dynamic process that organizations have to activate so as to enable extensive IT capabilities and achieve their business objectives. De Haes et al. (2020) mention that organizations that proceed in proper strategic alignment measures ensure that their business and IT functions are working simultaneously towards a common enterprise goal.

Overall, there is a plethoric body of knowledge associated to the strategic alignment research; nonetheless, there are many studies that recognize the vulnerability of many alignment evaluation mechanisms/frameworks in providing organizations with pragmatic alignment measurements and implementable performance indicators (Avison et al., 2004; Coltman et al., 2015; Alghamdi & Sun, 2017). Additionally, events such as the pandemic necessitate the modernization of these frameworks so that they are able to render an organization in a state of organizational agility. This means that such frameworks need to incorporate comprehensive, implementable, and straightforward assessment modules that can help organizations to quickly analyze their internal business-IT strategies and configurations, and resolve their strategic alignment bottlenecks. In that way, organizations can deliver effective remedies so they can quickly find their pace after a major disrupting event has happened (Tsilionis et al., 2021a, b; Tsilionis & Wautelet, 2022).

The present study aims to investigate the need for an operationalized version of the Strategic Alignment Maturity Model (SAMM), developed by Luftman (2000); such a version can be easily used when enterprises need to evaluate their alignment processes quickly when faced with business-impacting unexpected events (i.e., COVID-19). The SAMM is a renowned evaluation framework designed to assign a strategic alignment maturity score to organizations; indeed, it incorporates several alignment dimensions to determine the phase of strategic alignment progress within organizations (Luftman, 2000; De Haes et al., 2020). The full description of each

[1] The present study will be using the terms 'BITA', 'strategic alignment', or simply 'alignment' interchangeably.

corresponding alignment dimension of the framework is presented in Sect. 2. This section explicates also the alignment criteria that are nested within each dimension as well as the assessment process for the assignment of maturity scores. The suitability of the SAMM, for the purposes of this study, is substantiated on the work of Belfo and Sousa (2012); the study deduces a high goodness-of-fit when the SAMM is used as the instrument of the strategic alignment analysis in 130 multinational organizations. Nevertheless, the authors acknowledge that the evaluation procedure of the SAMM is rather complicated; besides the utilization of numerous evaluation criteria that harm the need for agility/flexibility on behalf of the companies that try to implement it, the assessment process requires also the set-up of a multimembered team; the latter includes senior Business/IT executives, nonmanagerial personnel, and application users, and urges them to go through a complete and time-exhausting data collection and evaluation process to reconciliate their opinions. Therefore, the SAMM is most likely to be customized in order to be practically executed in the context of a particular enterprise and its business-specificities (i.e., the enterprise's context, number of operations, personnel size, etc.,).

The remainder of this chapter is the following: Sect. 2 presents a short retrospection of the strategic alignment literature as well as a short representation of the most scrutinized strategic alignment evaluation frameworks. A detailed analysis of these frameworks is not within the scope of this study; rather, we pick up on the studies of Belfo and Sousa (2012) and El Mekawy et al. (2009) to offer the design of a methodology in order to produce an operationalized version of the SAMM. The point of differentiation of our methodology compared to previous studies (see Khaiata & Zualkernan, 2009; Ahuja, 2012) is the actual incorporation of the expertise of various IT executives for the design of a simple survey instrument (questionnaire) that could help companies operationalize the SAMM in the effort to determine their strategic alignment swiftly. The motivation for the need to design such a questionnaire will be based on a case study which is described in Sect. 3; this section also explains the motivation for the choice of the case study and the data collection process. Section 4 describes the analysis of the data and some preliminary results; Sect. 5 presents a discussion based on these results. Conclusions can be found in Sect. 6.

2 Background

2.1 A Retrospection of the Strategic Alignment Literature

The present segment will focus on some of the main attributes that characterize the strategic alignment literature. Overall, this topic is being extensively researched for over three decades (Karpovsky & Galliers, 2015). A preponderant amount of research findings has triggered a general consensus that organizations are bound to perform better when key IT resources (i.e., systemic competences, infrastructural components and IT-oriented skills) are intertwined with various strategic, infrastructural, and operational complicities within the business domain

(Luftman et al., 1999; Chan & Reich, 2007; Coltman et al., 2015). A better understanding of how IT influences major business decisions is supposed to yield (i) enabled change-management processes, (ii) faster response time for the decision-makers in terms of developing/adopting novel technologies, (iii) streamlined IT-investment paths, (iv) facilitated stakeholder management procedures, and (v) improved organizational financial performance (Collins et al., 2007; Cumps, 2007; Baker et al., 2011). In fact, a reinforced state of alignment can be of pivotal importance in critical sectors characterized by the need for a continuous (re)assessment of their IT systems in order to be aligned with the needs of multiple stakeholders; the higher education sector provides a distinctive example where IT systems/platforms have to be frequently assessed on their ability to improve educational and research activities as well as the efficiency of administrative processes. In this regard, any technological misappropriation within the sector – caused by depthless strategic alignment dependencies – is expected to resonate sociocultural reverberations (Snyder et al., 2007; Tsilionis et al., 2021a, b).

The earliest bastions of research were particularly focused on a top-down synchronization of the Business and IT strategic layers for the optimization of organizational performance (Alghamdi & Sun, 2017). However, the Strategic Alignment Model by Henderson and Venkatraman (1993) introduced a cross-layered alignment perspective; this was taking into account the strategic layer simultaneously with infrastructural and operational integrations, in the attempt to cluster (and coordinate) valuable organizational resources. Luftman et al. (1999) proposed the utilization of certain organizational enablers (i.e., the level of managerial support towards the IT, trusting relationship between the business and IT domains, IT involvement in strategic planning, etc.,) in raising incrementally the level of strategic alignment within organizations. In their perspective, the latter is to be considered as a dynamic and evolving process to be assisted by the manifestation of these enablers. Their position coincides with the one of Reich and Benbasat (2000) considering the achievement of alignment as a recurrent and evolving process; such a process requires constant (re)evaluations and amendments of the organizational culture. The authors assert that a process-oriented perspective should include the set-up of milestones and planning activities which evaluate the current stage of the alignment and establish goals for the next milestone. Sabherwal et al. (2001) reinforced this process-driven perceptive by studying the evolution of strategic alignment within various organizations. The authors note that even if alignment is considered to have been achieved, after a while, organizations are experiencing a so-called 'alignment plateau' because they tend to focalize on their internal core competencies; thereby, organizations will once again be in need of a revolutionary change to cope with external environmental changes (i.e., introduction of new technologies, disrupting external events, changing consumer preferences, etc.,).

More recently, the topic of strategic alignment has been pivoted towards the intersection of IT governance and software development resolutions. For example, we can mention the study of Bleistein et al. (2004); the latter negotiates the introduction of a framework that is meant to ensure the alignment between requirements for e-business systems and the business strategies that these systems support. The

novelty of the authors is the utilization of goal-oriented models in order to visualize the ways that strategic alignment can be achieved. Similarly, Wautelet (2019) proposes a model-driven corporate and IT governance process allowing to evaluate the alignment of so called 'business IT services' with strategic (business and IT) objectives. The approach allows to integrate the governance level as a (graphical) (business and IT) strategic layer made of long-term objectives that organizational services potentially contribute or hamper to attain. The strategic layer is custom developed for each organization and linked with organizational representations of services deployment in order to study their alignment. Pertaining to this topic, Tsilionis and Wautelet (2021a, b) detail a modeling approach that aims to help organizations reconcile their strategic (business and IT) objectives within their (operational) agile-driven software development processes via the study of a strategic and functional alignment diptych.

Despite these developments, the alignment topic has received some criticism. Traditionally, there has been a lot of ambiguity when it comes to the nature (and quality) of the metrics and evaluation criteria that organizations can employ in order to measure their strategic alignment statuses. Tallon and Kraemer (2003) and Avison et al. (2004) were among the first to question the existence of practical guidelines, mechanisms, and tools to measure this alignment. Even though today the presence of an increasing number of evaluation frameworks is not disputed, the debate has been revolving around (i) the easiness of applicability of these frameworks, (ii) their capacity to be adapted to the context of each organization, and (iii) their ability to providing quick insights in order to steer organizations out of compromising conditions. To give an example, the SAMM is considered by Ahuja (2012) as one of the most influential strategic alignment measurement frameworks; however, according to the author, its burdensome assessment process renders it unfit to be used as the single source of truth in terms of substantiating the alignment of all the organizational business/IT processes. The section that follows provides a short description of the main alignment evaluating frameworks and models that are met in the literature.

2.2 Strategic Alignment Evaluation Mechanisms, Models, and Frameworks

This section presents the significant trail of work that negotiates basic strategic alignment evaluation models and frameworks. Most importantly, we try to give a short assessment of each framework and the nature of their corresponding alignment measurement metrics. We did not proceed in a systematic literature review since there is a number of significant studies that have mapped the field pertaining the comparison of alignment evaluation frameworks (see the comprehensive studies of El Mekawy et al., 2009; Belfo & Sousa, 2012; Schlosser et al., 2012; De Haes et al., 2020). We do, however, aspire to make a short presentation of the most prominent strategic alignment evaluation frameworks in order to portray their major points of differentiation when compared to the SAMM.

To start with, we present the alignment model elaborated by Reich & Benbasat (2000); to this day, it is considered to be among the cornerstones for the foundation and development of strategic alignment evaluation protocols. During their study, the authors have performed extensive interviews with senior-level business and IT executives to capture their understanding and motivation that urges them to support strategic alignment processes within their organizations. The authors translated these motivations to specific alignment-inducing social factors such as (i) shared domain knowledge, (ii) IT implementation success, (iii) increase in the communication between business and IT executives, and (iv) business and IT planning connectivity. Despite its importance, the model follows a one-way top-down approach for the investigation of strategic alignment influence factors; this perceptive may seem outdated today given the attributed significance to bottom-up (user-oriented) input within the software development field. Additionally, the authors are focalizing their study towards the investigation of social dimensions that may influence an increase in strategic alignment but practical evaluation criteria (i.e., the level of technological adaptability towards the business, utilized IT/Business metrics etc) are not given the necessary attention in the model.

Moving on, the Integrated Architecture Framework (Goedvolk et al., 1999) can be visualized as a more refined version of the Framework for Enterprise Architecture (Zachman, 1987). The framework is comprised of many different cells, demonstrating all possible combinations of business, information systems, and technological infrastructures, all of which should be considered jointly to evaluate the overall organizational alignment. The framework places particular emphasis on the design phases for upcoming technologies in order to define their impact on the business model. Thusly, its use seems to be more directed towards the IT department whereas the business domain takes on a more passive role as the recipient of the former's assessments.

Following, we present the alignment evaluation model of Chen and Huang (2012); the latter aims to measure how much the level of alignment (or misalignment) among specific organizational strategic domains (i.e., knowledge management, IT management, and human-resource management) impacts the overall business performance. The entire model is based on the internal separation of the data sample in an ideal percentage of top-performing companies (i.e., 10% of the entire sample) while the remaining data-instances represent companies exhibiting average and below-average business performance. Following, the authors perform Euclidean-distance measurements between the top-, and the average-performing companies, to produce an overall correlation between the organizational alignment status and the business performance. Nonetheless, this numerical-indexed model does not yield any insights or criteria that a company must fulfil in order to reach a higher level of alignment.

At the same time, frameworks such as COBIT and ITIL entrusted with the optimization of IT governance processes and service-oriented mechanisms, may be considered too 'bureaucratic' and labor-intensive to be efficiently applied in organizations seeking to evaluate swiftly their state of alignment (De O'Luna, et al., 2013;

Qumer, 2017). Illustratively, COBIT[2] – one of the most renowned IT service governance frameworks – consists of 5 governance and 35 management processes. Thereby, COBIT is a heavily process-centered framework that treats software development activities as a supporting practice within a business value chain rather than a central business activity in itself (Dahlberg & Kivijärvi, 2006; Dubinsky et al., 2011; Tsilionis & Wautelet, 2021a, b). Meanwhile, ITIL[3] – a framework focused on setting up and managing the flow of IT services – consists of 7 guiding principles including 34 management practices; while it receives massive support from IT practitioners globally, the framework itself has traditionally provided little support in terms of mapping strategic IT concerns (Simonsson et al., 2010; Dubinsky et al., 2011; Tsilionis & Wautelet, 2021a, b).

Overall, the assessment processes of the aforementioned frameworks represent an indirect justification of the preference for this study on the 'maturity assessment approach' (De Haes et al., 2020) as utilized by the SAMM. To reiterate, the latter makes use of this approach to assign an alignment maturity score to organizations, based on several alignment dimensions (and criteria). A detailed presentation of the SAMM is offered below.

2.3 The Strategic Alignment Maturity Model (SAMM)

2.3.1 Description and Short Characterization of the SAMM

This section examines the SAMM, as developed and elaborated in the studies of Luftman (2000) and Luftman (2003). We detail its main structure and alignment dimensions along with a complete catalogue of their corresponding alignment criteria. Finally, this section culminates in a representation of the complicated assessment process of the model which is the cornerstone of our investigation for the need of an operationalized version; the latter is meant to be used by a limited (than its original) evaluating committee and is meant to produce shorter assessment cycles for the quick release of insights that can help moderate the business and IT configurations when organizations are faced with business-impacting adverse situations (e.g., COVID-19).

Overall, the SAMM investigates the organizational alignment with the use of six alignment dimensions. For their better comprehension, we enumerate these as: (1) Communications Dimension, (2) Competency/Value Measurements Dimension, (3) Governance Dimension, (4) Partnership Dimension, (5) Scope & Architecture Dimension, and (6) Skills Dimension. Each of these six alignment dimensions is further split into a set of four to eight alignment criteria which should be assessed individually when trying to determine the maturity score for each dimension.

[2] The current version is 'COBIT 2019': Retrieved from: http://www.isaca.org

[3] The current version is 'ITIL version 4': Retrieved from: https://www.axelos.com

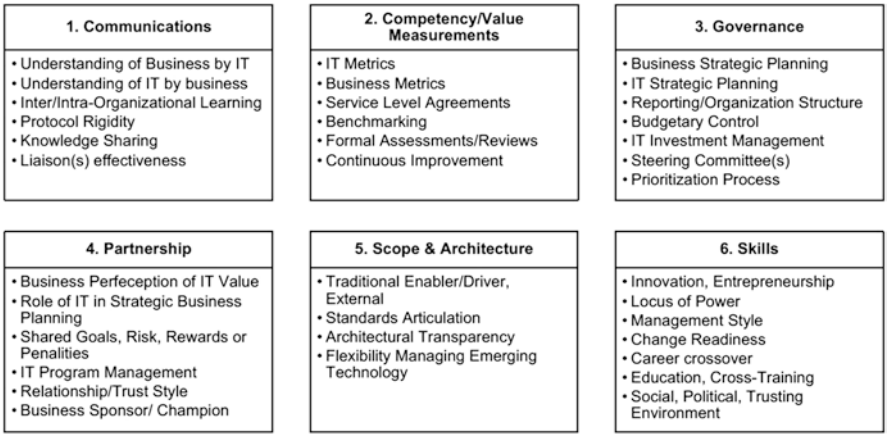


Fig. 1 The six alignment dimensions of the Strategic Alignment Maturity Model (SAMM) and their corresponding alignment criteria. (Source: Luftman, 2000)

Figure 1 visualizes these alignment dimensions as well as their encompassed alignment criteria.

2.3.2 Description of the Alignment Dimensions and Their Corresponding Alignment Criteria

The alignment dimension ***Communications*** can be encapsulated as the assurance of the understanding between the business and IT (Luftman, 2000, 2003). A best-case communications' scenario, describes a bidirectional, clear, regular, and informal communication channel between the business and the IT department for sharing common knowledge. Such a communication path between the business and IT should involve the utilization of specific (and usable) business and IT metrics. On the other hand, predefined and rigid communication protocols should be avoided as they are often considered to prevent an open dialogue and the sharing of ideas.

The alignment dimension ***Competency/Value Measurements*** is concerned with the ability of the IT function to demonstrate, in a comprehensive manner, its value to the entire business (Luftman, 2000, 2003). More specifically, this dimension is used to emphasize the importance of (i) well-defined service level agreements, (ii) existing benchmarking practices, and (iii) planned improvement programs, between the business and IT domains. An indicator of high competency and value measurement maturity within an organization is the existence of formal assessment mechanisms of its IT investments as well as a well-balanced prioritization/allocation of IT resources by the IT department.

The alignment dimension ***Governance*** is associated with the clear/definitive assignment of authority between the business and IT domains regarding matters of IT responsibility, resources, conflict resolution, and risks (Luftman, 2000, 2003). For instance, an indicator of high governance maturity necessitates the highest

extents of formality within the planning processes for the determination of the business and IT strategy, respectively. Organizational structures that are entirely centralized or completely decentralized yield a lower level of governance maturity; contrastingly, organizational structures that follow the formation of loose confederations yield higher levels of governance maturity. Direct reporting relationships between the Chief Information Officer (CIO) and the Chief Executive Officer (CEO) reveal a higher level of governance maturity than the CIO reporting to other members of the executive board before the CEO (i.e., the CIO reporting to the Chief Financial Officer). The overall assessment of governance maturity is also influenced by the way IT is budgeted (i.e., lower/higher maturity when the IT department is perceived as a cost/profit center).

The alignment dimension ***Partnership*** examines the type of relationship between the business and IT domains (Luftman, 2000, 2003). Mutual trust and appreciation of the contributions to each other determine the successful alignment between the two domains. In order to assess the quality of the partnership maturity, one has to look at how the IT is being perceived by the business domain altogether. A valued IT-proposition that enables future business activity reveals an organization scoring high in partnership maturity. Additionally, an equitable sharing of risks and rewards between the business and IT domains is an indicator for high-level partnership maturity. Contrastingly, organizations that do not involve the IT function within the strategic business planning process, or yield an inequitable ratio of risks/rewards for their IT department, receive low maturity scores. The management of the business/IT relationship is another criterion for the evaluation of this dimension; If the relationship is only managed when needed, or not at all, the maturity scores for this criterion are quite low. A relationship handled under the notion of continuous improvement indicate the highest partnership maturity levels.

The alignment dimension ***Scope & Architecture*** assesses the extend that the IT domain is capable of (i) supporting a flexible and transparent infrastructure, (ii) evaluating effectively and applying new technologies, and iii) providing customizable solutions pending on business demands (Luftman, 2000; Luftman 2003). This dimension also considers the ability of the IT proposition to enable and/or drive business strategies/processes. The encompassed alignment criteria assess whether IT is capable of applying emerging technologies effectively, enabling or driving business processes, and providing solutions to customer needs. Furthermore, this dimension is meant to assess whether the IT department has established well-articulated standards and whether there is a flexible and transparent ICT architecture.

Lastly, the alignment dimension ***Skills*** assesses traditional human-resources considerations (i.e., training, salary, performance feedback) (Luftman, 2000, 2003). This dimension also evaluates the organization's readiness for change and the perceived individual responsibility for business innovation. It explores the ability of business/IT individuals to learn quickly from their experience and the extent to which the organization leverages innovative ideas. The encompassed alignment criteria for this dimension are supposed to evaluate the existence of a spirit of entrepreneurship, innovation, hierarchical locus of power, and career crossovers within the organization.

2.3.3 The Assessment Process for the Assignment of an Alignment Maturity Score

Luftman (2003) suggests the following methodology to assess the overall alignment maturity while using the SAMM: The first step is comprised of the formation of the assessment team (typically 10–30 business/IT executives and personnel). Each team-member gathers detailed information on all the alignment dimensions; following, each member assesses individually the encompassed alignment criteria for each dimension. Next, each member assigns individually a numerical score (ranging from '1' to '5') explicating the maturity level of each criterion. Each score corresponds to a scale of five levels of alignment, namely: **Level 1: Without Process** (no alignment), **Level 2: Beginning Process**, **Level 3: Establishing Process**, **Level 4: Improved Process**, and **Level 5: Optimal Process** (complete alignment).

After each member has assigned scores to all the criteria of a particular alignment dimension, these scores are averaged to uncover the alignment maturity score for that particular dimension. This process is followed for all the six alignment dimensions. At the end, the scores of all the alignment dimensions for all the members of the team are averaged to retrieve the overall alignment maturity score for the organization. The most valuable part of the assessment is not the score itself, but understanding its implications for the entire company and what needs to be done to improve it (Luftman, 2003). This total alignment maturity score can be used for benchmarking or comparison with other organizations. The tally sheet for the assignment of alignment maturity scores is visualized in Fig. 2.

3 Methodology

3.1 Research Approach

The evolution of the strategic alignment assessment field has been mostly characterized by a static approach (Baker et al., 2011). Such an approach is mostly occupied with the attempt to develop mechanisms, tools, and frameworks whose end-products procure (quantifiable or descriptive) indicators that characterize the strategic alignment competency of organizations at a single point in time. There are studies that have dealt with the customization of 'bulkier' versions of beknown alignment evaluation frameworks; for example, we can cite the works of Martinsons et al. (1999), Khaiata and Zualkernan (2009), and Ahuja (2012). However, these studies mostly produce truncated versions of the original evaluation frameworks in the form of a balanced scorecard; the latter offers a different form of classification for the alignment dimensions of the original models. Thusly, the implementation of the truncated versions of these models seems improbable of releasing strategic alignment insights quickly when organizations are in need of emergent decision-making processes to deal with adverse issues within their internal and/or external ecosystems.

Tally Sheet

Practice Categories		Practices	Averaged Scores 1	1.5	2	2.5	3	3.5	4	4.5	5	Average Category Score
Communications	1	Understanding of business by IT										
	2	Understanding of IT by business										
	3	Organizational learning										
	4	Style and ease of access										
	5	Leveraging intellectual assets										
	6	IT–business liaison staff										
Competency/ Value Measurements	7	IT metrics										
	8	Business metrics										
	9	Link between IT and business metrics										
	10	Service level agreements										
	11	Benchmarking										
	12	Formally assess IT investments										
	13	Continuous improvement practices										
Governance	14	Formal business strategy planning										
	15	Formal IT strategy planning										
	16	Organizational structure										
	17	Reporting relationships										
	18	How IT is budgeted										
	19	Rationale for IT spending										
	20	Senior-level IT steering committee										
	21	How projects are prioritized										
Partnership	22	Business perception of IT										
	23	IT's role in strategic business planning										
	24	Shared risks and rewards										
	25	Managing the IT–business relationship										
	26	Relationship/trust style										
	27	Business sponsors/champions										
Technology Scope	28	Primary systems										
	29	Standards										
	30	Architectural integration										
	31	How IT infrastructure is perceived										
Skills	32	Innovative, entrepreneurial environment										
	33	Key IT HR decisions made by:										
	34	Change readiness										
	35	Career crossover opportunities										
	36	Cross-functional training and job rotation										
	37	Social interaction										
	38	Attract and retain top talent										

Your Alignment Score: _____

Fig. 2 The assessment Tally sheet of the Strategic Alignment Maturity Model (SAMM). (Source: Luftman, 2003)

Additionally, the existing academic literature dealing with the operationalization of existing alignment maturity models, has, to the best of our knowledge, failed to include the opinions/expertise/knowledge of the directly-implicated constituents (i.e., business/IT executives and personnel) within the process of achieving their operationalized versions. Subsequently, we chose to perform an exploratory study

(Brown, 2006) targeted at investigating, comprehending, and performing in-between comparisons of three companies (and their dedicated needs) to realize if they can exploit the features of one of these strategic alignment maturity models for their swift appropriation and utilization. Instead of setting up initial testable hypotheses, we chose to be truly exploratory and rely on the collection of empirical data to identify, gather, and iteratively refine the activators and inhibitors affecting the SAMM's capability to produce alignment insights quickly. Indeed, the setting of our research exercise began with the identification of three companies and the collection of data exploring their current strategic alignment evaluation needs; we wanted to capture rich in-content, non-quantitative data in a bottom-up manner by the stakeholders' opinions, experiences, and expertise within these companies so a qualitative research methodology (Mack, 2005) was adopted. The analysis of this data led to the identification of themes, patterns, and challenges within the SAMM which will eventually help us generate hypotheses, regarding the need for operationalization of the SAMM, based on inferences that best explains our empirical data.

To recapitulate, the present research is meant to elaborate on the design of a case study; the latter is to be used as the instrument of hypothesis-setting in terms of examining the operational potentialities of the SAMM within the context of three companies engaged in business activities in Belgium, at the aftermath of the COVID-19 pandemic. Overall, the utilization of a case study format is justified by the researchers' need to investigate empirically a contemporary phenomenon, in its real-life context, without their active participation in the investigation (Wohlin, 2021). We are ultimately interested in capturing qualitative data expressing the opinions, experiences, and perceptions of these companies' stakeholders. Thereby, a qualitative research methodology is to be followed with each one of these companies acting as the case study's unit of analysis. The survey-participating companies were of different business contexts and sizes but they were required to have one subsidiary that is currently operating in Belgium to guarantee a minimum convergence in their working standards. For privacy reasons, the present study will refer these units of analysis as 'Company A, B, and C' respectively. An overview of their characteristics can be found in Table 1.

That ultimate goal of this exercise is the release of an operationalized version of the SAMM fitting to the needs of the case study participants. Given the time constraints, we did not proceed in a full evaluation of this operationalized version; this is to be fully instantiated in another study that is meant to be presented in a future communication. Presently, the points of emphasis are on the exploration of the need for such an operationalized version, and on the design of a methodology that

Table 1 Participating companies and their characteristics

Company affiliation	Main business activity	Employees
Company A	Transportation & logistics	6413
Company B	Material design & advertising	20
Company C	Food & agriculture	133

culminates in a survey instrument that is aspired to make the SAMM quickly implementable within the premises of the case study participants.

This paragraph is meant to present some details about the case study's units of analysis. More specifically, **Company A** is a Belgian-headquartered corporation operating in the European transportation & logistics sector. The firm has a total workforce of 6413 employees and a current annual turnover of €249,613,703. **Company B** refers to the Belgian subsidiary of a multinational corporation, headquartered in Japan, offering advertising and material design services, specialized in the creation and design of catalogs. The Belgian subsidiary achieved a current annual turnover of €9,699,188. The company has been impacted severely from the pandemic and the number of its workforce has decreased considerably over the last 4 years (the personnel used to be comprised of 130 employees but has now dropped to 20). **Company C** is a Belgian-headquartered corporation operating in the food and agriculture sector. The firm has an annual turnover of €30,097,146 and a workforce of 133 employees.

3.2 Data Collection

The nature of our exploratory qualitative research study dictates the use of a purposive sampling technique (Saunders et al., 2016) in order to determine the pool of respondents for each one of the participating companies. We used each company's email directory as our initial sampling frame in order to make our study known to employees that would be knowledgeable about their company's state of interplay between its main business operations and internal IT processes. Our target sample was consisted primarily of executives implicated in the dynamic determination of the organization's business and IT alignment status. Our initial email invitation to participate in the survey was accepted by ten employees, all occupying senior-level IT roles. Following, we arranged a 20-min online prescreening meeting with these ten potential participants where we explained the dual purpose of our study; this referred to (i) the determination of the easiness/comprehension of the original SAMM, and (ii) the exploration of the creation of an operationalized version of the SAMM which should facilitate a swifter/easier process for the determination of the alignment maturity scores for each company. Out of these ten employees, seven were eliminated from the selection process as their roles were entirely focused on technical assignments. The remaining three candidates were knowledgeable in matters of BITA configurations and they were aware of the SAMM. At a later stage, these three executives received another formal email invitation to participate in our survey along with detailed information about the interview process which would take the form of an online individual conversation. Due to privacy reasons, the names of these respondents will not be revealed; Table 2 provides an overview of their background and responsibilities.

For the purposes of our study, we used in-depth semi-structured interviews (Longhurst, 2009); The semi-structured format helped us perform the interviews

Table 2 Participating respondents and their characteristics

Respondent	Company	Job function	Responsibilities
Respondent 1	A	Principal IT architect	Oversees a team of business and IT architects; assists the IT administration process in order to create a roadmap for the implementation of the global IT landscape.
Respondent 2	B	Head of IT division for Belgium	Oversees the company's IT division in Belgium; supervises the creation of training programs; inspects the up-to-date status and the modernization of business continuity plans.
Respondent 3	C	IT service manager	Oversees the IT service division.

based on a predetermined list of questions; the latter were meant to evaluate the applicability, easiness of use, benefits, and drawbacks of the SAMM. Since we were interested in a deeper understanding of the participants' perceptions in terms of the structural composition of the SAMM and its internal constituents, we could omit some of the listed questions, rearrange their order and insist on some particular questions, hence the in-depth format of the interview process. Overall, the interview process was split in two phases, taking place in two different dates: The **first phase** lasted about 90 min and was composed of an informal, in-depth, online discussion (see Sect. 4.3.1). For that session, each respondent was asked initially to describe his/her job function/responsibilities and provide a short overview of the profile of his/her respective company and its ongoing strategic alignment processes. Next, a member of our research team explained the concept of the study to each interviewee; following, SAMM was explained in detail to each survey-participant; special attention was provided by the interviewer to the description of each alignment dimension of the SAMM. The alignment criteria and the alignment maturity levels, per alignment dimension, were also explained to each interviewee. The last part of this phase was dedicated to each interviewee appraising the alignment dimensions and the corresponding alignment criteria of the SAMM; for this, a mixture of 60 open-ended and closed Likert-scale questions were used. These were meant to encapsulate the respondents' opinions about the perceived usability/easiness/comprehension of each dimension (and criterion) of the SAMM; they were essentially meant to estimate whether the SAMM was up-to-date with the need of contemporary companies to be in possession of a swift and dynamic evaluation method of their strategic alignment capabilities. The **second phase** of the interview took place a month after the first one, lasted 45 min, and was dedicated to the implementation of an operationalized version of the SAMM that the research team had produced, using as input the interviewees' directions (as captured in the first phase of the interview process). During this phase, the interviewees had to implement the operationalized version of the SAMM; the latter takes the form of a questionnaire comprised of a set of 13 complete and non-redundant questions (see Table 3) meant to capture efficiently/effectively the strategic alignment maturity level of a company. This phase essentially describes the performance of structured interviews allowing the three

Table 3 Operationalized version of the SAMM and its internal components (questions)

Evaluation dimension	Questions
Communication maturity	**1)** How would you characterize the mutual understanding between the business and the IT domain within your company? Have there been any problems caused by miscommunication between those two parties in the recent past (2–3 years)? **2)** Explain how is the newly acquired knowledge distributed within your organization. Which communication channels and learning methods are being used? Is there any kind of effectiveness monitoring? **3)** Describe how your IT department communicates with the business. Is the communication bidirectional? Are there any formalized communication methods and which are those?
Competency/value measurements maturity	**1)** Which metrics do you use to measure business and IT performance? How regularly are these measures being reviewed? **2)** Are your business and IT metrics linked in any way? **3)** How regularly do you perform benchmarking analyses? What impact do the results have on future decisions and actions of your organization? **4)** State to which extent your company has implemented continuous improvement practices. Does the organization measure the effectiveness of these practices? If so, how frequently are they being reviewed?
Governance Maturity	**1)** Do you have a senior level IT steering committee in place? If so, please de-scribe briefly its structure: Who is involved? What is the nature/frequency of these meetings (formal, informal, etc.,)? **2)** To whom does the CIO of your company report to? (CFO, COO, CEO) **3)** What is the main reason, in your opinion, for your organization to invest in IT?
Partnership Maturity	**1)** How would you estimate the role of IT in strategic planning? Does it have an impact on the company's business processes or strategies? **2)** Does your organization use defined processes to manage the IT-business relationship? If so, are they subject to continuous improvement? **3)** How are risks and rewards shared within the business focus within the company? How are risks and rewards shared within the IT department within the company? Are there any special incentives for IT managers to take risks?
Scope & Architecture Maturity	**1)** Are there any defined technological standards within your organization? If so, are these standard definitions valid for the whole enterprise, or even for interactions with other enterprises? **2)** Is your IT architecture transparent and flexible to support technological infrastructure changes? Does the term "technology management" has an applicable tribute in the company?
Skills Maturity	**1)** Do hiring and retention programs exist for the staff members; if yes, are they effective? Do you also consider business skills with IT hiring decisions? **2)** Are career crossover opportunities or job transfers a frequent phenomenon in your organization? Do they mainly concern the staff within a department or is the unit or corporate management also affected? **3)** Do change readiness programs exist in your enterprise? If so, are they restricted to the functional level or are there change readiness programs at corporate level as well?

respondents to trial-run this questionnaire by measuring the strategic alignment maturity levels of their respective companies (see Sect. 4.2 for the results). The specifics of the two phases of the interview protocol are given below.

3.3 Interview Protocol

3.3.1 Phase 1: Capturing the Interviewees' Opinions About the SAMM

For each respondent, this interview phase was split in three parts: **Part I** was meant to introduce some open-ended questions that were meant to collect general background information about themselves (i.e., prior education and work experience, current occupational role and work-related responsibilities etc.). The respondents were also asked to introduce some generic information about their respective companies (i.e., the sector that the company is currently operating in, its generic growth performance for the last 5 years, etc.,). Lastly, the respondents were asked to provide some information about the ongoing strategic alignment procedures of their companies (i.e., were they aware of any established policies/procedures to measure their business IT alignment statuses; were there any actions taken based on the insights of these procedures, etc.,). All the respondents replied that their companies had already set-up (mostly) ad-hoc BITA processes that would help them achieve a better communication between the Business and IT functions. Next, the respondents were asked some initial open questions that were meant to assess their generic knowledge in terms of the structure of the SAMM, its alignment dimensions/criteria/maturity levels etc. Given the seniority of their roles, all respondents exhibited a well-versed understanding of the SAMM; However, extra theoretical explanation was provided during the next part when it comes to identifying/analyzing the alignment dimensions/criteria of the model. This first part of the interview lasted about 10–15 min.

As previously explained, **Part II** was meant to introduce the general purpose and structure of the SAMM to each interviewee. Each alignment dimension and alignment criterion, according to the visualizations of Fig. 1, was meticulously explained to the interviewees. Finally, the assessment procedure of the SAMM, according to the visualizations of Fig. 2, was also explained to them. The respondents were free to ask questions at any time during this part about the SAMM and its internal constituents. This part lasted about 20–30 min.

In **Part III,** a member of the research team (the interviewer) introduced the main questions; these were purposed to capture the interviewees' opinions about the SAMM's ability to produce a swift evaluation in order to give out quick and meaningful insights that companies can take advantage of in times of and adverse disrupting events. These questions were divided conceptually into six segments, each one corresponding to one of the six alignment dimensions of the SAMM (i.e., *Communication, Competency/Value measurements, Governance, Partnership,*

Scope & Architecture, and *Skills*). Each segment clustered a mixture of 10 open-ended and closed questions that were meant to capture the interviewees' perceptions in terms of the efficiency of the alignment criteria incorporated in each alignment dimension of the SAMM. To reiterate, the point of this part was the analysis of the SAMM to appraise the need for its 'modernization' in order to be able to provide a swift BITA evaluation. For example, for the first segment (i.e., Communication), some of the questions that were asked: *Do you understand the purpose of the 'communication' alignment dimension of the SAMM, as it was explained to you in Part II?., Do you understand the meaning of the dimension's corresponding criteria, as they were explained to you in Part II?., Do you consider all the dimension's criteria relevant and up-to-date in terms of capturing the communication interconnectedness between the business and IT side of your company?., Starting at "not at all likely" and scaling all the way up to "extremely likely", how would you rank each individual alignment criterion for inclusion in your assessment of the business and IT communication capabilities?*. A similar set of questions were asked respectively for each criterion for the remaining alignment dimensions of the SAMM. Part III lasted about 60 min and concluded the first phase of the interview process. The evaluation process for the data that was gathered in this phase can be found in Sect. 4.1.

3.3.2 Phase 2: Implementing the Operationalized Version of the SAMM

At the end of phase 1, the members of the research team evaluated the data gathered by the interviewees concerning their appraisal of the SAMM. The insights gathered by this data was used to create an operationalized version of the SAMM in the form of a questionnaire containing a set of 13 questions covering all the alignment dimensions of the SAMM (see Table 3). The second phase of the interview process was dedicated to the interviewees implementing this questionnaire in the context of their respective companies. We essentially performed three individual structured-interviews, while utilizing the operationalized version of the SAMM as our survey instrument, to estimate the strategic alignment maturity level of the interviewees' companies. Each respondent had to answer these 13 questions and their answers should be able to provide valuable feedback in order to estimate the strategic alignment maturity score of their companies without going through the entire complicated evaluation process as described in the original SAMM. At the end of each individual interview, each respondent had to assess the questionnaire's fit-for-purpose, easiness to use, and completeness. Each interview lasted about 45 min. The analysis of the respondents' answers can be found in Sect. 4.2.

4 Data Analysis and Preliminary Results

4.1 Phase 1: The Data Analysis Process of Arriving at the Operationalized Version of the SAMM

The discussions taking place during the first phase of the interview session were recorded in audio format after having acquired the consent of each of the interviewee. Upon completion of the interviews, the respondents' recordings/answers were subsequently transcribed into text, analyzed, and codified; this means that parts of the text were annotated a code representing a certain opinion/justification/theme etc. Additionally, the rankings of the Likert-scale answers of the respondents were analyzed as interval data; this means that their central tendencies (i.e., means) were identified. Given the small sample size of our participants in a relatively controlled environment (Tsang, 2014), we did not proceed in a full statistical (descriptive) realization of our case study. Contrastingly, we treated the results of the entire exercise under the tenets of analytic generalization (Yin, 2010). More specifically, we relied on the premises described in Thomas (2010) and Halkier (2011) which considers qualitative case studies to be enriched in sample instances that can be clustered together in order to create constellations of insights derived from our qualitative data. In particular, we went through the text recordings and interview notes to identify a convergence cluster within the respondents' answers which could take the form of similar phrases in different parts of the material, patterns in the data, reoccurring differences between sub-groups of answers, etc. Special attention was given to the justification of the respondents' answers to the open questions of Part III of the first phase of the interview process. These questions were purposed to capture the respondents' opinions in terms of the relevance of the evaluation criteria of the SAMM, and their implementation capability within their respective companies. Data was tabulated so as to give an overview of all main insights that the respondents would like to see within the transmutation process towards the creation of an operationalized version of the SAMM that would help their companies yield quick insights regarding their alignment status.

Overall, the preferences and the rankings of the utility of the SAMM's alignment criteria that were yielded from the respondents' answers were cross-referenced with the main insights derived from the studies of Luftman (2000) and Luftman (2003) in order not to lose sight of the significant features of the SAMM that should be kept in the latter's operationalized version. The interview data (from phase 1) made us realize that this new survey instrument should retain the basic form of the alignment dimensions of the SAMM, as presented in its original version. However, the interviewees noted that some of the alignment criteria, incorporated in these dimensions, were rather obscure, difficult to be practically measured, or perhaps obsolete in the context of their companies. According to the interviewees, the main impediment for the applicability of the SAMM lies in its complicated evaluation process; the alternative that was proposed by the respondents was the creation of a simple structured questionnaire that would entail fundamental alignment criteria as the basis for the

alignment maturity evaluation process. The work-product of the entire data evaluation process can be encapsulated within the questionnaire presented in Table 3.

4.2 Phase 2: Administering the Operationalized Version of the SAMM

This section describes the administration of the operationalized version of the SAMM in order to retrieve the alignment maturity levels of the respondents' companies. The point was to utilize our newly-established survey instrument in order to gather insights about the alignment maturity statuses of their companies in more efficient and swift manner rather than activating the complete evaluation process described within the original SAMM. Thereby, during the second phase of the interview process, the interviewees had to answer all the questions presented in Table 3. A member of the research team could assign the alignment maturity level of each alignment criterion on the basis of the respondents' answers to each question. These assigned maturity scores were discussed with the respondents at the end of the process to discover any difference of opinions; no discrepancy was noted between the researchers and the respondents regarding these scores. We follow the structure of the questionnaire of Table 3 to present the respondents' answers and the results for the alignment maturity levels for companies A, B and C respectively.

4.2.1 Communications Maturity

1) How would you characterize the mutual understanding between the business and the IT domain within your company? Have there been any problems caused by miscommunication between those two parties in the recent past (2–3 years)?

- **Company A:** The first respondent believes that, despite a free and open communication channel between the business and IT domains, there is still a significant problem in the mutual understanding between the two; this misunderstanding manifests itself in the form of a lack of a mature demand management procedure that causes a significant work overload within the development teams of the company. Therefore, an alignment maturity level of **1** (Without Process) can be assigned.
- **Company B:** The second respondent recognizes a basic form of mutual understanding between the company's business and IT domains. However, this understanding seems to be limited in context; the respondent perceives that the understanding of the IT domain, by the business domain, can be significantly improved. However, due to a flexible and informal communication channel, there has been no severe communication mishap between the two domains thus far. Hence, the alignment maturity can be best classified as of level **2** (Beginning Process).

- **Company C:** The third respondent describes a state of continuous communication for the mutual understanding between the business and IT domains, and does not recall any communication problems between the two. However, the respondent seems to recognize some small margins of improvement within the business communications (towards the IT) so that understanding can be even more encouraged among business staff members. This yields an alignment maturity level of **4** (Improved Process).

2) Explain how is the newly acquired knowledge distributed within your organization. Which communication channels and learning methods are being used? Is there any kind of effectiveness monitoring?

- **Company A:** The first respondent acknowledged that the enterprise has a formal global education development initiative that is supplemented by an end-cycle evaluation process; this formal method corresponds to an organizational learning alignment maturity of level **4** (Improved Process).
- **Company B:** The second respondent placed informational e-mail communications combined with online (or optional physical presence) user trainings among the most frequently used organizational learning methods; this corresponds to an alignment maturity of level **3** (Established Process).
- **Company C:** The third respondent mentions that knowledge distribution and organizational learning is facilitated in a formal way by means of written documentations and personal evaluations/trainings. Organizational learning and knowledge distribution is subject to daily monitoring by the IT manager. All of these facts together indicate an alignment maturity of level **5** (Optimal Process).

3) Describe how your IT department communicates with the business. Is the communication bidirectional? Are there any formalized communication methods and which are those?

- **Company A:** The respondent mentions that the communication between the business and IT domains happens in a bidirectional and ad-hoc basis. The respondent characterizes this communication method as highly informal and flexible; this results in an alignment maturity of level **5** (Optimal Process).
- **Company B:** The second respondent believes that the communication method between the business and IT is not formal at all. The respondent believes that the communication is very flexible and takes place in both directions, therefore, an alignment maturity of level **5** (Optimal Process) can be assigned for this alignment sub-criterion.
- **Company C:** The third respondent reports that the communication between the Business and IT domains is not done only in person; the respondent mentions the existence of other media (emails, WhatsApp groups) being part of this informal communication path. Given the existence of more formalized communication media, the alignment maturity for this sub-criterion is of level **4** (Improved Process).

4.2.2 Competency/Value Measurements Maturity

1) Which metrics do you use to measure business and IT performance? How regularly are these measures being reviewed?

- **Company A:** The respondent acknowledged that the business performance is measured through a formal and regularized Key Performance Indicators (KPIs) analysis and therefore achieves an alignment maturity of level **3** (Establishing Process). Contrastingly, the IT performance is not yet being measured in a formalized way so it receives the lowest alignment maturity of level **1** (Without Process).
- **Company B:** No metrics are being used to measure and review the business and IT performance. Which is why the lowest alignment maturity of level **1** (Without Process) has to be assigned.
- **Company C:** The third respondent does not recognize any metrics that are currently in use for measuring and reviewing the business and IT performance. Which is why the lowest alignment maturity of level **1** (Without Process) has to be assigned.

2) Are your business and IT metrics linked in any way?

- **Company A:** As there are no metrics for the IT performance presently, the respondent recognized no formal linkage between the business and IT metrics. Consequentially, this corresponds to an alignment maturity of level **1** (Without Process).
- **Company B:** Since the second respondent did not recognize any formal metrics to measure the Business and IT performance, it is self-evident that no link exists between the business and IT metrics. Consequentially, this corresponds to an alignment maturity of level **1** (Without Process).
- **Company C:** Since the third respondent did not recognize any formal metrics to measure the Business and IT performance, there can be no link between the business and IT metrics. This corresponds to an alignment maturity of level **1** (Without Process).

3) How regularly do you perform benchmarking analyses? What impact do the results have on future decisions and actions of your organization?

- **Company A:** According to the first respondent, the corporation uses regular benchmark analyses to compare suppliers. The results of these benchmarking analyses usually prompt some sort of accompanying action, so a maturity of level **4** (Improved Process) can be assigned.
- **Company B:** The second respondent did not recognize any benchmarking practices taking place within the company. Consequentially, an alignment maturity score of level **1** (Without Process) can be assigned.
- **Company C:** The third respondent reports that there are no benchmarking practices taking place within the company. An alignment maturity score of level **1** (Without Process) can be assigned.

4) State to which extent your company has implemented continuous improvement practices. Does the organization measure the effectiveness of these practices? If so, how frequently are they being reviewed?

- **Company A:** The organization is finalizing the set-up up a system of continuous improvement practices in their IT department after some major incidents have occurred in the past. An alignment maturity of level **2** (Beginning Process) can thus be attributed.
- **Company B:** The second respondent did not recognize any continuous improvement practices put in place within the company. Consequentially, an alignment maturity score of level **1** (Without Process) can be assigned.
- **Company C:** The third respondent does not recognize any continuous improvement practices within the company. Consequentially, an alignment maturity score of level **1** (Without Process) can be assigned.

4.2.3 Governance Maturity

1) Do you have a senior level IT steering committee in place? If so, please describe briefly its structure: Who is involved? What is the nature/frequency of these meetings (formal, informal, etc.,)?

- **Company A:** The first respondent replied that there is a senior-level steering committee meeting established, including, among others, the CIO and the business development manager. However, the convening of this IT steering committee happens on an ad-doc timing. The alignment maturity level corresponding to this structure is of level **3** (Establishing Process).
- **Company B:** The second respondent does not recognize any senior-level IT steering committee meetings taking place within the company; wherefore, an alignment maturity of level **1** (Without Process) can be assigned.
- **Company C:** The third respondent does not recognize any senior-level IT steering committee mechanism set in place within the organization. Thereby, the corresponding alignment maturity is of level **1** (Without Process).

2) To whom does the CIO of your company report to? (i.e., CFO, COO, CEO)

- **Company A:** According to the first respondent, there is an indirect reporting relationship between the company's CIO and CEO; the former reports directly to the CFO, which makes for an alignment maturity of level **1** (Without Process).
- **Company B:** According to the second respondent, there is an indirect reporting relationship between the company's CIO and CEO; the former reports directly to the CFO, which makes for an alignment maturity of level **1** (Without process).
- **Company C:** The third respondent notes a more direct reporting relationship as the CIO reports to the COO and CEO; this reporting relationship matches an alignment maturity of level **3** (Establishing Process).

3) What is the main reason, in your opinion, for your organization to invest in IT?

- **Company A:** The first respondent mentions safety considerations in transportation as the main reason why the company invests in IT. With regard to the processes related to safety and security in transportation, IT spending can be regarded as a process enabler. Hence, the alignment maturity is of level **3** (Establishing Process).
- **Company B:** The second interviewee states that the rationale for IT spending lies in its role as a process driver, which corresponds to an alignment maturity of level **4** (Improved Process).
- **Company C:** The third respondent names the business requirements as the rationale for IT spending. In that way, the IT domain (and its spending logic) takes the role as a business process enabler and is assigned an alignment maturity of level **3** (Establishing Process).

4.2.4 Partnership Maturity

1) How would you estimate the role of IT in strategic planning? Does it have an impact on the company's business processes or strategies?

- **Company A:** At the time of the interview, the respondent acknowledged that IT did not have any impact on the enterprise's strategic planning. For this reason, this first sub-criterion for partnership maturity receives an alignment maturity of level **1** (Without Process).
- **Company B:** The second interviewee reports that the role of IT in the company can be considered as a supportive one where the IT functions as a service to the business and is, consequently, not involved in strategic business planning. So this first sub-criterion for partnership maturity achieves an alignment maturity of level **1** (Without Process).
- **Company C:** The third respondent mentions that the IT domain does not seem to have an impact on the overall organizational strategic planning. This yields an alignment maturity of level **1** (Without Process).

2) Does your organization use defined processes to manage the IT-business relationship? If so, are they subject to continuous improvement?

- **Company A:** According to the respondent, the organization in question does not use any defined processes managing the IT-business relationship presently; hence an alignment maturity of level **1** (Without Process) can be assigned.
- **Company B:** The second respondent mentions that the organization does not make use of any defined processes managing the IT-business relationship; this results in an alignment maturity of level **1** (Without Process).
- **Company C:** The third respondent does not recognize any defined processes to manage the business/IT relationship; thereby, an alignment maturity of level **1** (Without Process) can be assigned.

3) How are risks and rewards shared within the business focus within the company? How are risks and rewards shared within the IT department within the company? Are there any special incentives for IT managers to take risks?

- **Company A:** When asked, the first respondent stated that there is currently no risks-rewards awareness within the IT domain. The business domain seems to be getting an approximate equitable margin of returns of the rewards-risks ratio. However, the respondent does not recognize it to be the case with the IT domain. In consequence, the alignment maturity that can be assigned is of level **1** (Without Process).
- **Company B:** The second respondent attributes to the entire IT domain the role of a service; therefore, there is no distribution of risks and rewards. The accordant alignment maturity is of level **1** (Without Process).
- **Company C:** The third respondent mentions that while risks are shared between the two domains, the IT function receives no share of the rewards. Therefore, one cannot assume an alignment score of level 3, since the organization would have to start sharing both risks and rewards to reach that level. Consequently, the alignment maturity is of level **2** (Beginning Process).

4.2.5 Scope & Architecture Maturity

1) Are there any defined technological standards within your organization? If so, are these standard-definitions valid for the whole enterprise, or even for interactions with other enterprises?

- **Company A:** Establishing standard-definitions is part of an assignment of a newly created architecture team; however, the team has not established any standard-definition so far. So, for the moment, the alignment maturity is of level **1** (Without Process), with a tendency to increase in the near future.
- **Company B:** The company has no defined technological standards, according to the second respondent; thereby, the alignment maturity that can be assigned is of level **1** (Without Process).
- **Company C:** The respondent recognizes that the company has not defined any existing technological standards, which makes for an alignment maturity of level **1** (Without Process).

2) Is your IT architecture transparent and flexible to support technological infrastructure changes? Does the term "technology management" has an applicable tribute in the company?

- **Company A:** The respondent characterizes the degree of architectural transparency and flexibility as limited, which corresponds to an alignment maturity of level **2** (Beginning Process). However, improving the degree of architectural transparency and flexibility via the establishment of technology management practices is a mid-term goal of the architectural rework process the enterprise has started, so there is a tendency for improvement in the future.

- **Company B:** Despite the inexistence of technological standards, the second respondent describes the IT architecture of the company as flexible and transparent. Yet, there is no formal effective emerging technology management; Accordingly, the alignment maturity score that can be attributed is of level **3** (Establishing Process).
- **Company C:** The third interviewee attributes transparency and flexibility to the company's ICT, but the question whether technology management exists could not be affirmed. Since effective emerging technology management would be the prerequisite for an alignment maturity of the level 4, we have to attribute a alignment maturity of level **3** (Establishing Process).

4.2.6 Skills Maturity

1) Do hiring and retention programs exist for the staff members; if yes, are they effective? Do you also consider business skills with IT hiring decisions?

- **Company A:** Business skills are not an equally important prerequisite when considering the hire of IT staff. In other words, the IT hiring decisions are based mostly on technical skills. For this sub-criterion, this means an alignment maturity of level **2** (Beginning Process).
- **Company B:** The second respondent realizes great hindrances in the organization's ability to attract and retain top talent. Business skills are completely bypassed when considering an IT hire. In consequence, an alignment maturity of level **1** (Without Process) can be assigned.
- **Company C:** The third respondent mentions that he is the only employee in the IT department. Therefore IT staff hiring and retention programs are not relevant to this company. We can assign an alignment maturity of level **1** (Without Process).

2) Are career crossover opportunities or job transfers a frequent phenomenon in your organization? Do they mainly concern the staff within a department or is the unit or corporate management also affected?

- **Company A:** Internal mobility and career crossover opportunities occur regularly at all levels, including the corporate level; this corresponds to the highest possible alignment maturity of level **5** (Optimal Process).
- **Company B:** The second respondent realizes great hindrances in the possibility to perform career crossovers or job transfers within the organization. In consequence, an alignment maturity of level **1** (Without Process) can be assigned.
- **Company C:** The third respondent mentions that career crossover opportunities do not really exist within the company so an alignment maturity of level **1** (Without Process) can be assigned.

3) Do change readiness programs exist in your enterprise? If so, are they restricted to the functional level or are there change readiness programs at corporate level as well?

- **Company A:** The change readiness sub-criterion seems to be at an alignment maturity of level **1** (Without Process), as the first respondent does not recognize any applicable and effective change readiness program within the company. Changes still occur based on employer-employee evaluations.
- **Company B:** The second respondent does not acknowledge the existence of any change readiness program within the organization; hence, an alignment maturity of level **1** (Without Process) can be assigned.
- **Company C:** The third respondent mentions that change readiness programs do not exist within the company so an alignment maturity of level **1** (Without Process) can be assigned.

4.3 Preliminary Results

Table 4 presents a synopsis of the respondents' answers; in particular, the table presents the attributed alignment maturity levels, per alignment dimension, per company; The numerical values of the cells in each row represent the average score attributed to all the aforementioned questions, nested within their corresponding alignment dimension. The final row presents the average strategic alignment maturity level, per company. When comparing the individual alignment maturity scores per row, we can observe a generalized tendency, on behalf of the respondents, to assign very low scores to their companies' partnership maturity. Contrastingly, all respondents perceive that their respective companies score the highest in term of their communications maturity. It is interesting to consider the impact of the pandemic in the shaping of these two particular alignment dimensions; more specifically, we expect the switch to remote-working norms (due to the pandemic) to have influenced the need for increased communication between the business/IT domains. At the same time, these remote-working modules may have inflicted a severe impact in the relationship and trust-management status between these two domains. A future research studying the evolution of the alignment maturity scores of organizations before and during the COVID-19 pandemic could shed some light on this hypothesis.

5 Discussion and Future Orientations

At this point, we need to mention that the attributed alignment maturity scores, as summarized and presented in Table 4, should not be regarded as the centerpiece of the present study. We have to be cognizant of the fact that the process describing the

Table 4 Comparison of the strategic maturity scores for companies A, B, and C

	Company A	Company B	Company C
Communication maturity level	3,3	3,3	4,3
Competency/value measurements maturity level	2,2	1,0	1,0
Governance maturity level	2,3	2,0	2,3
Partnership maturity level	1,0	1,0	1,3
Scope & architecture maturity level	1,5	2,0	2,0
Skills maturity level	2,7	1,0	1,0
Average strategic alignment maturity level[a]	**2,2**	**1,7**	**2,0**

Source: Luftman (2000)

[a]Maximum Maturity-Level Score: 5. Rounded to one decimal place

achievement of the alignment maturity scores for these particular companies (Sects. 3.2 and 4.2) was only a fragment of the broader methodology for the investigation of the need for an operationalized version of the SAMM. In fact, the premise of the entire study is concerned with the exploration of the need for an alignment evaluation mechanism, tool, or instrument that could yield significant alignment insights in a short fraction of time, and without having to mobilize numerous human and technological resources in order to attain these insights. Thereby, a point of limitation that can be construed by the use of a small sample size within our case study can actually be ascribed to the exploratory nature of the aforementioned exercise. The next stage of our research strand is comprised of the planification for the orchestration of a wider sample-sized interview process within various companies while utilizing our questionnaire as the main survey instrument. The objective of such a descriptive research would be to fully corroborate the utilization of our survey instrument to yield swift strategic alignment insights without jeopardizing the uninterrupted the daily mode of operations for organizations. The results of this analysis are to be released in a future communication.

At this point, we need to mention that the methodology establishing the achievement of the operationalized version of the SAMM has evolved within the context of commercial (profit-seeking) organizations (i.e., companies A, B, and C). Thereby, a second point of limitation stems from the study's lack of inclusion of organizations having multifaceted missions (i.e., being responsible for sociocultural propagations besides the establishment of their financial bottom-line). Accordingly, another orientation of the present research can be derived by the replication of our proposed methodology within such organizations/institutions. The study of Tsilionis et al. (2021a, b) can provide the baseline for such an endeavor; the latter focuses on the establishment of a goal-oriented conceptual model to evaluate the strategic fit between the generic strategy of a Belgian higher education institution and a new GDPR[4]-implementation IT project[5] undertaken by the latter. In particular, the study

[4] General Data Protection Regulation.

[5] The IT project refered to the development and deployment of a new database to support the Belgian university-college with the processing/maintenance of data-sensitive records of students.

illustrates (i) the higher education missions, and (ii) the strategic objectives of that institution; it also shows how the alignment between the GDPR-implementation project and these missions/objectives can be identified, represented, and evaluated. However, the IT strategy of the higher education institution was not included as a formal element in the study. As a result, applying the SAMM to that institution can offer a holistic appreciation of the interconnectedness between its business and IT domains while uncovering possible bottlenecks that might call for the SAMM's operationalization/customization within the particular educational setting.

Overall, our present analysis amounted to the recognition of the dominant opprobria related to the assessment process of the SAMM after the occurrence of adverse events that can impact the orderly conduct of business for enterprises. In this context, a major disdain attributed to the SAMM (i.e., the commitment of costly resources before starting the strategic alignment evaluation process) is addressed with the provision of an operationalized version of the SAMM. A major policy implication derived from our analysis resides in the realization of the need for a thorough re-evaluation of alignment-assisting models and frameworks that have been traditionally considered as 'golden standards'. These models, frameworks, and/or tools may have been considered as the vessels for the materialization of invaluable strategic alignment insights in the past; however, contemporary organizations have to be able to operationalize (and perhaps customize) any supporting mechanism that allows them to activate their dynamic capabilities (thusly reducing their strategic decision-making time) in order to battle the rising dynamicity of the modern business environment.

6 Conclusion

The importance of strategic alignment has been well-instantiated within a variety of academic sources. Nevertheless, the literature has debated the accommodating nature and the quality of existing strategic alignment performance indicators; this discourse surmises the need for a better cartography for the establishment of pragmatic, well-defined, and swift alignment processes within organizations. Indeed, a model, a mechanism, or a framework that allows a quick evaluation of strategic alignment constrictions is particularly important during the COVID-19 pandemic; the latter has been forcing organizations to perform faster oscillations between the phase of becoming inert to develop their internal core competences and the phase of becoming agile to face external (environmental) adversities.

A quick assessment of prominent alignment evaluation frameworks reveals an augmented level of incoherence in their alignment evaluation techniques. This study has focused particularly on the theoretical elaboration of the SAMM; the latter, despite its robustness, it has been found to entail a multiplex of alignment criteria as well as the formation of an overly complex assessment process for the assignment of alignment maturity scores to organizations. In this context, the present research was meant to elucidate an exploratory case study where high-level IT executives in

three companies were asked to assess the structure and the potential aid they would get if they were to implement the SAMM within their organizational premises. Their insights, experiences, and opinions were used as input in order to explore the need for the overlay of on operationalized version of the SAMM. The encompassment of the expertise of such specialized personnel in the creation of this operationalized version is a major point of differentiation from previous studies; those, either focused on a mere customization of the SAMM – depending the context of the company that would apply it – or detailed an alternative form of classification for its alignment criteria (i.e., balanced-scorecard format). Contrastingly, our methodology was meant to be based on a 'by the people, for the people' premise; in that way, the same business roles being responsible for the daily materialization of strategic alignment policies within their companies are given the chance to purpose-built an operationalized version of one of the most renowned alignment evaluation frameworks (SAMM).

The operationalized version of the SAMM, as presented in this study, takes the form of a survey instrument (questionnaire); the latter contains a set of non-redundant questions that are meant to provide quick and effective insights about the alignment maturity status of a company. The comprehensive/compact structure of the questionnaire makes its utilization rather easy; indeed, the latter can be administered by any internal worker involved in the company's business-IT activities or an external role (i.e., consultant). Overall, we hypothesize that this survey instrument is supposed to provide quicker alignment evaluation opportunities. We performed a trial-run where we were able to receive crucial insights about the participants' companies strategic alignment statuses. Given the exploratory nature of our research, the next step would be to perform a more concrete evaluation of this survey instrument. The design and the materialization of such a hypothesis-testing (thusly descriptive) case study is to be released in a future communication.

References

Ahuja, S. (2012, June). *Strategic Alignment Maturity Model (SAMM) in a cascading balanced scorecard (BSC) environment: Utilization and challenges*. In International conference on advanced information systems engineering (pp. 567–579). Springer.

Alghamdi, H. A. S. S. A. N., & Sun, L. I. L. Y. (2017). Business and IT alignment in higher education sector. *International Journal of Technology and Engineering Studies, 3*(1), 01–08.

Amankwah-Amoah, J., Khan, Z., & Wood, G. (2021). COVID-19 and business failures: The paradoxes of experience, scale, and scope for theory and practice. *European Management Journal, 39*(2), 179–184.

Avison, D., Jones, J., Powell, P., & Wilson, D. (2004). Using and validating the strategic alignment model. *The Journal of Strategic Information Systems, 13*(3), 223–246.

Baker, J., Jones, D., Cao, Q., & Song, J. (2011). Conceptualizing the dynamic strategic alignment competency. *Journal of the Association for Information Systems, 12*(4), 2.

Belfo, F. P., & Sousa, R. D. (2012). *A critical review of Luftman S instrument for business-IT Alignment*.

Bleistein, S. J., Aurum, A., Cox, K., & Ray, P. K. (2004). Strategy-oriented alignment in requirements engineering: Linking business strategy to requirements of E-business systems using the SOARE approach. *Journal of Research and Practice in Information Technology, 36*(4), 259–276.

Brown, T. A. (2006). Confirmatory factor analysis for applied research. Guilford. *Organizational Research Methods*. 2010, *13*(1), 214–217.

Carracedo, P., Puertas, R., & Marti, L. (2021). Research lines on the impact of the COVID-19 pandemic on business. A text mining analysis. *Journal of Business Research, 132*, 586–593.

Chan, Y. E., & Reich, B. H. (2007). IT alignment: What have we learned? *Journal of Information Technology, 22*(4), 297–315.

Chen, Y., & Huang, H. (2012). Knowledge management fit and its implications for business performance: A profile deviation analysis. *Science Direct, 27*, 262–270.

Collins, J., Macehiter, N., Vile, D., & Ward-Dutton, N. (2007). *The technology garden: Cultivating sustainable IT-business alignment*. Wiley.

Coltman, T., Tallon, P., Sharma, R., & Queiroz, M. (2015). Strategic IT alignment: Twenty-five years on. *Journal of Information Technology, 30*(2), 91–100.

Cumps, B. (2007). *Business-ICT alignment: Practices and determinants*, Leuven, K.U. Leuven, Faculteit Economische en Toegepaste Economische Wetenschappen, 2007 (PhD dissertation).

Dahlberg, T., & Kivijärvi, H. (2006). *An integrated framework for IT governance and the development and validation of an assessment instrument*. In Proceedings of the annual Hawaii international conference on system sciences, 8(C), pp. 1–10.

Dairo, M., Adekola, J., Apostolopoulos, C., & Tsaramirsis, G. (2021). Benchmarking strategic alignment of business and IT strategies: Opportunities, risks, challenges and solutions. *International Journal of Information Technology, 13*(6), 2191–2197.

De Haes, S., Van Grembergen, W., Joshi, A., & Huygh, T. (2020). *Enterprise governance of information technology: Achieving alignment and value in digital organizations* (3rd ed.). Springer.

De O'Luna, A. J. H., Kruchten, P., & De Moura, H. P. (2013). *GAME: Governance for Agile management of enterprises: A management model for Agile governance*. In Proceedings – 2013 IEEE 8th international conference on global software engineering workshops, ICGSEW 2013, pp. 88–90.

Dubinsky, Y., Yaeli, A., Feldman, Y., Zarpas, E., & Nechushtai, G. (2011). Governance of software development. *Software Applications*, 309–327.

El Mekawy, M., Rusu, L., & Ahmed, N. (2009). Business and IT alignment: An evaluation of strategic alignment models. In *Best practices for the knowledge society. Knowledge* (Vol. 49, p. 447). Springer.

Goedvolk, J. G., de Bruin, H., & Rijsenbrij, D. B. B. (1999). *Integrated architectural design of business and information systems*. In The second Nordic Workshop on Software Architecture (NOSA'99).

Halkier, B. (2011). Methodological practicalities in analytical generalization. *Qualitative Inquiry, 17*(9), 787–797.

Henderson, J. C., & Venkatraman, H. (1993). Strategic alignment: Leveraging information technology for transforming organizations. *IBM Systems Journal, 32*(1), 472–484.

Karpovsky, A., & Galliers, R. D. (2015). Aligning in practice: From current cases to a new agenda. *Journal of Information Technology, 30*(2), 136–160.

Khaiata, M., & Zualkernan, I. A. (2009). A simple instrument to measure IT-business alignment maturity. *Information Systems Management, 26*(2), 138–152.

Liebowitz, J. (Ed.). (2020). *The business of pandemics: The COVID-19 story*. CRC Press.

Longhurst, R. (2009). Interviews: In-depth, semi-structured. In *International encyclopedia of human geography* (pp. 580–584).

Luftman, J. (2000). Assessing business-IT alignment maturity. *Communications of the Association for Information Systems, 4*(14).

Luftman, J. (2003). Assessing IT/business alignment. *Information Systems Management, 20*(4), 9–15.

Luftman, J., Papp, R., & Brier, T. (1999). Enablers and inhibitors of business-IT alignment. *Communications of the Association for Information Systems, 1*(1), 11.

Mack, N. (2005). *Qualitative research methods: A data collector's field guide*.

Martinsons, M., Davison, R., & Tse, D. (1999). The balanced scorecard: A foundation for the strategic management of information systems. *Decision Support Systems, 25*(1), 71–88.

Qumer, A. (2017). *Defining an integrated agile governance for large agile software development environments*. In International conference on extreme programming and agile processes in software engineering, pp. 157–160.

Reich, B. H., & Benbasat, I. (2000). Factors that influence the social dimension of alignment between business and information technology objectives. *MIS Quarterly*, 81–113.

Sabherwal, R., Hirschheim, R., & Goles, T. (2001). The dynamics of alignment: Insights from a punctuated equilibrium model. *Organization Science, 12*(2), 179–197.

Saunders, M., Lewis, P., & Thornhill, A. (2016). *Research methods for business students* (7th ed.). Pearson.

Schlosser, F., Wagner, H. T., & Coltman, T. (2012). *Reconsidering the dimensions of business-IT alignment*. In 2012 45th Hawaii international conference on system sciences (pp. 5053–5061). IEEE.

Seetharaman, P. (2020). Business models shifts: Impact of Covid-19. *International Journal of Information Management, 54*, 102173.

Simonsson, M., Johnson, P., & Ekstedt, M. (2010). The effect of IT governance maturity on IT governance performance. *Information Systems Management, 27*(1), 10–24.

Snyder, I., Marginson, S., & Lewis, T. (2007). 'An alignment of the planets': Mapping the intersections between pedagogy, technology and Management in Australian Universities. *Journal of Higher Education Policy and Management, 29*(2), 187–202.

Tallon, P. P., & Kraemer, K. L. (2003). Investigating the relationship between strategic alignment and information technology business value: The discovery of a paradox. In *Creating business value with information technology: Challenges and solutions* (pp. 1–22). IGI Global.

Thomas, G. (2010). Doing case study: Abduction not induction, Phronesis not theory. *Qualitative Inquiry, 16*, 575–582.

Tsang, E. W. K. (2014). Generalizing from research findings: The merits of case studies. *International Journal of Management Reviews, 16*, 369–383.

Tsilionis, K., & Wautelet, Y. (2021a). Aligning strategic-driven governance of business IT services with their agile development: A conceptual Modeling-based approach. In *Balancing agile and disciplined engineering and management approaches for IT services and software products* (pp. 228–247). IGI Global.

Tsilionis, K., & Wautelet, Y. (2021b). *From service-orientation to Agile development by conceptually linking business IT services and user stories: A meta-model and a process fragment*. In 2021 IEEE 23rd Conference on Business Informatics (CBI) (Vol. 2, pp. 153–162). IEEE.

Tsilionis, K., & Wautelet, Y. (2022). A model-driven framework to support strategic agility: Value-added perspective. *Information and Software Technology, 141*, 106734.

Tsilionis, K., Chagniot, A., & Wautelet, Y. (2021a). Achieving business and IT alignment in higher education institutions using conceptual Modeling: A GDPR implementation project as case study. In A. Visvizi, M. D. Lytras, & N. R. Aljohani (Eds.), *Research and innovation forum 2020*. Springer.

Tsilionis, K., Wautelet, Y., & Tupili, D. (2021b). *Digital transformation and operational agility: Love story or conceptual mismatch*. In Proceedings of workshops co-organized with the 14th IFIP WG 8.1 Working Conference on the Practice of Enterprise Modelling (PoEM 2021), 3031 (pp. 1–14). CEUR workshop proceedings.

Verbeke, A., & Yuan, W. (2021). A few implications of the COVID-19 pandemic for international business strategy research. *Journal of Management Studies, 58*(2), 597–601.

Verma, S., & Gustafsson, A. (2020). Investigating the emerging COVID-19 research trends in the field of business and management: A bibliometric analysis approach. *Journal of Business Research, 118*, 253–261.

Wautelet, Y. (2019). A model-driven IT governance process based on the strategic impact evaluation of services. *Journal of Systems and Software, 149*, 462–475.
Wohlin, C. (2021). Case study research in software engineering – It is a case, and it is a study, but is it a case study? *Information and Software Technology, 133*, 106514.
Yin, R. (2010). Analytic generalization. In A. J. Mills, G. Durepos, & E. Wiebe (Eds.), *Encyclopedia of case study research* (pp. 21–23). Sage.
Zachman, J. (1987). A framework for information systems architecture. *IBM Systems Journal, 26*, 276–292.
Zito, M., Ingusci, E., Cortese, C. G., Giancaspro, M. L., Manuti, A., Molino, M., et al. (2021). Does the end justify the means? The role of organizational communication among work-from-home employees during the COVID-19 pandemic. *International Journal of Environmental Research and Public Health, 18*(8), 3933.

Franz Huber held a Master's degree in Business Information Management from KU Leuven, Belgium. He worked as an IT consultant focusing on resolving Business-IT Alignment issues within organizational settings. The optimization of IT Governance structures within enterprises was also among his occupational duties and research interests.

Konstantinos Tsilionis holds a Bachelor's degree in Physics from the Aristotle University of Thessaloniki, Greece. He holds a Master's degree in Business Economics and a Master's degree in Business Administration (MBA) from KU Leuven, Belgium. He worked for 2.5 years as a physics instructor in Greece and more than 2 years within the Belgian financial sector as a corporate actions market expert as well as a financial data analyst. He is currently a Ph.D. researcher at the Research Centre for Information Systems Engineering of KU Leuven. His research interests include (Agile) Requirements Engineering, Model-Based Systems Engineering, IT Governance.

Yves Wautelet is a Professor in Information Systems at KU Leuven, Belgium and invited professor at Université de Namur, Belgium. He formerly has been an IT project manager and a Postdoc Fellow at Université catholique de Louvain, Belgium. He completed a Ph.D. thesis focusing on project and risk management issues in large enterprise software design. Yves also holds a Master of Management Sciences as well as a Master of Information Systems. His research interests include various aspects of software engineering and enterprise information systems such as life-cycle management, requirements engineering, IT governance, agent-oriented development and e-learning. He also focuses on the application of his research into industrial environments.

Claude Doom is both an academic and a professional. He is an Associate Professor in Business Information Management at KU Leuven, Belgium. Prior to teaching, he worked as an IT technical architect and as a consultant in enterprise IT strategy and architecture. He has authored over 70 scientific and technical publications on information management and astronomy.

Dorien Martinet holds a Master's degree in Business Information Management from KU Leuven, Belgium. During her Master's degree, she analyzed shifts in business-IT alignment during COVID-19 in collaboration with KPMG. She is currently working on projects in the public sector as a business analyst at Sopra Steria. During these projects, she focuses on European applications and conversational agents.

Digitizing Education During COVID-19 Pandemic in Bahrain Higher Education Context

Ghilan Al-Madhagy Taufiq-Hail and Adel Sarea

1 Introduction

The lockdown and the emergent regulations imposed combined with social distance measures escalated the situation, especially at schools, universities, and other higher education institutions. The education process was affected heavily and both the staff and students along with the administration and families were not prepared for such a sudden attack of the Covid-19 and its consequences on the pedagogical process (Sarea et al., 2021, 2022). Also, it is opined in recent works, pertaining the impact of Covid-19 on the education and mental health inside the universities, that the effect is still unknown but expected to be sever (Araújo et al., 2020; Odriozola-González et al., 2020). Additionally, new challenges emerged such as the online teaching and learning as an outcome of the social distance measures, and another challenge was the transformation of syllabi in a short time from face-to-face into a completely online method of teaching and learning. These critical issues emerged—such as the readiness of educators as well as the students, academic institution administration, and families—or faced have created a situation of instability, uncertainty, and fear of unexpected outcomes for the students, the families, the university administration, and the academic staff.

In this region, the online education was lagging behind western countries and suffered from various issues (Al-Odeh, 2020). There were different causes that can be summarized as follows (Al-Odeh, 2020): (1) the technical infrastructure and the internet were late to be well-established and utilized; (2) the knowledge of the immense benefits of the online education was lacked; (3) the strong belief of the

G. A.-M. Taufiq-Hail
University of Buraimi, Buraimi, Oman

A. Sarea (✉)
Ahlia University, Manama, Bahrain
e-mail: asarea@ahlia.edu.bh

M. Alaali (ed.), *COVID-19 Challenges to University Information Technology Governance*, https://doi.org/10.1007/978-3-031-13351-0_8

superiority and adequacy of the traditional education compared with the online education; (4) the belief that the resources available on-campus are enough to achieve the pedagogical goals and no need for further online materials that could cost a lot; and finally (5) the bureaucracy and corruption.

To accomplish the objective of the study, this descriptive and empirical study with a quantitative research method using a survey instrument was developed and distributed among the Academic Staff in Bahrain. The scope is the higher education institutions in a public or private entity in Bahrain.

2 Literature Review

During Covid-19 outbreak, many universities and higher education institutions around the world faced many challenges and obstacles to continue the pedagogical education as a consequence of the sudden attack of the coronavirus (Sarea et al., 2021). This swift and unpredicted change impacted the Academic staff as well. The higher education institutions are, therefore, under severe pressure in terms of reorganizing the teaching schedules, transforming the conventional syllabi into digital form, and continuing their educational high-quality mission. Gulf Cooperative Council (GCC) countries were on the same boat and higher education institutions with its stakeholder were affected by the Covid-19 pandemic as well.

The early measures and the compliance with World Health Organizations guidelines lead to a relatively a smaller number of confirmed cases in GCC. As the mortality rate dramatically increased globally and the number of confirmed cases GCC were increasingly changing, the higher education institutions were affected heavily and a number of 12 million students were affected (Bensaid & Brahimi, 2021).

As reported in recent studies (Sarea et al., 2021), the closure and suspension of educational institutions were imposed in all GCC countries that started on February 25, 2020, in Bahrain, next United Arab Emirates on March 8, 202, followed by Qatar and Kingdom of Saudi Arabia on March 9, 2020. Kuwait followed the crowed in the closure on March 12, 2020, and eventually Oman implemented the closure on March 15, 2020. As a result of this, not only the higher education institutes and students impacted by this adversity caused by Covid-19, but also the educators that were among those who were negatively affected with new and emerging burden to shift toward the online and distance education with all difficulties and challenges surrounded.

In general, the past two decades have witnessed the development of high-quality education in GCC countries and many initiatives advocated the establishment of the blended education. The transition to the digital era was slowly accepted although the resources and the technical infrastructure were ready for it. In fact, the human factor was one of the obstacles as the motivation to move to the blended education was not really looked at as beneficial as the traditional education (Al-Odeh, 2020). However, the emergent of Covid-19 pandemic has led to a complete transition to the online education with no exception as there is no other way around to endure the

education process. In principle, the transformation into online learning was heavily conducted during the lockdown imposed by countries around the globe. Bahrain was among these countries that adopted the transition. In addition, if this situation endures for longitudinal periods, this will require the accreditation of academic degrees obtained via this type of education. Importantly, the attestation of academic degrees in Bahrain is still not in effect and many holders of academic degrees attained by distance learning are still struggling to get their certificates attested and accredited by the ministry of higher education. Furthermore, the acceptance of this type of higher education teaching and learning methods was suffering a lot in the pre-Covid-19 era, although Covid-19 has emerged to be a vital player to raise the accreditation issue in order to find a plausible solution. More importantly, if the certificate is not accredited, the holder such a degree would not be able to pursue any higher education. Also, the public and recruiting bodies would not accept such academic degrees with no accreditation in order to employ the graduates. Hence, there is an immense need to study this issue from the perspective of the teaching staff at the universities in middle east, in general, and in Bahrain in specific. Brining their thoughts to the forefront would help and motivate the decision makers to reconsider the issue of accreditation.

3 Methodology

3.1 Sampling and Data Collection Procedures

The survey employed self-administered procedure and the survey questions were formulated using Google forms. Based on the new procedures imposed in Bahrain to flatten the number of infected cases and the social distance was one of the obstacles to distribute the survey. Therefore, the online participation was best suited to acquire the responses. Selecting the snowball and purposive sampling techniques was decided to collect the responses from the relevant participants. Also, these techniques started with small number of participants where they were asked to send the survey to others using the link provided through WhatsApp application.

The collection of the responses took almost 2 months. The unit of sampling recruited is the teaching staff at the higher education institutions at public and private universities in Bahrain. To identify the minimum sample size of the current research, the researchers followed the guideline of Sekaran (2003) where sample sizes greater than 30 are appropriate for most research. However, the larger the samples, the better insights that can be attained as many scholars recommends (Creswell, 2012; Tabachnick & Fidell, 2013; Hair et al., 2017).

After collecting the data, the screening phase was conducted to eliminate non-complete responses. Then the organization of the question groups and the coding of data were taken place. The Microsoft Excel was used to generate the figures and tables, and SPSS software packages was used to analyse the demographic part. The

Table 1 Main topics covered in the research

Topic measured and related items	Scale				
Covid-19 impact on digitizing education					
1. Because of the Covid-19 pandemic, I believe that totally digitizing education would be compulsory around the globe?	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
2. Because of the Covid-19 pandemic, in my opinion, digitizing education would be per se an educational authorities' requirement.	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
3. Because of Covid-19, in my opinion, digitizing education would be the common trend of the educational institutions?	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
4. Because of the Covid-19 pandemic, in my view, digitizing education would facilitate the recognition of online distance-learning academic certificates/ degrees in both developed and developing countries?	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
5. Because of the Covid-19 pandemic, in my view, online distance-learning would be more acceptable and recognized in public life, ministries of education/ authorities or recruiting bodies?	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree

collected responses were 88 from both public and private universities in Bahrain. However, the valid number of responses is 83 after eliminating the incomplete responses with 94.3% response rate.

Table 1 exhibits DE questions with related items and their scale.

3.2 Measurements' Development

The questionnaire is divided into two main sections. The first section pertaining the demographics such as: gender, age, type of university, experience, and the current academic degree. Section two includes three groups of question. The second section, Covid-19 Impact on Digitizing Education group of questions has five items anchored with five-points Likert-scale ranging from "1 Strongly disagree to 5 Strongly agree". This group of items covered topics of (1) whether digitizing education implementation would be compulsory globally, (2) Whether digitizing education implementation would be a requirement locally, (3) Whether digitizing education implementation would be a common trend in educational institutes, (4) Whether the recognition of the degree obtained through online distance learning would be acceptable and accredited, and (5) finally the acceptance of online distance learning by the higher education authorities, the public, and the recruiting agencies or employers as a result of Covid-19 pandemic.

4 Results and Discussion

4.1 Respondents' Profile

For the demographic's analysis, the gender, the age group, the experience, and the academic degree is evaluated. As shown in Table 2, the number of males and females are almost the same with a percentage of 48.19% of males and 51.81% females. As can be found in the results, the gender equality is achieved in this research that employs judgment purposive sampling techniques. Regarding the age, it has been found that the dominant age group is group 1 (26–33 years) with 38.6%, followed by group 3 (42–49 years) with 31.3%, then group 2 (34–41 years) with 22.9%, while the least percentage in age group is group 5 (above 57) with a 2.4%. Pertaining the experience, the most dominant group is in group 1 (less than 3 years) with 25.3%, then group 5 (over 17 years) with 24.1%, followed by group 3 (8–12 years) with a percentage of 19.3%, then group 2 (3–7 years) with a percentage of 18.1%., and finally, group 4 (13–17 years) with 13.3%. The experience result shows that

Table 2 Respondents' demographics

Attribute	Mean	Std. Deviation	Min	Max	Freq	Percent%
Gender	1.52	0.50	1	2		
Male					40	48.19
Female					43	51.81
Total					83	100
Age group	2.10	1.05	1	5		
1. 26–33					32	38.6
2. 34–41					19	22.9
3. 42–49					26	31.3
4. 50–57					4	4.8
5. Above 57					2	2.4
Total					83	100
Experience	2.93	1.52	1	5		
1. Less than 3 years					21	25.3
2. 3–7 years					15	18.1
3. 8–12 years					16	19.3
4. 13–17 years					11	13.3
5. More than 17 years					20	24.1
Total					83	100
Academic degree	3.25	1.15	1	5		
1. Diploma					11	13.3
2. Bachelors' degree					8	9.6
3. Master's degree					18	21.7
4. Ph.D. degree					41	49.4
5. Post doctorate					5	6
Total					83	100

majority of the respondents (almost 50% of the total responses) are in the higher and lower extremes. Regarding the educational level, majority of the respondents hold Ph.D. degree (49.4%), followed by master's degree holders (21.7%). On the other hand, post doctorate holders are the least group in the academic degree category (6%). Table 1 has more details with respect of mean, standard deviation, minimum and maximum values, frequency, and percentage.

4.1.1 Evaluation of Covid-19 Impact on Digitizing Education

Referring to Fig. 1, the results show that about 46% agrees and strongly agrees on the notion of changing the education into digitized method instead of the conventional way of teaching and tutoring students at higher education institutions in Bahrain. However, 24% disagrees or strongly disagrees on this issue.

The researchers could conclude that apparently those majority (46%) believe in change and feel the transformation of education in the near future is inevitable rather than those who tries to ignore or at least neglect the reality that may be overwhelmed in the coming semesters in 2020/2021.

In item number 2, the focus is on the concept of digitizing education based on the requirements of authorities at the Ministry of Higher Education. Results show, in Fig. 2, that majority (59%) of the educators believe that digitizing education would be one of the requirements to achieve the goals of the higher education future policy and transformation. This view reflects the wide vision of this group as they perceive the education process trend around the globe is turning towards it. Also, calls increasingly show that the social isolation is one of the effective ways to prevent the infection; hence, digitizing education would be compulsory during the pandemic or even in catastrophic events. However, 16% of the respondents, which is considered the minority of the total participants, presume that digitizing education would not be

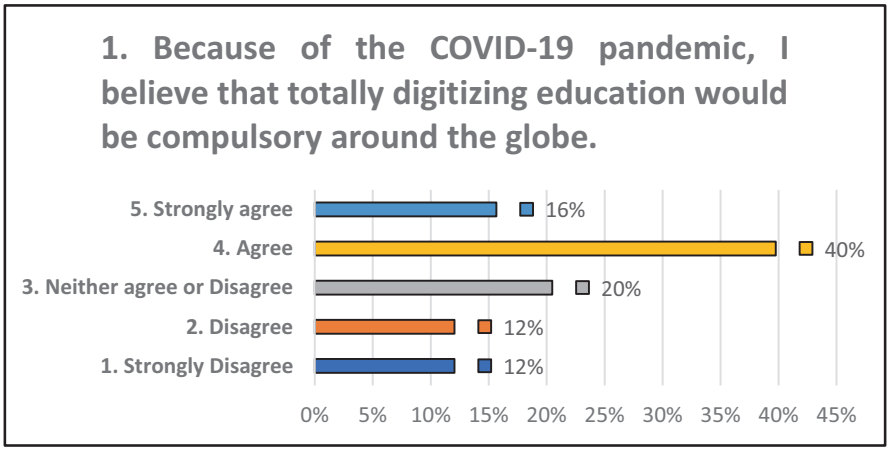


Fig. 1 Measuring whether or not digitizing education would be compulsory

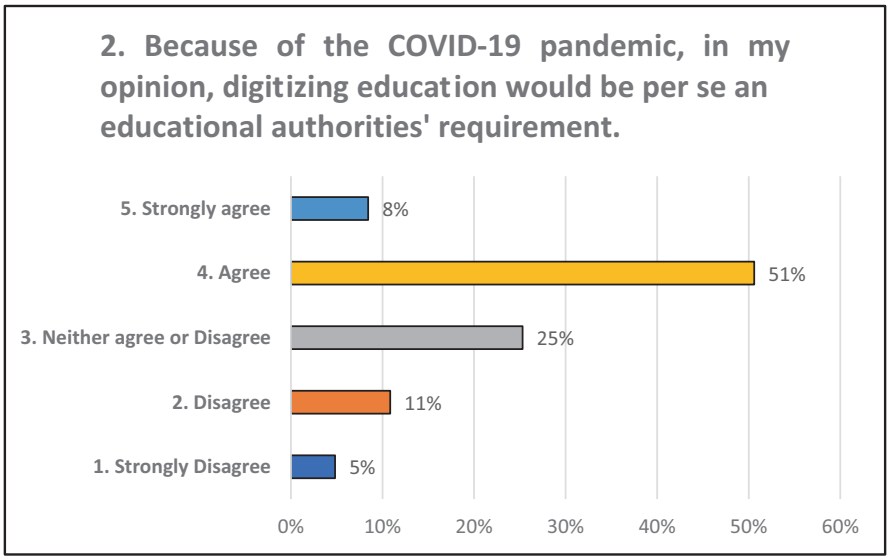


Fig. 2 Whether or not digitizing education would be a requirement

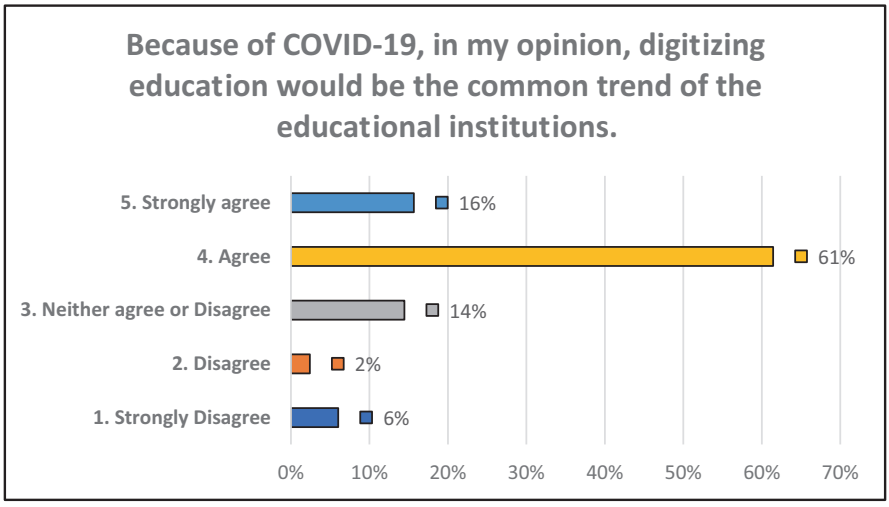


Fig. 3 Measuring the trend of digitizing education

a requirement. Interestingly, 25% of the participants do not have any clue or at least have an appraisal on this regard. The researchers conclude that the future direction of digitizing education would be inevitable based on the statistics obtained.

In item number 3, the focus is on probing the opinions of adopting and changing the education into a digital form at higher education institutions. As exhibited in Fig. 3, the graph shows an overwhelming majority of participants foresee the

adoption of digital education methods at the higher education institutions. Only 8% of the participants disagree or strongly disagree with this issue. This can be explained as the trend perceived in the near future is to adopt the online digital form of education and Covid-19 fostered the process at the management level of these universities.

While inspecting the graph in Fig. 4 for item number 4, it is clear that the majority of the teaching staff predict the acceptance of the academic degree of the online distance learning in the new era of digitizing education. On the other hand, minority (13%) of participants disagrees or strongly disagrees that a major change in the current policy of accrediting academic degrees obtained through online or distance learning is possible. Hence, the overall perception of the teaching staff is in congruent with the acceptance stance of the view of accreditation of academic degree from online distance learning. The view that advocates the accreditation of the academic degree may have an influence on the decision makers at higher education ministries to accelerate the process of accreditation, eliminate the short list of recognized universities that are approved by some GCC countries, and reduces the obstacles to give opportunities for employees who want to upskill and get better education while working.

Inspecting the graph in Fig. 5 for item number 5, the majority of participants (69%) on the idea of the acceptance and recognition of online distance-learning among the public, government entities represented by Ministry of Higher Education or other authorities is dominant. In the contrary, minority of views (12%) by some respondents in this topic can be said to be neglected. Markedly, those who did not give positive or negative answer and remained neutral represent (18%) of the total number of participants. The majority reflects the general and dominant accord on the notion that online distance-learning is going to be a reality and widely accepted within the populace and in government sectors as well as recruiting agencies. The

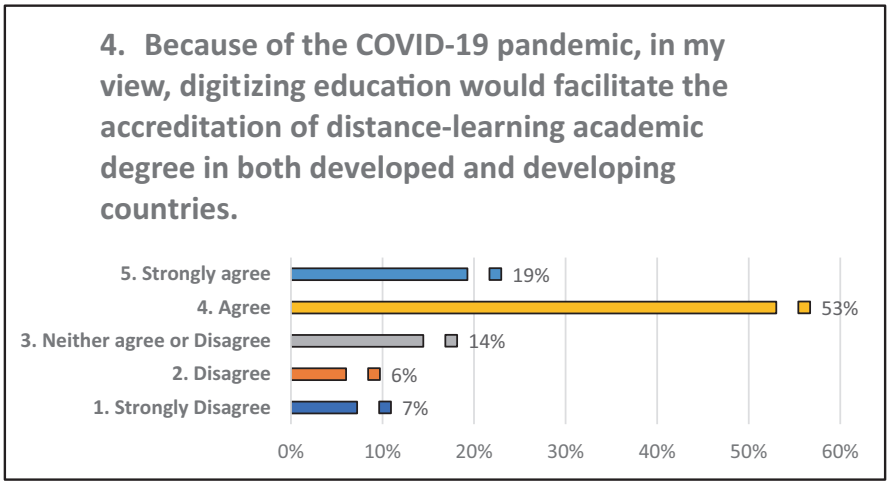


Fig. 4 Statistics of the accreditation of online distance learning academic degrees

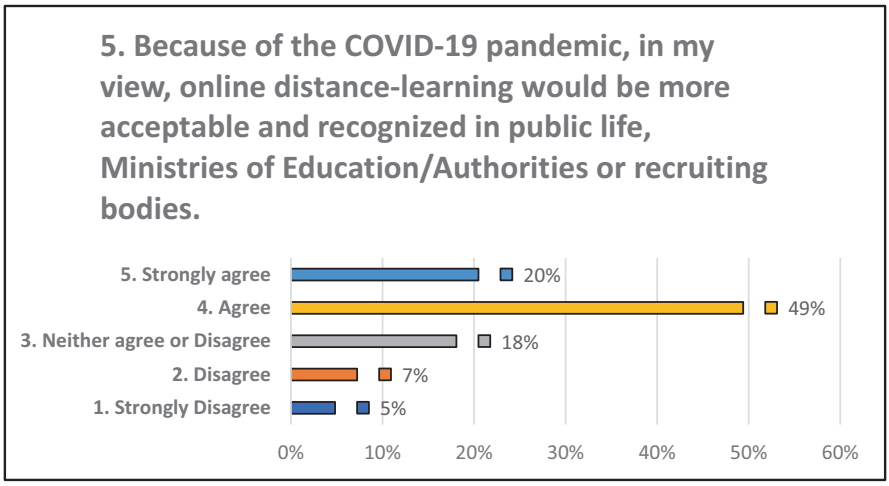


Fig. 5 Statistics on the future acceptance of online distance learning

results gained may convince the Higher Education ministries or other authorities to make amendments to the current policies and to encourage the shift toward the accreditation of academic degrees obtained through distance learning.

5 Conclusion, Implications, Limitations and Future Directions

The outcome of the study revealed interesting results of the crucial role of Covid-19 in the transformation process of digital education. Additionally, after probing into the matter of digitizing education and the accreditation of academic degrees attained by means of online distance-learning, the answers show that the educators foresee positively the future of accredited academic degrees attained by means of digital education. Also, their feedback shows that the recognition of this type of education by the government authorities, recruitment agencies as well as the public is indispensable. In addition, they perceive that digitizing education would be compulsory and the higher education institutions would follow the queue in implementing programs to support this type of education.

Educational Implications: the majority of the academic staff opined that the digital transformation would be compulsory and a requirement by the authorities. This means that the higher education authorities should focus in building a culture of acceptance of this new shift among the public by using different official media and the social networks. Also, they should urge the public to encourage their children to deal with technology positively not only to entertain, but also to learn and extend the knowledge in building different skills.

The results revealed that digitizing education and shifting to online learning, would facilitate the accreditation of academic degrees in Bahrain. This could highlight the dire need to go forward and accelerate the accreditation of academic degrees obtained by online learning and eliminate the restrictions of certain and very limited universities approved by the higher education institutions.

Although the current study revealed valuable results and contributed to the knowledge of literature during the early stages of Covid-19 in Bahrain in getting specific information with subgroup of the higher education sector, the limitations reside can open new avenues for future research. Firstly, the limitations found in the current research can exist in any research and this research is not an exception in that a supportive qualitative interview with open ended questions is recommended to support this explorative study. Therefore, future directions should consider this point.

References

Al-Odeh, M. (2020). What universities in the Middle East can learn from the American online education system. *International Journal of Informatics and Communication Technology (IJ-ICT), 9*, 31. https://doi.org/10.11591/ijict.v9i1.pp31-39

Bensaid, B., & Brahimi, T. (2021). Coping with covid-19: Higher education in the GCCcountries. In A. Visvizi, M. D. Lytras, & N. R. Aljohani (Eds.), *Research and innovation forum 2020* (Springer proceedings in complexity) (pp. 137–153). Springer. https://doi.org/10.1007/978-3-030-62066-0_12

Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (4th ed.). Pearson.

Araújo, F. J. D. O., de Lima, L. S. A., Cidade, P. I. M., Nobre, C. B., & Neto, M. L. R. (2020). Impact of Sars-Cov-2 and its reverberation in global higher education and mental health. *Psychiatry Research, 288*, 112977. https://doi.org/10.1016/j.psychres.2020.112977

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling (PLS-SEM)* (2nd ed.). Sage.

Odriozola-González, P., Planchuelo-Gómez, Á., Irurtia, M. J., & de Luis-García, R. (2020). Psychological effects of the COVID-19 outbreak and lockdown among students and workers of a Spanish university. *Psychiatry Research, 290*, 113108. https://doi.org/10.1016/j.psychres.2020.113108

Sarea, A., Alhadrami, A., & Taufiq-Hail, G. A.-M. (2021). COVID-19 and digitizing accounting education: Empirical evidence from GCC. *PSU Research Review*, ahead-of-print. https://doi.org/10.1108/PRR-10-2020-0034.

Sekaran, U. (2003). *Research methods for business: A skill building approach* (4th ed.). Wiley.

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Pearson Education.

Ghilan Al-Madhagy Taufiq-Hail is an author of a number of articles. His research interests include cloud computing and Green IT, Technology and Innovation, social impact of information technology, information behavior, virtual/e-community, e-government, teleworking, ICT, e-banking, e-government, e-education, e-library, Smart Cities, blockchain studies, human and computer interaction, statistical analysis using PLS-SEM, and open source studies. He is a volunteer reviewer with different peer-review journals including IEEE Access. He is a member of different system and network entities such as Cisco microsystems and Microsoft corporation. He has achieved many certificates in network, security, and systems from Microsoft and Cisco Systems auditing.

Adel Sarea is the winner of Emerald Literati Award 2014 (UK). He possesses over 100 publications indexed in [SCOPUS, SSCI, ESCI, ABDC, ABS] and he has more than a decade of teaching experience. He has been bestowed with many awards and been summoned as the keynote speaker on several occasions. He serves on the editorial team of several international journals published by Elsevier, Emerald, and Taylor & Francis. He is a member of the Accounting and Finance Association of Australia and New Zealand (AFAANZ). In 2015, AP Dr. Sarea has been appointed as a recognized Ph.D. supervisor by Brunel University London. In 2021, he has been entitled as the Senior Editor of the International Journal of Emerging Markets at Emerald Publishing (UK). Associate Editor, Heliyon Business and Economics – (Elsevier), Consulting Editor, Journal of Education for Business – (Taylor & Francis.), Associate Editor, International Journal of Islamic and Middle Eastern Finance and Management- (Emerald), Associate Editor, ISRA International Journal of Islamic Finance – (Emerald), Associate Editor, Asian Journal of Accounting Research (Emerald), Associate Editor, Journal of Islamic Accounting and Business Research- (Emerald), Guest Editor, Journal of Financial Reporting and Accounting- (Emerald) and Associate Editor, MENA Journal of Cross-Cultural Management-Inderscience (UK).

Adopting COBIT 2019 for Information Technology Risks in University Online Learning During COVID-19

Dinar Mutiara Kusumo Nugraheni, Beta Noranita, Satriyo Adhy, and Andi Kurniawan Nugroho

1 Introduction

During the COVID-19 pandemic in early 2020, the learning process and academic situations in university dramatically changed to digital environment. The physical environment is neglected and silent. The virtual and digital traffic in the academic environment is congested. These circumstances drastically altered the university. Technology has changed the possibilities within teaching and learning. Classes, which were previously limited to lectures, talks, and physical objects, are no longer required to be designed in this manner. Teachers and students can use conference technology for replacing the interaction learning process.

The conferencing application significantly increases in term of use during the COVID-19 pandemic. According to the data, leading mobile conferencing platforms Zoom, Microsoft Teams, and Google Meet reported 200 million downloads from users worldwide in August 2021. However, this represents a drop of more than 58 percent from 2020, when Zoom, Microsoft Teams, and Google Meet had 479 million installed (Statista, 2022a). As for the devices to access internet, the majority of the Indonesians were mobile internet users. This may be due to the affordability and user-friendliness of the mobile devices that are available in the Indonesian market (Statista, 2022b). In terms of user penetration, YouTube and WhatsApp were the leading social networks in Indonesia as of the third quarter of 2020 (Statista, 2022b).

D. M. K. Nugraheni (✉) · B. Noranita · S. Adhy
Computer Science Department, Faculty of Science and Mathematics, Universitas Diiponegoro, Tembalang, Semarang, Indonesia
e-mail: dinar.mutiara@live.undip.ac.id; satriyo@live.undip.ac.id

A. K. Nugroho
Electrical Engineering, Engineering Faculty, Universitas Semarang, Tlogosari, Semarang, Indonesia
e-mail: andikn@usm.ac.id

M. Alaali (ed.), *COVID-19 Challenges to University Information Technology Governance*, https://doi.org/10.1007/978-3-031-13351-0_9

According to a survey from September 2020, 25 percent Indonesian started using remote learning services for their children since the COVID-19 situation started. Furthermore, since COVID-19, 21% of Indonesian respondents have begun using videoconferencing for professional purposes, and 17% have begun using remote learning for themselves (Statista, 2022c).

With the COVID-19 pandemic in Indonesia in early 2020, the university's priority response is to make sure that all the university academic staff and student is safe from the COVID-19 pandemic. Furthermore, the university must ensure that the university's business processes are operational and that the business goals are met even in disaster situations.

Remote learning is the first option to make sure all the university academic staff and student is safe from the COVID-19 pandemic. For remote learning, universities must plan what capabilities and facilities will be required to deal with COVID-19 pandemic situations. Furthermore, what plans does the university have to please the stakeholder? Remote learning technology includes information technology (IT) for lecturers and students to learn from home, as well as communication to coordinate. Given the growing importance of remote learning services technology in COVID-19 situations, technology remote learning services is critical for Indonesian universities to ensure university business continuity. It is essential to make sure that the university has a capability for continuing the university vision and mission when experiencing COVID-19 pandemic situations.

Despite the recent proliferation of technologies for remote learning, there are numerous issues that arise that are related to the risk associated with the technology used for learning. This is also a consideration because the quality of teaching and learning suffers as a result of the technology used for remote learning. Furthermore, COBIT 2019 includes a risk profile for identifying IT-related risks that may occur in an organization. However, COBIT 2019 focuses on the enterprise level (ISACA, 2019). Therefore, the goal of this paper is to use the COBIT 2019 risk profile to identify IT risks in the University Online Learning Environment during COVID-19. In this study, we utilize the risk factor and identify Online Learning Systems (Universitas Diponegoro, Semarang, Indonesia).

2 University Strategy Map During the COVID-19 Pandemic

It is essential to make sure that the university has a strategy map for managing the business process when experiencing COVID-19 pandemic situations. The strategy map assists the university in identifying strategic mapping that will be carried out by the university in order to meet anticipated targets during the pandemic. During the COVID-19 pandemic, university business sustainability strategy makes IT strategic goals in maintaining business continuity during the COVID-19 pandemic. First, IT strategic goals are stakeholders who are always up to date, such as scheduling communication time and determining the topic of communication. The second

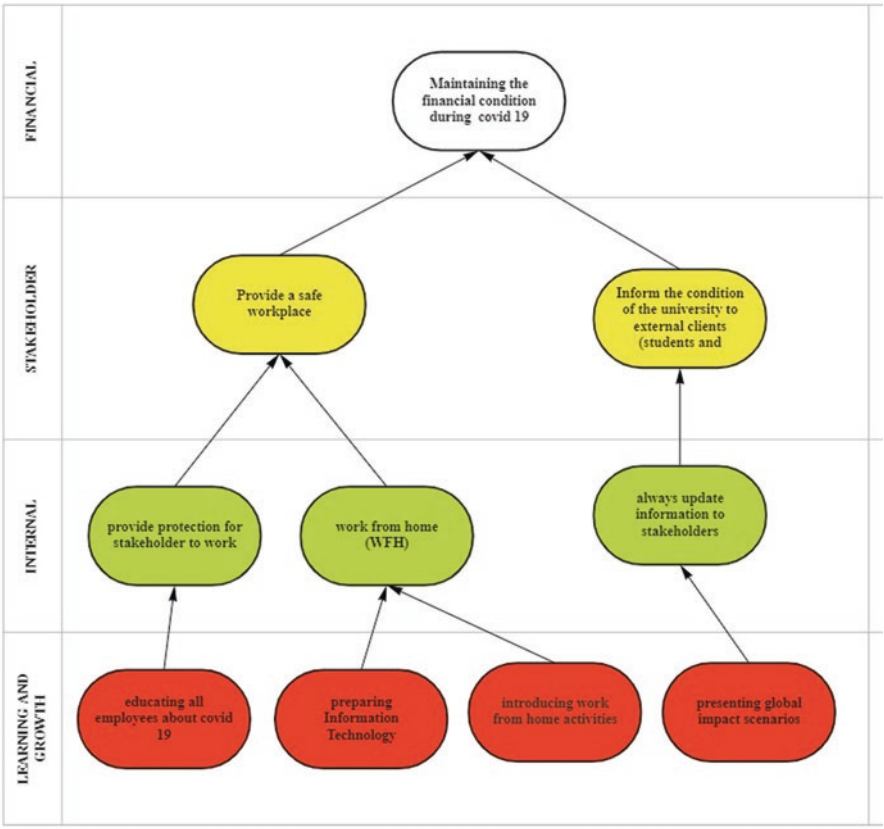


Fig. 1 University Strategy Map for handling COVID-19

option is work from home (WFH), in which the stakeholder has the ability to work from home, has access to tools and materials, and can work remotely.

The four perspective Balance Score card (Fig. 1) divides the score into four perspectives. The first is in finance. From a financial standpoint, the university must continue to make the business profitable. Second is from the standpoint of the stakeholders. To ensure the continuation of the business, the university must satisfy the stakeholders (students, lecturers, and academic staff). Third, there is the internal University process. What plans does the university have to appease the stakeholder? The final component is learning and infrastructure. What capabilities and facilities do universities require to manage the business process during COVID-19 pandemic situations?

From ***learning and growth*** point of view, the university has four strategies:

– educating all employees about COVID-19,
– presenting global impact scenarios,
– preparing IT

– and introducing work from home activities.

The first strategy is to educate employees about Covid through direct practice and care programs. The second strategy is the delivery of global impact scenarios, carried out by identifying operational impacts and updating plans for the future. The third strategy is the readiness of IT facilities, where IT should facilitate university activities and services to the stakeholder. Furthermore, it is essential to provide information about the university's latest condition to all stakeholders. The fourth strategy is to enhance and provide IT capabilities and facilities. The strategy means that the university's information technology advancement and provision should support all university business processes. Which all the office work activity for supporting the university business process can be accessed from the stakeholder's homes. Furthermore, there is the readiness of IT infrastructure and IT networks that all stakeholders can access from their homes.

From the **internal** business point of view, there are three goals to be achieved. The first is to provide protection for stakeholder to work. It is accomplished by providing workplace protection through social distancing programs and travel restrictions. Second, keep stakeholders informed of any changes. The process of updating information is on schedule. The third strategy work from home (WFH). This WFH activity is coordinated through remote communication. It is critical to ensure the availability of IT from all stakeholders in order to conduct remote communication.

From the **stakeholder** point of view, there are two strategic objectives to be achieved. The first is to provide a safe workplace to anticipate any health impacts on stakeholders, anticipate the impact on required stakeholder education, and anticipate the daily needs of stakeholders. The second objective is to provide information to customers and stakeholders for the current state of the university.

From the **financial** perspective, there is only one goal: maintain the university business process, which has an impact on the university‘s existence, for as long as possible during the COVID-19 pandemic. All objectives in the financial perspective can be met by achieving goals in the stakeholder, internal, and learning and growth perspectives.

3 The Component of Information Technology in Online Learning

Because of the impact of the 2019 covid pandemic, lecturers and students should be able to use technology to support university learning activities. The university learning activities can be accomplished through the advancement of technology and innovations that facilitate lecturer and student learning activities. The primary reason for incorporating technology into education is to allow students to learn comfortably and according to their needs (Radha et al., 2020). Furthermore, because classes and universities are closed due to COVID-19, students and lecturers are

forced to rely solely on technology to aid in the learning process. Prior to the pandemic, e-learning had been implemented as an accessibility tool via mobile phones and computers, providing students with flexibility. Because of the drastic reduction in the costs of implementing these technologies, the use of web-based technologies for educational purposes has increased rapidly (Maatuk et al., 2021).

Table 1 depicts the various technologies used by universities to facilitate teaching activities. When universities promote the use of ICT, they must first understand their lecturers' and students' attitudes toward it (Maatuk et al., 2021). The learning environment's reliance on IT is generally intended to increase access to education, improve educational quality, improve communication and interaction among students, and increase interaction between students and teachers during the pandemic. Furthermore, during a pandemic, IT can reduce physical interactions.

4 Risks of Information Technology in the Online Learning

Risk is the effect of uncertainty on the achievement of specific goals (Maatuk et al., 2021). Identification of risk can be help to overcome the problem before it is occurring. Along with the growth of e-learning technologies, however, there exist problems; for instances Faculty members acceptance of e-learning systems Identifying risks can assist in preventing problems from occurring. However, as e-learning

Table 1 Application of on-line learning system on Internet

Learning area	Descriptions	Remote learning strategies and technologies
Student presentation	Presentations	Video on the WWW
Security	Security for enter application for remote learning	Single sign on (SSO)
Sharing the learning material	Sharing the material from lecturer to students	Cloud storage, learning management system
Assignment	Quiz and assignment	www on form application
Class activity	Online classes	Conference meet application
Collaborative projects	Group project	Collaboration tools on the WWW
Student Tours on project	Virtual tours	www integrated with the conference meet application
Student laboratory	Virtual laboratory	WWW integrated with, WWW integrated with subject of laboratory
Simulation	Using simulation	www for training and education, multimedia application
Communication	Internet chat room	www, internet chat or messenger room, e-mail
Attendance in class	Presence system	QR code based on WWW
Digital library	Sharing resources based on e-journal	E-journal

technology advances, problems may arise, such as faculty members' acceptance of the e-learning system (Purdy, 2010). With the importance of e-learning systems during a pandemic situation, there are several problems at the university, such as faculty members' lack of IT skills; lack of acceptance of teacher technology; and a lack of hardware, software, facilities, and network capabilities in the university environment, which could be part of the risk effect. The challenge is to ensure that the university's sustainability process is supported by the e-learning system. This can be overcome through learning in the e-learning system. In summary, the risk factors for e-learning in a university environment can be divided into four categories as shown in Table 2 (Mahdizadeh et al., 2008).

5 Method

This study employs a case study approach in which six processes are described: (1) plan, (2) design, (3) prepare, (4) collect, (5) analyze, and (6) share. The planning stages focus on justification for conducting a case study based on its strength and limitations (Pollard & Hillage, 2001). The study aims to identify the risk of using IT in the learning environment among students and teachers, and it proposes a Risk Management Model for the long-term sustainability of learning in a real university setting using the case study method. The case study method is appropriate for this study because our research does not seek to generalize to other universities because each university's use of technology for learning is unique in practice. In this study, we used risk factors and identify the use of Online Learning System at Universitas Diponegoro in Semarang, Indonesia.

The following design steps were used with the aim of describing the unit of analysis, identifying the problem underlying the projected research, and implementing a process to maintain the quality of the case study (Pollard & Hillage, 2001). Universitas Diponegoro was chosen as a case study because it is one of Indonesia's state universities and a model for many pilot projects. Universitas Diponegoro is a public university in Indonesia with 11 faculties located in Semarang, Central Java. This study created a university strategy map for dealing with the COVID-19

Table 2 Risk Category of on-line learning System

Risk category remote learning technology	Risk factor
End user	Self-efficacy of technology strategies and adoption Adoption of technological teaching in practical
Infrastructure	Lack of proper supporting IT infrastructure Lack of bandwidth Intermittent communications
	Lack of proper devices for accessing the technology
Technological	Adaptability of technology with the courses content
Financial	Financial constraint

pandemic. Financial, stakeholder (customer focus and employee satisfaction), internal, learning, and growth indicators are included in the strategy map.

The following stage is preparation, which focuses on the investigator, developing a case study protocol, conducting a pilot case, and obtaining any necessary approvals (Pollard & Hillage, 2001). Our team consists of qualified researchers who are familiar with case study methodology, and a case study protocol was developed to ensure the study's integrity. We were able to get the study approved without any problems because our team of researchers works as lecturers at Universitas Diponegoro and the study focuses solely on technology without involving any critical data.

The collection stage follows, and it entails following the case study methodology, gathering evidence from various sources, creating a case study database, and maintaining a chain of evidence (Pollard & Hillage, 2001). We conducted a series of observations on technology used by the University for our case study to gain an overview of the university's activities as well as the current state of its online learning activity implementation. To assess a risk in IT governance, a systematic approach is required.

The analysis stage follows, and it is based on theoretical propositions and other sources. The following analytical steps investigate the purpose of clarity and interpretation of findings using theoretical concepts and other tools (Pollard & Hillage, 2001). The COBIT 2019 strategy map and framework with online learning system risk management techniques have been used to improve the theoretical propositions in this study. As a result, explanation building analysis is used because it can analyze case study data by generating an explanation about the case (Pollard & Hillage, 2001) and explaining how and why things happened in the university setting regarding the risk of the online learning system.

6 IT for Online Learning in Universitas Diponegoro During COVID-19

The sections below describe the online learning system that is employed by Universitas Diponegoro.

6.1 Single Sign On (SSO)

Single Sign On (SSO) is a mechanism that requires users to remember only one username and password in order to access a service at the same time. The SSO system is a technology that allows users to access existing network resources with a single login (Pollard & Hillage, 2001). The SSO system authenticates the user

across all applications to which they have been granted access. As a result, when users switch applications, authentication requests are no longer required (Yin, 2009).

Using an SSO system can avoid multiple logins by displaying authentication information and identifying the subject strictly on a trusted system. The application of the SSO system makes it easy for users, because users only need to do the authentication process once to get permission to access all services on a network (Ponnapalli, 2004) and the SSO system provides efficiency and security for users in managing and accessing various application services (Rudy & Gunadi, 2009).

Applications and services that can be accessed by students and lecturers of Universitas Diponegoro via SSO are the Academic, Academic System Application, and E-journal.

6.2 *QRC for Students' Attendance System*

The students' attendance system is an educational management tool at Universitas Diponegoro that is used for attendance activities. This system uses QRC (Quick Response Code) for students' attendance system effectively for online learning system using technology because it is fast, effective, and efficient, the student captures the QRC which is activated by the lecturer. The student captures the QRC using smartphone for triggering the attendance system. Figure 2 shows the QRC for student's attendance system at Universitas Diponegoro.

The data collection for understanding the student's usage of attendance system was carried out on December 16, 2019 – January 14, 2020. The total number of respondents was 516 students from Universitas Diponegoro's 2019 batch. The questionnaire was distributed on various social media platforms such as Instagram, Line, and WhatsApp to collect data.

Fig. 2 QRC Student attendance System

Table 3 Student using attendance system during COVID-19

	Frequent	Percentage
Year of entry		
2019	506	100%
Faculty		
Faculty of Law	13	2.57%
Faculty of Economics	15	2.96%
Faculty of Engineering	36	7.11%
Faculty of Medicine	33	6.52%
Faculty of Animal and Agricultural Sciences	19	3.75%
Faculty of Humanities	61	12.06%
Faculty of Political and Social	14	2.77%
Faculty of Public Health	62	12.25%
Faculty of Sains and Mathematics	162	32.02%
Faculty of Fisheries and Marine	65	12.85%
Faculty of Psychology	1	0.20%
Faculty of Vocational	25	4.94%
Gender		
Female	323	63.83%
Male	183	36.17%
Smartphone used		
Android	447	88.34%
IOS	59	11.66%

Table 3 shows the distribution of students who used the Universitas Diponegoro attendance system in each faculty. The data shows 2.57% were students from the Faculty of Law, 2.96% were students at the Faculty of Economics, 7.11% were students at the Faculty of Economics. students of the Faculty of Engineering, 6.52% are students of the Faculty of Medicine, 3.75% are students of the Faculty of Animal Husbandry and Agriculture, 12.06% are students of the Faculty of Humanities, 2.77% are students of the Faculty of Social and Political Sciences, 12.25% are students of the Faculty of Public Health, 32.02% are students of the Faculty of Science and Mathematics, 12.85% are students of the Faculty of Fisheries and Marine Sciences, 0.20% are students of the Faculty of Psychology, and 4.94% are students of the Vocational Faculty. With 447 respondents, Android was the most popular smartphone, followed by IOS with 59. In summary, during the pandemic COVID-19, students have easy access to the attendance system.

6.3 Online Learning System

This study conducted in Universitas Diponegoro; therefore, this section describes the remote learning technology that employed in Universitas Diponegoro. KULON (Kuliah Online), the online learning system used at Universitas Diponegoro, provides a variety of services that allow students to conduct long-distance lectures,

such as students being able to download materials, take quizzes, take exams, and participate in forums.

During the COVID-19 pandemic, KULON users increased dramatically from 2000 users to around 58,180. This is because all lecture activities are done online. With the existence of KULON UNDIP, it is hoped that one of UNDIP's missions, education, can still be effectively carried out. KULON is an online lecture service provided to facilitate long-distance lectures for all Universitas Diponegoro students. KULON UNDIP is integrated and can be accessed by Single Sign On (SSO) UNDIP via www.sso.undip.ac.id

The data for understanding the UNDIP students who used UNDIP KULON for online lecture activities was collected from May 18, 2020 to June 24, 2020. Data was collected by distributing questionnaire links created in the form of a Google Form. The questionnaire link is distributed through various platforms such as Line, WhatsApp, Instagram, and Twitter. Table 4 displays the data.

Table 4 shows that KULON has been used evenly across all faculties and schools at Universitas Diponegoro. In addition, the respondents in this study also came from different faculties, with details of around 1.99% coming from the economics and

Table 4 Students using KULON during COVID-19

Respondent profile	Frequent	Percentage
Year		
2014	1	0.33%
2015	2	0.66%
2016	84	27.81%
2017	88	29.14%
2018	65	21.52%
2019	62	20.53%
Faculty		
Faculty of Economics and Business	6	1.99%
Faculty of Law	7	2.32%
Faculty of Cultural Studies	1	0.33%
Faculty of Social and Political Science	13	4.30%
Faculty of Medicine	13	4.30%
Faculty of Public Health	4	1.32%
Faculty of Fisheries and Marine Sciences	19	6.29%
Faculty of Animal and Agricultural Sciences	5	1.66%
Faculty of Psychology	1	0.33%
Faculty of Science and Mathematics	183	60.60%
Faculty of Engineering	44	14.57%
Vocational School	6	1.99%
Gender		
Male	137	45.36%
Female	165	54.64%
Platform for accessing KULON		
Smartphone	23	7.62%
Laptop	98	32.45%
Smartphone and laptop	181	59.93%

business faculties, about 2.32% coming from the law faculty, about 0.33% coming from the cultural sciences faculty, about 4.30% came from the faculty of social and political science, about 4.30% came from the faculty of medicine, 1.32% came from the faculty of public health, about 6.29% came from the faculty of fisheries and marine science, about 1.66% came from the faculty of animal husbandry and agriculture, about 0.33% came from the psychology faculty, about 60.60% came from the science and mathematics faculty, 14.57% came from engineering faculties, and around 1.99% came from vocational schools.

To access KULON UNDIP, around 7.62% use a smartphone, 32.45% use laptops, and around 59.93% use both smartphones and laptops. In summary, students have no difficulty accessing KULON during the COVID-19 pandemic.

6.4 Virtual Laboratory

In Indonesia, the learning-by-doing method is used in education. Learning by doing is a method of teaching in which the teacher attempts to engage students in more practical and creative learning methods (Seel, 2012). This concept can be implemented in higher education through practical activities that aim to prepare students for the world of work. As a result, the presence of a laboratory is critical for putting classroom theories into practice. A laboratory is defined as a specific location or room that is outfitted with equipment for conducting experiments (investigations and so on). The equipment provided in the laboratory can be real or digital.

A laboratory that uses equipment in digital form is called a virtual laboratory. A virtual laboratory is defined as an interactive environment for the creation and implementation of laboratory installation simulation experiments (Smirnova & Clark, 2018). A virtual laboratory uses a software as a visualization of a real laboratory. All equipment and processes are carried out on the software which can be accessed via a PC/laptop. Generally, the use of virtual laboratories is used for certain reasons, such as the unavailability of practicum equipment, expensive practicum tools, and it is impossible to do practical work directly (for instances such as pandemic situations).

Some of the advantages obtained when using a virtual laboratory are reducing maintenance costs, as remote access to the laboratory, motivating students to conduct experiments according to their interests, and learning basic and advanced concepts of experiments through remote access (Prasad et al., 2019). Virtual laboratories can be used as an alternative to overcome limited learning resources (Kusumaningsih et al., 2017) and save money on relatively more expensive practicum tools and materials, as well as maintenance and repair of practicum tools when they are damaged. In addition, the use of virtual laboratories can also increase security and safety, because there is no interaction with practical tools and materials. The flexibility possessed by the virtual laboratory allows students to learn basic concepts and conduct experiments without limitations on time and place so as to make students have a better understanding.

DSCH as a logic simulator, Cisco Packet Tracer as a computer network simulator, Proteus as a microcontroller programming simulator, and other technologies are used in the implementation of virtual laboratories for Universitas Diponegoro students. The use of virtual laboratories can make it easier for students to conduct experiments and understand learning concepts safely and flexibly during COVID-19. In addition, it is one of the strategic techniques to achieve the university strategy map for handling COVID-19. Table 5 lists the software applications used by Universitas Diponegoro students to conduct virtual laboratories. The data was collected between February and July of 2021.

According to the survey results, 114 students (22.22%) use Matlab, DSCH 151 students (29.44%), Cisco Packet Tracer 172 students (33.53%), Proteus 35 students (6.82%), Programmable Logic Control (PLC) 14 (2.73%), Autoland 2 (0.39%), and other software 25 students (4.87%).

From the results of all respondents, a total of 185 respondents with a percentage of 67.03% used a software once a week, a number of 22 respondents with a percentage of 7.97% used a software every 2 weeks, and a total of 69 respondents with a percentage of 25% used a software for 1 month.

6.5 Video Conferencing

Video conferencing is a face-to-face application that can be used for online learning. Video conference is an internet-based communication tool in the form of voice and image to take people to different places but at the same time at a meeting (Smirnova & Clark, 2018). This platform has a significant influence on learning activities in both schools and universities because, in addition to online communication, it can transfer voice, video, and interactive data between two or more groups or people.

Table 5 Software used for virtual laboratory

Software's Name	Frequent	Percentage
Matlab	114	22.22%
DSCH	151	29.44%
Cisco packet tracer	172	33.53%
Porteus	35	6.82%
Programmable logic control (PLC)	14	2.73%
Auto-land	2	0.39%
Others	25	4.87%
Frequency of virtual laboratory software use		
Once a week	185	67.03%
Per fortnightly	22	7.97%
Once a month	69	25.00%

Video conferencing is divided into 3 categories (Gough, 2006). First is known as Personal video conferencing, using the term private because this call is usually only used between two people. Video calls at least assist communication between two or more people who have audio and motion video images using a computer, dedicated video phone, or both. Then, business video conferencing provides the same solution as personal video conferencing, but with the addition of several features, such as the ability to include multiple people in video calls, collaboration features, document sharing capabilities, increased presentation capabilities, whiteboard capabilities, additional bandwidth requirements, and additional cost. Business video conferencing is specifically designed to meet the needs of business meetings and group collaboration, not our personal needs to collaborate with family and friends. Following that is Web video conferencing, which is specifically designed to transmit video calls in a web page or classroom setting.

The data collection process was carried out by researchers between May 31 and July 31, 2021. In terms of student characteristics based on the most frequently used video conferencing platforms as media for lectures in virtual class, Table 6 shows that 463 respondents use Microsoft Teams and 8 students use Zoom. The significant difference occurred because Universitas Diponegoro offers premium services on the Microsoft Teams video conference platform. It can be summarized that the use of

Table 6 Students' video conference use for accessing virtual class

Faculty	Frequent	Percentage
Faculty of Economics and Business	58	12.3%
Faculty of Law	32	6.8%
Faculty of Cultural Studies	21	4.5%
Faculty of Social and Political Science	51	10.8%
Faculty of Medicine	29	6.2%
Faculty of Public Health	6	1.3%
Faculty of Fisheries and Marine Sciences	42	8.9%
Faculty of Animal and Agricultural Sciences	33	7.0%
Faculty of Psychology	15	3.2%
Faculty of Science and Mathematics	102	21.7%
Faculty of Engineering	47	10.0%
PSDKU	2	0.4%
Vocational school	33	7.0%
Devices commonly used for accessing virtual class		
Laptop	358	76.0%
Mobile phone (smartphone)	105	22.3%
PC (computer)	6	1.3%
Tablet (tab)	2	0.4%
Applications commonly used for accessing class		
Microsoft teams	463	98.3%
Zoom	8	1.7%

Table 7 Identification of IT risks for online learning at Universitas Diponegoro

Learning area	Descriptions	Remote learning Strategies and Technologies	Risk identification
Share the learning material	Sharing the material from lecturer to students	Using WWW for accessing KULON system (*Kuliah online*)	Students can access easily There are no financial constraints There is no obstacle for the infrastructure The technology can support
Assignment	Quiz and assignment	Using WWW for accessing KULON system (*Kuliah online*)	
Class activity	Online classes	Conference meet application	
Attendance system	Presence system	QR code based in WWW	
Student laboratory	Virtual laboratory	WWW integrated with, WWW integrated with subject of laboratory	
Communication	Internet chat room	Www, internet chat or messenger room, e-mail	

video conferencing for replacing activity poses no barriers to teaching activity at Universitas Diponegoro.

Table 7 summarizes the component of technology for online learning system based on an overview of teaching activity at Universitas Diponegoro.

The identification of information technology risks in online learning at Universitas Diponegoro is that students can easily access the material, there are no financial constraints because Universitas Diponegoro provides the best services on the Microsoft Teams video conference platform, Learning management system, Software tools for virtual laboratory, and attendance system services. Furthermore, there are no impediments to the infrastructure, and the technological support is adequate.

7 COBIT 2019 Risk Profile

The primary drivers for COBIT 2019 are confirming IT governance, remaining relevant in a changing environment, and addressing the limitations of COBIT 5. As previously stated, the goal of COBIT is to assist in the creation of value. One of the things mentioned in COBIT 2019 is addressing the business risk associated with the use, ownership, operation, involvement, influence, and adoption of IT within an enterprise. The design factors in the 2019 COBIT Framework propose several factors that influence Enterprise Governance of Information and Technology (EGIT). Each design factor is tailored to the organization's specific context. In practice, when evaluating organizations, it is critical to develop evaluation solutions (Maatuk et al., 2021). The introduction of the Design Factor (DF) in COBIT 2019 is expected to make it easier for practitioners to identify the state of the organizations. In COBIT

2019, the risk profile is introduced as the third design factor. The risk profile consists of 19th risk profiles:

1. IT Investment decision making, portfolio definition maintenance
2. Program and projects Lifecyle management
3. IT cost and oversight
4. IT expertise, skills & behavior
5. Enterprise/IT architecture
6. Unauthorized actions
7. IT operational infrastructure incidents
8. Software adoption/usage problems
9. Hardware incidents
10. Software failures
11. Logical attacks (hacking, malware, etc.)
12. Third-party/supplier incidents
13. Noncompliance
14. Geopolitical Issues
15. Industrial action
16. Acts of nature
17. Technology Based Innovation
18. Environmental
19. Data & information management

These design factors can have an impact on the company's priorities, governance, and management objectives. As a result, these factors influence the EGIT component's instantiation.

8 Formulation of Online Learning Systems in Universities in a Pandemic Situation

The university is compelled to use an online learning system to ensure that the business strategy map is followed during pandemic situations. The risks of online learning system have been identified in Table 2. This study attempts to sort risk for using an online system and to synergies with the university's strategic map during pandemic situations by adopting the design factor for risk profile in COBIT 2019. The risk profile is the focus of the COBIT 2019 risk profile design factors. The risk profiles define the different types of IT-related risks that can occur in an organization. The risk profile can show which risk areas the company may encounter. COBIT 2019 includes 19 risk profile categories (see Fig. 3) (Maatuk et al., 2021).

However, COBIT 2019 focuses on the enterprise level. As a result, for the university online learning system, we identify only four factors that have a significant influence in the university.

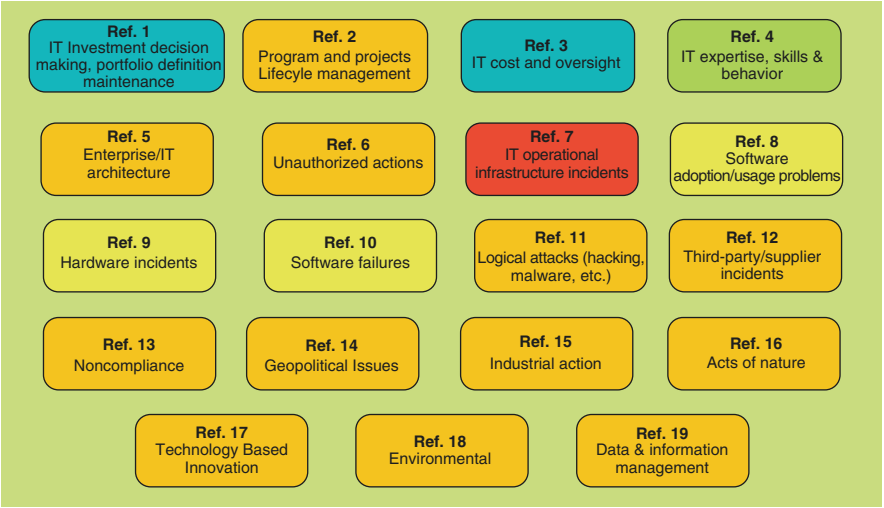


Fig. 3 COBIT 2019 Risk Profile (Design Factor 3) (ISACA, 2019)

Figure 4 shows the correlation between the 2019 COBIT risk profile, the IT risk of the university's online learning system, and the university's strategy map during the pandemic. Tables 2 and 7 show that the identified risk factors for IT risk in the university's online learning system are end users, technology, infrastructure, and finance. In the COBIT 2019, the End user is represented by ref. (ISACA, 2019) (IT expertise, skills & behavior). As for finance in COBIT 2019, it is represented by ref. (Statista, 2022a) (IT investment decision making, portfolio definition, and maintenance) and ref. (Statista, 2022c) (IT cost & oversight). Next is infrastructure aspect in COBIT 2019, which is shows in ref. (Purdy, 2010) (IT operational infrastructure incidents). As for technological aspect in COBIT 2019, it is represented by ref. (Mahdizadeh et al., 2008) (Software adoption/usage problems), ref. (Pollard & Hillage, 2001) (Hardware incidents), and ref. (Yin, 2009) (Software failures). All of the risk factors identified are aimed at understanding the impediment when the university needs to achieve the university strategy map during a pandemic. The university can prepare risk recovery management by identifying the risk factor.

9 Conclusion

In pandemic situations, the objective of an online learning system is to ensure that stakeholders are always up to date, for example, by scheduling time to communicate and determining the topic of communication. The second option is to work from home (WFH). Furthermore, even in pandemic situations, the university business must be maintained. It is possible to secure the implementation and business processes by understanding the risk factor in online learning systems. The COBIT 2019

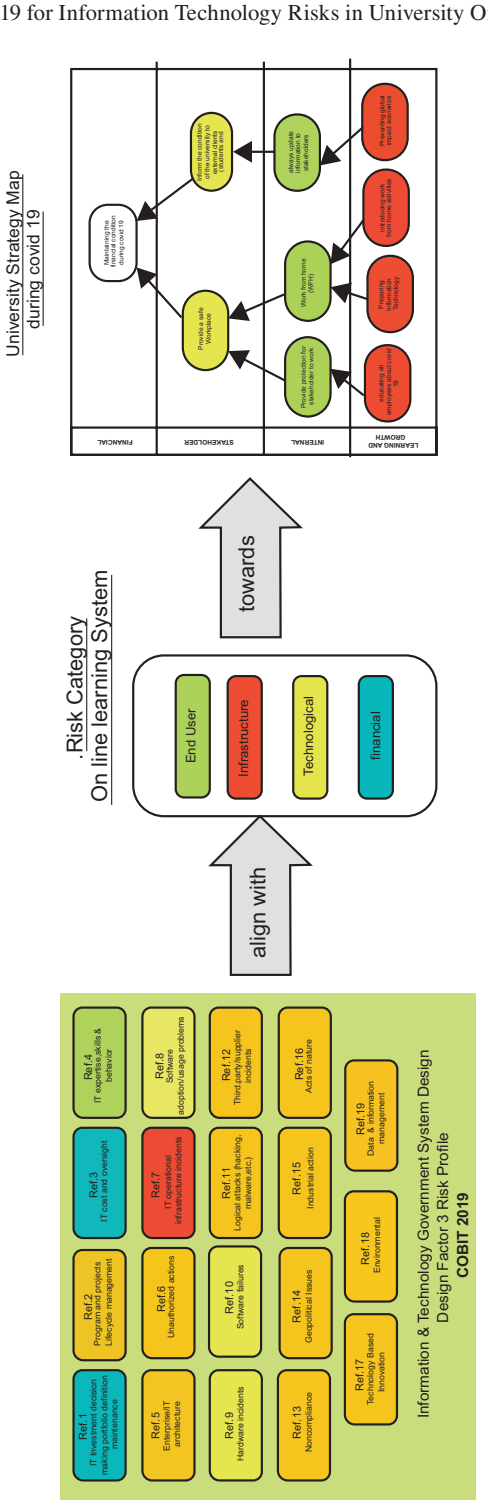


Fig. 4 Online learning system's IT risk categories

risk profile establishes best practices for enterprise-level risk management. As a result, this study discovered that only four risk factors corresponded to the university's strategy map for dealing with pandemic situations. The risk factors are End user, Technological, Infrastructure, and Financial. In the COBIT 2019, the End user is represented by ref. (ISACA, 2019) (IT expertise, skills & behavior). As for financial risk factor in COBIT 2019, it is represented by ref. (Statista, 2022a) (IT investment decision making, portfolio definition, and maintenance) and ref. (Statista, 2022c) (IT cost & oversight). Next is infrastructure aspect in COBIT 2019, which is shown in ref. (Purdy, 2010) (IT operational infrastructure incidents). As for technological aspect in COBIT 2019, it is represented by ref. (Mahdizadeh et al., 2008) (Software adoption/usage problems), ref. (Pollard & Hillage, 2001) (Hardware incidents), and ref. (Yin, 2009) (Software failures).

Acknowledgements The author would like to thanks to Universitas Diponegoro, students and lecturers of Universitas Diponegoro for supporting this research. This research was financially supported by Diponegoro University from non-APBN funds in 2019 Number 329-90/UN7.P4.3/PP/2019.

References

Gough, M. (2006). Video conferencing over IP. *Syngress Publishing*.

ISACA, COBIT 2019 Framework: Design and Guide, 2019.

Kusumaningsih, Y. R., Iswahyudi, C., & Susanti, E. (2017). Pengembangan Model Laboratorium Virtual Sebagai Solusi Keterbatasan Sumber daya Pembelajaran. In *Proc, the National Application Sciences & Technology (SNAST)* (pp. 301–306). Yogyakarta, Indonesia.

Maatuk, A. M., Elberkawi, E. K., Aljawarneh, S., Rashaideh, H., & Alharbi, H. (2021). The COVID-19 pandemic and E-learning: Challenges and opportunities from the perspective of students and instructors. *Journal of Computing in Higher Education, 34*, 1–18.

Mahdizadeh, H., Biemans, H., & Mulder, M. (2008). Determining factors of the use of e-learning environments by university teachers. *Computers & Education, 51*, 142–154.

Pollard, E., & Hillage, J. (2001). *Exploring e-learning*. Institute for Employment Studies.

Ponnapalli, R. (2004). *Secure implementation of Enterprise single sign-on product in an organization*. SANS Institute InfoSec Reading Room.

Prasad, B. M. K., Singh, K., Pandey, S. S., & O'Kennedy, R," Communication and Computing Systems: Proceedings of the 2nd International Conference on Communication and Computing Systems (ICCCS 2018),", 2019. https://books.google.co.id/books?id=40W4DwAAQBAJ. Retrieved 2022, March.

Purdy, G. (2010). ISO 31000: 2009—Setting a new standard for risk management. *Risk Analysis: An International Journal, 30*, 881–886.

Radha, R., Mahalakshmi, K., Kumar, V. S., & Saravanakumar, A. R. (2020). E-learning during lockdown of Covid-19 pandemic: A global perspective. *International Journal of Control and Automation, 13*, 1088–1099.

Rudy, D. R., & Gunadi, O. (2009). *Application integration using single sign on based on Lightwight Directory Access Protocol (LDAP)*. in Binus@ccess Portal (BEE-PORTAL), Jakarta, Universitas Bina Nusantara.

Norbert M. Seel, "Encyclopedia of the sciences of learning. 2012 https://doi.org/10.1007/978-1-4419-1428-6. Retrieved 2022, March.

Smirnova, E. V., & Clark, R. P. (2018). *Handbook of research on engineering education in a global context*. IGI Global. https://books.google.co.id/books?id=FYhoDwAAQBAJ. Retrieved 2022, March

Statista,Global: Mobile app downloads by segment 2017–2025, 2022a., https://www.statista.com/forecasts/1262881/mobile-app-download-worldwide-by-segment. Retrieved 2022, March.

Statista, Indonesia: Leading smartphone apps used daily 2021, 2022b., https://www.statista.com/statistics/1280293/indonesia-leading-smartphone-apps-used-daily. Retrieved 2022, March.

Statista, Indonesia: Time spent learning online weekly 2020, 2022c., https://www.statista.com/statistics/1189274/indonesia-time-spent-learning-online-weekly. Retrieved 2022, March.

Yin, R. K. (2009). *Case study research: Design and methods*. Sage.

Dinar Mutiara Kusumo Nugraheni, lecturer of Computer Science – Informatic Departemen, Faculty of Science and Mathematics, Universitas Diponegoro, Semarang, Indonesia, since 2019. Her research interest is in Applied Computer Science, User-Behavior in Technology, Information System Architecture, usability, Adoption Model for Information Technology, and audit for IT. She graduated from the University of Diponegoro University (IND). She gained her Master of information Technology (computer Science) and PhD at the University of Flinders University, Adelaide, South Australia.

Beta Noranita is a lecturer and researcher at the Department of Informatics, Diponegoro University, Indonesia. She holds a Master's degree in Computer Science from Gajah Mada University, Indonesia and a Bachelor's degree in Mathematics from Diponegoro University, Indonesia. Currently, she is the head of the Lecturer Laboratory for Information Systems and Technology at the Department of Informatics UNDIP.

Satriyo Adhy is a lecturer, researcher, and project manager at Universitas Diponegoro, Indonesia. Holds a Master's degree in Informatics from Institut Teknologi Bandung, Indonesia. His areas of interest are Information System, Internet of Things, Database, and Big Data.

Andi Kurniawan Nugroho has been working as a Lecturer in Electrical Engineering at the University of Semarang since 2001. He obtained a bachelor's degree in Electrical Engineering at Semarang University in 2015. Then, he continued his studies and obtained a Master of Engineering degree in Electrical Engineering at Gajah Mada University in 2007. He is currently completing his doctoral studies at the Electrical Engineering Institute of Sepuluh Nopember Institute of Technology (ITS) Surabaya. His research areas interests are IoT-Based Medical Analysis and Intelligent Artificiant.

The Impact of Cloud Computing on the Development of Accounting Education in Light of the Corona Pandemic

Omar Ikbal Tawfik and Hamada Elsaid Elmaasrawy

1 Introduction

Cloud computing is a technology based on the transfer of processing and storage space of a computer to the so-called cloud, a distributed system consisting of a group of interconnected computers that are dynamically provisioned and presented as one or more resources based on Service Level Agreements Buyya et al. (2009). In the cloud, software is transformed from products to services, and thus users can access them via the Internet, without the need to possess knowledge and experience (Sultan, 2010). Under cloud computing, users are less dependent on applications and programs as well as the capabilities of the hardware parts in the computer, instead relying on the capabilities of the hardware components of the cloud computing system; All that the individual needs in networks is a computer connected to the Internet, meaning that the work system will move from devices located in a specific place to other devices that swim in the Internet space, and thus access is made from anywhere and at any time (Bazi et al., 2017; Battistelli et al., 2018). The processing effort is then transmitted from the local machines to the data center. In the cloud the software is seen as a service and the applications and data are stored on multiple servers that can be accessed from the internet. Because of its dynamic scalability and efficient use of resources, cloud computing has become an attractive technology; So that they can be used under conditions where resources are limited.

UNESCO considered education as the fourth development goal of the sustainable development goals for societies. Education or learning is an important component of life and no human being can live properly without education. Nowadays,

O. I. Tawfik (✉)
Dhofar University, Salalah, Oman
e-mail: otawfik@du.edu.om

H. E. Elmaasrawy
Tanta University, Tanta, Egypt

M. Alaali (ed.), *COVID-19 Challenges to University Information Technology Governance*, https://doi.org/10.1007/978-3-031-13351-0_10

there are a lot of paradigms to gain knowledge or learn something. E-learning is one of the most promising models that helps the learner to access learning resources anywhere and anytime (Alhabeeb & Rowley, 2017). E-learning represents a basic pillar and an important means of modern methods that rely on the employment of technology in the educational process, in order to achieve better efficiency of the educational process. E-learning is one of the most promising models of education. Describe e-learning in general as the use of information and communication technology (ICT) in teaching and learning, and it is provided through a digital device (Rajabion et al., 2019). This device may be an electronic device, such as a desktop computer, laptop, smartphone, or tablet (Mayer, 2017). E-learning is one way to bridge the gap between traditional education and smart education (Van Biljon & van der Merwe, 2018). The internet in education has completely restructured the learning and training paradigm.

Based on the above, it has become necessary to adopt modern trends and methods in education, and perhaps the most important of these methods is cloud computing, due to the development of its applications and the possibility of benefiting from it in developing education, raising the level of quality and improving outputs, through which processing and storage operations are transferred from the user's computer to a server device called the cloud. . Cloud computing, with its data storage and internet services, is the basis for the future of e-learning (Attaran et al., 2017; Al-Samarraie & Saeed, 2018). The transition to cloud computing applications in education provides unprecedented opportunities for learning systems. It helps users to access an unlimited amount of scalable information resources stored on the cloud (El Mhouti et al., 2018); Al-Samarraie & Saeed, 2018). Most of all, the cloud option can offer a low cost solution for educational institutions. The advantages that cloud computing enjoys have led to increased demand and adoption in all areas of life. (Nasr & Ouf, 2011) sees cloud-based e-learning as the next generation of e-learning. Argues (Bora & Ahmed, 2013) Cloud computing is expected to revolutionize the field of e-learning, especially in universities. Therefore, the modern trend of education is to build an electronic system within the cloud. Several international conferences have recommended taking advantage of cloud computing in the educational process, including the International Cloud Conference in Florida 2010, the International Conference on E-Learning and Distance Learning in Riyadh 2011, and the Nineteenth International Conference on Information Systems and Computer Technology in Egypt 2012, . Thus, through the use of cloud computing in the teaching and learning process, it is possible to enhance e-learning among students, as the student can easily subscribe to references, magazines, software and other educational tools, and this is done using the cloud storage service.

The COVID-19 pandemic and the measures it brought about, and the attendant suspension of traditional education, made the focus on e-learning as one of the most important pillars of education sustainability. Most of the higher education institutions that were closed were forced to resort to e-learning, and in a short period of time the education was completely converted to e-learning. Most educational institutions, from schools and institutes to the most prestigious international colleges and universities, have implemented different models of e-learning (Fogarty, 2020).

The majority of universities have provided learning management systems such as (Microsoft Teams, Zoom, Big Blue Button), which enabled them to move from traditional learning to online learning, especially since most universities were using e-learning even in a simple way through some programs such as Moodle, which was used In downloading student learning material, assignments, and holding exams online for some subjects (Bensaid & Brahimi, 2020). Learning management systems enable teachers to interact with their students virtually through live or recorded lectures, chats, online exams, quizzes, and assignments (Sarea et al., 2021). This decision received mixed reactions from both teachers and students (Alshurafat et al., 2021). The COVID-19 pandemic has largely proven that crises are an important factor in accelerating and expanding reliance on cloud services and continuing to drive the transformation to cloud services. Cloud-centric IT (https://www.idc.com/getdoc.jsp?containerId=prUS46934120).

Like the rest of the world, the Gulf Cooperation Council (GCC) countries have been affected by this crisis. Closed all educational institutions in all countries of the Council. Bahrain was the first of the GCC countries to close its educational institutions on February 25, 2020, followed by the United Arab Emirates on March 8, 2020, Saudi Arabia and Qatar on March 9, 2020, followed by Kuwait on March 12, 2020, and finally Oman on March 15, 2020. As a result, all Higher education institutions in the GCC countries, like the rest of the countries, have moved to the e-learning system using different education management systems (Bensaid & Brahimi, 2020). . The majority of universities in the Gulf Cooperation Council (GCC) countries are equipped with learning management systems that have enabled a smooth transition from traditional to online learning (Bensaid & Brahimi, 2020). Then the majority of educational institutions returned to traditional education completely in the academic year 2021–2022, and a few of them adopted hybrid education.

As top management in universities and colleges scrambled to devise ways to counteract trauma, the accounting faculty faced the challenge of changing their curriculum overnight in every aspect of their work: teaching, learning, assessment, and student support. The way remote universities and colleges operate, and the duration of restrictions have varied and continue to vary around the world and at many levels: the individual, the department, the institution, and local and national politics.

This study aims to show how the use of cloud computing affected the development of accounting education in light of the Corona pandemic, especially in the period when the online education programs were completely relied upon in accounting education. In addition, the study attempts to propose a framework for developing and improving the quality of accounting education programs by relying on both cloud computing and traditional education. The rest of this chapter deals with in the second section the relationship of accounting education to information technology and cloud computing. The third section reviews various previous studies, and the fourth section deals with the impact of cloud computing on the development of accounting education in light of the Corona pandemic, while the fifth section will deal with the proposed framework for developing accounting education programs using cloud computing, and we conclude the chapter with a summary and recommendations.

2 Accounting Education and Cloud Computing

The quality of accounting education can be measured through the needs and expectations of students for specific characteristics that are the basis for their education and training in line with the labor market (Ibrahim, 2019). Accounting education institutions must be distinguished in their educational programs that they provide so that they become smart universities in terms of curricula and teaching methods, providing laboratories and equipment, and keeping pace with modern scientific developments (Mattis, 2019). In the field of accounting, there are standards for international accounting education. These standards are issued by the International Accounting Education Standards Board (IAESB). This council is considered one of the four councils of the International Federation of Accountants. The importance of international accounting education standards lies in developing the efficiency of educational programs to prepare qualified accountants with scientific and practical qualifications at the international level. International Education Standard 2 "Content of professional accounting education programs - International Education Standard 3" Professional skills – International Education Standard 4 "Values, ethics and professional behavior – International Education Standard 5" Work experience requirements – International Education Standard 6 "Assessment of professional competence and capabilities – Standard International Education 7 "Continuing Professional Development (Professional Education and Continuing Development Program for Lifelong Professional Qualification) – International Education Standard 8 "Qualification requirements for professional auditors".

Day by day, the information revolution has proven its great ability to reduce production and service costs. Which contributed to saving the use of labour, raw materials and energy, as well as representing the link between market requirements and the activities of the organization. Cloud services generally mean services that are carried out through hardware and software connected to a server network that carries its data in a virtual cloud that ensures its permanent, uninterrupted connection with various devices (computer, tablet, smart phones, etc.) after setting a special code to unlock the network, and thus access is made From anywhere and at any time (Bazi et al., 2017; Battistelli et al., 2018).

Accounting education is viewed as an integrated system consisting of a set of interrelated elements to achieve its objectives. Accounting education is defined as all concepts, decisions and standards provided by accounting programs and specializations for students to practice the professions of accounting and auditing (Alshurafat et al., 2021). The importance of accounting education stems from the importance of accounting and the benefits it can provide to the society in which it operates. Since the needs of this society are diverse and multiple, it is required to prepare the academic and professional cadres capable of meeting these needs, and this is done through accounting education that takes care of providing the labor market's needs of qualified accountants. Several studies have found that information technologies of all kinds can be used to improve accounting education (Mwalumbwe & Mtebe, 2017). Online learning is expected to become a mainstream method of

education by 2025, to provide high-quality and affordable education to "non-traditional" students (Palvia et al., 2018).

The actual reality of accounting education in the Arab countries indicates the existence of a large gap between the specifications of graduates of accounting programs and the needs of the labor market, due to many factors, including that the accounting curricula did not keep pace with the successive technological changes such as cloud computing, big data, chain block and other successive developments (Naghi, 2016). The large and continuous changes in the contemporary business environment in terms of knowledge, information, technology, and communications have imposed the need for university accounting education to pursue these changes, which has increased interest in developing university accounting education towards accounting education appropriate to the needs of the labor market. The sustainability of accounting education is an urgent need for accounting education institutions and requires long-term improvements to the components of the educational process, and to benefit from global experiences and technological developments as much as possible (Younes, 2019). Gregory and Bannister-Tyrrell (2017) see that nearly 94% of accounting jobs will become automated, and therefore accounting students and accountants must acquire skills and knowledge related to information technology, so that they can keep their jobs.

Before the Corona pandemic, the use of technology in accounting education was unequal, because it was a personal choice. After the pandemic, the accounting faculty faced the challenge of changing their curriculum overnight in every aspect of their work: teaching, learning, assessing, and supporting students. The way remote universities and colleges operate, and the duration of restrictions have varied and continue to vary around the world and at many levels: the individual, the department, the institution, and local and national politics. Cloud computing is one of the most important and latest technological means that can be used in the field of university accounting education, where cloud-based e-learning represents the future of e-learning. The trends in the field of higher education development indicate a rapid pace towards its adoption, in view of the services it provides from facilitating the management and use of information in an easy way, and helping universities to focus on their priorities instead of wasting time in the infrastructure (Yoosomboon & Wannapiroon, 2015; Gerholz et al., 2018). Especially with the increase in the number of students and the decrease in the education budget in most Arab countries. Cloud computing in accounting education provides access to applications and resources available in the cloud, such as Docs& Drop Box Google applications, Cloud IAAS, spreadsheets and databases, from anywhere and at any time, so that the user can create, modify and save files in the cloud structure using a web browser according to for his needs (Darbandi, 2017; Mell & Grance, 2009). In addition, the user can quickly expand the scope of work and storage spaces and buy them in any quantity and at any time. This leads to a reduction in: automation costs, infrastructure maintenance costs and provides effective management and user access (Lin & Chen, 2012).

Based on the foregoing, researchers believe that cloud computing provides an effective digital infrastructure that allows all users to access and modify their files,

add data, and then obtain the output, using any type of digital devices capable of communication. Your device is a communication tool only,. This makes the spread of electronic accounting education possible and available. Therefore, many educational institutions have turned to using cloud services, because they are an effective alternative to provide high-quality resources and services to all participants in the learning process at an affordable price. Cloud computing offers educational infrastructure, platform, and services that create an innovative and affordable learning environment. The use of applications and services, provided by third-party providers, is a cost-effective and efficient solution for educational institutions and allows for enhanced financial flexibility.

The latest international standards for accounting education issued by International Accounting Education Standards Board "NEW EDUCATION STANDARDS FOCUS ON ENHANCING ACCOUNTANCY'S TECHNOLOGY" emphasized the need to enhance the use of technology and communications in accounting. The revised standard provides an ICT roadmap that supports accounting education. Through the education of information and communication technology in addition to the possibility of using technology in accounting education. The Corona crisis has contributed to promoting the use of online learning systems, e-learning, and other forms of distance learning in accounting education.

3 Previous Studies

The traditional and electronic accounting education has received great attention from researchers, and these previous studies that restricted us in conducting this study can be divided into two groups as follows:

3.1 Studies Dealt with Electronic Accounting Education and the Extent to Which Students Accepted It Before the Pandemic

The advent of the Internet and the explosive development of technology have contributed to the use of learning systems based on technological solutions (Bacow et al., 2012; Humphrey & Beard, 2014; Moore et al., 2011; Yadegaridehkordi et al., 2019). For example, some universities have developed courses that combine the advantages of online teaching with traditional face-to-face (F2F) teaching (Fortin et al., 2019; Love & Fry, 2006; Peng & Abdullah, 2018). Online learning has evolved from mere recordings of lectures placed online into carefully designed programs using best practice standards that include synchronous and asynchronous delivery methods. A well-designed online program will actively engage learners in supported learning tasks, uses a variety of technological tools, provides timely

feedback and includes clear channels of communication where student-student-teacher interactions can occur (Holzweiss et al., 2014; Wandler & Imbriale, 2017). Involving students, whether in the face-to-face classroom or through an online program, is a critical factor in students' academic success.

Several studies dealt with the effectiveness and obstacles of e-learning systems. Barsky and Catanach (2005) suggested using the Business Planning Model (BPM) to teach management accounting. The students were divided into two groups, the students who took the course with the BPM model and those who took the management accounting course without the BPM model. The results of the study indicated that the students in the BPM class achieved their goals. Marriott et al. (2004) examined the use of information and communication technology (ICT) by undergraduate accounting students at two universities in the United Kingdom and their views regarding the use of the Internet in their programmes. The results showed a significant increase in the use of the Internet and e-mail during the study period. A study (Zhang, 2010) found a gap between accounting education and accounting practice in China. The results of the study showed that the teaching methods used in teaching accounting curricula are traditional methods that are not available in information technology and modern electronic means of communication. (Bawaneh, 2011) touched on the possibility of using information technology in accounting education, through the use of the PowerPoint service in management accounting. The results showed that the use of PowerPoint in accounting education achieved many advantages, including: improving the educational level, increasing their ability to understand the study materials, in addition to providing additional and complete information about the contents of these materials. A study (kushniroff, 2012) dealt with changes in the business environment (big technological changes, the complexity of commercial transactions, and the emergence of new professional services.) and affecting accounting education. The study found that accounting education suffers from problems that affected the level of graduates and their ability to keep pace with modern methods applied in business areas. The study emphasized the need to develop accounting education curricula in line with accounting education standards and changes in the business environment, and to encourage faculty members to develop their teaching methods through the use of modern technologies and the provision of all kinds of presentation tools. Chugh (2010) cited technologies related to accounting approaches, such as blogs, wikis, bulletin board systems, email, podcasts, vodcasts, chat rooms, audio and video conferencing. The study concluded that technology is of great importance to accounting curricula, and many techniques are related to these curricula. Duncan et al. (2012) found that accounting students' performance improves during online exams, especially in courses that include synchronous and asynchronous interactions between students. Online learning systems are said to have many benefits. The study of (Anomah et al., 2013) aimed to identify appropriate standards for improving the curricula, in a way that contributes to the development of the accounting education method and accounting practices. The results of the study showed the need for universities to develop their accounting programs to fit with modern technological changes, in line with the requirements of accounting education standards. The study (Johnson and College 2014) attempted

to identify the extent to which accounting education programs are able to meet the challenges of the contemporary business environment. The results showed that the accounting education program does not provide the knowledge and skills necessary to meet the requirements of the labor market, and that there is a large gap between accounting education and accounting practices. The study emphasized the need for faculty members to pay attention to the professional aspect of student training and development of accounting programs, and the need for a link between theoretical study and applied study to raise the skills and capabilities of graduates and deal with the requirements of the labor market.

A study of (Fortin et al., 2019) attempted to compare the performance and satisfaction of accounting students in two integrated formats with similar content and design for traditional education, i.e. face-to-face education, versus e-learning. The study also evaluated the characteristics of students who choose the latter option (e-learning), and students' opinions were surveyed in four accounting subjects. The results indicate that the main determinants of students' decision to enroll in an online course are due to increased weekly working hours, and the belief that this type of blended course facilitates learning. The results show that students on advanced accounting courses with equivalent content and design perform similarly and have the same level of course satisfaction across course delivery formats. The study (Coovadia & Ackermann, 2020) aimed to determine whether the integration of digital teaching methods into the student learning life cycle. Exploring the use of technology as a platform for knowledge transfer in formal education, this phenomenon has prompted higher education institutions to enhance teaching and learning practices by integrating digital teaching methods into their courses. The results showed that accounting education by offering a comprehensive approach to technology integration can be effective in improving students' exam performance. The study (Mah'd & Mardini, 2020) aimed to examine the perceptions of academics and practitioners about the quality of accounting education and the extent of the integration of international education standards (IES) in accounting programs offered in higher education institutions (HEI) in the Middle East and North Africa (MENA). A mixed approach was used that included a questionnaire and semi-structured interviews and the data consisted of 151 responses and 12 semi-structured interviews with academics and practitioners in six countries in the MENA region. The results indicate that the majority of respondents believe that there is a gap between theory and practice and that the International Education Standards (IES) are not in use in universities and do not have a significant impact on accounting education.

On the other hand, the results showed that the application of international accounting education standards contributes to improving accounting education in the future. By contrast, some previous studies have pointed to barriers to online learning systems. These obstacles may include the high cost of implementing online learning systems (Bacow et al., 2012; Allen & Seaman, 2007; Almaiah et al., 2020). He touched on many challenges facing the adoption of online learning systems, including lack of financial support, lack of trust, administrative problems, and technological challenges.

Based on what has been previously shown, many previous studies have found the effectiveness of information technology in improving the efficiency and effectiveness of education, including accounting education, and developing the skills of teachers and students. In addition, the effectiveness of adopting electronic accounting education alongside traditional education in accounting education.

3.2 Studies Dealing with Accounting Education After the Corona Pandemic

The International Association of Universities (IAU) conducted a study to investigate the impact of COVID-19 on higher education globally, a global survey distributed to 9670 higher education institutions. The results indicated that all institutions were affected by this epidemic. Almost all higher education institutions said that the learning process has been affected. The results of the study showed that (67%) of the participants went through a transitional stage from traditional (face-to-face) learning to online learning. While 24% of organizations reported that they are developing solutions that ensure the learning process continues. The majority of higher education institutions have stated that all campus activities have been cancelled. A high percentage of institutions (91%) say they are well equipped to communicate effectively with their students and staff. Financially, 81% of the institutions surveyed expected a decrease in freshman enrollment, which would have dire consequences for their institutions financially. In terms of evaluation, 94% of these institutions said they would implement new performance measures and 6% would conduct exams as usual. Another institution in high-income countries reported that it was not prepared for this transition due to the financial implications of investing in an LMS. In addition, some institutions have been concerned about unequal opportunities for learning among students, as some may have good access, while others do not. Regarding pedagogical efficiency and challenges, many institutions revealed that distance learning requires a unique pedagogical approach to maintain the quality of face-to-face learning, but the sudden shift did not allow them to prepare faculty for this new technology. This led to a lack of the necessary competence among the faculty members. Another major challenge posed by the institutions participating in this study is that distance learning cannot work effectively with all fields of study, for example, practical fields of study such as medical studies and other lab-based studies cannot be effective unless they are There are reliable online learning tools. The above discussion shows that universities around the world have been greatly affected by this pandemic, in terms of providing effective and qualitative education to their students during the period of this crisis. Although most universities are well-equipped to complete their educational services for their students, they have faced some challenges due to the sudden transition to distance learning, especially in low-income countries. The study (Sangster et al., 2020) attempted to survey the opinions of those interested in accounting education in 45 countries and

concluded that most universities, schools and departments did not have previous experience in dealing with natural disasters and did not develop contingency plans to deal with an event of this type. In the context of this sweeping change in an emergency online learning environment, the benefits as well as the challenges were seen; Besides the negatives. The results of the study indicate that the contributors believe it is necessary to make some long-term changes even when it is possible to return to the campus. Additionally, the things learned in this experience mean that accounting education in most parts of the world will not return to what it was before COVID-19. Fogarty (2020) concluded that there are some clear lessons that accounting education should draw from the COVID-19 pandemic is that accounting education must be prepared for change with the world and change management should provide the best and the availability of emergency plans. Mousa (2021) examined the impact of COVID-19 on opportunities to initiate and/or implement responsible management education (RME) in Egyptian public business schools through personal interviews with academics working in four out of 25 business schools in Egypt. Findings that COVID-19 had no effect on the adoption of sustainable business education in the study sample institutions. Moreover, some respondents went even further and indicated that coronavirus is slowing down any attempt to implement RME in public Egyptian business schools.

Accordingly, the study suggested that business schools can implement RME after COVID-19 if they overcome a number of obstacles. The study (Bordoloi et al., 2021) attempted to understand the perceptions of teachers and learners regarding the use of online/blended learning styles and to know the prospects and challenges of providing online/blended learning in a country like India, particularly during and after Covid-19 through the design of a questionnaire Organized in Google Forms covering perceptions of teachers and learners in various Indian universities and colleges. The study finds that blended learning is the solution to providing education in the context of the twenty-first century in India. However, unlike traditional education, Open Education has expanded the scope of learning by adhering to the motto – "Bring your own device" to learning. Extensive use of open educational resources, open online courses, social media and meeting applications during the Covid-19 lockdown has opened the minds of people thirsty for knowledge, enabling them to receive necessary educational inputs, training and skills even during the pandemic situation. The study (Alhelou et al., 2021) aimed to determine the role of using cloud computing in improving the quality of accounting education in Palestinian universities in light of the COVID-19 pandemic. The results of the study showed that the use of cloud computing in accounting education helps faculty members and students to access and retrieve their files and applications at any time and from anywhere. It also helps in developing the student's technological skills that are commensurate with the requirements of the labor market. The study recommended the necessity of using cloud computing in teaching accounting in Palestinian universities for its role in developing students' professional and technological skills and improving their educational attainment. The results of the study (Sarea et al., 2021) revealed a critical role of COVID-19 in the process of transformation in digital education in general and accounting. Study data were collected from faculty members

in accounting departments in the Gulf Cooperation Council countries. The results showed that faculty members in accounting departments in the Gulf Cooperation Council countries have a positive perception towards the impact of the Corona virus on teaching methods and the shift to distance learning via the Internet. The results indicated that accounting teachers have changed their teaching methods to deal with the outbreak of the COVID-19 pandemic. On the other hand, the application of online learning in accounting education has improved the efficiency of the lecturer in managing his time, due to the reduced weekly time required for lecture and preparation.

It is clear from the above that the appropriate type of accounting education during the Corona pandemic is hybrid education, and that the Corona pandemic represents an opportunity to reorganize learning and teaching strategies, how it can be developed, and the most important obstacles and negatives that should be eliminated until the development of the accounting education process occurs.

4 The Impact of Cloud Computing on the Development of Accounting Education in Light of the Corona Pandemic

The transformation in the pattern of education would have taken years of planning in normal circumstances, and required developing prototypes and taking other steps before implementing those plans. However, the rapid spread of the Corona virus in the world and the necessity of physical distancing and home isolation, motivated the responsible authorities to move to e-learning. The use of the Internet in the educational process is not new today, but dates back to before the year 2000. Most of the universities were using the so-called "Learning Management Systems". In light of the "Corona crisis" that the world has experienced; The majority of educational institutions headed towards e-learning as a more appropriate alternative to ensure the continuity of the educational process. During the pandemic, the use of online video chat applications such as Zoom, Google, Meeting, WebXMate and others increased significantly (Al-Khatib, 2020). Most of the studies used the questionnaire list to survey the opinions of students and faculty members about the impact of the use of cloud computing on the development of accounting education. Internet. Therefore, the researchers in this study conducted a set of personal interviews with accounting students and faculty members in accounting departments in universities in the Sultanate of Oman, as one of the Gulf Cooperation Council countries, as well as by examining previous literature that dealt with accounting education based on cloud computing. Through interviews and reviewing studies about the pandemic in the Gulf Cooperation Council countries, the researchers found that there are many advantages and disadvantages to the experience of cloud-based accounting education in the countries of the Gulf Cooperation Council, which can be stated as follows:

4.1 First: Advantages Cloud-Based Accounting Education

Cloud-based accounting education has achieved many advantages, including:

1. Students were allowed to continue their studies without interruption while facilitating social distancing, which limited the spread of the Corona virus.
2. The use of accounting education based on cloud computing allowed students to choose the appropriate time for the educational process and not be bound by specific dates. Also, this method of studying does not need to be stuck in a classroom, but you can go to study in your garden or on the sofa of the living room on your own or in your own bed, you can choose the perfect time to study when you are at your most productive.
3. It makes studying easier and helps to acquire the skill of self-learning and organizing and managing time for some students
4. The application of online learning in accounting education as a result of this epidemic has improved the efficiency of the lecturer in managing his time, due to the decrease in the weekly time required for lecture and preparation.
5. Many accounting teachers have changed their teaching methods to deal with the dramatic change in the method of delivery as a result of the COVID-19 outbreak.
6. The focus of educational institutions in the Gulf Cooperation Council countries has been on the interactive learning management system such as Microsoft Teams and Zoom, to support the e-learning process, because these systems enable them to interact with their students and meet their needs

In addition to the above, the third international standard for accounting education IES3 indicated that the professional accountant nominated for membership in a professional organization or professional practice must be equipped with multiple skills (for example, intellectual skills, communication skills, personal skills, and organizational skills) and that cloud computing should be adopted in education The accountant greatly contributes to the development of previous skills through:

A. Teaching using cloud computing helps students to collaborate, teamwork, and work within a team or groups. In addition, education using cloud computing helps hold discussion sessions, hold seminars and forums between students and their teachers, and teach students how to deal with others who are culturally and intellectually different, which contributes to the development of students' communication skills.
B. Education using cloud computing helps in developing the intellectual skills of students, by obtaining information from different sources at any time. Computer-ready programs also help in developing logical thinking and problem-solving skills, as the program offers many options to solve the problem, and in the event the student stumbles, he can use the aid and instructions available in the program. Thus, it can be said that accounting education using cloud computing helps in developing students' intellectual skills.
C. Accounting education using cloud computing helps to learn the skill of lifelong learning by enabling the student to use electronic databases, modern means of

communication, and electronic libraries. Thus, it can be said that accounting education using cloud computing helps the student to acquire the skill of self-education.

D. Accounting education using cloud computing helps students master information technology, the Internet and its various tools, and employ them in the field of accounting and decision-making. In addition to obtaining a larger knowledge base, which develops students the skill of good thinking and the ability to solve problems. Thus, it can be said that accounting education using cloud computing helps in developing organizational and technological skills for students (Mahmoud, 2018).

4.2 Secondly: Disadvantages of Cloud-Based Accounting Education

The nature of higher education in accounting education was mostly, prior to COVID-19, traditional. Researchers believe that the Corona virus forced accounting education institutions to move to e-learning, without accounting education institutions being sufficiently prepared for this transformation. Hence, accounting education based on cloud computing in the Gulf Cooperation Council (GCC) countries had many shortcomings and negatives, including:

1. The students suffered from slow internet speed, especially in some mountainous areas, and the high costs of using it for many students.
2. Personality traits, especially of faculty members, preference for face-to-face interactions, and rigidity towards transition to alternatives (reflected in many references to the relief faculty feel or expect when they return to face-to-face learning).
3. Lack of skills and experience of some professors and students in the field of e-learning, due to the familiarity with traditional education. At the same time, some of the skills that the teacher possesses may lose their effect in this type of education.
4. The lack of face-to-face interaction between accounting professors and their students led to a high chance of distraction by browsing various websites. As well as the weakness of the motivation towards learning and the feeling of boredom as a result of sitting in front of computers and the Internet and dealing with them for a long period of time. Especially since the presented scientific material is free of audio-visual effects that attract the student towards learning and focuses primarily on the cognitive aspect.
5. Lack of practical and studied models for integrating traditional learning and e-learning. Where accounting education based on cloud computing has been applied to all accounting education courses without taking into account that some of these courses may be appropriate for traditional education only or e-learning only or the percentage allocated to both traditional and e-learning.

6. Although educational institutions in the Gulf Cooperation Council countries use the interactive learning management system such as Microsoft Teams and Zoom to support the e-learning process, many teachers have suffered from the problem of communicating with students, especially since many students open the interactive program screen without The use of the video, and then there is a difficulty by the professor in verifying the actual attendance, which made the process of evaluating students difficult in most cases.

Through personal interviews with a number of accounting professors and students in universities in the Gulf Cooperation Council countries, the researchers found that the Gulf Cooperation Council countries should benefit from the advantages that have been achieved from e-learning with a return to traditional education and then adopt hybrid accounting education. The next section will address the proposed framework for developing Accounting Education Programs Using Cloud Computing.

5 The Proposed Framework for Developing Accounting Education Programs Using Cloud Computing in Addition to Traditional Education

Researchers believe that although the Corona virus represents a great challenge to accounting education, it represents a great opportunity that must be exploited in order to take long-awaited steps and decisions in order to improve the quality of accounting education. In a Sangster et al., 2020 study that included experts in accounting education in 45 countries, nearly half of the contributors were convinced that the post-COVID-19 future lies in the blended/hybrid education approach. Although some accounting education experts point out that the internet can only be used for some modules/courses/programs, universities and faculty have found that e-learning and hybrid were more feasible and achievable than expected. Therefore, most of the views of accounting education experts were that the mixed/hybrid learning and education environment is the future of accounting education. At the same time, a study (Bordoloi et al., 2021) concluded that hybrid education is appropriate for the future of accounting education in India for a future.

This framework aims to develop accounting education in general and hybrid accounting education that combines traditional education and education using cloud computing applications in the countries of the Gulf Cooperation Council. In all Gulf Cooperation Council countries, this is due to many reasons, including:

1. The Corona pandemic is not over yet, and therefore there should be continuous preparation for the transition to education through various cloud computing applications, whether fully or partially.
2. Taking advantage of the advantages of the e-learning experience that took place during the Corona pandemic and at the same time, overcoming the negatives of e-learning by being part of the traditional educational process.

3. There must be a willingness, even partially (effective alternative), such as universities to switch to e-education, whether due to the Corona pandemic or other natural and unnatural disasters that occur in countries.
4. Hybrid education helps educational institutions achieve the largest possible return on investments made in e-learning during the Corona pandemic.
5. The current time represents a great opportunity that must be exploited by educational institutions in the countries of the Gulf Cooperation Council in order to take long-awaited steps and decisions in order to shift, even partially, in the accounting education methodology in the countries of the Gulf Cooperation Council in light of improving the skills and capabilities of e-learning that has been made for both Students, teachers and staff during the Corona pandemic
6. Accounting education does not need devices, laboratories and laboratories, and therefore accounting education must be divided into traditional education and e-learning according to the courses and the need for practical exercises in each course, which results in an expected decrease in the costs of the educational process for both the educational institution and the student of the world at the same time

Effective integration of ICTs into higher education is a complex and multifaceted process that includes not only technology but also teaching curricula, institutional readiness, digital literacy for teachers, and ongoing funding (Kundi et al., 2014; Kundi & Nawaz, 2013). Therefore, it is necessary to develop new skills and new ways to use them in e-learning/hybrid projects (Zubair et al., 2013). The proposed framework is based on the so-called hybrid education, an education system that combines "face-to-face learning" and "learning through cloud computing applications.", in order to work on obtaining the advantages of both systems through different levels of blended learning with multiple experimental applications of information and communication technology in teaching, learning and education management. This framework is based on several basic components that represent the components of the educational environment, which are:

5.1 First: Preparing the Human Resource Elements

Humans represent the basis of the educational process, whether the student, the professor, or the workers who provide services to students and professors at the same time. The human elements can be divided into:

1. Preparation of accounting professors: Reports indicate that decisions made by professors about the use of computers in the classroom are affected by several factors, including: access to related hardware and software, the nature of the curriculum, personal abilities, and teachers' beliefs in their ability to work effectively with technology. Moreover, the teacher's concern is that he will be replaced by ICT or deprived of his leadership in the classroom, because the educational process has become more focused on the learner. This feeling can be reduced

and eliminated if teachers develop an understanding and appreciation for their changing roles. (Kundi & Nawaz, 2013). One of the biggest problems facing e-accounting education is the readiness of professors and faculty members to use modern technology in the education process, and therefore teachers must be trained to employ technology and communication in education. The success of e-education depends on training teachers because they are the ones who prepare students as well as officials as digital users. (Abbas & Nawaz, 2014) Therefore, universities must attract the best human skills and experiences that help implement the hybrid education system (traditional and cloud-based). The success of the hybrid educational system will depend mainly on the skills, capabilities and flexibility of the faculty members sufficient to communicate with students and to enhance their creativity, whether in face-to-face education or education via cloud computing, universities must develop and continuously train faculty members on modern technologies related to cloud computing.

2. Prepare students: The design and development of learning environments must be in line with the "student requirements (Young, 2003). Undoubtedly, students' use of smart phones will make it much easier for them to keep up with technology compared to professors. This generation of students differs from their predecessors in terms of their abilities and skills And their readiness for participatory learning, given that most students have access to various forms of information technology, especially the Internet and mobile phones. At the same time, additional support or motivation must be provided to students and constantly guide them in light of e-learning, and therefore the university administration must train students to use modern technologies Concerning cloud computing and how the services it provides can be benefited from, attention should be paid and the level of education efficiency should be monitored during lectures.
3. Equipping and preparing technicians and administrators: sustainable technical support is one of the most important challenges. Once the e-learning system is developed, providing continuous technical support is a challenge. The need for continuous and uninterrupted technical support is required by professors, students and administrators in addressing their hardware and software problems, which are considered common in any application, and the importance of this dimension is illustrated by the fact that almost all researchers of e-learning in institutions of higher education have empirically demonstrated that successful e-learning projects depend on consistent and continuous technical support in a timely manner (Abbas & Nawaz, 2014). Electronic access is not only about access to infrastructure (and thus filling the hardware gap) but rather it must enable users to obtain knowledge, skills and continuous support for organizational structures (Ågerfalk et al., 2006). Therefore, the university administration should select a specialized team that supervises the management and follow-up of the work. To supervise the activation of modern technologies related to cloud computing, universities must also rely on the method of continuous training for employees who They maintain and provide continuous support to students both in traditional face-to-face education and through cloud computing applications

5.2 Second: The Teaching/Educational Process

The educational process begins with the curricula, curricula, and the means and methods in which the educational process is carried out and ends with the assessment of students. The elements of the educational process can be stated as follows:

1. Educational content/curricula: IES2 defines the components of professional knowledge with three components: (accounting knowledge, financial knowledge and related knowledge. Organizational and business knowledge includes business environment, corporate governance, economics, business ethics, financial markets, quantitative methods, business and management knowledge and behavior Regulatory and others (Technical knowledge, including knowledge of information systems, technology, control systems, and how to use them). The content of the accounting education programs in universities is in need of modification and development to serve the accounting labor market. Therefore, amendments must be made to the current accounting curricula to keep pace with the requirements of international accounting education and to add curricula that keep pace with the developments and accounting applications on modern technology, and at the same time the work of accountants (banks, companies, ... etc.), as well as professional bodies and associations for accounting and auditing, must cooperate to be in line. Curriculum with the needs of the labor market.
2. Teaching aids: The choice of teaching aids constitutes a major challenge in traditional and electronic education. In traditional education, interactive education must be employed, which increases students' attention by involving them directly as contributors, not as recipients. This will increase the stimulus factor and achieve better results. Here the teacher must make a considerable effort to determine the appropriate interactive means for each goal; The process of engaging students in different places, and maintaining their attention across devices, is not easy, but certainly not impossible. There are many programs and applications available on the Internet to achieve student interaction in the educational process individually or in groups, including Quizziz, Socrative, Padlet, kahoot and Mindmaps, not to mention the applications provided by Google, Microsoft, Apple and others. All that the teacher needs is good planning to choose the appropriate method for each educational goal, but it may not yet be sufficient for the final evaluation and monitoring of students' grades (Al-Khatib, 2020).
3. Covering different needs and learning styles: Taking into account the diversity of learning styles is part of the planning elements for a fair and successful educational process; There are - according to Fleming and Mills' VARK model - four basic learning styles: auditory, visual, kinesthetic, and literate learning style (Al-Khatib, 2020). Researchers believe that the use of different applications of cloud computing and the various media it contains represented in various audio and video technologies Texts, etc. will positively affect the effectiveness of accounting education, and therefore accounting professors must diversify their methods and use different technological means, tools and applications. The method of interactive meetings can be used through different applications, written and

audio correspondence, and other various educational means that are in line with different styles.

4. Developing student evaluation methods: Students are evaluated in two stages:

   The first stage: It is carried out through the educational process and between its stages, steps and procedures, and provides continuous feedback in all stages first-hand, with an indication of strengths and weaknesses, to modify what is needed in a constructive and continuous manner, through several methods and tools such as oral questions, short tests and worksheets. This stage aims to diagnose what the student has mastered and what he has failed to achieve at an early stage, so that the teacher can remedy the defect. Through personal interviews with faculty members in the Gulf Cooperation Council countries, this stage of evaluation was the most difficult at all in light of the use of accounting education through cloud computing applications, as many professors suffered from the problem of communicating with students, especially that many students open the screen of the interactive program Without the use of the video, and then there is difficulty by the professor in actually verifying attendance, which made it very difficult to assess students.. A group of programs and applications that are used for discussion and display questions to students on the projector, such as Slideo, can be used to activate Discussions with students and enabling them to express their opinions on various topics and ideas that help improve communication and increase interaction during lectures (Al-Hatami, 2020; Hamdan, 2020).

   The second stage: takes place after the completion of the teaching process, where students are exposed to a set of tools and questions through which they can determine their understanding and comprehension of the lesson. This type of assessment usually occurs at the end of the lesson, unit, or semester. This assessment aims to give grades and grant certificates, and here the electronic assessment can be used to assess cognitive and skill abilities through the "electronic test".

   Third: Material and technological capabilities: The availability of technological capabilities and resources is an important factor for the success of the idea of learning in general, whether traditional education, e-learning or hybrid education. Therefore, it is necessary to create and modernize the infrastructure in accounting education institutions and to make maximum use of the existing capabilities of accounting education institutions at the same time. Therefore, financial resources must be provided in order to rely on cloud computing technologies that can be easily integrated with the currently used system. At the same time, cloud computing applications must be chosen that save significant costs for its users, such as the need to rely on special devices after purchasing them. It is also necessary to take advantage of the applications that It works using cloud computing, and at the same time, universities must enter into partnerships and long-term agreements with international companies that provide cloud computing technologies, for example, Microsoft, Google, etc. The researchers believe that the material and techno-

logical capabilities related to education through cloud computing did not represent any problem for universities in the Gulf Cooperation Council countries, as these universities have already implemented education through cloud computing during the Corona pandemic.

5.3 What Distinguishes the Current Study

The results of the study showed that accounting education based on cloud computing (online learning) has achieved many advantages, including that it allowed students to continue their studies without interruption while facilitating social distancing. In addition, it allowed students to choose the appropriate time for the educational process and not be bound by specific dates. On the other hand, this way of studying does not need to sit a classroom which made studying easier and helped to gain the skill of self-learning, organization and time management. This result agrees with the study (Sarea et al., 2021; Bordoloi et al., 2021; Alhelou et al., 2021), which found that the application of online learning in accounting education led to increased knowledge of technology, improved learning outcomes and flexibility. In addition to improving the efficiency of the lecturer in managing his time, due to the decrease in the weekly time required for lecture and preparation.

On the other hand, e-learning has faced many challenges, such as Students have suffered from slow internet speed, especially in some remote areas, the high costs of using it for many students, and the lack of experience of some professors and students in the field of e-learning. These results agree with the study (Alshurafat et al., 2021), which found that online learning systems in developing countries such as Jordan suffer from many challenges and difficulties. Make some long-term changes even when it is possible to return to campus.

The most important feature of the current study is that it's done after the Corona pandemic and the return of most universities to traditional education (face to face), except for some study subjects that continued via the Internet. The results of the study confirm that the ministries of higher education and universities in the Arab Gulf region should benefit from the experience of e-learning, in order to work on obtaining the advantages of both systems through different levels of mixed learning with multiple experimental applications of information and communication technology in teaching, learning and education management.

6 Conclusion

University accounting education programs aim to prepare graduates who possess the knowledge and skills necessary to meet the needs of the new knowledge economy in terms of accounting and financial reports and information, and who can work in a changing and complex environment and suffer from financial problems

and crises. The response of universities in the Gulf Cooperation Council countries to the Corona pandemic was to adopt the e-learning system, and the educational institutions in the Gulf Cooperation Council countries focused on the interactive learning management system such as Microsoft Teams and Zoom ... etc., to support the e-learning process, because these systems enable them to interact with its students and meet their needs. Accounting education based on cloud computing has achieved some advantages, including allowing students to continue their studies without interruption while facilitating social distancing, allowing students to choose the appropriate time for the educational process and not being bound by specific lecture dates. It also made studying easier, which helped in acquiring the skill of self-learning and organizing and managing time for some students. But on the other hand, students suffered from slow internet speed, especially in some mountainous areas, the high costs of using it for many students, and the lack of experience of some professors and students in the field of e-learning due to getting used to traditional education, and at the same time, some of the skills that the professor has may lose their impact in this type of education. Through personal interviews with several accounting professors and students in universities in the Gulf Cooperation Council countries, the researchers found that the previous obstacles were at a great level at the beginning of the application of e-learning through cloud computing applications, but the level of these obstacles has decreased over time, and many technical problems have been solved. Solved and there is a relative acceptance of education through cloud computing. Added to this is the lack of studied practical models for integrating traditional and e-learning. Where accounting education based on cloud computing has been applied to all accounting education courses without taking into account that some of these courses may be appropriate for traditional education only or e-learning only or the percentage allocated to both traditional and e-learning.

The limitations of this research are an attempt to explore the perceptions of faculty members and students of accounting education in the Gulf Cooperation Council countries regarding the impact of using cloud computing applications on the development of accounting education during the Corona period through personal interviews and examination of previous literature. Therefore, researchers recommend conducting future studies that use other research tools such as the questionnaire, as well as conducting comparative studies on evaluating the quality of accounting education in three different periods: the time period for education before the Corona pandemic, the period of education using cloud computing applications, and the time period after the restrictions were abandoned.

References

Abbas, Z., & Nawaz, A. (2014). Digital-literacy as the predictor of political-participation a survey of university graduates in D. Khan, KP, Pakistan. *Global Journal of Human Social Science, (F), 14*(8), 7–14.

Ågerfalk, P. J., Goldkuhl, G., Fitzgerald, B., & Bannon, L. (2006). Reflecting on action in language, organisations and information systems. *European Journal of Information Systems, 15*(1), 4–8.

Alhabeeb, A., & Rowley, J. (2017). Critical success factors for eLearning in Saudi Arabian universities. *International Journal of Educational Management, 31*(2), 131–147. https://doi.org/10.1108/IJEM-01-2016-0006

Al-Hatami, A. G. (2020, March 28 Saturday). Yes. It is possible to evaluate students remotely. *Gulf News newspaper*.

Alhelou, E. M., Rashwan, A. R. M., & Abu-Naser, S. S. (2021). The role of using cloud computing in improving the quality of accounting education in Palestinian universities in light of the Covid-19 Pandemic. *Journal of Economics, Finance and Accounting Studies, 3*(1), 11–32.

Allen, I. E., & Seaman, J. (2007). Making the grade: Online education in the United States, 2006. Sloan Consortium. PO Box 1238, Newburyport, MA 01950.

Maan Al-Khatib. (2020). *The challenges of E-learning in the light of the Corona crisis and beyond*. https://www.aljazeera.net/

Almaiah, M. A., Al-Khasawneh, A., & Althunibat, A. (2020). Exploring the critical challenges and factors infuencing the E-learning system usage during COVID-19 pandemic. *Education and Information Technologies, 25*, 5261–5280.

Al-Samarraie, H., & Saeed, N. (2018, September). A systematic review of cloud computing tools for collaborative learning: Opportunities and challenges to the blended-learning environment. *Computers and Education, 124*, 77–91.

Alshurafat, H., Al Shbail, M. O., Masadeh, W. M., Dahmash, F., & Al-Msiedeen, J. M. (2021). Factors affecting online accounting education during the COVID-19 pandemic: An integrated perspective of social capital theory, the theory of reasoned action and the technology acceptance model. *Education and Information Technologies, 26*(6), 6995–7013.

Anomah, S., Aduamoah, M., & Agyabeng, O. (2013). Examining and justifying the IS/IT skills that may be designed into the Accountancy education curricula for Tomorrow's professionals. *European Journal of Accounting Auditing and Finance Research, 1*(3), 1–14.

Attaran, M., Attaran, S., & Celik, B. G. (2017). Promises and challenges of cloud computing in higher education: A practical guide for implementation. *Journal of Higher Education Theory and Practice, 17*(6), 20–38.

Bacow, L. S., Bowen, W. G., Guthrie, K. M., Lack, K. A., & Lon, M. P. (2012). *Online learning systems in US higher education*. ITHAKA.

Barsky, N. P., & Catanach, A. H. Jr. (2005). Motivating student interest in accounting: A business planning approach to the introductory management accounting course. *Advances in Accounting Education, 7*, 27–63.

Battistelli, C., McKeever, P., Gross, S., Ponci, F., & Monti, A. (2018). Implementing energy service automation using cloud technologies and public communications networks. In *Sustainable cloud and energy services* (pp. 49–84). Springer.

Bawaneh, S. S. (2011, June). Does using computer technology improve students' performance? Evidence from a management accounting course. *International Journal of Business and Social Science, 2*(10), 266–274.

Bazi, H. R., Hassanzadeh, A., & Moeini, A. (2017). A comprehensive framework for cloud computing migration using meta-synthesis approach. *Journal of Systems and Software, 128*, 87–105. NT and the. https://doi.org/10.1016/j.jss.2017.02.049

Bensaid, B., & Brahimi, T. (2020, April). Coping with COVID-19: Higher education in the GCC countries. In *The International Research & Innovation Forum* (pp. 137–153). Springer, Cham.

Bora, U. J., & Ahmed, M. (2013). E-learning using cloud computing. *International Journal of Science and Modern Engineering, 1*(2), 9–12.

Bordoloi, R., Das, P., & Das, K. (2021). Perception towards online/blended learning at the time of Covid-19 pandemic: An academic analytics in the Indian context. *Asian Association of Open Universities Journal, 16*(1), 41–60. https://doi.org/10.1108/AAOUJ-09-2020-0079

Buyya, R., Yeo, C., & Venugopal, S. (2009). Market oriented cloud computing: Vision, hype, and reality for delivering it services as computing utilities. *10th IEEE International Conference on High Performance Computing And Communications 2008*. Dalian, China.

Chugh, R. (2010). E-learning tools and their impact on pedagogy. In K. J. Editors: Ubha DS (Ed.), Emerging Paradigms in Commerce and Management Education (pp. 58–81). Khalsa College Press, Patiala, India: GSSDGS.

Coovadia, H., & Ackermann, C. (2020). Integrating digital pedagogies into a typical student learning lifecycle and its effect on exam performance. *Accounting Education*, *29,* 42–62.

Darbandi, M. (2017). Proposing new intelligent system for suggesting better service providers in cloud computing based on Kalman filtering. *HCTL International Journal of Technology Innovations and Research, 24*(1), 1–9.

Duncan, K., Kenworthy, A., & McNamara, R. (2012). The efect of synchronous and asynchronous participation on students' performance in on-line accounting courses. *Accounting Education, 21*(4), 431–449.

El Mhouti, A., Erradi, M., & Nasseh, A. (2018). Using cloud computing services in e-learning process: Benefits and challenges. *Education and Information Technologies, 23*(2), 893–909.

Fogarty, T. J. (2020). Accounting education in the post-COVID world: looking into the Mirror of Erised. *Accounting Education, 29*(6), 563–571.

Fortin, A., Viger, C., Deslandes, M., Callimaci, A., & Desforges, P. (2019). Accounting students' choice of blended learning format and its impact on performance and satisfaction. *Accounting Education, 28*(4), 353–383.

Gerholz, K.-H., Liszt, V., & Klingsieck, K. B. (2018). Effects of learning design patterns in service learning courses. *Active Learning in Higher Education, 19*(1), 47–59.

Gregory, S., & Bannister-Tyrrell, M. (2017). Digital learner presence and online teaching tools: higher cognitive requirements of online learners for effective learning. *Research and Practice in Technology Enhanced Learning, 12*(1), 1–17.

Hamdan, H. R. (2020). Education in the Time of Corona: Assessing Student Learning in E-Learning, Donia Al- Watan Newspaper 30/40/2020.

Holzweiss, P. C., Joyner, S. A., Fuller, M. B., Henderson, S., & Young, R. (2014). Online graduate students' perceptions of best learning experiences. *Distance Education, 35*(3), 311–323.

Humphrey, R. L., & Beard, D. F. (2014). Faculty perceptions of on-line homework software in accounting education. *Journal of Accounting Education, 32*(3), 238–232.

Ibrahim, E. S. Z. (2019). A proposed framework to increase the effectiveness of accounting education in Egypt: A field study. *The Third Scientific Conference of the Accounting and Auditing Department "Challenges and Prospects for the Accounting and Auditing Profession in the Twenty-First Century" Faculty of Commerce*, Alexandria University.

Johnson, R. (2014). Accounting practitioners reflect on faculty impact: bridging the gap between theory and practice. *American Journal of Business Education (AJBE), 7*(2), 114–109.

Kundi, G. M., & Nawaz, A. (2013). From eLearning 1.0 to eLearning 2.0: Threats & opportunities for HEIs in developing countries. *European Journal of Sustainable Development, 3*(1), 145–160.

Kundi, G. M., Nawaz, A., & Akhtar, R. (2014). Digital revolution, cyber-crimes and cyber legislation: A challenge to governments in developing countries. *Journal of Information Engineering and Applications, 4*(4), 61–71.

Kushniroff, M. C. (2012). Where do we go to ensure the continuation of accounting education? *Journal of Accounting and Finance, 12*(4), 110–122.

Love, N., & Fry, N. (2006). Accounting students' perceptions of a virtual learning environment: Springboard or safety net?. *Accounting Education: An International Journal, 15*(2), 151–166.

Lin, A., & Chen, N.-C. (2012). Cloud computing as an innovation: Percepetion, attitude, and adoption. *International Journal of Information Management, 32*(6), 533–540.

Mah'd, O. A., & Mardini, G. H. (2020). The quality of accounting education and the integration of the international education standards: evidence from Middle Eastern and North African countries. *Accounting Education, 31*(2), 113–133.

Mahmoud,W. H. M., (2018). Using cloud computing services to develop university accounting education in Egypt. *Accounting Thought, 22*(7), 638–581.

Marriott, N., Marriott, P., & Selwyn, N. (2004). Accounting undergraduates' changing use of ICT and their views on using the Internet in higher education–a research note. *Accounting Education, 13*(sup1), 117–130.

Mattis, G. (2019). *How to improve sustainability in higher education*. Electronic Copy available at https://www.qs.com

Mayer, R. E. (2017). Using multimedia for e-learning. *Journal of Computer Assisted Learning, 33*(5), 403–423.

Mell, P., & Grance, T. (2009). The NIST Definition of Cloud Computing. *National Institute of Standards and Technology, 53*, 50.

Misra, S. C., & Mondal, A. (2010). Identification of a company's suitability for the adoption of cloud computing and modelling its corresponding return on investment. *Mathematical and Computer Modelling, 53*(3–4), 504–521.

Moore, J. L., Dickson-Deane, C., & Galyen, K. (2011). E-learning, on-line learning, and distance learning environments: Are they the same? *The Internet and Higher Education, 14*(2), 129–135.

Mousa, M. (2021). Responsible management education (RME) post COVID-19: What must change in public business schools? *Journal of Management Development, 40*(2), 105–120.

Mwalumbwe, I., & Mtebe, J. S. (2017). Using learning analytics to predict students' performance in Moodle learning management system: A case of Mbeya University of Science and Technology. *The Electronic Journal of Information Systems in Developing Countries, 79*(1), 1–13.

Naghi, M. El-S. (2016). Accounting education and the accounting and auditing profession between reality and ambition, *Journal of Finance and Trade, Faculty of Commerce*, Cairo, Issue 3.

Nasr, M., & Ouf, S. (2011). An ecosystem in e-learning using cloud computing as platform and Web2. 0. *The Research Bulletin of Jordan ACM, 2*, 134–140.

Palvia, S., Aeron, P., Gupta, P., Mahapatra, D., Parida, R., Rosner, R., & Sindhi, S. (2018). Online education: Worldwide status, challenges, trends, and implications. *Journal of Global Information Technology Management, 21*(4), 233–241. https://doi.org/10.1080/1097198X.2018.1542262

Peng, J., & Abdullah, I. (2018). Building a market simulation to teach business process analysis: Effects of realism on engaged learning. *Accounting Education, 27*(2), 208–222.

Perera, L., & Richardson, P. (2010). Students' use of on-line academic resources within a course web site and its relationship with their course performance: An exploratory study. *Accounting Education: an international journal, 19*(6), 587–600.

Rajabion, L., Wakil, K., Badfar, A., Nazif, M., & Ehsani, A. (2019). A new model for evaluating the effect of cloud computing on the e-learning development. *Journal of Workplace Learning, 31*(5), 324–344. https://doi.org/10.1108/JWL-12-2018-0156

Sangster, A., Stoner, G., & Flood, B. (2020). Insights into accounting education in a COVID-19 world. *Accounting Education, 29*(5), 431–562.

Sarea, A., Alhadrami, A., & Taufiq-Hail, G. A.-M. (2021). COVID-19 and digitizing accounting education: Empirical evidence from GCC. *PSU Research Review, 5*(1), 68–83. https://doi.org/10.1108/PRR-10-2020-0034

Sultan, N. A. (2010). Reaching for the "cloud": How SMEs can manage. *International Journal of Information Management, 31*(3), 272–278.

Teng, L., Tan, Q., & Ehsani, A. (2021). Assessing the impact of cultural characteristics, economic situations, skills and knowledge on the development and success of cloud-based e-learning systems in the COVID-19 era. *Kybernetes*. ahead-of-print No. ahead-of-print. https://doi.org/10.1108/K-12-2020-0838

Turnbull, D., Chugh, R., & Luck, J. (2021). Issues in learning management systems implementation: A comparison of research perspectives between Australia and China. *Education and Information Technologies*, 1–22. https://doi.org/10.1007/s10639-021-10431-4

Van Biljon, J., & van der Merwe, R. (2018). Research on mobile cloud computing in teaching and learning: A conceptual framework. *Presented at ICEL 2018 13th International Conference on e-Learning*.

Wandler, J. B., & Imbriale, W. J. (2017). Promoting undergraduate student self-regulation in online learning environments. *Online Learning, 21*(2), n2.

Yadegaridehkordi, E., Shuib, L., Nilashi, M., & Asadi, S. (2019). Decision to adopt on-line collaborative learning tools in higher education: A case of top Malaysian universities. *Education and Information Technologies, 24*(1), 79–102.

Yoosomboon, S., & Wannapiroon, P. (2015). Development of a challenge based learning model via cloud technology and social media for enhancing information management skills. *Procedia Social and Behavioral Sciences, 174*, 2102–2107.

Younes, N. M. M. (2019). The role of big data in sustaining accounting education: A field study. *The Third Scientific Conference of the Accounting and Auditing Department "Challenges and Prospects of the Accounting and Auditing Profession in the Twenty-First Century"*. Faculty of Commerce, Alexandria University.

Young, L. D. (2003, Fall/Autumn). Bridging theory and practice: Developing guidelines to facilitate the design of computer-based learning environments. *Canadian Journal of Learning and Technology, 29*(3), 1–12.

Zhang, C. (2010, June 22–24) Notice of retraction team-based project teaching and its application tactics in accounting education. *International Conference on Education Technology and Computer* (Vol. 2), Wuhan University, China. Available at : https://ieeexplore.ieee.org/document/5507986

Zubair, S., Yan, F., & Wang, W. (2013). Dictionary learning based sparse coefficients for audio classification with max and average pooling. *Digital Signal Processing, 23*(3), 960–970.

Omar Ikbal Tawfik is a PhD holder in Accounting (2004) and has vast experience in teaching both bachelor and MA levels in Accounting & Management. He evaluated several research papers published in sage open and Journal of Islamic Accounting and Business Research. Also, Dr. Tawfik had published several research papers in Scopus, five book and conference articles in different topic of Accounting. Moreover, he is a reviewer of journal of financial reporting and Accounting. Finally, he has interest in Cloud Accounting, Corporate Governance, Financial Performance and Auditing. Currently, he is working in the Accounting Department of Dhofar University in the Sultanate of Oman with the rank of Associate Professor in 2015 after 15 years at the University of Iraq, Yemen and Jordan.

Hamada Elsaid Elmaasrawy is an Assistant Professor at the Department of Accounting, Tanta University, Egypt. He has many published articles in the field of Accounting, Finance, Auditing and Corporate Governance and reviewer in a number of journals listed in the Scopus database. He is also a co-author of books on Islamic finance, presentation skills and writing reports in the field of accounting and auditing.

Business Alignment of Information Technology Governance Planning at a Professional Council in South Africa

Tshepo Chauke and Mpho Ngoepe

1 Introduction and Background

While information is recognised as a valuable organisational asset, many organisations fail to realise its full business value due to misalignment of their information governance (IG) systems. This may even limit organisations as employees might not be able to work remotely. Indeed, it was evident during lockdown in many countries as a result of Covid-19 pandemic. In developing countries such as South Africa, many organisations were not operational during lockdown due to non-alignment of IT governance to business needs. In some organisations, there are financial and personal constraints that limit better alignment between IT and business. Such organisations are unable to locate data to make informed decisions. Caravaca (2016, p. 47) claims that data are stored in organisations without a clear concept due to the following factors: the use of standardised formats, resolution, image integrity, and metadata. As a result, information is disorganised due to a lack of fixed form and stable content, as well as technological obsolescence, which renders it inaccessible. A proper technological infrastructure must be in place to address management challenges in order for the business to derive value out of its investments. As observed by Panian (2010, p. 940) poor IG necessitates the integration of information systems with business processes. The problem is that in many organisations, IG is implemented in silos. Hence, Mullon and Ngoepe (2019) advocate for information to be an integral part of organisational governance because it is regarded as an enabler of such business. In this regard, Fitroh et al. (2017) outline benefits such as efficient operations, reduced costs, improved information technology (IT) infrastructure control, and continuity even during disasters such as the Covid-19 pandemic, where employees work remotely. Covid-19 pandemic accentuated the need for

T. Chauke · M. Ngoepe (✉)
University of South Africa, Pretoria, South Africa
e-mail: ngoepms@unisa.ac.za

M. Alaali (ed.), *COVID-19 Challenges to University Information Technology Governance*, https://doi.org/10.1007/978-3-031-13351-0_11

organisation to accelerate integration of their IG to business needs which resulted in digitalisation. Indeed, the success of IG is key in ensuring timely, adequate, and compliant information throughout business activities in order to make decisions that improve organisational competitiveness and efficiency (Nguyen et al., 2014). In South Africa, for example, while many organisations were unable to function due to the Covid-19 pandemic, those that had integrated their information technology systems, such as the South African Local Government Authority (SALGA) and the University of South Africa (UNISA), to name just two, were able to fully function. While SALGA was able to fully comply with external audit requirements by providing reliable evidence to auditors remotely (Ngoepe et al., 2022), UNISA, on the other hand, was able to complete the 2020 and 2021 academic years, whereas some institutions of higher learning struggled due to a lack of learning management systems. This was possible as these organisations have moved towards digital transformation. For example, at UNISA, systems for managing digital records, as well as learning management system, student system and enterprise resource planning have been implemented (Ngoepe et al., 2022). What is left for a full digital transformation is just integration of all these systems. However, even without integrations, employees of this university are able to execute all their functions remotely. The greater risk may be that organisations have to protect their information that is available everywhere and put in place protection measures to ensure business continuity. This explains why Iles (2013) proposes IG as a more complete and richer way to add value to business by taking a more holistic view of organisational information. However, information technology governance is not always aligned with business objectives in many organisations. When systems are aligned and integrated, it makes it easier for employees to perform their duties from any location at any time. The chapter used one of the three concepts of the Control Objective for Information and Related Technology (COBIT) – align, plan, and organise – to explore the business alignment of information technology governance planning at the South African Council for Social Service Professions (SACSSP).

In terms of IG, the SACSSP used silo-based systems that were not integrated with other functions. As a result, the organisation experienced delays with paper-based processes, including difficulties with document tracking. It was even more challenging during lockdown caused by Covid-19 pandemic as many organisations were operating remotely. The SACSSP is a statutory body established in accordance with Section 2 of the Social Service Professions Act, No. 100 of 1978 (Republic of South Africa (RSA), 1978), as amended by Act No. 102 of 1998. (RSA, 1998). The act has restricted that the office must be in Pretoria. Furthermore, the council guides and regulates the professions of social work and child youth care work in terms of registration, education and training, professional conduct, and ethical behaviour, as well as ensuring continuing professional development and fostering compliance with professional standards (SACSSP, 2018a).

The SACSSP previously relied on a manual filing system and disparate IT systems, making it difficult to provide an integrated view in support of IG. The organisation made use of an obsolete Silverlight-based application (SACSSP, 2018a). All

IT services are outsourced, making it difficult for the organisation to access reports because all database access is controlled by the service provider (SACSSP, 2018b). The qualifications of the members are sent to the South African Qualifications Authority (SAQA) for verification on an annual basis, and the process is delayed due to inconsistent data. The researchers were present at the exploratory meeting, where issues with information access were raised, and permission was granted for a system overhaul to maximise information efficiency and integration within the organisation (SACSSP, 2018a).

The problem for this study was defined by the SACSSP when the council realised that there was a need to move away from manual data processing towards more integrated and technologically supported data systems. The Covid-19 pandemic accelerated the digitalisation plan of the SACSSP. This was because most of the registrations and renewals of membership by professionals were done in person. With restrictions of movement dues to lockdown, this was not possible, while there was a need for professionals to display their valid practicing certificates at their employment places. This put the SACSSP under severe pressure to expedite the digital transformation plan. Compounding the problem was the postal service that was not functioning at all during the lockdown. Even where postal service was functioning, there were a number of returns. This is also emphasised by Maluleke et al. (2021) as they argue that the library at an open distance e-learning institution incurred costs due to high return of books from the post office. Many branches of post office also have to be closed as they were not making profit. The SACSSP had to embrace technology to transform its services digitally. In this regard, the SACSSP acknowledged that its greatest asset is information and part of attaining a harmonious integration of solutions is to transition from manual processes to automated solutions. The transition required an overhaul of IT operations and digitisation of systems. The organisation experienced a lack of a cogent IT system design, as well as disparate inherited registration, finance, and external verification systems that are incompatible with new system innovations to ensure effective and efficient operations (Chauke & Ngoepe, 2020). Following this realisation, the SACSSP embarked on a digital transformation process to modernise the organisation by implementing architectural aspects of information governance. In this regard, the SACSSP acknowledged that its greatest asset is information, and that transitioning from manual processes to automated solutions is part of achieving a harmonious integration of solutions. In this regard, the SACSSP was involved in a comprehensive IG implementation using COBIT. The Information System Audit and Control Association (ISACA) (2018b, p. 13) confirms the updated COBIT framework that enterprise information and technology (I&T) governance and management should be aimed at the entire enterprise and not just the IT department of an organisation. According to Moeller (2013, p. 126), organisations make efforts to mitigate enterprise-wide risks, whereas the SACSSP's risk management processes cannot be said to be formalised. Two strategic IT risks were identified: a lack of a disaster recovery plan (DRP) and secure intellectual property (IP) of SACSSP data, both of which would result in the loss of critical information and SACSSP IP (SACSSP, 2019, p. 1).

2 Theoretical Framework and Literature Review

While the COBIT framework comprises five domains: Evaluate, Direct and Monitor (EDM); Align, Plan and Organise (APO); Build, Acquire and Implement (BAI); Deliver, Service and Support (DSS); and Monitor, Evaluate and Assess (MEA), this chapter focused on the APO constructs (see Fig. 2). The APO domain's role is to implement a consistent management approach for meeting enterprise governance requirements, which includes governance components such as management processes, organisational structures, roles and responsibilities, dependable and repeatable activities, information items, policies and procedures, skills and competencies, culture and behaviour, and services, infrastructure, and applications (ISACA, 2018a, p. 55). According to Mourad et al. (2017, p. 4), the APO is a representation of the strategic dimension of I&T governance (Fig. 1).

According to Mourad et al. (2017, p. 4), planning is a representation of the strategic dimension of I&T governance. The plan domain's role is to implement a consistent management approach for meeting enterprise governance requirements, which includes governance components such as management processes, organisational structures, roles and responsibilities, dependable and repeatable activities, information items, policies and procedures, skills and competencies, culture and behaviour, and services, infrastructure, and applications (ISACA, 2018a, p. 55). Figure 2 depicts the 14 processes discussed in the planning domain.

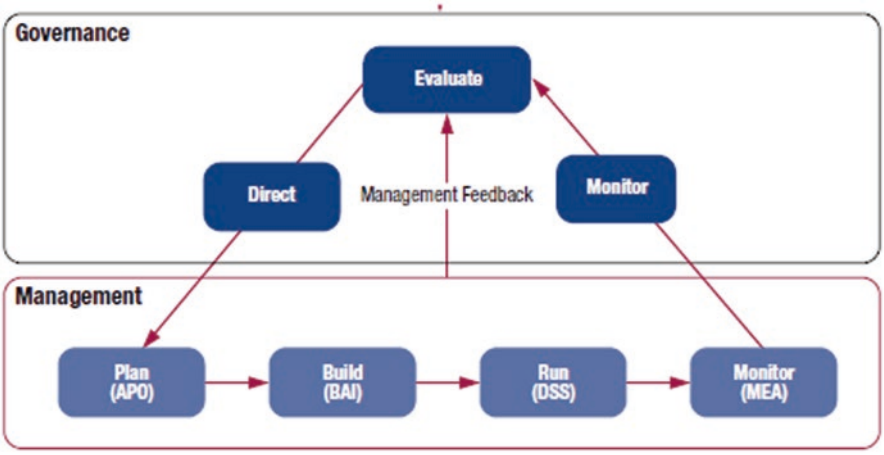


Fig. 1 Governance and management key areas. (Source: ISACA, 2011, p. 32)

Fig. 2 Plan domain processes. (Source: ISACA, 2018b, p. 12)

2.1 Information and Technology Management Framework

The I&T management ensures that governance components such as roles and responsibilities, organisational structure, processes, policies, and procedures, skills and competencies, culture and behaviour, and services, infrastructure, and applications are implemented in a consistent management approach (ISACA, 2018a, p. 55). The SACSSP has adopted King IV report as a governance framework for the board and staff to effectively execute the approved five-year strategic plan and respond promptly to pandemics and disasters. The framework employs a demand management process to anticipate, plan for, and manage the demand for I&T services while ensuring that capacity management meets the required demand of an organisation (Cabinet Office, 2011, p. 246). The planning included the overall IT systems that were siloed and digitising physical documents. For this kind of projects, the board and management would have to commit their time and resources to make success to the business and digitisation initiatives.

2.2 Strategic Management

The Cabinet Office (2011, p. 134) defines strategy management as a method of prescribing and sustaining an organisation's perspective, position, plans, and patterns in relation to its services and their management. All strategic requirements are packaged into a business case for a new system or hardware required to carry out the improved business process (Valacich & Schneider, 2018, p. 374). Board and management's buy-in is important in supporting and driving the strategic mandate of an organisation.

Strategic management, according to Ansoff et al. (2019, p. 12), is the holistic view of the current business environment, proposed goals, and steps required to achieve the desired future. A strategy needs to respond to organisational needs to may arise due to urgent requirements or changed priorities. According to Gamble et al. (2017, p. 2), a company employs a strategy to explain why it matters in the marketplace by defining its application to generating utility and warranty for customers, as well as how competency and resources can be used to provide value to

customers. The South African government adopted a medium-term strategic planning framework to help state entities identify important outcomes-oriented goals and objectives that can be measured and evaluated by oversight bodies (RSA, 2010, p. 1).

2.3 Enterprise Architecture

The enterprise architecture's purpose is to establish a common architecture that would create a glue that binds business processes, information and data, application and technology architecture layers, and the development of re-usable building block components (Buckl & Schweda, 2013, p. 239). The importance of enterprise architecture (EA) ensures that it manages innovation because it is critical for the survival of and success of an enterprise. Sarno and Herdiyanti (2010) chose the Open Group Architecture Framework (TOGAF) because it provides a detailed method and a set of supporting tools for developing an enterprise architecture (Sarno & Herdiyanti, 2010, p. 145). According to The Open Group (2019, p. 6), it helps to optimise the fragmented legacy of manual and automated processes into an integrated environment that is responsive to the ever-changing business strategy.

TOGAF is a framework that advocates for putting data first in an organisation and that supports a boundaryless information flow vision in which systems can easily exchange information and use that information to improve enterprise operations (The Open Group, 2019, p. 2). Previously, the process was defined as interoperability, which relies on the ability of information and software solutions to easily create the capability of sharing, interacting with, and exchanging information (Telesca et al., 2007, p. 1). TOGAF is composed of four architectural domains that are commonly accepted as subsets of an overall enterprise architecture, according to Sarno and Herdiyanti (2010, p. 146): business architecture – it defines the business strategy, governance, organisation, and key business processes; data architecture – the structure of the organisation's logical data requirements that describe the existing state, definition of data requirements, and guide to data integration. Interoperability requirements, as defined by Sarno and Herdiyanti (2010) and The Open Group (2019), identify integration requirements as multiple levels and information flows that are classified to indicate the extent of operability that would be required between organisations and systems, as shown in Table 1.

To provide guidance to government entities in South Africa, the Government Wide Enterprise Architecture Framework (GWEA), which is based on TOGAF, was adopted to serve as a minimum standard against which ICT plans can be aligned with such government entity's business objectives and processes (RSA, 2009, p. 9).

Table 1 Operability requirements

Phase	Determination of interoperability
Architecture vision	The business scenarios capture the nature and security considerations of the information and services.
Business architecture	Information and service exchanges are further defined in business terms.
Data architecture	The organisation's data and/or information exchange model details the content of the information exchanges.
Application architecture	It specifies the way the various applications must share the information exchanges.
Technology architecture	It specifies the appropriate technical mechanisms to permit information and service exchanges.
Opportunities architecture	The selection of actual software solutions.
Migration planning	The logical implementation of the interoperability.

Source: The Open Group (2019, p. 1)

2.4 Innovation

Innovative solutions are discovered when organisations use open innovation, in which many customer-generated ideas are solicited and submitted to companies for adoption and implementation (Valacich & Schneider, 2018, p. 101). Having innovative solutions ensures that there is a competitive advantage against your rivals. According to the findings of a study conducted by Mhlungu et al. (2019, p. 7), customers prefer enterprises that provide digital offerings, indicating that an organisation has the capability to respond to the market. These initiatives resulted in a significant improvement in bringing innovative solutions to market. Previously, universities and businesses had complex research programmes that involved bureaucratic processes, resulting in the actual innovations becoming obsolete and failing to reach the intended market (Valacich & Schneider, 2018, p. 30). The world is littered with stories of companies like Kodak and Blackberry that failed to innovate and thus lost out (Valacich & Schneider, 2018, p. 553). In this regard, Nokia's failures to compete are highlighted as a result of a lack of innovation in product offerings and were predestined for graveyard of uninspiring organisations and toppled from being a market leader.

2.5 Other Processes

Budgeting, human resources, vendor management, quality management, risk management, and data management are some of the other APO processes. ISACA (2018a, p. 94) defines the budgeting and costing process as the formation of a partnership between key IT and enterprise stakeholders to provide transparency and accountability of the costs and value of solutions that the business would realise in order for the business to make informed decisions about using I&T solutions and

services. Human resource management, on the other hand, provides a structure to ensure the optimisation / sourcing, planning, evaluation, and development of talent required to support enterprise objectives that are as productive as possible (Wild & Wild, 2016, p. 476).

Vendor management entails overseeing all vendors to ensure that I&T-related products and services are delivered in accordance with I&T strategy, including contract procurement, selection, and performance monitoring (ISACA, 2018a, p. 119). Vendor management "allows an institution to select its suppliers carefully and negotiate the best prices for the goods and services that it needs" (RSA, 2015, p. 17). ISACA (2018a, p. 125) defines and communicates the quality requirements of all enterprise processes and procedures to the satisfaction of stakeholders. ISACA (2018a, p. 131) emphasises the integration of I&T-related enterprise risk within management's tolerance threshold.

3 Research Methodology

PAR was used as the research methodology in this study because the project required collaboration between the researcher and study participants in defining and solving the problem. The Look phase: getting to know stakeholders so that the problem is defined on their terms and the problem definition is reflective of the community context; the Think phase: interpretation and analysis of what was learned in the Look phase; and the Act phase: planning, implementing, and evaluating, based on information collected and interpreted in the other phases (Stringer, 2014). In response to research questions, the current study used a qualitative research approach that included data collection through focus groups, systems, and document analysis (Creswell, 2014, p. 139). The researchers were present at the exploratory meeting, where issues with information access were raised and permission was granted for a system overhaul to maximise information efficiency and integration within the organisation (SACSSP, 2018b). To interview some of the participants, the researchers used the Zoom video communications® solution, the LimeSurvey online tool, physical interviews, and email (see Table 2).

During the Covid-19 pandemic (March 2020–February 2021), focus groups were held both physically (bid evaluation committee for hardware tender opening of bids, software development tender briefing) and virtually (Microsoft Teams®). The

Table 2 Interviews sources

Mode of interview	Number of participants
Zoom video communications	3
Email	1
LimeSurvey	1
Face-to-face interviews	3

opening of bids for software development was in March 2020, and the bid evaluation committee software development tender and interviews were in February 2021.

With regard to document analysis, system documentation, policies (approved or draft) and procedures were requested to build a baseline in preparation for an integrated system (see Table 3). In some cases, no documentation was available, and reverse engineering was performed by analysing the system components and their relationships.

For system (applications) analysis, the process consisted of objectively doing quantitative assessments of systems through modelling and simulation, and

Table 3 Document analysed

Document	Purpose
Social Service Professions Act 110 of 1978	Act to define the establishment of the SACSSP and the definition of the organisation's power and functions (RSA, 1978).
Social Welfare Act 102 of 1998	An amendment of 1978 act to provide for the establishment, constitution and objects of the SACSSP and professional boards for social service professionals (SSPs) (RSA, 1998)
SACSSP records management policy	The policy stipulates that record keeping in a systematic manner is important for the day-to-day management of financial and non-financial information of an organisation, while it also underpins its ability to participate in internal audits and external audits.
SACSSP Strategic Plan 2016 to 2021	Strategic guiding document approved to guide SACSSP operations for a specific period linked to the term of the appointed board, in this case 2016–2021.
Regulations specialities in social work	It prescribes regulations in accordance with the SACSSP Act, the qualifications and proficiencies required to be registered for a speciality in occupational social work.
PBSW – CDP standards & guidelines	The norms and standards relating to continuing professional development, in conjunction with the policy on CDP for social workers and social auxiliary workers, set standards required for social auxiliary workers, employers, and service providers to promote excellence in service delivery.
Regulations regarding the registration of social auxiliary workers and the holding of disciplinary inquiries	A regulation that gives guidance to students in the subject of social work at a provider involved with social work learning in a real-life situation to register from the second year of study.
SACSSP departments processes	The processes adopted by different SACSSP divisions were consolidated and used to prepare an IT systems development tender specification
IT and business re-engineering meetings minutes	Governance committee for IT-related matters and policies are discussed.
SACSSP general notices	The information that is communicated to SACSSP stakeholders.
SACSSP organogram	Investigating current approved positions, turnover, and posts that are likely to be redundant and advising on the reskilling of such staff.

technical risk analysis in order to assist in technical decision-making for the proposed system architecture based on the organisation's system requirements (Stevens Institute of Technology, 2020, p. 363). Applications identified in Table 4 were evaluated for data that was useful for future system development planning for the SACSSP's integrated online system.

The next section presents the results of business alignment of IT governance.

4 Data Analysis and Presentation

Data is analysed and presented as per the themes from COBIT framework, that is, information technology management framework, strategic management, innovation, and quality management. Interview transcripts, documents, and photographs were entered into Atlas Ti 9, a computer-assisted qualitative data analysis software, to be coded and analysed. This study's participants were drawn from various departments and governance structures at the research site, including administration, benchmarking, and the board.

4.1 Information Technology Management Framework

The purpose of this theme was to review how information governance planning could assist in business alignment of operations during Covid-19 pandemic at the SACSSP. Data emanating from document analysis revealed that the I&T management framework components assisted with the accountability and responsibilities with regard to ICT functions and operations. Some of the issues found to assist with digitisation and responding to Covid-19 challenges are presented in Table 5.

The APO on the table regulate how the organisation's daily operations are aligned with the approved strategic plan and the revised/reprioritise plans in response to Covid-19 pandemic. Organisational assessment and reporting provide assurance to SACSSP stakeholders about performance and stated goals.

Table 4 Applications analysis

System	Purpose
SACSSP hardware & software audit	Preparing the AS-IS documentation and checking hardware warranty status and suitability for the proposed ERP solution and new hardware.
System benchmarking exercise (two organisations visited)	Benchmarking with organisations of similar operations allows systems implemented.
Telephone and internet connectivity	Investing in the telephony installations was able to accommodate VoIP digital phones and video conferencing.
Hardware refresh	Invited hardware resellers for presentation on new hardware.
SACSSP website portal	Harvesting of information uploaded on the website.

Table 5 I&T management framework

#	APO issues	Proposed intervention
1	Data quality issues	Integration with other government agencies such as the Department of Home Affairs can mitigate some of the data quality challenges already experienced. This includes real time verification of details with the population register.
2	Postal	Creation of a portal for social service professionals to be able to update their details as they change.
3	Practitioners certificates	Digital certification implemented with an inclusion of QR code for verification
4	Physical archives	Back scanning of all physical records of all social service professionals who are still in active service. This will consolidate all information at the fingertips of decision makers.

4.2 Strategic Management

According to this sub-theme, the SACSSP created a five-year strategy document, which was approved and published on August 31, 2017. The strategy's goal was to achieve digitisation of current physical records as well as automation to address IG. Covid-19 pandemic accelerated the digitisation initiatives. As previously stated, the IG challenges discovered in the document analysis related to the SACSSP strategic plan (2016–2021):

- "Inadequate IT system
- Unreliable database
- No synergy between systems"

Based on the three challenges identified, the professional council had to reprioritise its performance measures in place to monitor targets, as stated in the annual performance plan (APP). IT and Business Re-engineering was tasked to clearly redefine IT strategy that will define our strategy to meet organisational objectives including Covid-19 IT-related interventions. An APP to manage the new IT performance targets approved to ensured that the business delivers on its business strategy.

It can be argued that the organisation has clear performance goals and strategy that can guide organisational operations. The view of organisational participants viewed IT as enhancing and helping business achieve its strategy.

4.3 Innovation

In order to address innovation challenges, the organisation and the researchers conducted three benchmarking processes of digitising the certificates. Two service providers were invited to present on their products and services. The first company desired complete control over certificate issuance, requiring the SACSSP to provide a comma separated values (CSV) file containing a list of social service professionals

to the service provider. The benchmarking process for digital certificates took place on February 5, 2020. The innovation process included converting manual certificates to digital certificates and storing the generated certificates in the service provider's digital vault. Benchmarking with the second service provider resulted in a proposal for the development of an in-house certificate vault that would be integrated with the enterprise resource planning system and would not require any human intervention. An additional question was also posed to the interviewees in order to determine what innovative solutions they might bring to improve the organisational IT environment.

The benchmarking process was carried out as part of the innovation components that can be incorporated into the integrated online system. The organisation budgeted for the proposed system to include features such as registration and other divisions. The innovation elements in Table 6 shows interventions implemented to ensure continuity during Covid-19 lockdowns:

4.4 Budgeting and Costing

The main emphasis was that the organisation prepares a budget and monitors the spending and the reduction of costs, where possible. The budget was found to be aligned to APP. Budget ensures that whatever is spent on, is according to the plan and what was found is that IT is a very dynamic environment, difficult to control. The budget was prioritised to ensure that most important needs to address the immediate needs and looking at long term and the alignment of IT procurement with long-term needs. Budgetary constraints have been a challenge as the professional council has not been fortunate enough to have large funding to overhaul our IT system. IT department was overspending. It was one of the reasons the professional council ended up not filling more vacancies and more laptops are needed for planned and unplanned posts. Most of the procurement of these resources were procured towards the end of the year to make sure that the professional council does not overspend.

Expenditure for technological items rose higher due to matters beyond their control since they could not control the costs in the financial year 2020/21. They had

Table 6 Innovation elements

Legacy operations	Digitisation implementations
Physical meetings	MS Teams video conferencing
Asymmetric digital subscriber line (ADSL)	Fiber internet line
Analogue telephones	Internet protocol telephony
Walk-ins	Integrated online system
Coming to office	Virtual private network connectivity
On-premise MS Office	Microsoft Office 365
Physical certificate	Digital certificate

Table 7 Positions affected by digital disruption

Position	Quantity	Role filled
Registration clerk	12	2
Secretary for boards	2	2
Archive clerk	2	1
Mailroom clerk	1	1
Data capturer	3	1
Call Centre agent	3	2

overrun their budget by around 30% for hardware refresh and system development. It was clear from the responses that IT costs were unpredictable. This is because all computing equipment is imported, and currency fluctuations play a significant role in budget overruns.

4.5 Human Resource Management

As shown in Table 7, there were positions that would be impacted by ongoing automation. It was discovered that the most affected department had ten vacant registration clerk positions.

Since the organisation identified and presented the need at the initial meeting, a job description was drafted and presented to the HR Committee for approval. The HR Committee approved, and the advertisement was posted to find a suitable candidate. One of the researchers was a member of the interview panel and assisted in the development of questions and their submission for consideration. A 24-month service level support contract would be included in the implementation of an integrated online IT system. Another risk-mitigation strategy was for the organisation to hire an IT intern with a university degree who would like to gain workplace experience for a period of 24 months. The audit report stated that critical positions remained vacant for extended periods of time, causing employees to be overworked and council staff to be unable to carry out all mandates. The IT division only had one permanent employee, so a temporary solution was to hire interns to ensure that services were provided for a two-year period.

4.6 Vendors Management

This section highlights the outcomes of vendor management. It was discovered that the organisation had no diverse I&T vendors registered. The organisation lacked access to the CSD, which contains a list of all vendors who are certified to do business with government entities. The vendors who were hired on a time-and-materials basis dictated and made proposals to the organisation. Figure 3 depicts the bidding

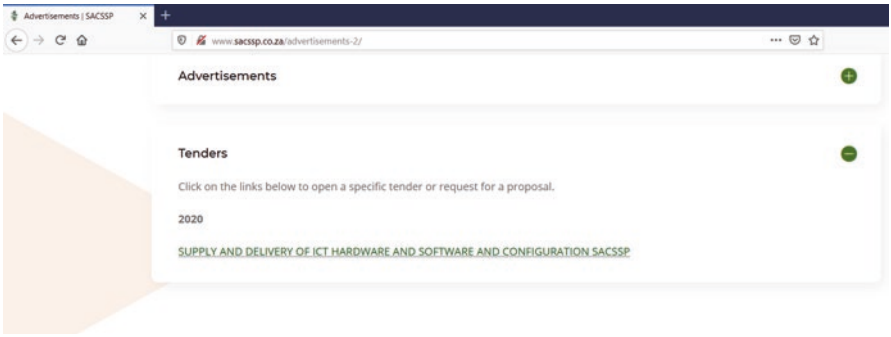


Fig. 3 Hardware and software tender advertisement

of IT-related services, hardware, and system development tender advertisements on the SACSSP's website. To ensure continuity during Covid-19 pandemic, the professional council created an email account to accept bids as opposed to prospective bidders dropping off physical bids to the office.

The next section presents the outcomes of quality management issues that addressed to effect smooth operations during lockdown due to Covid-19 pandemic.

4.7 Quality Management

The organisation has been concerned about the return of mail. In other cases, social service professionals were reported to have incurred costs when travelling to the SACSSP offices to physically collect the returned certificates. Figure 4 depicts files and cabinets containing returned certificates determined to be undeliverable by the South African Post Office (SAPO).

The auditor report revealed that there were inadequate internal control processes in place to maintain adequate supporting information and records by the professional council. As a result, the records submitted for qualifications verification were rejected by the qualification authority. The most serious issues discovered were inconsistencies in data that were rejected by SAQA due to the following factors of not verifying data during capturing of records in Table 8:

Fig. 4 Files, cabinets with returned certificates. (Photographer by researchers)

Table 8 Data verification issues

Data verification issues	Verification issues addressed
No identity or passport number were found on some records	Not allowing a null value
Numbering convention not followed, that led to incorrect identity values captured	Numbering convention followed and incorrect identity values rejected
Date of birth not matching with identity number	Date of birth matching the first six numerical values of an identity number
Garbage values rejected – records that would be rejected by SAQA	Garbage values not allowed
Duplicate identity numbers	Only unique identity numbers allowed
Invalid email addresses – submitted e-mail address validation checks failed, records submitted with blank e-mails but need to be fixed on register for communications aspects, etc	Emails follow validation check and make compulsory inclusion of email
Physical address fields left blank with the input field defined as not compulsory	Physical address designated as compulsory
Building plan discrepancies	Proposed improvements to include implications to other components.

Furthermore, when renovations for the refurbishment of a server room was planned, it was discovered that the building plan of the professional council had not been updated with previous building alterations.

4.8 Risk Management

Risks were identified through the analysis of documents, interviews, meetings, and system analysis. In terms of numbers and content, the validity of the professional council's current database has been called into question for several years. The organisation's risks were identified and mitigated. Risk management is a regular topic on the agendas of management and Business Re-engineering Committee meetings. Management is responsible for addressing the seven identified risks and reporting progress to the IT and Business Re-engineering Committee on a quarterly basis. Since there were pockets of data on people's computers and hard copies in archive rooms, data were not properly managed. Some of the risks identified were mitigated as stated in Table 9.

The risk register was established in order to track and mitigate identified risks. An organisational data that is not integrated, results in decision-making delays due to inefficiencies. The staff would be frustrated by the lack of access to data and reports. The high return rate of posted items was costly due to incorrect data, such as practitioners' personal details and addresses.

Table 9 risk mitigation in response to Covid-19

Risk identified	Mitigation in relation to Covid-19
Lack of audit trail due to lack of adequate filing records.	Merging of scanned data with digital data created on the integrated system
Organisational data in people's computers	Backup of all staff's computing data.
Old server hardware	Procurement of new servers
Inability by the professional council to support financial transactions reported on its annual financial statements.	Integrated with a banking partner to update financial transactions timeously.
Board's meeting minutes and supporting documentation	Shared folders created.
Non-availability of email	Transferred to cloud through the use of Microsoft Office 365 (MS exchange email)
High return rate of posted items	Self-service portal to update with latest details

5 Conclusion and Recommendations

The chapter used the APO domain of COBIT to explore business alignment of information technology governance planning at a South African professional council. It was established that no common enterprise architecture was adopted to assist in the development of business process, information, data, application, and technology architecture layers, as well as reusable building block components. In the absence of information technology alignment to business, the chapter proposes a process flow (see Fig. 5) that could assist in the alignment of information technology governance and business goals, as well as ensuring continuity in the event of disasters such as the Covid-19 pandemic. In this regard, it is hoped that in the event of a disaster, employees will be able to work remotely as long as they have access to the Internet. The formulation of a process workflow for alignment of business and ICT, follows four design workflow stages, namely understand the enterprise strategy, determine the scope of the ICT strategic goals, refine the scope of the ICT strategic goals and conclusion the enterprise strategic integration and alignment.

The organisation should manage all programmes from the investment portfolio in alignment with the organisational strategy in a coordinated way (ISACA, 2018a, p. 151). Organisations should adopt the governance framework of portfolio, programmes and projects, which should be tailored to the organisational culture, types of projects and the needs of the organisation (PMI, 2017, p. 44).

In terms of planning, it is recommended that the organisation manage the definition, acquisition, and implementation of I&T solutions, as well as their integration into organisational processes. In this regard, revised planning, monitoring, and reporting guidelines should be in place each financial year, and the organisation's annual performance plan should detail the performance indicators and targets that the organisation seeks to achieve in the upcoming financial year and the 2 years following the MTEF period. Strategic objectives, performance indicators, and targets

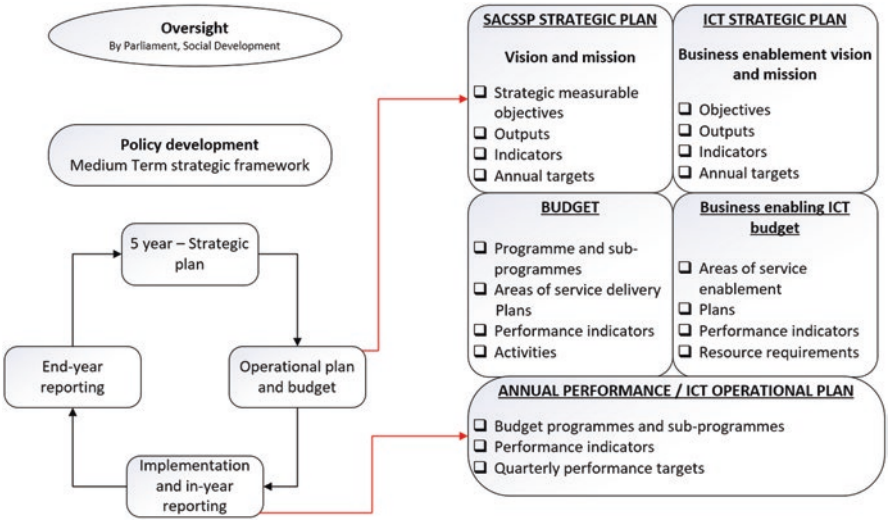


Fig. 5 A process workflow for alignment of business and ICT

should be aligned with each budget programme and sub-programme, as applicable, and include a quarterly breakdown of performance targets for the upcoming financial year. These performance indicators and targets must be consistent across the organisation's annual plans, budgets, and in-year and annual reports. The adoption of the framework necessitates the optimisation of the core business processes for it to achieve its business goals. ISACA (2018b, p. 12) adds to this by stating that strategic alignment is critical to apply to overall activities in the organisation to ensure that I&T-related objectives are aligned with enterprise goals. The chapter has advanced the process of aligning information technology governance to ensure that the organisation stays on track to achieve its business and I&T goals, as well as the measurement of information technology governance performance. This, in turn, will ensure continuity in the event of a disaster, such as the Covid-19 pandemic, which engulfed the world beginning in December 2019 and caused many countries to shut down. One of the study's limitations is that only one domain of COBIT, APO, was applied. Therefore, a comprehensive study that employs all of the COBIT domains is recommended.

References

Ansoff, H. I., Kipley, D., Lewis, A. O., Helm-Stevens, R., & Ansoff, R. (2019). *Implanting strategic management*. Palgrave Macmillan. https://doi.org/10.1007/978-3-319-99599-1

Buckl, S., & Schweda, C. M. (2013). A systemic view on enterprise architecture management: State-of-the-art and outline of a building block-based approach to design organization-specific enterprise architecture management functions. In *A systemic perspective to managing complexity with enterprise architecture* (pp. 237–254). Business Science Reference.

Caravaca, M. M. (2016). *Spanish legislation on records management and digital preservation*. https://interparestrust.org/assets/public/.../EU04_20160811_FinalReport.pdf

Chauke, T., & Ngoepe, M. (2020). *Implementation of the custom-made knowledge management system at the South African Council for Social Professionals*. In Proceedings of the 21st European Conference on Knowledge Management (pp. 924–933). Coventry University.

Creswell, J. W. (2014). *Research design qualitative quantitative and mixed methods approaches*. Thousand Oaks, CA. Sage Publications.

Fitroh, E., Siregar, S., & Rustamaji, E. (2017). *Determining evaluated domain process through problem identification using COBIT 5 framework*. https://repository.uinjkt.ac.id/dspace/bitstream/123456789/38370/2/document-4.pdf

Gamble, J. E., Peteraf, M. A., & Thompson, A. A. (2017). *Essentials of strategic management: The quest for competitive advantage*. 5th ed. New York: McGraw Hill Education.

Iles, H. (2013, August). *Information governance: A brief introduction – New Zealand focus*, pp. 1–7. https://doi.org/10.13140/2.1.2069.1847.

Information System Audit and Control Association. (2011). *Integrating COBIT into the IT audit lifecycle*. ISACA.

Information System Audit and Control Association. (2018a). *COBIT 2019 framework: Governance and management objectives*. https://www.isaca.org/resources/cobit

Information System Audit and Control Association. (2018b). *COBIT 2019 framework: Introduction and methodology*. ISACA. https://doi.org/10.1007/978-981-15-7650-8_1

Maluleke, S., Ngoepe, M., & Marutha, N. (2021). A framework for document delivery services in an open distance e-learning environment library. *Journal of Interlibrary Loan, Document Delivery & Electronic Reserve, 29*(1–2), 29–43.

Mhlungu, N. S. M., Chen, J. Y. J., & Alkema, P. (2019). The underlying factors of a successful organisational digital transformation. *SA Journal of Information Management, 21*(1), 1–10.

Moeller, R. R. (2013). *Executive's guide to IT governance: Improving systems processes with service management, COBIT, and ITIL*. Wiley.

Mourad, E. B., Malik, M., Anong, A. C., & Mustappha, B. (2017). Combination between Cobit 5 and ITIL V3 2011. *International Journal of Advanced Engineering Research and Science, 1*(5), 41–47.

Mullon, P. A., & Ngoepe, M. (2019). An integrated framework to elevate information governance to a national level in South Africa. *Records Management Journal, 29*(1–2), 103–116. https://doi.org/10.1108/RMJ-09-2018-0030

Ngoepe, M., Jacobs, L., & Mojapelo, M. (2022). Inclusion of digital records in the archives and records management curricula in a comprehensive open distance e-learning environment. *Information Development, 1–12*, 02666669221081812.

Nguyen, C., Sargent, J., Stockdale, R., & Scheepers, H. (2014). *Towards a unified framework for governance and management of information*. In Proceedings of the 25th Australasian conference on information systems. ACIS.

Panian, Z. (2010). Some practical experiences in data governance. *World Academy of Science, Engineering and Technology, 62*, 939–946.

Project Management Institute. (2017). A guide to the project management body of knowledge (PMBOK Guide). 6th ed. Newtown Square, Pennsylvania: Project Management Institute, Inc.

Republic of South Africa. (1978). *Social Service Professions Act 110 of 1978*. Government Printers.

Republic of South Africa. (1998). *Social Work Amendment Act No. 102 of 1998*. Government Printers.

Republic of South Africa. (2009). *Government wide architecture framework*. Government Printers.

Republic of South Africa. (2010). *National Treasury Framework for strategic plans and annual performance plans*. Government Printers.

Republic of South Africa. (2015). Public sector supply chain management review. Pretoria. Available from: http://www.treasury.gov.za/publications/other/SCMRREPORT2015.pdf

Sarno, R., & Herdiyanti, A. (2010). A service portfolio for an enterprise resource planning. *International Journal of Computer Science and Network Security, 10*(3), 144–156.

South African Council for Social Service Professions. (2018a). *About us – Mandate*. https://www.sacssp.co.za/About
South African Council for Social Service Professions. (2018b). *SACSSP – UNISA partnership exploration meeting*. SACSSP.
South African Council for Social Service Professions. (2019). *Information technology risk register*. SACSSP.
Stevens Institute of Technology. (2020). *Guide to the systems engineering body of knowledge*. http://g2sebok.incose.org/app/mss/menu/index.cfm
Stringer, E. T. (2014). *Action research* (4th ed.). Sage.
Telesca, L., Rana, J., & Ion, M. (2007). *Challenges of interoperability issues for enterprise software and applications*. https://cordis.europa.eu/pub/ist/docs/ict-ent-net/eivp-create_en.pdf
The Cabinet Office. (2011). *02 ITIL 2011 – Service Design.pdf*. The Stationary Office.
The Open Group. (2019). *Open group standard Open Data Format (O-DF), an open group Internet of Things (IoT) standard*. The Open Group.
Valacich, J., & Schneider, C. (2018). *Information systems today managing in the digital world* (8th ed.). Pearson Education. http://www.pearsonglobaleditions.com
Wild, J. J., & Wild, K. L. (2016). *International business the challenges of globalization* (8th ed.). Pearson Education.

Tshepo Chauke is an IT Architect, IT Service Management practitioner, and IT Governance specialist. He is currently a Director: ICT Infrastructure at the Department of Transport. He is a PhD candidate at the University of South Africa. He holds a master's degree in Information Science from the University of South Africa which he completed in 2018 with a dissertation title: "Integration of Information Management Systems to enhance Business Intelligence at the Department of Transport in South Africa." Mr Chauke is certified in the following IT frameworks: Information Technology Infrastructure Library for IT service management, Control Objectives for Information and Related Technologies for IT governance; and Total Open Group Architecture Framework for IT architecture.

Mpho Ngoepe is a professor and the Director of School of Arts at the University of South Africa (Unisa). Prior to his current position at Unisa, Prof Ngoepe has worked for the United Nations Children's Fund, Auditor-General South Africa and the National Archives of South Africa. Prof Ngoepe is serving in the national committee of the South African Society of Archivists (2009–2022) and the board of Eastern and Southern Regional Branch of the International Council on Archives (2009–2019) as the editor of the journals. He also served on the advisory council of the National Archives of South Africa in his capacity as the chairperson of Gauteng Provincial Archives (2015–2020). He was the director of Team Africa for the multi-national, interdisciplinary research project exploring issues concerning digital records called the International Research on Permanent Authentic Records in Electronic Systems (InterPARES Trust) (2013–2018).

E-Readiness of the Universities During the COVID-19 Pandemic: Evidence from Bahrain

Adel Sarea and Ghilan Al-Madhagy Taufiq-Hail

1 Introduction

The novel Coronavirus 2019 (COVID-19) outbreak started in Wuhan city, in China, during December 2019. Since then many cases were reported and on the 31st, December 2020 the confirmed cases were 697,244 with mortality rate of 4.77% (Crawford et al., 2020). The rapid and unexpected spread of the infection developed into a pandemic. Many countries faced the inevitable infection that many at the beginning, suspected to be as a seasonal viral infection. A state of chaos and hysteria rapidly spread out (Taufiq, 2020). However, Bahrain, as a member of the Gulf Cooperative Council (GCC) countries, was susceptible to this outbreak. Soon, many regulations, including IT governance were undertaken by the government to protect the society and the well-being of the citizens and residents. For instance, the suspension of schools and higher education institutions were some of the major changes in people's normal life.

Before the pandemic, information on how to teach remotely, across all disciplines during an emergency, was limited. COVID-19 era offers an opportunity to improve the online teaching experience for faculty and to improve the quality of online learning for students (Doug Lederman, 2020).

For students with poor network connections and IT governance, institutions could consider alternative approaches such as pre-packaged instructional materials made available through CDs, flash drives, e-books, or mobile media, in combination with printed materials (Doug Lederman, 2020).

A. Sarea (✉)
Ahlia University, Manama, Bahrain
e-mail: asarea@ahlia.edu.bh

G. A.-M. Taufiq-Hail
University of Buraimi, Al Buraimi, Oman

M. Alaali (ed.), *COVID-19 Challenges to University Information Technology Governance*, https://doi.org/10.1007/978-3-031-13351-0_12

Institutions should anticipate a continuing need for this mode of instruction and should find ways to support students who opt for online learning because of its flexibility or other benefits.

In this regard, the recent development in Bahrain promoted the establishment of the blended education, there was no complete transition to the digital era—the online learning and teaching—until the emergent of Covid-19 pandemic and its rapid spread globally. In principle, the transformation into online learning was heavily conducted during the lockdown imposed by countries around the globe. Bahrain is among these countries that adopted the transition (Sarea et al., 2021). However, the attestation of academic degrees in Bahrain still not in effect and many holders of academic degrees attained by distance learning are still struggling to get their certificates attested and accredited by the ministry of higher education. Furthermore, the society, the employment agencies, the authorities, and the higher education ministry acceptance of this type of higher education teaching and learning methods was suffering a lot and not accepted in the times of pre-Covid-19 era, although Covid-19 has emerged to be a vital player to raise the issue in order to find a plausible solution.

Therefore, these issues were taken into consideration in this explorative research in Bahrain to study the effect of Covid-19 epidemic on teaching staff. So, the main objective is to answer the following questions to contribute to the body of knowledge and future possibilities:

1. Based on the perception of teaching staff, did Covid-19 change the methods of teaching, the time consumed for lecturing, and software tools used to deliver the syllabi to students during the lockdown in Bahrain?
2. Based on the perception of the teaching staff, did Covid-19 influence the readiness in delivering the courses' content to students during the pandemic lockdown in Bahrain?

2 Literature Review

2.1 Teaching Staff Professional Skills Impact on Students

Education is referred to the training concerning one's development of his/her character, mental power, knowledge, and skills that is characterized by being a continual process which helps to enhance the individual's interaction with different environments efficiently and effectively (Nwosu et al., 2020). Based on this definition, enhancing education can lead to better results for the individual and the society. In other words, when education is developed to adapt itself to the recent technological aspects, it is more likely to impact positively the individual and the society as a whole. In principle, the building blocks of the educational system is based on the resources' availability, the encouraging environment, the intention to learn, and most importantly the educator who carries the burden to covey the knowledge and information to the learner. Some of the key elements of student's success are the

teaching quality and the educator. So, when the educator devotes more efforts to enhance his/her technological skills, this would likely lead to better perform in teaching or lecturing; thus, the impact on the quality of teaching or lecturing is reflected on the student's performance. Additionally, recent research emphasized the importance of the higher education institutions to scale up the training of the educators as it has a positive effect on the students understanding and performance, which is aligned with the goals of universities. It is also opined that the highly educated people, such as the teaching staff, spend more time on the internet for information seeking, personal development, and getting the news in effective way and purposively (Kaarakainen et al., 2018). This can occur more intensively during the lockdown and social-distance events as is the case of Covid-19 pandemic. Therefore, probing the perceptions of the educators during those times could help in building better strategies to enhance education.

During Covid-19 the traditional methods to teach or lecture are no more applicable as the social-isolation is imposed by governments around the world. Furthermore, this catastrophic event changed the attitudes and norms of individuals as well as how they are working and from where (Satici et al., 2020). This sudden change of the working environment made it necessary to transform education into an online and distance-learning to cope with the change of circumstances. In this way, this change would require an increased effort to prepare for the classes in a digital form and a change of the way in teaching and lecturing. Also, the time to prepare the classes is inevitably increased. Hence, focusing this research on such issues is warranted and deserves the investigation in context of Bahrain higher education institutions.

2.2 Covid-19 Impact on the Teaching Method at Bahrain Universities

To promote Sustainable Development Goal 4 (SDG), that is the quality education, digital literacy/education is introduced to help students perform in a better way (Tran, Ho, et al. 2020). However, during the coronavirus pandemic the need of such quality education is not an easy task neither for the higher education institutions nor for the educators. Also, the way of teaching has probably changed as well as the time consumed for the preparation of the course's materials, assignments, and quizzes in digitized format. Furthermore, the time consumed in teaching and answering the students' inquiries was one of the challenges to explore. That is to say, in face-to-face lecturing, the educator can notice the students' attention and participation. Also, the feeling of boredom can be easily noticed. Additionally, the student comprehension of the topic explained can be spotted from the body language of the student that is observable by the educator during the lecture. All these issues are better controlled in the traditional way of teaching. However, in distance teaching, these issues can be time consuming, unobservable, and uncontrollable as the

educator receives more inquiries from the students after the lecture. These frequent and many questions reflects the issues aforementioned. Additionally, the lecturers are required to answer all inquiries from the students during the day and sometimes during the night as it is not possible to meet physically with the lecturer due to the lockdown m. The administration extremely needs to assure that the course's contents are delivered to students but at the cost of educators' time and efforts. Lots of strategies, polices, tools, and skills are essential to attain the tangible benefits of the online learning/teaching if the perception of the lecturers are taken into account. Therefore, this research tries to cover some of these aspects by getting answers to the following questions that reflect Covid-19 impact on the teaching method at Bahrain universities.

2.3 Covid-19 Impact on Teaching Staff and Their Readiness to Cope with It

Worth mentioning, reports from different countries contend that feelings such as anxiety, uncertainty, depression, stress, and fear are common symptoms during Covid-19 outbreak (Arslan et al., 2020; Bao et al., 2020; Wang et al., 2020) which are referred to as another form of epidemic—i.e., mental and psychological issues. This new situation made an urgency to conduct research to probe the side effects and impacts of the novel coronavirus Covid-19 on different working individuals (Tanhan, 2019; Wang et al., 2020). The teaching staff at higher education institutions are no exception of this emergent phenomena. Consequently, knowing that would lead to develop strategies and a clear roadmap for the authorities at higher education ministries as well as the educational institutions to avoid the negative outcomes or education disruption that can affect the learning and teaching process. Also, getting insights of the teaching staff readiness to face the challenges of Covid-19 and its implications on the education process, would likely help to avoid shortcomings in the current implementation of online tools, strategies, and procedures and would offer new avenues to discover better ways to enhance digitizing the educational programs. This is because the end of this adversity is unknown and consequently to prepare for it is a wise decision. It is worth mentioning that the current crises of virus infection and spread is not new; however, the rapid and large scale of infection around the globe in addition to the speed of education disruption is unprecedented and may cause severe consequences if prolonged. Therefore, tackling different aspects faced by the teaching staff during the pandemic would draw valuable understanding of possible future difficulties and infections and how to mitigate them.

3 Methodology

3.1 Data Collection

The survey employed self-administered procedure and the survey questions were formulated using Google forms. The questionnaire covers some questions pertaining the Covid-19 Impact on Teaching Staff's Readiness towards Digitizing Courses' Content.

5 points Likert-scale were employed ranging from"1 Strongly disagree to 5 Strongly agree". The items' domains cover the development of new skills to cope with the new situation of Covid-19 pandemic.

4 Results and Discussion

4.1 Evaluation of Covid-19 Impact on Teaching Methods

As a first step, the Covid-19 Impact on Teaching Methods main topic is evaluated. From the graph, Fig. 1, it is clear that majority of the educators contend that Covid-19 changed the way that they usually use in teaching. The 45% strongly agree jointly with the 33% of agree make an outstanding insight of the impact of Covid-19 pandemic on the way that educators deal with the unprecedented event. On the other hand, 11% strongly disagree and 10% were neutral. Also, the minority disagree with the impact of Covid-19 on their way of teaching. If we jointly add up these three last responses, we find that only around 21% of the respondents disagree. Hence, from the majority results, we could conclude that the general

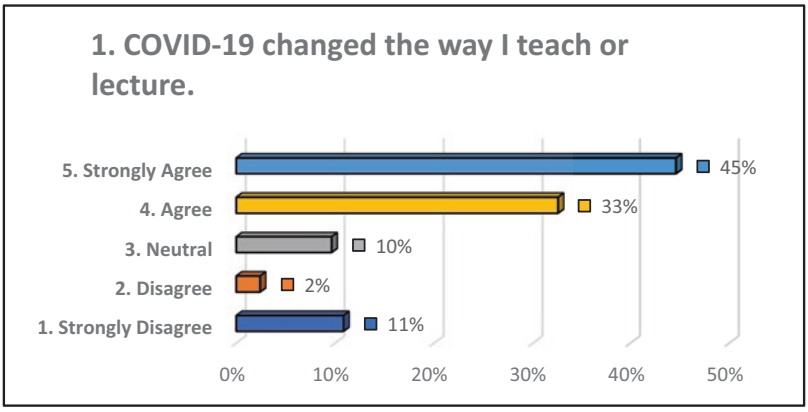


Fig. 1 Covid-19 impact on the way of teaching

perception of the educators emphasizes the crucial role of the coronavirus outbreak on their way of teaching.

Next, as can be seen in Fig. 2, the majority of educators use the online (i.e., synchronous teaching) (55.4%) followed by the second group (38.6%) who use both methods (online, synchronous, and off-line, asynchronous), whereas minority (6%) uses the off-line only method, which is to record and upload the lecture to the institute's portal. This result gives an indication of the current trend to use the online methods in teaching at the university level. Besides, it is also clear that the second group can be said to be a transitional group toward the full utilizing of the online distance learning. In other words, the Covid-19 changed thigs dramatically toward digitizing education.

Following that item number 3 is evaluated, where the research focuses on the online tools that has been used to deliver the courses to students. As can be seen in Fig. 3, majority of the respondent (45%) seems to use Microsoft Teams as a main tool to help them in their pedagogical process. As a second tool, the Zoom appeared to hold the second majority (33%) of software used to help educators at the university. The third tool is the Google Classrooms which achieved 7% of the total respondents. The fourth position is for the Cisco WebEx with 4%, followed by Facebook live streaming with 2%. All other software tools were used had only 1% of the total respondents. These results shadow the dominant role of Microsoft and Zoom software tool packages in leading the pedagogical process using online method. This can be inferred to the user-friendly interface, the availability of features that meet the necessities of the teaching staff, and the smoothness of the quality of the streaming when going live.

Following that item number 4 wherein the research focuses on the average hours per week that the educator needs to prepare for the course's content and convey it to the students before the pandemic. Referring to Fig. 4, the results reveal that there is no major difference in the average hours reserved for the preparation for the classes.

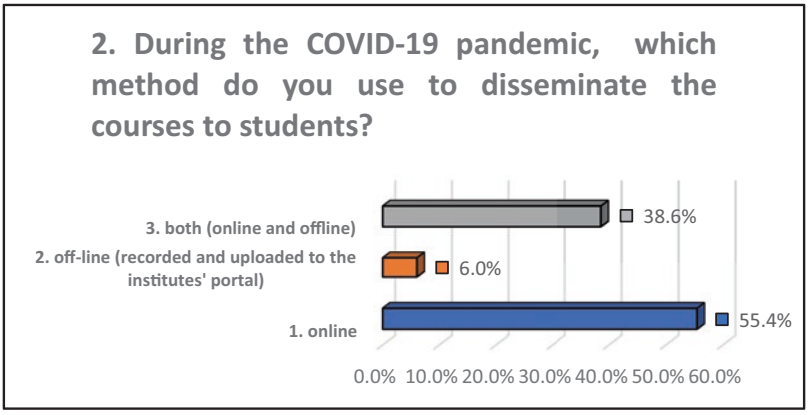


Fig. 2 Method of disseminating courses

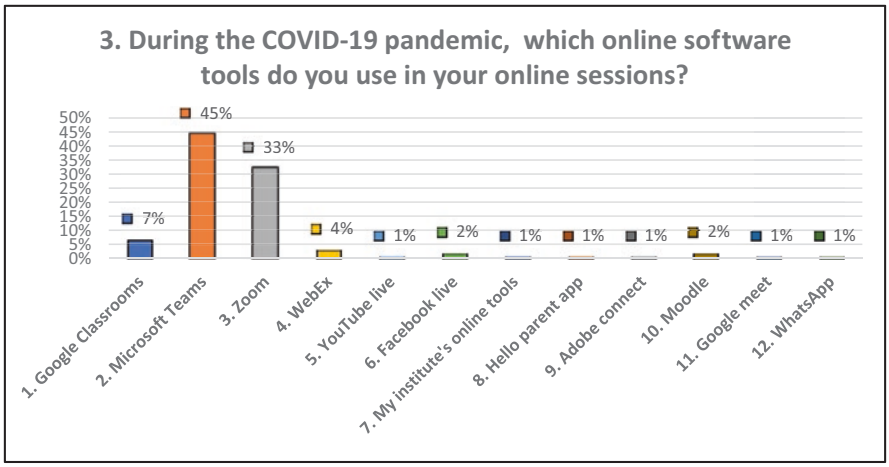


Fig. 3 Online software statistics

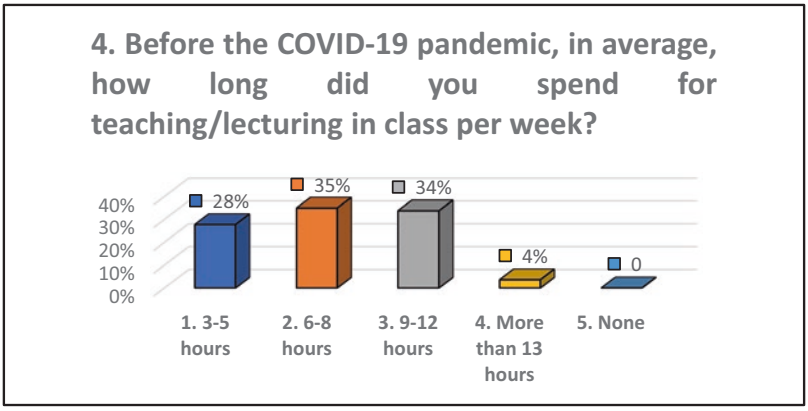


Fig. 4 Time needed to prepare for courses before Covid-19 outbreak

The percentages resemble each other, i.e., 35%, 34%, 28% for 6–8 h, 9–12 h, and 3–5 h, respectively. These tiny differences of the majority may be related to the number of subjects/courses that each lecturer has in his/her schedule. It may also be an indication of the experience that may decrease the number of hours utilized in the preparation of the courses' content. Additionally, the similarity may reflect the changing materials' content that made the teaching staff dedicate a long time in the preparation phase before delivering the lecture.

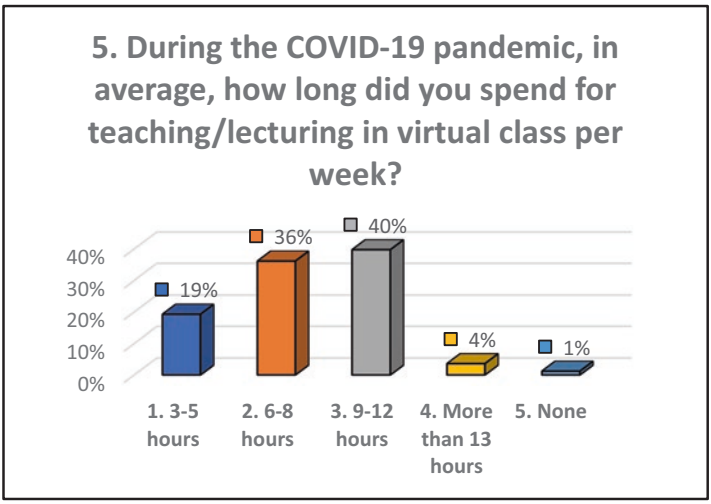


Fig. 5 Time needed to prepare for courses during COVID-19

Referring to Fig. 5, the graph seems to shadow an increase as the 9–12 h a week during the pandemic jumped from 34%, before the spread of infection to 40%, during the Covid-19 pandemic. This can be inferred to the fact that this category either having many classes or are having difficulties to cope with the stress with the preparation of the classes. Also, the next category, 6–8 h increased slightly from 35%, before the coronavirus outbreak to 36% during the virus outbreak. This can be interpreted as this category of respondents have less difficulties in dealing with online courses or they have more skills compared with others that lead to slightly increase in the hours needed for the preparation of the digital format of the courses' content. This needs to be investigated in future directions to know the rationale behind that as the limitation of the length of the article is preventing further longitudinal analysis and interpretations.

In previous research, Sarea et al. (2021) in their study in GCC countries contend that distance teaching has its own characteristics that needs special and unique pedagogical approach which differ from the traditional face-to-face mode of teaching. However, the sudden transition to online did not allow the faculty members to adapt swiftly and caused lack of competency that made them invest more time of their own to follow the crowd in achieving their duties as pedagogical objectives on time and on schedule (Sarea et al., 2021). In general, the time consumed for the preparation and teaching during Covid-19 has increased as a normal reaction of the sudden event; however, it could create other consequences that may impact the educator him/herself. In other words, there will be a sacrifice of the time reserved for the family or to get some self-healing by doing some sports or activities inside home. This would create negative consequences on the teaching staff psychological status such

as increased stress, boredom, anxiety, and deteriorate mental health. On the other hand, the 3–5 h percentage declined from 28%, before the pandemic, to 19%, during the pandemic. This can be said that the difference in the percentage, i.e., 9%, is due to the new change of the habits in conducting and preparing for the online courses. That can explain the increased percentages in third category (9–12 h) followed by the second category (6–8 h).

4.1.1 Evaluation of Covid-19 Impact on Teaching Staff's Readiness Towards Digitizing Courses' Content

In this group of items, the first item asks about the impact of Covid-19 on the teaching staff's readiness in using and learning new skills to disseminate the courses' contents among students. The results revealed the majority of respondents (78%) agrees or strongly agree on this notion, while the minority (14%) seems not to agree with the notion. Hence, it can be concluded that the teaching staff are preparing themselves to cope with the emergent event of the novel Covid-19 pandemic and this reflects their readiness for the future challenges. Figure 6 exhibits more illustrative results.

The graph in Fig. 7 clarifies that the majority (71%) agrees or strongly agrees with the view. In the contrary, 19% of the participants disagrees or strongly disagrees with the idea and have different perception on it. Additionally, the results shadow a dominant agreement with the impact of Covid-19 on their efforts to continue the pedagogical process during the pandemic; thereby their readiness is expected with this unprecedented event. Previous works such as indicated that the sudden shift towards online teaching necessitates an elaborated lesson plan design, technology teams support for the teaching staff, and the digitized materials in the form of documents, audio, and video (Bao, 2020). All these necessities are lacked during the sudden attack of Covid-19 in many universities and many educators lack the experience, the early preparation, or the technical support that made them devote more efforts to continue the education process (W. Bao, 2020). several institutions revealed that distance learning requires a unique pedagogical approach to maintain the quality of the face-to-face learning, but the sudden transition did not allow them to prepare the faculty members to this new technique. This caused lack of the necessary competence among the faculty members (Sarea et al., 2021).

With this in mind and in the context of the current study, if the teaching staffs' efforts increased when dealing with the online teaching compared with the traditional teaching, this means that working with different tools and applications caused an extra effort in addition to the preparation of the material, following up with students' inquiries, and reporting to the administration at their respective university.

Figure 8 exhibits the dominance of the increased feeling of responsibility during the pandemic towards the students. There is no wander in that as this sudden and unexpected event hindered the continual of the semester and forced regulations that

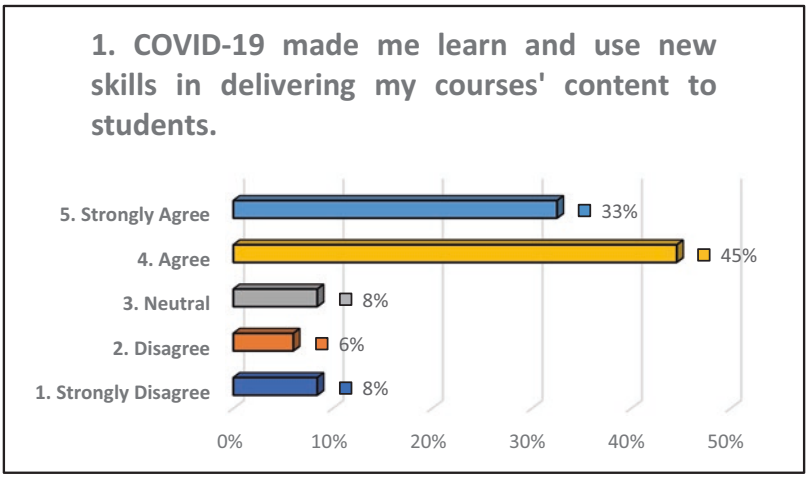


Fig. 6 Statistics on acquiring new skills during COVID-19

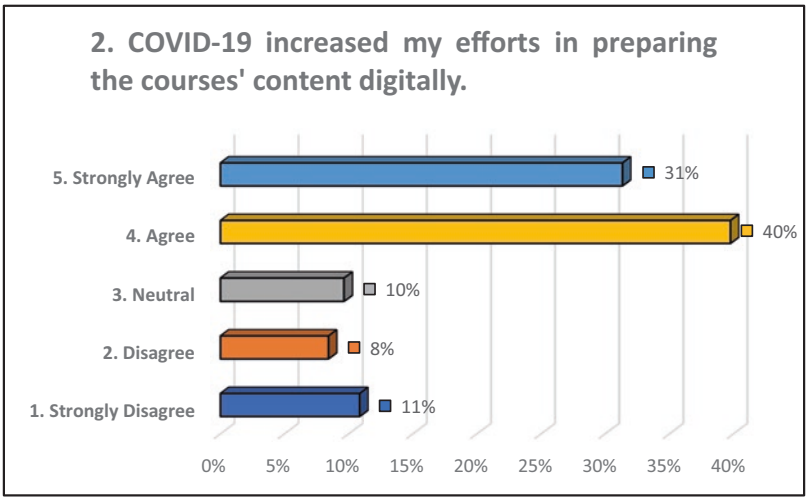


Fig. 7 Statistics on the efforts to prepare online courses

made things difficult in terms of teaching and transforming the courses into digital format that also included the assignments, projects, quizzes, and exams. More importantly, the educators might be trigged with a sense of guilt or improper dissemination of the courses' content. This is because the impression and the real evaluation of the students' comprehension does not become easy as it was before Covid-19. That is, the facial expressions of the students or the general attitude in the physical class was observable and that no longer exist in the virtual classes. Also,

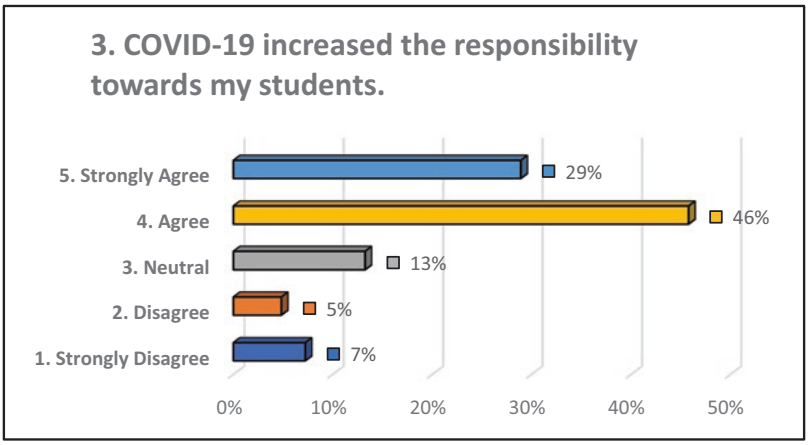


Fig. 8 Statistic on the responsibility felt during COVID-19

the online learning was criticized due to the lack of human interaction between the tutor and the learner (Sarea et al., 2021). Moreover, digitizing education may be useful with its flexibility and variety of accessed resources; however, educators have some concerns about the knowledge gained (Humphrey & Beard, 2014). Besides, the sudden shift to the a complete online education could lead to unexpected outcomes that could severely affect the students in their future profession prospects (Aguguom & Dare, 2020). On the other hand, the results revealed only 12% disagrees or strongly disagrees on this view. Nevertheless, the overall view is accepting the idea that responsibility towards students increased during the pandemic.

By referring to Fig. 9, it is clear that the majority (77%) of educators believe that there is a demand to upgrade their technical skills to cope with digitizing education during the Covid-19 outbreak. Contrarily, the minority (12%) disagrees or strongly disagrees on that. Therefore, it can be interpreted that the coronavirus has made an immense need to upgrade the educator's technical skills to cope with the pandemic consequences. Recent research emphasized the importance of the higher education institutions to scale up the training of the educators as it has a positive effect on the students understanding and performance, which is aligned with the goals of universities. Also, upskilling during Covid-19 was not voluntarily but a must to achieve the goals of the institution and one's objective to cover the requirements during this sensitive time. Moreover, the sense of feeling the necessity to upskilling could be a motivation for the educators to work harder, to learn more about proper and handy tools in order to act effectively as they were in the physical class.

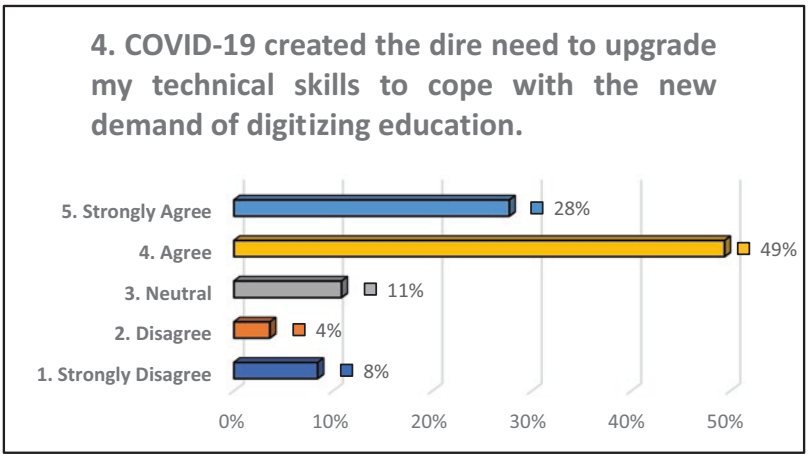


Fig. 9 Statistics on the need to upgrade the technical skills of teaching staff

5 Conclusion

The novel Coronavirus 2019 (COVID-19) outbreak affected all nations globally. Bahrain as a member of GCC countries was also affected and the consequences of the outbreak impacted the higher education sector in the country. Although the newly imposed regulations undertaken by the government to protect the society and the well-being of the citizens and residents yield positive results, the social isolation was one of the biggest challenges for the teaching staff and higher education institutions . For this reason, the research conducted to unveil the perceptions of educators pertaining the issues of teaching methods, and the readiness of the teaching staff in the event of Covid-19 pandemic.

Regarding the role of Covid-19 on the readiness of the teaching staff, results revealed the agreement of majority of the respondents that the impact increased: (1) their responsibility toward students, (2) the dire need to upgrade their technical skills and learn new ones, (3) their efforts to cope with the new challenges to meet the organizations' objective in addition to perform well to meet their schedule and pedagogical objective. By obtaining these results, the third research question is answered. By answering these questions, the main objective of this research is satisfied to investigate and explore the perceptions of the teaching staff on these three topics that warrant investigation thoroughly in different countries around the globe.

Although the current study revealed valuable results and contributed to the knowledge of literature during the early stages of Covid-19 in Bahrain in getting specific information with subgroup of the higher education sector, the limitations reside can open new avenues for future research. The study conducted is cross-sectional; thus, a more appropriate is to conduct a longitudinal study to unveil the effects with wider scope and changes of time. Fourthly, the study did not include: (1) a comparison between males and females, (2) handling the follow-up assignments

of the students, (3) the adequacy and appropriateness of mid- and final exam, which conducted online inside the students' accommodations. Hence, it is suggested to incorporate these aspects related to Covid-19 impact in other settings and countries.

References

Aguguom, T. A., & Dare, E. (2020). Covid-19 and accounting education in Sub-Sahara Africa, *European Journal of Business, Economics and Accountancy, 8*(3), 1–11

Arslan, G., Yıldırım, M., Tanhan, A., Buluş, M., & Allen, K.-A. (2020). Coronavirus stress, optimism-pessimism, psychological inflexibility, and psychological health: Psychometric properties of the coronavirus stress measure. *International Journal of Mental Health and Addiction*. https://doi.org/10.1007/s11469-020-00337-6

Bao, W. (2020). COVID-19 and online teaching in higher education: A case study of Peking University. *Human Behavior and Emerging Technologies, 2*, 113–115. https://doi.org/10.1002/hbe2.191

Bao, Y., Sun, Y., Meng, S., Shi, J., & Lin, L. (2020). 2019-nCoV epidemic: Address mental health care to empower society. *The Lancet, 395*, e37–e38. https://doi.org/10.1016/S0140-6736(20)30309-3

Crawford, J., Butler-Henderson, K., Rudolph, J., Malkawi, B., Glowatz, M., Burton, R., Magni, P. A., & Lam, S. (2020). COVID-19: 20 countries' higher education intra-period digital pedagogy responses. *Journal of Applied Learning & Teaching, 3*. https://doi.org/10.37074/jalt.2020.3.1.7

Doug Lederman (2020) *Will shift to remote teaching be boon or bane for online learning?* Available at: https://www.insidehighered.com/digital-learning/article/2020/03/18/most-teaching-going-remote-will-help-or-hurt-online-learning. Accessed date on 28 June 2021

Humphrey, R. L., & Beard, D. F. (2014). Faculty perceptions of online homework software in accounting education. *Journal of Accounting Education, 32*, 238–258. https://doi.org/10.1016/j.jaccedu.2014.06.001

Kaarakainen, M.-T., Kivinen, O., & Vainio, T. (2018). Performance-based testing for ICT skills assessing: A case study of students and teachers' ICT skills in Finnish schools. *Universal Access in the Information Society, 17*, 349–360. https://doi.org/10.1007/s10209-017-0553-9

Nwosu, P. O., Aye, E. N., Eze, C. O., Chukwujekwu, C. O., Ezeah, M. A., Okoro, M. E., Asogwa, F. O., Ajibo, D. U., & Oforka, T. O. (2020). Impact of educational qualification on work stress among academic administrators of universities in South-East Nigeria*, 9*.

Sarea, A., Alhadrami, A., & Taufiq-Hail, G. A.-M. (2021). COVID-19 and digitizing accounting education: Empirical evidence from GCC. *PSU Research Review*. ahead-of-print. https://doi.org/10.1108/PRR-10-2020-0034

Satici, B., Saricali, M., Satici, S. A., & Griffiths, M. D. (2020). Intolerance of uncertainty and mental wellbeing: Serial mediation by rumination and fear of COVID-19. *International Journal of Mental Health and Addiction*. https://doi.org/10.1007/s11469-020-00305-0

Tanhan, A. (2019). Acceptance and commitment therapy with ecological systems theory: Addressing Muslim mental health issues and wellbeing. *Journal of Positive Psychology & Wellbeing, 3*, 197–219.

Taufiq Hail, G. A.-M. (2020). Educational learning and teaching methods' challenges during COVID-19 outbreak and a sudden transformation towards totally digitizing education. *International Journal of Education and Science, 3*. https://doi.org/10.26697/ijes.2020.2.39

Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., Ho, C. S., & Roger, C. H. (2020). Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *International Journal of Environmental Research and Public Health, 17*, 1729. https://doi.org/10.3390/ijerph17051729

Adel Sarea is the winner of Emerald Literati Award 2014 (UK). He possesses over 100 publications indexed in [SCOPUS, SSCI, ESCI, ABDC, ABS] and he has more than a decade of teaching experience. He has been bestowed with many awards and been summoned as the keynote speaker on several occasions. He serves on the editorial team of several international journals published by Elsevier, Emerald, and Taylor & Francis. He is a member of the Accounting and Finance Association of Australia and New Zealand (AFAANZ). In 2015, AP Dr. Sarea has been appointed as a recognized Ph.D. supervisor by Brunel University London. In 2021, he has been entitled as the Senior Editor of the International Journal of Emerging Markets at Emerald Publishing (UK). Associate Editor, Heliyon Business and Economics – (Elsevier), Consulting Editor, Journal of Education for Business - (Taylor & Francis.), Associate Editor, International Journal of Islamic and Middle Eastern Finance and Management- (Emerald), Associate Editor, ISRA International Journal of Islamic Finance - (Emerald), Associate Editor, Asian Journal of Accounting Research (Emerald), Associate Editor, Journal of Islamic Accounting and Business Research- (Emerald), Guest Editor, Journal of Financial Reporting and Accounting- (Emerald) and Associate Editor, MENA Journal of Cross-Cultural Management-Inderscience (UK).

Ghilan Al-Madhagy Taufiq-Hail is an author of a number of articles. His research interests include cloud computing and Green IT, Technology and Innovation, social impact of information technology, information behavior, virtual/e-community, e-government, teleworking, ICT, e-banking, e-government, e-education, e-library, Smart Cities, blockchain studies, human and computer interaction, statistical analysis using PLS-SEM, and open source studies. He is a volunteer reviewer with different peer-review journals including IEEE Access. He is a member of different system and network entities such as Cisco microsystems and Microsoft corporation. He has achieved many certificates in network, security, and systems from Microsoft and Cisco Systems auditing.

The Use of Artificial Intelligence in Higher Education – Systematic Review

Fatema AlDhaen

1 Introduction

The use of AI in education is currently a hot topic in academia since COVID-19 has promoted the online learning, which gives an opportunity to introduce advanced AI technology, particularly in schools and universities (Pantelimon et al., 2021). The use of AI in teaching and learning is not new and been practiced in several ways of teaching methods (Niemi, 2021). The technological advancements in HEIs have the potential to bring about significant improvements that benefit all stakeholders, including students, educators, administrative personnel, and institutions (Montebello, 2018).

AI is a rapidly evolving technology that has the potential to change every aspect of our social interactions and growing more widespread in our daily lives, influencing every sector, including government and higher education (Malik et al., 2019). The technology of AI seems to be a fast developing topic in education, with significant potential to expand and improve teaching and learning in higher education (Crompton et al., 2020). In developing countries, a number of HEIs started considering virtual learning by the use of AI (Al Dhaen et al., 2022) and recommended HEIs to develop clear and rigour policies and procedures to govern the implementation of the AI usage and digital transformation.

HEIs future is strongly related to technological breakthroughs and rising intelligent machine computing capabilities. Technologies such as AI have the potential to completely transform governance and institutional architecture, bringing new opportunities and challenges for teaching and learning in higher education. It was argued by researchers that AI could also be a potential support for HEIs in information management and strategic decision making (Kosack et al., 2021).

F. AlDhaen (✉)
University of Bradford, Bradford, UK
e-mail: fsfaldha@bradford.ac.uk

M. Alaali (ed.), *COVID-19 Challenges to University Information Technology Governance*, https://doi.org/10.1007/978-3-031-13351-0_13

AI is one of six technologies that have been identified as having a positive impact on HEIs (Crompton, 2021). It has the potential to raise the standard of higher education by providing huge benefits such as automated curriculum building, individualized student involvement, interactive teaching, smart content, improved learning outcomes, and simpler administrative work (Priya Gupta & Bhaskar, 2020). Countries in the Gulf Cooperation Council (GCC) started considering setting quality assurance measures for online learning that is facilitated by the use of digital transformation technologies including AI (Al Dhaen et al., 2022).

There are numerous potential advantages of using AIED; however, the use of AIED has challenges and opportunities that need to be considered by HEIs. This chapter will provide a systematic literature review analysis and shed the light on governing policies that could be developed by HEIs, policy maker and regulators etc.

2 Definition of AI

AI is an area of computer science and engineering that is heavily impacted by other fields such as philosophy, cognitive science, neurology, and economics (Zawacki-Richter et al., 2019). According to the definition of AI by (Russell & Norvig, 2010) that "the abilities of machines to carry out tasks by displaying intelligent, human-like behavior; and to behave rationally by perceiving the environment and taking actions to achieve some goals". Also AI is defined as "computing systems that are able to engage in human-like processes such as learning, adapting, synthesizing, self-correction and use of data for complex processing tasks" (Popenici & Kerr, 2017). Besides, (Alimi et al., 2021) described AI is a device or tool that is commonly employed in many areas and institutions throughout the world (Alimi et al., 2021). There is broad consensus that AI, together with robotics, virtual reality, 3D printing, and networks, will be one of the most valuable technologies in the next years (Chai et al., 2020; Janpla & Piriyasurawong, 2020).

There are various examples of AI usage in the real-word such as smartphones, the use of internet, search engines and household appliances. AI participates in some human-like processes and are capable of performing sophisticated practices related to teaching and learning. As a result, HEIs are now entering a new era. AI has its roots in earlier efforts to imitate human intellect, which is defined as the ability to understand and learn from data (Alimi et al., 2021).

Some AI solutions are programmable, and most of these solutions require the ability to anticipate and perceive things. Machine learning is a type of software that generates predictions, detects trends, and applies newly found patterns to situations not covered by its core design (Fahimirad, & Kotamjani, 2018).

3 Background of AIED

AIED began as a specialty field in the 1970s, focusing on the integration of new technology into the classroom, mostly in higher education (Joshi et al., 2021). As computers and information processing techniques have progressed, AIED has taken numerous forms, including intelligent tutoring systems, teaching robots, learning analytics dashboards, adaptive learning systems, human-computer interfaces, and so on (Chen et al. 2020a, b). It intends to provide more personalized, flexible, inclusive, and engaging learning while also automating daily learning tasks via automated monitoring and evaluation (Gulson et al., 2018; Luckin et al., 2016). AIED might theoretically assist parents in improving their children's early linguistic development, as well as educators in selecting tools, organizing classrooms, encouraging participation, and providing tailored instruction to their students (Joshi et al., 2021). AIED integrates virtual reality and is enclosed as a robot or virtual assistance (VAs). It operates as sensors that record students' and educators 'visual, aural, and physiological data. Such types of learning data can assist educators truly understand how learning happens in real time and determine effective teaching methods (Luckin et al., 2016). According to (Coccoli et al., 2016) that AIED technologies ought to be able to aid help educators avoid burnout reducing the gap between students and educators created by individual or social differences (Joshi et al., 2021).

The AIED academic community has debated the prospects of AI education for the past 30 years. The debate has moved to the worldwide level of government policy as datacomplex algorithms, artificial intelligence, learning, processing capability, and technology uses have grown in popularity (Joshi et al., 2021). It also becomes as the key research emphasis in the field of computers and education, with the potential to enhance knowledge, cognition, and cultural transformation (Hwang et al., 2020).

4 Usage of AI in Higher Education

Prior to the COVID-19 pandemic, AI had little impact on education (Chen et al. 2020a, b). As a result of COVID-19, the use of online education has improved, allowing advanced AI technologies like chatbots, text-to-speech and many others to be deployed in classrooms (Nawaz et al., 2020).

Governments and large private companies are investing heavily in the development and use of AI in higher education (Priya Gupta & Bhaskar, 2020). Where the usage of AI in higher education is classified into two categories: institutional administration and teaching and learning. Starting with the management side, AI is being used to assist institution management in areas such as branding, human resources, enrollment, financial aid assessment as well as answering typical student questions through chat bots (Dhawan & Batra, 2020; Pence, 2019).

AI has the ability to address a variety of social and educational problems related to HEI and students (Jain & Jain, 2019; Kuleto et al., 2021). The Findings of Kuleto et al. (2021) revealed that AI and machine learning are technologies that contribute to the learning and teaching process while also improving the safety and efficiency of the institution. From educator's point of view, AI demonstrated to be quite promising tool in teaching and learning (Onaolapo & Onifade, 2020), and tends to be a beneficial technology that saves time and efforts for HEI educators by automating administrative, assessment, course feedback, and plagiarism detection processes (Kuleto et al., 2021; Zawacki-Richter et al., 2019).

(a) **AI in teaching and learning:** According to research conducted by (Priya Gupta & Bhaskar, 2020), bringing AI into the classroom provides two educational benefits: "improved teaching quality" and "improved student learning." AI-based teaching and learning systems are among the most significant educational achievements. A number of AI-based teaching and learning solutions have been developed and adopted in various nations (Priya Gupta & Bhaskar, 2020). For instance, Latin American countries have adopted the "Mathematics Adaptive Platform," which provides personalized feedback based on student experiences (Perera & Aboal, 2018). Another AI example created by Brazilian government called "MecFlix," which is a video content site designed to help students prepare for their exams (Priya Gupta & Bhaskar, 2020). Since AI tutoring systems contain algorithms that provide assistance automatically and allow learners to apply self-study skills, they can replace teachers (Kamuka, 2015).

Literature shows that COVID 19 has demonstrated that both online learning and artificial intelligence are linked and may complement one another to assist educators, with the usage of AI makes online learning more transformed, improved, and appealing (Goksel & Bozkurt, 2019; Pantelimon et al., 2021).

Similarly, there is evidence that not only AI based systems or application can aid educators but also robots can assist with language acquisition, writing skills, teaching sign language, improving reasoning, and some types of problem solving (Newton & Newton, 2019). Robots help small group work of educators by answering questions, allowing them to devote more time to other groups and individuals (Pandey & Gelin, 2017).

One of the successful tools of AIED tool is chatbots in education which have the potential to increase learning results and student satisfaction dramatically (Winkler & Söllner, 2018). Several researches have found that chatbots can be successfully applied in educational settings (Durall & Kapros, 2020, Ndukwe et al., 2019; Mikic-Fonte et al., 2018). Okonkwo & Ade-Ibijola, (2021) asserted that educators can employ chatbots to construct an automated and intelligent teaching system that analyzes and assesses a student's learning abilities as well as to evaluate students' understanding of a subject by recording their comments and responses. Chatbots can be used in classrooms, deliver instructional materials, examinations, and quizzes to students. The chatbots collect the answers and communicate them to the teachers, allowing them to keep track of their pupils' development and help accelerate activities.

Another significant benefit of AI systems in education is that they reduce the lecturing burden and saving time for other tasks (Ma et al., 2020). Also, (van der Vorst & Jelicic, 2019) asserted that AI learning tools can benefit both students and educators because it is used to build an educational environment and promote collaborative learning (Chaudhary, 2017). For example Virtual teaching assistant powered by AI (VTA) known as Jill Watson (JW) is considered as one of the most transformational educational technologies of the past fifty years (Myers & Lusk, 2016). VTAs can sometimes be employed as para-teachers to offer students with round-the-clock experience and relieve educators of the strain, allowing them to focus on more productive activities and participate in more meaningful interactions with students (Dhawan & Batra, 2020). (VTAs) para-staff could deliver quicker, more personalized, cost-effective, and efficient solutions at the front desk. AI technology can help learners learn by making lectures more fascinating and engaging.

AI-based teaching and learning solutions can give students with comprehensive learning experiences through the use of gaming technology and simulations (Priya Gupta & Bhaskar, 2020).

Furthermore, another useful tool is gamification in education makes use of gaming features and graphics to improve student engagement and learning (Kalogiannakis et al., 2021; Zimmerling et al., 2019). Since AI has recently advanced to the point that it can be integrated with gamification.,where gamification has been used in science, mathematics, foreign languages, health as well as in mobile applications such as Duolingo application, is a language-learning program combining gamification and interactive chatbots that converse with the user (Acosta-medina et al., 2020; Fadhil & Villafiorita, 2017). Such successful tools which has demonstrated a superior application proven that AI and gamification and are play a vital role in teaching and learning (Almeida & Simoes, 2019). Such techniques can make learning more adaptable and simple, resulting in improved student performance (Pima, 2019).

(b) **Facilitating collaboration between learners:** Since academics in higher education spend a lot of time reading and moderating discussion forums. AI systems tends to be a great solution to take on the task of evaluating the speeches and warning faculty members when students stray off subject or have misconceptions (Crompton, 2021), besides AI can use student data to create matched or differentiated groups based on learning needs, as well as organize students based on their interests (Crompton, 2021). In addition to enhancing collaborative learning by forming adaptive groups based on learner models, encouraging online group interaction, and summarizing discussions that can be used by a human tutor to facilitate the students toward the course's goals and objectives (Zawacki-Richter et al., 2019). AI can be used to give personalised experiences to students at any time at their request for instance, Presentation Translatoris, a free PowerPoint plug-in that creates real-time subtitles for what the educator is saying, and Microsoft's Conversation Transaction Service, that also assists in the identification of speakers as well as the real-time transcription of their discussions (Dhawan & Batra, 2020).

(c) **Automated grading:** Time is very crucial for all academics in higher education due to their workload of teaching; supervising and doing research thus automated grading is one of the most well-known uses of AI which goes beyond multiple-choice assessments, allowing AI to grade more complicated student text contributions (Crompton, 2021). Faculty who spend hours assessing lengthy papers will greatly benefit from essay scoring. So the time saved will be devoted towards additional one-on-one contacts between instructors and students and concentrate on their main responsibilities (Crompton, 2021; Zawacki-Richter et al., 2019). For instance Jani et al. (2020) demonstrated that AI automatic answers were found to be beneficial for tracking students' development and highlighting areas where medical procedures could be improved. The study employed a combination of machine learning and checklists to demonstrate how AI may be used for feedback, assessment, and formative evaluation.

(d) **Enrolling system:** AI chatbots often known as conversational agents, are gaining popularity and can perform a wide range of tasks.AI chatbots utilize machine learning (ML) and natural language processing (NLP) techniques to replicate human interactions through messaging platforms (Schuetzler et al., 2020). Such Intelligent chatbot systems have been increasingly popular in recent years, particularly in the sphere of education. As a result, demand for online consulting services like chatbots is growing (Nguyen et al., 2021).

AI chatbots are commonly used in businesses to offer more efficient and effective inquiries, such as responding users' questions like availability24/7.This technology has been shown to increase productivity, automate repetitive operations, and reduce the cost of customer support help by simultaneously managing many customers in multiple languages (Adamopoulou & Moussiades, 2020). Chabot is useful not only for registering students, but also for establishing a curriculum, educating students, personalized courses, and overcoming high dropout rates, which are all issues faced by educational institutions. Even if these issues are handled manually, they can be exhausting. According to the study (Kuleto et al., 2021), one way to ensure institutional success is to use data analytics and AI in education and promote their effective use. Several academic institutions have created virtual teaching assistants using data from chatbots meant to engage individual students and look through applicant data. Accordingly, some of educational and technical organizations are increasingly employing artificial intelligence (AI) to automate boring, repetitive processes and provide a more interesting learning experience. And others will eventually follow.

(e) **AI as a facilitator:** According to (Fahimirad, & Kotamjani, 2018) that AlED can be also designed to provide course material, ask questions, and find answers to common course questions; however, the instructor's role has recently been shifted to facilitator, with instructors using AI lessons as additional tools to assist challenging students and provide hands-on experiences through human interaction. AI gives tailored learning to learners is by displaying content that is appropriate for that particular learner. AI systems can make precise recommendations for reading material and activities based on a student's behavior in a

course. AI is applied in formative assessments mathematics courses in university programs (Deo et al., 2020; İnce et al., 2020).

(f) **Personalized learning:** According to (Roll & Wylie, 2016) that both students and educators require more individualized guidance, where AI will help students study at their own pace, (Subrahmanyam & Swathi, 2018) also noted the advantages of AI in education in terms of leading students toward proficiency by repeating classes as needed, and rapidly creating a personalized learning plan for each student. Educators can utilize from AI to provide personalised coursework that is tailored to their students' requirements. Their teaching can be more effective if they use individualized, tailored, and interactive instructional approaches (Baylor & Ritchie, 2002). Furthermore, AI can aid educators in material development, assignment design, and evaluation, allowing them to devote more time to quality instruction (Ahmad et al., 2017).

(g) **Advisory:** Advisory conversations are another key area where AI chatbot technology has been used in education. According to the findings (Ho et al., 2018; Ismail & Ade-Ibijola, 2019) that chatbots are being utilized to deliver academic assistance to students, assisting them in making important decisions about their various academic programs or activities. A very good example (D'Silva et al., 2020) created a chatbot to help people better understand themselves as well as job trends, allowing them to make more informed career and educational decisions. The Virtual assistants (Vas) can help raise enrollments, dropout rates, summer melt, and attract and keep the greatest minds since AI can supply them in real time. It can assist professors in recognizing students who are on the verge of dropping out (Dhawan & Batra, 2020).

(h) **AI as plagiarism checker:** In both education and research, ethical writing is crucial. Academic dishonesty is unfortunately common among undergraduate and graduate students. As a result, written essays and articles are subjected to certain detection systems and most teaching and research organizations employ a variety of anti-plagiarism plagiarism software (Abd-Elaal et al., 2019). Plagiarism detection software is an important tool in HEI that may be used to detect plagiarism after assignment submissions (Stappenbelt & Rowles, 2009), in which AI presents a new platform for new kinds of significant academic misconduct. Several AI-based systems (such as Turnitin) enable educators to check the originality of graduate student writings (Alharbi & Al-Hoorie, 2020). This is a critical AIED application in student assessment. According to (Annabestani et al., 2020; Vij et al., 2020; Yuan et al., 2020), AI technology will assist students through exam automation and essay scoring-related outcomes.

(i) **Exam invigilation:** AI assists in the transformation of a school into a smart campus by automatically managing and controlling the majority of the campus facilities as well as exams invigilation that can be invigilated and attended robotically and tracked using AI technology (Alam & Kendall, 2018).

Exams are invigilated by a person who watches either the live or recorded exam. Artificial intelligence invigilation entails the use of specialized technologies to detect probable misbehavior violations. When compared to artificial intelligence invigilation, human invigilation is normally carried out.

Using AI-based facial recognition systems (FRT) to monitor online exams and, in particular, to validate students' identities and flag suspicious activities during the exam to prevent academic misconduct such as plagiarism, unapproved collaboration, and sharing of test questions or answers are discussed in this article. In a variety of ways, FRT can assist (or perhaps replace) human proctors and to identify students' in-test misconduct by examining room settings and assessing behavior that could indicate cheating (Colonna, 2021). FRT can also detect additional faces in a testing environment who may be supporting the student inappropriately and track eye movements that could signal wrongdoing, such as looking away from the computer screen (Scott, 2019).

5 Challenges of Adopting and Using AI

AI in higher education has its own set of challenges (Alfarsi et al., 2021). Despite the benefits of AI and its application in student learning, students may encounter a variety of challenges when using technology to learn (Mathew et al., 2019; Terekhov, 2017). Also AI challenges would be more complicated and detailed, especially if they were linked to an educational application (Zhai et al., 2021). The adoption of new technology in all fields of education, learning, and development is hindered by many challenges such as the lack of intention of taking risks or adopt new innovations, as well as a lack of funding for anything other than traditional methods of teaching (Wheeler, 2019).

Priya Gupta and Bhaskar (2020) pointed out that educators' attitudes and desire to use AI-based teaching and learning technologies in HEIs are critical, as they are the end users who use AI in the classroom. As a result, it's critical to learn about teachers' perspectives on the major elements that influence their acceptance of AI-assisted teaching and learning solutions.

Since the development of several training robots, some teachers are aware that intelligent robots may jeopardize their careers (Stone et al., 2016). While the role of the instructor may change, most experts agree that AI support and complement rather than replaces the educator's experience (Luckin et al., 2016).

The (Horizon Report, 2018) study identified a major concern that redefining of educational' roles. The success of deploying AI in education is heavily influenced by teachers' opinions toward AI. Educators may fluctuate between absolute resistance and excessive reliance. Insufficient, unsuitable, irrelevant, or obsolete professional development could cause the former (Zhai et al., 2021). These educators may place too much stress on emerging AI technology rather than on learning (Kessler, 2018).

Another challenge was identified by (Bates et al., 2020) that AI has had a limited impact on teaching and learning in education sector is and the process of accepting technology it is typically slow. Priya Gupta and Bhaskar (2020) asserted that educators' knowledge, abilities, and attitudes influence how they use technology in the classroom, explaining that negative attitudes and resistance to change are some of

the challenges that slow the adoption and acceptance of technology such as AI in education (Alsheibani et al., 2018; Bates et al., 2020). As a result, educators must be convinced that a new idea will improve or expand learning outcomes and experience (Bates et al., 2020).

(a) **Fear of losing jobs:** Job loss is one of the most pressing worries, according to Picciano (2019) that those who can use smart machines or intelligent systems, will be able to outperform those who cannot. Similarly, Roll and Wylie (2016) argue that teaching in the current context will no longer be the same; as a result, educators should take on the role of mentors, teaching their students lifelong skills, interaction, breaking out of their comfort zones, and concentrating on life problems. Employees' fears of losing their jobs have grown due to a lack of information and awareness of AI, as dull repetitive duties are gradually replaced by AI tools and technologies.

According to Alfarsi et al. (2021) explained that most prominent limitations of AI in student learning are that, unlike educator instructions, it can only manage the results of a limited amount of data. Educators gain experience when they work in their field over longer periods of time, yet AI-based instructions remain the same due to their algorithms. Also, Alfarsi et al. (2021) mentioned that there are no alternative approaches to teach students about the scenario in AI applications if they cannot comprehend the solution to the issue using one approach.

(b) **Cost of AI:** Artificial Intelligence (AI) is one of the most popular technology trends right now. The expense of developing AI is quite high and overwhelming (Dhawan & Batra, 2020). Previously, AI was only available to a few firms, but now it is available to the majority of enterprises. The cost of AI is expensive, but it has numerous advantages that attract many firms. AI's numerous advantages can assist companies outperform their competitors. However, before investing, one must exercise caution and weigh all of the advantages and disadvantages (Dhawan & Batra, 2020). The cost of AI is determined by the amount of data available, the reliability and stability, and algorithm tuning. The initial costs for deploying software and cloud support AI systems are highly expensive (Abioye et al., 2021; Fahimirad, & Kotamjani, 2018), the continuing staff training is high and also the costs of ongoing AI system training if organizational procedures change (Moreno-Guerrero et al., 2020; Fahimirad, & Kotamjani, 2018). As a result, AI is relatively expensive; however this is decreasing as the cost of building numerous open source and low-cost systems reduces (Handa, 2019).

(c) **AI Implementation:** One of the most difficult challenges for HEI is implementing AI. AI-based technology is hard to integrate into the higher education system. It tends to be a challenge to integrate digital skills in order to have a good technical environment with a large number of digital specialists. Strong operations are essential to develop AI-based systems since they require capacity, speed, and storage. As a result, for AI to be implemented in HEI, user-friendly interfaces and a well-defined implementation strategy are required (Dhawan & Batra, 2020).

(d) **Motivation:** Many challenges and problems stand in the way of educators integrating AI into their classrooms. The impact of these constraints, however, can be reduced by improving educator motivation to use technology into their usual teaching and other related responsibilities (Priya Gupta & Bhaskar, 2020). Both extrinsic and intrinsic motivational elements are important for educators' motivation to adopt technology, according to Ibrahim and Nat (2019).Educators can be encouraged to employ ICT in the classroom through praise, promotion, and monetary incentives (Bower, 2001; Baylor & Ritchie, 2002). Ungar and Baruch (2016) also claimed that if teachers are paid for their digital projects, they are more likely to continue utilizing them. Therefore, (Priya Gupta & Bhaskar, 2020) indicated that educators rely more heavily on external motivation and incentive than internal motivation since they see no personal benefit in adopting AI-based teaching and learning solutions.

(e) **Lack of awareness and ethical implications:** For both academics and educators, the ethical considerations raised by AI provide a significant challenge. It was apparent that AI has advanced significantly in recent years, owing to lower processing costs and increased data availability; yet, individual student data may be disclosed, shared, or misused (Zhai et al., 2021). To ensure that AI in education benefits students and educators while also addressing or justifying ethical problems, the profession must first be aware of those concerns (Remian, 2019). Many educators are unaware of AI-based teaching tools and are hesitant to implement them in their classrooms (Chiu & Chai, 2020). Also it has been observed that AI-based feedback is slow at times. This can make AI use dull for teachers (McCarthy et al., 2016). The majority of people's knowledge of ethical issues in AI and education is restricted to privacy, security, and the proper use of personal data. Although AI has the ability to assist both students and faculty in higher education, it is equally crucial to examine what student data is required to drive this intelligence. For AI to be effective, it must gather information about the learner in order to determine his or her cognitive level as well as personal preferences. Faculty members must be aware of where their students' data is going and how to secure it when needed (Crompton, 2021).

(f) **Personalized learning:** The incorrect sequencing of information is one of the obstacles to personalized learning. The reorganization of presenting sequences is an attempt to reorganize knowledge according to the student's reaction. Feedback is an important strategy for meeting learners' proximal learning habits in this setting (De Melo et al., 2014). The system uses an artificial neural network to deliver rapid feedback based on the input of students, allowing them to gradually gain access to abstract concepts and conduct practical activities.

(g) **Lack of humanization:** Despite these developments and the potential of AI in the field of education, some issues have been remarked in the literature such as Ulum (2020) which indicated that AI technology requires humanization because the way AI functions and performs procedures in the context of teaching is far from human intelligence (Cope et al., 2021) due to deficiency of clarity in decision-making algorithms.

(h) **AI in correcting assignments:** The inadequate technical capabilities of AI are one of the most commonly noted challenges. For instance, AI could not be very good at assessing pictures, numbers, or text. Fitzgerald et al. (2015) found that when texts included graphics, an AI-based system failed to assess their complexity. Another significant difficulty was discovered to be the AI algorithm's inadequate reliability.(Qian et al., 2020) also stressed the importance of improving the AI algorithm's reliability in automatic writing evaluation systems in order to give teachers with reliable feedback.

6 Challenges of Artificial Intelligence for Students

AI techniques may give intelligent and efficient tools that enable students to avoid undertaking the knowledge processing work that teachers expect them to undertake. AI translators, for instance, provide pre-made visuals, pronunciation, predefined words, and even a series of instances. As a result, students are hesitant to participate in deep learning inquiry procedures (Zhai et al., 2021). Moreover, lack of awareness of AI is one of the challenges based on the study (Alimi et al., 2021) found that the majority of university students are unaware of the use of AI for learning. Students' attitudes toward dealing with such technology, according to (Flogie & Aberšek, 2015), are another emerging concern. Unfortunately, some of them fail to utilize effective AI methodologies for a given learning setting, resulting in negative attitudes toward learning. As a result, students must understand that AI plays a vital role in improving learning outcomes. Furthermore, (Dhawan & Batra, 2020) pointed out that as a result of AI technology, many jobs in the labor market will become obsolete, forcing the creation of new skill sets. This will be the most pressing issue for higher education, as students will need to be equipped with new skill sets in order to find or create jobs in the market (Ma & Siau, 2018). Subsequently HEI must prepare students to deal with challenges such as automation, a worldwide culture, and rising job complexity.

7 Conclusion

This chapter provided a systematic review on the use of AI in HEIs, AI appears to be gaining popularity in several areas especially in the field of education; AI began to have an impact as a supplement to traditional teaching and learning approaches. It has huge promise for increasing access to learning opportunities, scaling up personalized learning experiences, and optimizing methods and strategies to achieve desired learning outcomes. Furthermore, AI can help people improve their educational abilities, since research has shown that the best AI technology application can produce superior results.

AI is undoubtedly having an impact the life style and making life easier, including those with special needs in the field of education, where institutions, instructors, and parents are attempting to promote inclusive education through assistive technology that can replace human workers and parents. However; as mentioned above that the use of AI has a clear advantages and limitations. HEIs must set a clear strategy to adapt AI and consider clear operations academic and non-academic, HEIs must consider governing policies and procedure to support the user privacy and maintenance of ethical standards. Academics will face a fear in terms of AI overcoming their duties, leaders of HEIs must have clear faculty progression pathways to motivate faculty to use AI in teaching and learning with assurance that will be an added value for their annual evaluation.

As current technology pervades all areas, the labor market will change in the near future. Consequently, the current HEIs need to be fundamentally reformed by incorporating new technology that might help students develop skills relevant to future occupations.

In terms of regulatory authorities there is a need to have clear standards for the use of AI in education that secures users data and privacy. In some countries, there is a need to establish clear quality assurance standards to support HEIs to use AI in different operations.

This chapter provides a call for future researchers to investigate the use of AI in teaching and learning in terms of assessing the students' performance, faculty utilization, the use of AI in facilitating decision making etc.

References

Abd-Elaal, E. S., Gamage, S. H., & Mills, J. E. (2019, January). Artificial intelligence is a tool for cheating academic integrity. In 30th Annual Conference for the Australasian Association for Engineering Education (AAEE 2019): Educators becoming agents of change: Innovate, integrate, motivate (pp. 397–403). : Engineers Australia.

Abioye, S. O., Oyedele, L. O., Akanbi, L., Ajayi, A., Delgado, J. M. D., Bilal, M., ... & Ahmed, A. (2021). Artificial intelligence in the construction industry: A review of present status, opportunities and future challenges. *Journal of Building Engineering, 44*, 103299.

Acosta-Medina, J. K., Torres-Barreto, M. L., & Alvarez-Melgarejo, M. (2020). Literature mapping about gamification in the teaching and learning processes. *Revista Espacios, 41*(11).

Adamopoulou, E., & Moussiades, L. (2020, June). An overview of chatbot technology. In *IFIP international conference on artificial intelligence applications and innovations* (pp. 373–383). Springer.

Ahmad, A., & Ibrahim, K. M. (2017). Managerial, organizational and technological determinants of ICT adoption: Survey of academic staff in Bauchi state. *ATBU Journal of Science, Technology and Education, 5*(1), 157–165.

Al Dhaen, E., Stone, M. D., & Mahmood, M. (2022). Higher education institutional strategies to sustain quality education: COVID-19 practices and lessons. In *Assessing university governance and policies in relation to the COVID-19 pandemic* (pp. 37–48). IGI Global.

Alam, N., & Kendall, G. (2018). Five ways artificial intelligence will shape the future of universities. *The Conversation*. https://theconversation.com/five-ways-artificialintelligence-will-shape-the-future-of-universities-94706. Accessed 17/08/2020.

Alfarsi, G., Tawafak, R. M., ElDow, A., Malik, S. I., Jabbar, J., Al Sideiri, A., & Mathew, R. (2021). General view about an artificial intelligence technology in education domain In Proceedings of the international conference on culture heritage, education, sustainable tourism, and innovation technologies (CESIT). Chicago.

Alharbi, M. A., & Al-Hoorie, A. H. (2020). Turnitin peer feedback: Controversial vs. non-controversial essays. *International Journal of Educational Technology in Higher Education, 17*, 1–17. https://doi.org/10.1186/s41239-020-00195-1

Alimi, A. E., Buraimoh, O. F., Aladesusi, G. A., & Babalola, E. O. (2021). University students' awareness of, access to, and use of Artificial Intelligence for learning in Kwara State. *Indonesian Journal of Teaching in Science, 1*(2), 91–104.

Almeida, F., & Simoes, J. (2019). The role of serious games, gamification and industry 4.0 tools in the education 4.0 paradigm. *Contemporary. Educational Technology, 10*(2), 120–136.

AlSheibani, S., Cheung, Y., & Messom, C. (2018). Artificial intelligence adoption: AI-readiness at firm-level. In *PACIS* (p. 37).

Annabestani, M., Rowhanimanesh, A., Mizani, A., & Rezaei, A. (2020). Fuzzy descriptive evaluation system: Real, complete and fair evaluation of students. *Soft Computing, 24*(4), 3025–3035. https://doi.org/10.1007/s00500-019-04078-0

Bates, T., Cobo, C., Mariño, O., & Wheeler, S. (2020). Can artificial intelligence transform higher education? *International Journal of Educational Technology in Higher Education, 17*(1), 1–12. https://doi.org/10.1186/s41239-020-00218-x

Baylor, A. L., & Ritchie, D. (2002). What factors facilitate teacher skill, teacher morale, and perceived student learning in technology-using classrooms?. *Computers & Education, 39*(4), 395–414.

Bower, B. L. (2001). Distance education: Facing the faculty challenge. *Online Journal of distance learning administration, 4*(2), 1–6.

Chai, C. S., Wang, X., & Xu, C. (2020). An extended theory of planned behavior for the modelling of Chinese secondary school students' intention to learn artificial intelligence. *Mathematics, 8*(11), 2089.

Chaudhary, S. (2017). Artificial Intelligence in education. *International Journal of Social Science & Interdisciplinary Research, 6*(4), 16–28.

Chen, X., Xie, H., Zou, D., & Hwang, G. J. (2020a). Application and theory gaps during the rise of artificial intelligence in education. *Computers and Education: Artificial Intelligence, 1*, 100002.

Chen, L., Chen, P., & Lin, Z. (2020b). Artificial intelligence in education: A review. *Ieee Access, 8*, 75264–75278.

Chiu, T. K., & Chai, C. S. (2020). Sustainable curriculum planning for artificial intelligence education: A self-determination theory perspective. *Sustainability, 12*(14), 5568.

Coccoli, M., Maresca, P., & Stanganelli, L. (2016). Cognitive computing in education. *Journal of E-learning and Knowledge Society, 12*(2).

Colonna, L. (2021). *Legal implications of using AI as an exam invigilator* (p. 91). Stockholm University Research Paper.

Cope, B., Kalantzis, M., & Searsmith, D. (2021). Artificial intelligence for education: Knowledge and its assessment in AI-enabled learning ecologies. *Educational Philosophy and Theory, 53*(12), 1229–1245.

Crompton, H. (2021). The potential of artificial intelligence in higher education. *Revista virtual Universidad Católica del Norte, 62*. https://doi.org/10.35575/rvucn.n62a1

Crompton, H., Bernacki, M., & Greene, J. A. (2020). Psychological foundations of emerging technologies for teaching and learning in higher education. *Current Opinion in Psychology, 36*, 101–105. https://www.sciencedirect.com/science/article/pii/S2352250X20300695

D'Silva, G., Jani, M., Jadhav, V., Bhoir, A., & Amin, P. (2020). Career counselling Chatbot using cognitive science and artificial intelligence. In *Advanced computing technologies and applications* (pp. 1–9). Springer.

De Melo, F. R., Flôres, E. L., De Carvalho, S. D., De Teixeira, R. A. G., Loja, L. F. B., & de Sousa Gomide, R. (2014). Computational organization of didactic contents for personalized virtual learning environments. *Computers & Education, 79*, 126–137.

Deo, R. C., Yaseen, Z. M., Al-Ansari, N., Nguyen-Huy, T., Langlands, T. A. M., & Galligan, L. (2020). Modern artificial intelligence model development for undergraduate student performance prediction: An investigation on engineering mathematics courses. *IEEE Access, 8*, 136697–136724.

Dhawan, S., & Batra, G. (2020). Artificial intelligence in higher education: Promises, perils, and perspective. *Expanding Knowledge Horizon. OJAS, 11*, 11–22.

Durall, E., & Kapros, E. (2020, July). Co-design for a competency self-assessment chatbot and survey in science education. In *International Conference on Human-Computer Interaction* (pp. 13–24). Springer.

Fadhil, A., & Villafiorita, A. (2017, July). An adaptive learning with gamification & conversational UIs: The rise of CiboPoliBot. In *Adjunct publication of the 25th conference on user modeling, adaptation and personalization* (pp. 408–412).

Fahimirad, M., & Kotamjani, S. S. (2018). A review on application of artificial intelligence in teaching and learning in educational contexts. *International Journal of Learning and Development, 8*(4), 106–118. https://doi.org/10.5296/ijld.v8i4.14057

Fitzgerald, J., Elmore, J., Koons, H., Hiebert, E. H., Bowen, K., Sanford-Moore, E. E., & Stenner, A. J. (2015). Important text characteristics for early-grades text complexity. *Journal of Educational Psychology, 107*(1), 4. https://doi.org/10.1037/a0037289

Flogie, A., & Aberšek, B. (2015). Transdisciplinary approach of science, technology, engineering and mathematics education. *Journal of Baltic Science Education, 14*(6), 779–790.

Goksel, N., & Bozkurt, A. (2019). Artificial intelligence in education: Current insights and future perspectives. In *Handbook of research on learning in the age of transhumanism* (pp. 224–236). IGI Global.

Gulson, K., Murphie, A., Taylor, S., & Sellar, S. (2018). *Education, work and Australian society in an AI world. A review of research literature and policy recommendations*.

Handa, U. (2019). Is artificial intelligence development expensive? *Cynoteck*. https://cynoteck.com/blogpost/is-artificial-intelligence-development-expensive/

Ho, C. C., Lee, H. L., Lo, W. K., & Lui, K. F. A. (2018, July). Developing a chatbot for college student programme advisement. In *2018 International Symposium on Educational Technology (ISET)* (pp. 52–56). IEEE.

Horizon Report: 2018 higher education edition. *EDUCAUSE*. https://library.educause.edu/~/media/files/library/2018/8/2018horizonreport.pdf.

Hwang, G. J., Xie, H., Wah, B. W., & Gašević, D. (2020). Vision, challenges, roles and research issues of artificial intelligence in education. *Computers and Education: Artificial Intelligence, 1*, 100001.

Ibrahim, M. M., & Nat, M. (2019). Blended learning motivation model for instructors in higher education institutions. *International Journal of Educational Technology in Higher Education, 16*(1), 1–21.

İnce, M., Yiğit, T., & Hakan Işik, A. (2020). A novel hybrid fuzzy AHP-GA method for test sheet question selection. *International Journal of Information Technology & Decision Making, 19*(02), 629–647.

Ismail, M., & Ade-Ibijola, A. (2019, November). Lecturer's apprentice: A chatbot for assisting novice programmers. In *2019 International Multidisciplinary Information Technology and Engineering Conference (IMITEC)* (pp. 1–8). IEEE.

Jain, S., & Jain, R. (2019). Role of artificial intelligence in higher education. *International Journal of Research and Analytical Reviews*, *6*(2), 144–150. http://ijrar.com/upload_issue/ijrar_issue_20544069.pdf

Jani, K. H., Jones, K. A., Jones, G. W., Amiel, J., Barron, B., & Elhadad, N. (2020). Machine learning to extract communication and history-taking skills in OSCE transcripts. *Medical Education, 54*(12), 1159–1170.

Janpla, S., & Piriyasurawong, P. (2020). The development of an intelligent multilevel item Bank model for the national evaluation of undergraduates. *Universal Journal of Educational Research, 8*, 4163–4172.

Joshi, S., Rambola, R. K., & Churi, P. (2021). Evaluating artificial intelligence in education for next generation. *Journal of Physics: Conference Series, 1714*(1), 012039. IOP Publishing.

Kalogiannakis, M., Papadakis, S., & Zourmpakis, A. I. (2021). Gamification in science education. A systematic review of the literature. *Education Sciences, 11*(1), 2.

Kamuka, E. E. D. I. (2015). Artificial intelligence in programmed education. *The Arab Institution for Scientific Counsel and Development of Human Resources, 49*(1), 84–96.

Kessler, G. (2018). Technology and the future of language teaching. *Foreign Language Annals, 51*(1), 205–218.

Kosack, E., Stone, M., Sanders, K., Aravopoulou, E., Biron, D., Brodsky, S., et al. (2021). *Information management in the early stages of the COVID-19 pandemic*. The Bottom Line.

Kuleto, V., Ilić, M., Dumangiu, M., Ranković, M., Martins, O., Păun, D., & Mihoreanu, L. (2021). Exploring opportunities and challenges of artificial intelligence and machine learning in higher education institutions. *Sustainability, 13*(18), 10424.

Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence unleashed: An argument for AI in education*.

Ma, Y., & Siau, K. L. (2018). Artificial intelligence impacts on higher education. *MWAIS Proceedings, 42*(5), 1–5.

Ma, Z. H., Hwang, W. Y., & Shih, T. K. (2020). Effects of a peer tutor recommender system (PTRS) with machine learning and automated assessment on vocational high school students' computer application operating skills. *Journal of Computers in Education, 7*(3), 435–462. https://doi.org/10.1007/s40692-020-00162-9

Malik, P., Pathania, M., & Rathaur, V. K. (2019). Overview of artificial intelligence in medicine. *Journal of Family Medicine and Primary Care, 8*(7), 2328.

Mathew, R., Malik, S. I., & Tawafak, R. M. (2019). Teaching problem solving skills using an educational game in a computer programming course. *Informatics in education, 18*(2), 359–373.

McCarthy, T., Rosenblum, L. P., Johnson, B. G., Dittel, J., & Kearns, D. M. (2016). An artificial intelligence tutor: A supplementary tool for teaching and practicing braille. *Journal of Visual Impairment & Blindness, 110*(5), 309–322. https://doi.org/10.1177/0145482X1611000503

Mikic-Fonte, F. A., Llamas-Nistal, M., & Caeiro-Rodríguez, M. (2018, October). Using a chatterbot as a FAQ assistant in a course about computers architecture. In *2018 IEEE Frontiers in Education Conference (FIE)* (pp. 1–4). IEEE.

Montebello, M. (2018). *AI injected e-learning: The future of online education*. Springer. https://doi.org/10.1007/978-3-319-67928-0

Moreno-Guerrero, A. J., López-Belmonte, J., Marín-Marín, J. A., & Soler-Costa, R. (2020). Scientific development of educational artificial intelligence in Web of Science. *Future Internet, 12*(8), 124.

Myers, B., & Lusk, E. (2016). The digital era: How 50 years of the information age transformed education forever. *Chronicles of Higher Education*.: https://www.chronicle.com/interactives/50-years-of-technology. Accessed 17/08/2020.

Nawaz, N., Gomes, A. M., & Saldeen, M. A. (2020). Artificial intelligence (AI) applications for library services and resources in COVID-19 pandemic. *Artificial Intelligence (AI), 7*(18), 1951–1955.

Ndukwe, I. G., Daniel, B. K., & Amadi, C. E. (2019, June). A machine learning grading system using chatbots. In *International conference on artificial intelligence in education* (pp. 365–368). Springer, Cham.

Newton, D. P., & Newton, L. D. (2019, November). Humanoid robots as teachers and a proposed code of practice. In *Frontiers in education* (Vol. 4, p. 125). Frontiers Media SA.

Nguyen, T. T., Le, A. D., Hoang, H. T., & Nguyen, T. (2021). NEU-chatbot: Chatbot for admission of National Economics University. *Computers and Education: Artificial Intelligence, 2*, 100036.

Niemi, H. (2021). AI in learning: Preparing grounds for future learning. *Journal of Pacific Rim Psychology, 15*, 18344909211038105.

Onaolapo, S., & Onifade, T. (2020). Teaching and learning in the cloud: Prospects and Challenges of Artificial Intelligence for education in Africa. In *10th annual international conference on sustainable development (ICSD)* (pp. 1–9). Virtual; Virtual. Retrieved May 15, 2022. https://ic-sd.org/wp-content/uploads/2020/11/Sodiq-Onaolapo.pdf

Pandey, A. K., & Gelin, R. (2017). Humanoid robots in education: A short review. *Humanoid Robotics: A Reference*, 1–16.

Pantelimon, F. V., Bologa, R., Toma, A., & Posedaru, B. S. (2021). The evolution of AI-driven educational systems during the COVID-19 pandemic. *Sustainability, 13*(23), 13501.

Pence, H. E. (2019). Artificial intelligence in higher education: New wine in old wineskins? *Journal of Educational Technology Systems, 48*(1), 5–13.

Perera, M., & Aboal, D. (2018). The impact of a mathematics computer-assisted learning platform on students' Mathematics test scores. In *UNU-MERIT working paper series (2019-007).* Maastricht Economic and social Research institute on Innovation and Technology (UNU-MERIT). https://cinve.org.uy/wp-content/uploads/2019/03/wp2019-00711.pdf

Picciano, A. G. (2019). Artificial Intelligence and the Academy's Loss of Purpose. *Online Learning, 23*(3), 270–284.

Pima, J. (2019). Factors that motivate teachers to use ICT in teaching: A case of Kaliua District secondary schools in Tanzania. *International Journal of Education and Development using ICT, 15*(1).

Popenici, S. A., & Kerr, S. (2017). Exploring the impact of artificial intelligence on teaching and learning in higher education. *Research and Practice in Technology Enhanced Learning, 12*(1), 1–13.

Priya Gupta, K., & Bhaskar, P. (2020). Inhibiting and motivating factors influencing teachers' adoption of AI-based teaching and learning solutions: Prioritization using analytic hierarchy process. *Journal of Information Technology Education: Research, 19*, 693–723. https://doi.org/10.28945/4640

Qian, L., Zhao, Y., & Cheng, Y. (2020). Evaluating China's automated essay scoring system iWrite. *Journal of Educational Computing Research, 58*(4), 771–790. https://doi.org/10.1177/0735633119881472

Remian, D. (2019). Augmenting education: Ethical considerations for incorporating artificial intelligence in education.

Roll, I., & Wylie, R. (2016). Evolution and revolution in artificial intelligence in education. *International Journal of Artificial Intelligence in Education, 26*(2), 582–599.

Russell, S. J., & Norvig, P. (2010). *Artificial intelligence: A modern approach* (3rd ed.). Pearson.

Schuetzler, R. M., Grimes, G. M., & Scott Giboney, J. (2020). The impact of chatbot conversational skill on engagement and perceived humanness. *Journal of Management Information Systems, 37*(3), 875–900.

Scott, A. (2019). *Artificial Intelligence is making online proctoring safe and secure*. Medium. Retrieved May 17, 2022, from https://medium.com/@aileenscott604/artificial-intelligence-is-making-online-proctoring-safe-and-secure-9b03845602da

Stappenbelt, B., & Rowles, C. (2009). *The effectiveness of plagiarism detection software as a learning tool in academic writing education*. In *4th Asia Pacific Conference on Educational Integrity (4APCEI)*. Australia. Retrieved October 11, 2022, from https://www.bmartin.cc/pubs/09-4apcei/4apcei-Stappenbelt.pdf

Stone, P., Brooks, R., Brynjolfsson, E., Calo, R., Etzioni, O., Hager, G., ... & Teller, A. (2016). Artificial intelligence and life in 2030: The one hundred year study on artificial intelligence.

Subrahmanyam, V. V., & Swathi, K. (2018). Artificial intelligence and its implications in education. *In* International Conference on Improv. Access to distance high. Educ*ation. Focus Underserved Communities Uncovered Reg*. Kakatiya University (pp. 1–11).

Terekhov, A. I. (2017). Bibliometric spectroscopy of Russia's nanotechnology: 2000–2014. *Scientometrics, 110*(3), 1217–1242.

Ulum, Ö. G. (2020). A critical deconstruction of computer-based test application in Turkish state university. *Education and Information Technologies, 25*(6), 4883–4896.

Ungar, O. A., & Baruch, A. F. (2016). Perceptions of teacher educators regarding ICT implementation in Israeli colleges of education. *Interdisciplinary Journal of E-Learning & Learning Objects, 12*.

van der Vorst, T., & Jelicic, N. (2019). Artificial Intelligence in Education: Can AI bring the full potential of personalized learning to education?

Vij, S., Tayal, D., & Jain, A. (2020). A machine learning approach for automated evaluation of short answers using text similarity based on WordNet graphs. *Wireless Personal Communications, 111*(2), 1271–1282. https://doi.org/10.1007/s11277-019-06913-x

Wheeler, S. (2019). *Digital learning in organizations: Help your workforce capitalize on technology*. Kogan Page.

Winkler, R., & Söllner, M. (2018). Unleashing the potential of chatbots in education: A state-of-the-art analysis. In *Academy of Management Annual Meeting (AOM)*.

Yuan, S., He, T., Huang, H., Hou, R., & Wang, M. (2020). Automated Chinese essay scoring based on deep learning. *CMC-Computers Materials & Continua, 65*(1), 817–833. https://doi.org/10.32604/cmc.2020.010471

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education–where are the educators? *International Journal of Educational Technology in Higher Education, 16*(1), 1–27.

Zhai, X., Chu, X., Chai, C. S., Jong, M. S. Y., Istenic, A., Spector, M., et al. (2021). A Review of Artificial Intelligence (AI) in Education from 2010 to 2020. *Complexity, 2021*.

Zimmerling, E., Höllig, C. E., Sandner, P. G., & Welpe, I. M. (2019). Exploring the influence of common game elements on ideation output and motivation. *Journal of Business Research, 94*, 302–312.

Fatema AlDhaen is a PhD student at the School of Management at the University of Bradford. She holds a master's degree in information technology and mathematical sciences with high distinction from Ahlia University. Fatema works as a lecturer and researcher, her research interests include the Internet of Things (IoT), Internet of Medical Things (IoMT), Artificial Intelligence (AI), Mobile Health, Multimedia, healthcare Technology, assistive technologies, and Education.

IS Risks Governance for Cloud Computing Service

Mohamed Gamal, Iman M. A. Helal, Sherif A. Mazen, and Sherif Elhennawy

1 Introduction

The widespread use of different internet services, particularly social networking sites, has improved global digital literacy. As a result, current technology-based learning paradigms, such as mobile learning, are gaining traction (Nguyen et al., 2014). E-learning is the purposeful use of networked information and communications technology (ICT) in teaching and learning. E-learning is the use of networked information and communication technologies to teach and learn.

Cloud computing offers a one-of-a-kind opportunity to increase educational accessibility. Cloud computing services, along with the advent and use of modern technologies, present a fantastic chance to build e-learning. Students and instructors may now use the Internet to quickly access a variety of application platforms and web-based instructional materials. An educational institution does not need to worry about setting up any software and hardware environment for online learning or investing significant amounts of money, human, and material resources in developing an e-learning system. The cloud computing service providers' team will be responsible for handling these tasks instead of the educational university staff.

Any educational institutions do not have the resources and infrastructure that are needed to run or install e-learning solutions. Cloud computing has revolutionized the IT industry. It has radically transformed the IT sector since its inception. It has radically transformed the IT sector since its inception. The cloud's unique characteristic is its capacity to deliver resources such as hardware and software through a

M. Gamal (✉) · I. M. A. Helal · S. A. Mazen
Faculty of Computers and Artificial Intelligence, Cairo University, Giza, Egypt
e-mail: muhamet.gervalla@ubt-uni.net

S. Elhennawy
IT Auditing Consultant, Giza, Egypt

M. Alaali (ed.), *COVID-19 Challenges to University Information Technology Governance*, https://doi.org/10.1007/978-3-031-13351-0_14

network. Cloud computing provides reliable and scalable resources and become more popular throughout the world by offering several computing tracks for its resources. Mostly the biggest organizations related to IT maintain their management systems with the help of cloud computing. Recently Cloud computing services are one of the main parts of e-learning systems.

Although there are many concerns while using cloud computing different services, IS/IT governance is used to confirm that these IS/IT assets are implemented and used according to policies and procedures. It also ensures that these assets are properly controlled, maintained, and support the organization's strategy and business goals.

The remainder of this chapter will help the reader to delve into the fundamentals of cloud computing and its services, as well as e-learning and governance in Sect. 2. Section 3 will highlight the various challenges that face decision-makers while applying cloud services in e-learning and land oud computing controls. It will also highlight the critical success factors of using cloud computing services in e-learning, risk management, and governance and the common frameworks, and service level agreement related to cloud computing. Finally, in Sect. 4, we conclude the current situation of binding the cloud environment with education and pinpoint a few recommendations for further research.

2 Basic Concepts

2.1 Cloud Computing Services

A cloud service is any service made available to the clients on-demand via the Internet from a cloud computing provider's server as opposed to being provided from a company's on-premises servers. Cloud computing services are fully managed cloud computing services that are meant to give easy, scalable access to applications, resources, and services. Cloud computing delivers dependable and scalable resources, and it has grown in popularity throughout the world because of its ability to provide several processing tracks for its resources.

Cloud computing services include several qualities, including (1) *On-demand self-service*: cloud services such as CUP time, storage, network access, server time, and web applications may all be automatically assigned as required by customers. (2) *Cost-effectiveness*: cloud service providers' services are relatively inexpensive, if not free. The payment approach is based on consumption, therefore there is no need to buy infrastructure, which minimizes maintenance costs too. (3) *Broad Network Access (mobility)*: customers may access cloud resources through the Internet at any time and from any location via a variety of devices. (4) *Resource Pooling*: physical and virtual computing resources are combined in the cloud. These resources are not location-dependent in the sense that the consumer has no influence over or awareness of where they are. (5) *Rapid Elasticity*: computing resources may be provided and released quickly and flexibly in response to user demand. Consumers

Table 1 Benefits category of cloud computing services

Benefit	Description	Type of benefit
Simplicity	To use cloud services, users simply needed a smattering of information	Non-functional
Elasticity	It's simple to use and may be changed as needed.	Non-functional
Mobility	Users can access these services anytime in the entire world.	Non-functional
Cost reduction	It makes cost reductions because users don't have to acquire and maintain pricey software.	Economical
Employee optimization	Reduction the employees according to reduce parts of work	Economical
Optimization of IT cost	Organizations charges according to the usage of services (pay as per use).	Economical
Scalability	Can scale up and down easily by adding or removing stations easily	Economical
Green environment	The efficient sharing of resources reduces the consumption of a considerable quantity of energy, lowering carbon emissions.	Economical
Virtualization	Creates multiple execution environments of a single physical resource and hides its physical properties from other systems, and application end-users to keep it simple.	Technological
Multi-tenancy	Multiple users can access cloud resources at the same time, as evidenced by this attribute.	Technological
Data management	Holds a big volume of cloud data and manages it by offering quick access	Technological
Tools	Numerous tools are available to assist in the implementation of the cloud setup.	Technological

believe that these resources are limitless and that they may be bought in any amount at any moment. (6) *Measured Services*: CSPs employ a pay-per-use business model to monitor, control, and optimize cloud resources and services. (7) *Multitenancy*: the cloud is a system that provides services to a big group of individuals at the same time the at network, host, and application levels, users share cloud resources, but each user is isolated within his or her own customized virtual application instance (Rashid & Chaturvedi, 2019). Table 1 categorizes the benefits of cloud computing services.

2.1.1 Cloud Computing Service Types

Three service-type models make up cloud services. The most basic cloud computing offering is (1) Infrastructure as a Service (IaaS); which allows you to rent IT infrastructure from a cloud provider, such as servers and virtual machines (VMs), storage, networks, and operating systems. (2) Platform as a Service (PaaS); refers to cloud computing services that provide a 24/7 environment for building, testing, deploying, and maintaining software applications. PaaS is a service that lets

Table 2 Responsibilities between the cloud service provider and cloud client

	Consumer	Provider
SaaS	Uses application/service for business process operations.	Installs manage, maintains, and supports the software application on a cloud infrastructure.
PaaS	Develops, tests deploys and manages applications hosted in a cloud system.	Provisions and manages cloud infrastructure and middleware for the platform consumers; provides development, deployment, and administration tools to platform consumers.
IaaS	Creates/installs, manages, and monitors services for IT infrastructure operations.	Provisions and manages the physical processing, storage, networking, hosting environment, and cloud infrastructure.

Table 3 Deployment Models characteristics

	Deployment			
Model Attribute	Public Cloud	Private Cloud	Hybrid Cloud	Community Cloud
Ownership	Owned by customers	Owned by a single organization	Partially owned by service provider and partially by the consumer	Owned by two or more organizations that basic common goal
Performance	Low to medium	Excellent	Good	Very good
Setup cost of building data center	Low initial cost	High	Medium	Varies from several organizations
Used by	Anyone can access	Limited people can access	Medium accessibility	Depend upon the number of cooperatives
Security	Less	Highest	Medium	High
User's control	Limited control	Full control	Full control over the private part and limited to the public part	High control but limited by community policies
Maintenance cost	Lowest	Highest	Moderate	High
Workload	Normal workload with short spikes in demand	Not suitable for handling a large workload	Highly dynamic or changeable	Suitable for handling a large workload
Virtualization	Resource utilization is optimized via server virtualization	Resource utilization efficiency gains through server virtualization	Resource utilization is optimized via server virtualization	Resource utilization efficiency gains via server virtualization

developers quickly build a web or mobile apps without worrying about the underlying infrastructure of servers, storage, networks, and databases. (3) Software as a Service (SaaS); is a subscription-based method of providing on-demand software products through the Internet. SaaS allows cloud providers to host and manage

software applications and underlying infrastructure, as well as provide normal maintenance like software upgrades and security patches. Users use a web browser on their phone or tablet to access the software through the internet (Ashraf, 2014). According to the selected model, the responsibilities will be divided between CC and CSP as shown in Table 2.

There are four deployment models for cloud computing service *private*, *public*, *hybrid*, and *community* models. (1) Private cloud is not available for others out of the company. Data centers may be on or off the sites as users of this type of cloud client may be from different units or departments but belong to the same organization. It is considered the most secured deployment model. (2) Public cloud provides its cloud clients with apps, storage, and several different services coming from CSP. Public architecture is intended to enable limitless memory storage and data exchange through the Internet to all enterprises. Cloud service providers host, maintain and operate it. (3) Hybrid cloud consists of public and private models. It aids in cost reduction by distributing costs among enterprises; most government institutions in a particular cloud area may be shared, but non-government agencies cannot. (4) Community cloud infrastructure is monitored and then used by a range of organizations with the same core enterprise, projects, or shared specifications, such as software and hardware so that IT operating costs can be minimized. This cloud can then be operated either by the related entities or by the cloud that provides the services (Naik et al., 2020). Table 3 illustrates the main differences between the deployment models.

2.1.2 Cloud Computing Domains

There are several domains that cloud computing services have contributed in, some of these domains are as follows:

1. **E-learning**: Cloud computing provides a hospitable environment for students, researchers, and faculty members in terms of education. Students, teachers, administrators, and researchers can use the cloud to access data and information at their educational institutions. E-mail, simulation tools, file streaming, class recording, virtual classrooms, virtual labs, surveys, and education forums are all available through cloud computing.
2. **E-Governance**: Cloud computing can help the government-run more efficiently. As a result, the different government agencies' services may be given in a better and more complex manner. Cloud computing will also make it easier to manage, install, and upgrade software packages.
3. **Enterprise Resource Planning (ERP):** As a company's business grows, cloud-based ERP becomes important. Software, human resources, payroll, and other duties become expensive and complex to manage. To address these issues, service companies can deploy ERP on cloud computing
4. **Healthcare:** In the medical profession, cloud computing is critical since it delivers multiple infrastructures at a low cost, allowing for more precise outcomes.

Cloud computing facilitates the sharing of medical data across multiple medical specialists, allowing them to reach any particular patient at any time and from any location (Mente & Kale, 2018).

2.1.3 Service Level Agreements

A Service Level Agreement (SLA) in cloud computing services must be included in every legal agreement between a provider and a consumer. It ensures the quality of the service and guides both the cloud client and cloud service provider in defining their roles and responsibilities. The SLA specifies the minimum performance requirements and quality that the supplier guarantees to meet (Lourenço et al., 2014). Service level agreement has many benefits while using cloud computing like:

1. It covers all services used by cloud clients.
2. An evident SLA outlines the payment and punishment rules of the service given, enhancing the connection between the parties. The consumer can assess services based on the Service Level Objectives (SLOs) outlined in the SLA.
3. A contract makes it easier for the parties to work out their differences.
4. It contains a list of services that the providers will supply, as well as a detailed description of each service.
5. The cloud customer's and cloud service provider's duties are defined by the SLA.
6. It specifies the cloud's primary security and privacy management principles.
7. It Improves Service Quality (QoS: Quality of Services): Each aspect of a Service Level Agreement (SLA) corresponds to a Key Performance Indicator (KPI) that defines the level of customer service inside an organization.

2.1.4 Risk Management

There is a classification for risk while using cloud computing services according to the stakeholders (customers, service providers, and government). For customers, the concerns are the downtime, disclosure of commercial secrets, and privileges of CSP. For providers, Assurance of the cloud data center's long-term, protection against network hackers and cyber-attacks, and effectively and securely managing demands of customers. Finally, governments, need to enhance the security protection of mass-scale data, manage the numerous and various scale CSPs, and the evaluation and ranking of the security level of CSPs (Patel Managing Director & Alabisi, 2019). Table 4 shows the concerns of using cloud computing services according to different types of stakeholders.

IS/IT Risk Hierarchy while using cloud computing services (Ramachandra et al., 2017) as shown in Fig. 1.

Table 4 Stakeholders' concerns in using cloud computing Services

Stakeholder	Concerns
Customers	1-Potential downtime with an impact on business
	2- revelation commercial secrets
	3-The privilege status of the cloud service provider
Service Providers	1-Assurance of the long-term secure operation of the cloud data center
	2-Protection against the numerous and aggressive network hackers is a disturbing security problem
	3- Need to manage the demands of customers effectively and securely – identify and block any malicious customers
Government	1- Need to enhance the security protection of a mass-scale data center;
	2- A means to securely manage the numerous and various scale cloud services, providers
	3- Evaluation and ranking of the security level of cloud service providers which extends to include the security credentials of other cloud customers, and a proactive alarm mechanism for malicious programs.

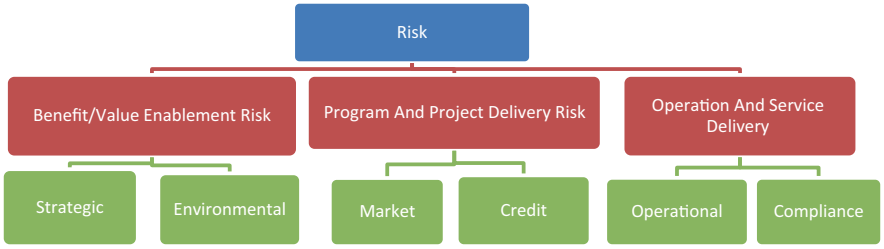


Fig. 1 Risk hierarchy

1. **IT Benefit/value Enablement Risk**
   (a) Strategic risk
      (i) Check if the organization can move to the cloud successfully within a specific budget and schedule
      (ii) Check if there is a profit from u Sing cloud service.
      (iii) Checking if there will be an additional risk for using cloud service.
   (b) Environmental risk: Checking for the risks that may be happened in an environment
2. **IT Program and Project Delivery Risk**
   (a) Market risk: Check if there is added value suitable and exceeds budget Give advantages more than competitors
   (b) Credit risk: Check if cloud service will be completed and maintained within the budget providing or exceeding the expected value

3. **IT Operation and service Delivery Risk**
   (a) Operational risk: defines the hardware basic components risks.
   (b) Compliance risk: checks if the cloud computing service provided meets current and future regulations

2.2 IT Governance

IT Governance is the management and regulation of an organization's information systems to fulfill its goals. As a result, IT governance has evolved into an important aspect of corporate governance. Prioritization and decision-making are used to set goals. Finally, it assesses performance and checks adherence to agreed-upon guidelines and objectives. IT governance as an organizational capability is the responsibility of the board, senior management, and IT management, to regulate the implementation of the IT strategy and establish business-IT integration. IT governance is based on five domains

1. **Value delivery:** is a necessary component of IT governance to ensure that investment in information technology yields a return on investment. It entails making sound financial decisions and managing them over their entire life cycle, from inception to retirement. It entails ensuring that IT delivers adequate quality on schedule and budget, as well as investigating how actual costs are controlled and Return of Investment (ROI) is calculated. It consists of:
   (a) Identifying project value drivers
   (b) Identifying service value drivers
   (c) Project management
   (d) External benchmarking
2. **Strategic alignment:** concerned with how IT supports the enterprise strategy and how IT operations are aligned with current enterprise operations. It contains:
   (a) Understanding the needs of the business
   (b) Developing IT strategy and objectives
   (c) Resource allocation – portfolio management
   (d) Demand management
   (e) Communication
3. **Performance management**: examines how IT tracks and monitors implementation strategy, how project success is assessed, resource utilization, and the resulting process and service delivery. It includes:
   (a) Customer satisfaction
   (b) Service level management
   (c) Business value measurement
   (d) Process improvement

4. **Resources management:** examines how IT manages and optimizes vital IT resources.
   (a) Hardware and software asset management
   (b) Third-party service providers & Outsourcing
   (c) Standardized architecture
   (d) Financial management – service costing
5. **Risk management:** discusses IT asset security, disaster recovery, and business continuity, including security and information integrity. It contains
   (a) Organizational risk appetite
   (b) Project and investment risk mitigation
   (c) Information security risk mitigation
   (d) Operational risk mitigation
   (e) Compliance with regulatory mandates
   (f) Audit

2.2.1 IT Governance Controls

Information systems controls are specific activities performed by persons or systems designed to ensure that business objectives are met. These controls are a set of procedures and technical measures to ensure the secure and efficient operation of information within an organization. Information systems are protected using both general and application controls. Data theft, information system breaches, and unauthorized alterations to digital information or systems are all dangers that can be mitigated by information security rules. After moving to cloud computing the controls will be divided between the cloud service provider and the cloud client according to the used service model.

When employing cloud computing services, there are numerous controls that must be implemented. The most important control is differentiating the responsibilities between cloud computing providers and cloud clients. Authorization is an important control as it refers to a security mechanism to determine access levels or user/client privileges related to system resources including files, services, computer programs, data, and application features (Bhatt et al., 2019). Data protection techniques, such as data encryption level, are also critical. Because data in cloud delivery architecture may travel to multiple places, it is critical to encrypt the data from beginning to end (Singh et al., 2016). Data can't be modified without sufficient authorization thanks to changing management controls. Security hygiene still matters to ensure that even if one control fails, other security features can keep the application, network, and data safe. Create, Store, Use, Share, Archive, and Destroy are the six steps of the data life cycle. After the data has been produced, it can freely move between stages. Data must be protected at every stage of its life cycle, from creation to annihilation. File controls are very important too to make sure that data are manipulated accurately in any type of file (P. R. Kumar et al., 2018). The credentials project addresses the need for a secure and privacy-preserving cloud-based identity management and data-sharing platform. The closure of contract procedure

in service level agreement parameters is very important to ensure the way of deletion of data to avoid future clients using it. Also, the service level agreement parameters are very important to determine the availability of data percentage, performance, and the backup plan (Aljoumah et al., 2015). Because data privacy is so critical, cloud service providers' security and information workers must have appropriate skills and the ability to prevent, detect, and respond to security breaches in a timely way (Carroll et al., 2011).

2.2.2 COBIT5 Framework

Control Objectives for Information and Related Technology (COBIT 5) includes a process reference model that specifies and describes in detail a range of governance and management methods. It offers a process reference model that depicts all of the processes associated with IT operations that are often seen in a company, allowing operational IT and business management to grasp a single model (Lainhart, 2012). Figure 2 shows the five principles of the COBIT5 framework. The principles of COBIT5 are:

1. **Covering the enterprise end to end:** The framework influences more than only the IT department of a company. COBIT 5 is a framework that should be used throughout an organization to maximize its value. The approach examines the entire company's governance and risk management, rather than focusing on IT.

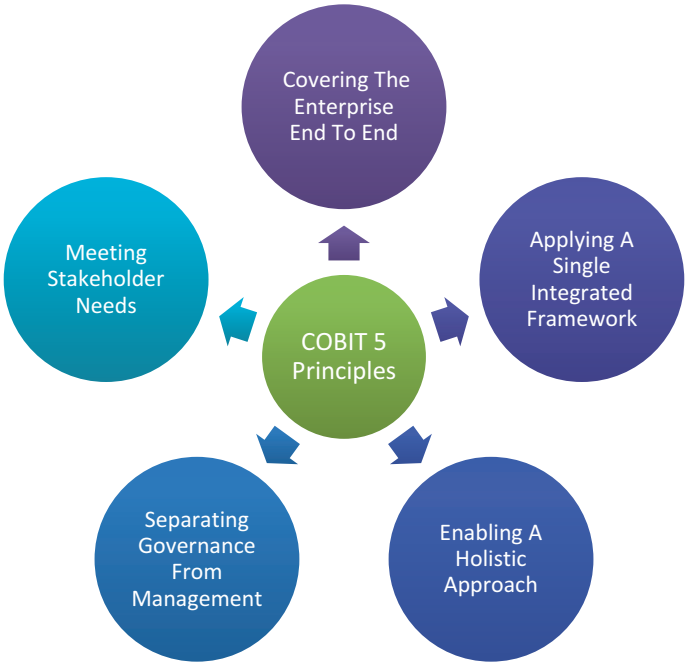


Fig. 2 COBIT 5 principles

2. **Applying a Single Integrated Framework:** includes all of the company's teams, workers, and divisions. It combines the company's IT administration and governance with the demands and operations of the organization. This comprehensive framework supports the detection of potential business risks as well as the enhancement of procedures to increase their efficiency.
3. **Enabling a Holistic Approach:** optimizes operational operations and increases efficiency through a comprehensive and integrated strategy. When a corporation employs the COBIT 5 framework, employees may be more productive and provide more useful output for customers.
4. **Separating Governance from Management**: All application and system governance should be delegated to IT operations by management. Because they are the best qualified to manage government, this is the case. When COBIT 5 is combined with IT governance and enterprise governance, the entire process becomes considerably more clear and more straightforward.
5. **Meeting stakeholder needs:** All processes and procedures should be geared toward meeting corporate goals, with stakeholder demands being the most important. Stakeholders have specific expectations, which the COBIT 5 framework satisfies by effectively managing all IT activities within the organization. This contributes to the production of value through delivery, which is crucial for customer satisfaction.

2.2.3 ISO38500 Standard

The international standard for the corporate governance of IT (ISO38500) sets out principles, definitions, and a high-level framework that organizations of all types and sized can use to better align their IT with organizational decisions, and meet their legal, regulatory, and ethical obligations. ISO 38500 establishes guidelines for the "effective, efficient, and acceptable use of information technology." On the one hand, these concepts are linked to six fundamental issues, and on the other, to a development process. "Responsibility, strategy, acquisition, performance, compliance, and human behavior" are among the fundamental challenges. The mentioned approaches consider Deming's five stages; however, the development process comprises the three core cyclic phases of "evaluate, direct, and monitor"(Taylor, 2011). Its focus is on assuring stakeholders (such as customers, shareholders, and employees) that the organization's corporate governance of IT will be trustworthy if the standard is followed, informing and guiding directors in governing the use of IT in their organizations, and providing a basis for objective evaluation of the corporate governance of IT (Feltus, n.d.). ISO38500 includes six main principals are:

1. Establish clearly understood responsibilities for IT
2. Plan IT to best support the organization
3. Acquire IT validly
4. Ensure that IT performs well, whenever required
5. Ensure IT conforms to formal rules
6. Ensure IT use respects human factors

2.2.4 ITIL Framework

The IT Infrastructure Library (ITIL) is one of the IT Governance frameworks that assist organizations in properly managing IT services. ITIL is a set of best practice guidelines for IT service management in organizations that has become one of the most commonly acknowledged models for IT service management in all types of enterprises around the world (Bernard & Jane, 2011). Organizations and people, value streams and processes, information and technology, and partners and suppliers are the four dimensions of service management presented in ITIL v4. These are mapped to service value chains and value systems. ITIL V4 includes 34 management practices divided into three categories general management practices, service management practices, and technical management practices as shown in Table 5.

Table 5 Categorizing ITIL practices

General management practices:	Services management practices:	Technical management practices:
Strategy management	Business analysis	Deployment management
Portfolio management	Service catalog management	Infrastructure and platform management
Architecture management	Service design	Software development and management
Service financial management	Service level management	
Workforce and talent management	Availability management	
Continual improvement	Capacity and performance management	
Measurement and reporting	Service continuity management	
Risk management	Monitoring and event management	
Information security management	Service desk	
Knowledge management	Incident management	
Organizational change management	Service request management	
Project management	Problem management	
Relationship management	Release management	
Supplier management	Change enablement	
	Service validation and testing	
	Service configuration management	
	IT asset management	

3 Utilizing Cloud Computing Services in E-Learning

E-learning poses substantial issues considering the exponential increase of knowledge at an ever-increasing rate. These difficulties, which include pedagogical, technological, and organizational concerns, must be addressed and resolved before e-learning may be fully integrated into the academic environment (Mhouti, 2018). Learner tracking, synchronous and asynchronous communication tools, assessment procedures, and collaborative spaces are all part of the e-learning system (Sneha & Nagaraja, 2013).

There were many trends in E-Learning (Siddiqui et al., 2019) besides using cloud computing services like:

1. Mobile Learning Enhancement: Because of the significant growth in smartphone users in recent years, the quality of mobile learning has progressively improved. Smartphone users are growing by the day, and they want to make their lives easier. Smartphone users prefer not to utilize laptops or desktop computers to access numerous applications. As a result, the mobile e-learning trend is gaining traction. Mobile
2. Forum-based Learning: This allows students to share their questions, thoughts, and issues on a centralized platform. An expert shares diverse responses or thoughts in response to inquiries, which helps to develop the learner's abilities and confidence.
3. Social E-learning: The student can engage and share his thoughts and experiences, as well as find and explore appropriate learning. In terms of boosting knowledge and efficiency, learners find this product to be very beneficial and trustworthy.

Cloud computing established a framework that explains how resources and data are kept in cloud storage and how users may access it remotely via their computers and mobile phones. For e-learning, the users can be instructors, students, researchers, and administrative staff each one of them will have specific rules and privileges. The cloud-side will contain the database, run-environment (app server), and the application code and the users will access these data through the internet. It offers a wide range of new opportunities for educational advancement and has had a considerable impact on teaching and learning methods. E-learning has become one of the most popular teachings and learning methods today due to its ability to overcome spatial and temporal limits (Li et al., 2010).

Many applications that are usually used in e-learning are based on cloud computing services according to the service type in IaaS AWS, Rackspace, and GoGrid are the most used applications in e-learning. The most popular PaaS systems for E-learning are Azure, APP Engine, and Force.com. Finally, many applications are used in E-learning based on SaaS like Google Docs, Freshbooks, salesforce, and basecamp. Figure 3 illustrates the applications used in e-learning based on the cloud services models. Implementing e-learning systems with cloud computing has numerous advantages over other e-learning systems like (Bora & Ahmed, 2013) (Wibowo & Astriawati, 2019):

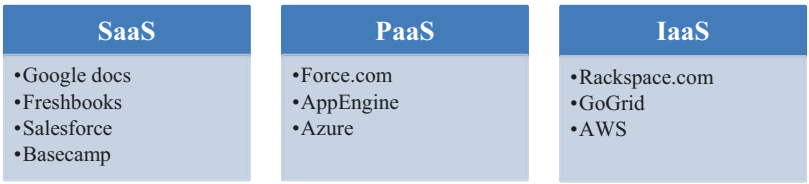


Fig. 3 Cloud computing application for E-learning

1. Software-as-a-Service, the service allows you to pay modest, predictable monthly fees instead of a costly license
2. There is less dependency on hardware. Not only do cloud solutions eliminate the need for pricey servers and end-user devices at the facility, but they are also platform-agnostic and accessible from anywhere.
3. Students who are busy, non-traditional, or live in a remote place are no longer required to arrive at school on time. With the move to the cloud, more people will be able to work from home.
4. Cloud computing allows for instant changes to class materials and textbooks, ensuring that students are studying with the most up-to-date information.
5. Cloud computing allows students and teachers to study and teach on their own time, allowing them to be more productive and happier.
6. Internal IT support is not required: as the cloud service provider will be responsible for all IT support on the cloud side and now data will store internally in the organization
7. Instant software updates: as one of the cloud computing services all software is updated.
8. Cloud-based e-learning platforms are dependable: as the cloud computing has high availability
9. Document format compatibility: because various file formats and fonts do not open correctly on some PCs/mobile phones, cloud-based e-learning apps do not have to deal with these issues. The file is opened from the cloud by cloud-based e-learning apps

Many changes in characteristics of E-learning happened after using cloud computing. Some of the duties that were formerly performed by educational institutions are now performed by cloud service providers. Also, there are many concerns that the educational organization has like the absence of some controls, the hardness of applying auditing on the IT/IS resources and the security issues that may be occurred because of using cloud computing. Table 6 shows the changes in these characteristics.

Table 6 Changes in E-learning Characteristics

E-Learning characteristics	Before cloud	After moving to cloud
A deployment process and team are required.	√	X
Loss of control on application or/and resources	X	√
Conflicts between clients' goals	X	√
Resource availability and failure risks	X	√
Lack of confidence in data change before storage	X	√
Denial of service attack in critical server health	X	√
Chances of stress, load, and congestion	X	√
Auditing task is more complex	X	√
Security policies and access control are not trusted	X	√
Technical IT support in the event of a failover.	√	X
Development tests are needed	√	X
Buying and management of hardware and software resources	√	X
In house responsible for configuring the latest technology updates	√	X
Confidentiality issues	X	√
High-speed internet access	X	√
Fees for subscriptions and registration	X	√
Requirement gathering and elicitation process	√	X
Testing required	√	X
Project management activities required	√	X

3.1 Cloud Computing Frameworks for E-Learning

Data security, IT governance, service availability, and reliance on service providers are just a few of the challenges restricting cloud computing adoption. The risk areas are divided according to the layers of cloud computing. There are many vulnerabilities like DoS attacks that happen because of multi-tenancy and virtualization. Also, the vulnerabilities of internet protocols may cause IP spoofing, ARP spoofing, DNS poisoning, RIP attacks, and flooding. Another issue is unauthorized access to the management interface, malicious insiders, and Vulnerabilities in browsers and APIs. One of the most of concerns is data loss and leakage which involve data tampering, deletion, or alteration. Because of the Cloud's dynamic and shared nature, such danger might become a serious concern, resulting in data theft. Finally, Security issues related to auditing, regulatory compliance, and laws are very critical issues when using cloud computing services (Modi et al., 2012).

Many advantages may be realized by using this technology in higher education institutions, notably in terms of their global rankings. However, cloud computing technology is facing a variety of hurdles at the same time, including issues with security and privacy, a lack of professionalism, and slow Internet rates in some areas. Nonetheless, owing to the numerous advantages of this technology, such as

the capacity to solve issues at reduced costs and the ease with which information can be shared, accessed, and managed, it has enormous potential for further development (Ghani & Azizi, 2016).

Many studies discussed the critical success factors and divided them into four dimensions 1) cloud service resilience which includes the security of the data on the cloud service side. Service reliability refers to the service's uptime and dependability, as well as a customizable service level agreement (SLA) that meets the goals and expectations of the company, 2) university technological maturity which indicates how the university can deal with cloud computing and have enough resources to handle these service requirements like network bandwidth, compatibility with the cloud services APIs, and used software packages, finally the technical support that will deal with cloud services, 3) University organizational readiness that refers to the support of management in transferring into cloud computing, participants readiness which includes instructors, students, and technical staff, 4) Cloud-based E-Learning Imperatives that includes the flexibility of cost as one of the benefits of cloud computing include an automated system based on open-source software and lower system utilization costs, secondly the system's simplicity improves the users' ability to use it to improve their performance. The usage of the system improves performance, but it's also vital to assess how much work it will take to utilize it; finally, the degree of faith that users have in the Cloud-based e-Learning system, and how valuable it will be for their academic achievement and performance (Quadri & Ahmad, 2019).

By employing Cloud Computing to provide Virtual Labs as a Service, the proposed Virtual LabCloud System (VLCS) offers one possible way to improve the learning process (VLaaS). The VLCS' main goal is to provide virtual labs while growing the usage of cloud assets. The proposed VLCS strengthens the link between distributed computing and e-learning by allowing virtual lab centers to handle as many clients as possible while increasing the use of private cloud assets. This technique provides the opportunity to improve the e-learning backdrop by including more effective teaching methods (Neelakantan, 2018).

By providing the most popular architecture that has been used, several applications' solutions employing cloud computing in e-learning for higher education are shown. Finally, the study analyses the challenge associated with the deployment of cloud-based e-learning systems in higher education and potential solutions (El Mhouti et al., 2019).

There is a strategy that is divided into five stages, with a focus on evaluating data and processes, functions, and applications from several major universities based on a set of key criteria, as well as establishing a link between these aspects and the models, services, and applications available on the Cloud market. The findings encourage and promote the adoption of Cloud solutions at universities by increasing knowledge in this area and giving practical guidance that is flexible to the structure of the university. The suggested model considers the university's architecture and criteria such as mission, availability, and relevance of applications, as well as the data's mission, sensitivity, confidentiality, integrity, and availability in order to be relevant in practice (Mircea & Andreescu, 2011).

Many studies provided approaches and frameworks for applying cloud computing services in higher education. Other studies discussed the risk areas and vulnerabilities of using cloud computing services in all fields. These risk areas are related to the service types and cloud deployment models. On the other hand, Even the IT governance is very important for any educational organization but there is a lack of frameworks related to applying it while using cloud computing services.

3.2 Cloud Computing Challenges

Many challenges face using cloud computing services. Security is the most pressing issue that clients of cloud computing services face (Sharma et al., 2017). When databases and application software are moved to a big data center, security concerns may arise when using cloud computing services (S. Kumar, 2018). Cloud computing may result in the loss of some or all controls, as well as a violation of cloud customer legislation, making compliance a major difficulty. Another concern with cloud computing services is performance, as switching to back up after a disaster would result in poor performance (Sharma et al., 2017). Additionally, data transport bottlenecks may result in a longer response time (Kim et al., 2009). The financial model and cost are major problems, as cloud computing services increase the cost of data transport as well as the cost of the license that each cloud client user would use (Sharma et al., 2017). Additional costs for rebuilding and redesign when shifting to the cloud, especially if the client chooses the SaaS model which is called the charge model. Data moves freely between clouds and inside those clouds, as well as between local applications because of interoperability. Downtime caused by a disaster or a loss of connectivity between a cloud service provider and a cloud client can damage a company's brand and cause financial loss, thus it's a crucial consideration when switching to cloud computing services. Another significant difficulty is Cloud.

Because there are no common APIs, combining cloud services is difficult; each provider has its approach to how consumers and applications interface with cloud infrastructure (Al-Dhuraibi et al., 2018). The Service Level Agreement (SLA) guarantees service availability, security, and compliance, as well as all problems that the client may encounter. Because most businesses are wary of transferring their data and entire functions to the cloud, they keep the core function in-house, which creates a migration problem (Bhatt et al., 2019). Load balance is one of the most challenging aspects of cloud computing is evenly distributing the workload across all nodes. To increase resource usage and the efficiency of the cloud computing environment, the workload must always be divided among all accessible nodes of the distributed system (Sharma et al., 2017).

3.3 E-Learning Challenges

The most significant issue that educational institutions face is this relating to the effective use of e-learning system resources. These difficulties also include keeping up with the fast growth in the number and diversity of data in these systems. As a result, e-learning systems still have a scalability problem at the infrastructure level. When heavy workloads are received in an e-learning system, multiple resources are deployed and assigned only for certain activities, which necessitate adding and configuring new resources of the same type. This makes cost and resource management extremely costly. The number of users (learners, trainers, etc.), services given, contents and resources made available by educational institutions, and the dimensions of e-learning systems are all increasing at a rapid rate. The problems that this new evolution brings, such as optimizing computing resources and meeting storage and connectivity needs, underscore the need for a platform that can scale and keep costs in check. Another issue is the pedagogical, technological, and financial ramifications of the available e-learning systems. Storage facilities are a stumbling block for hosting e-learning systems that allow for multimedia content (Gamundani et al., 2013). It's critical to understand that there are costs associated with maintaining both hardware and software resources in an e-learning system (computers, servers, infrastructure, data centers, and so on). as well as software resources in an e-learning system. In this instance, the institution is responsible for the individual software packages' site license, installation, and technical support.

3.4 Cloud Computing Challenges in E-Learning

Applying cloud computing services in the e-learning domain presented more challenges, such as:

1. The fact that cloud computing is reliant on an internet connection is an undesirable reality in education. Unlike traditional classrooms, internet service provider problems or poor bandwidth may obstruct online learning.
2. Because the solution is supplied "as a service," the infrastructure is handled by the cloud service provider and abstracted from your in-house team. Learning organizations will have less control over the infrastructure and system configuration because everything is hosted off-site.
3. Higher education cloud solutions rely on a single provider's services. Typically, businesses are unable to swap service providers. If a cloud customer enters a contract with a provider, he will almost probably be locked into a service contract with that provider. Most providers, on the other hand, will allow a client out of a contract if the client breaks it early, but they will charge the client a penalty.
4. There are inherent security vulnerabilities when all assets are housed online. Data security becomes a growing worry when hackers obtain access to cloud systems that aren't adequately secured. This starts with a properly configured cloud infrastructure and training all users on cloud security best practices.

5. The migration may be costly, depending on how many applications or services you're moving to the loud. There's also the opportunity cost of staff training on the new system and security best practices.

4 Conclusion

The covid-19 pandemic led to many changes in all fields. This pandemic increased the usage of information technology in most lifestyles. One of the most affected fields by Covid-19 is education, especially the higher education level. Most of the universities transferred to E-learning strategies even if this transfer was partial. There were a lot of challenges faced the E-learning technically, cost-wise, awareness of the users, lack of technical support, and the weakness of infrastructure of most educational organizations.

A great growth was happening in the last years in using cloud computing services through their different services models. Some universities started to use these services in their educational process to support E-learning strategies. Also, cloud computing services reduced the needed technical support and compensate for poor IT infrastructure in these organizations. On the other hand, there are many impediments and challenges while cloud computing services. The most critical challenges while using cloud services are security and data privacy as the data is very important and is considered a critical asset for an organization.

IT governance is very useful to decrease the risks faced using cloud computing services generally and while using them in E-learning especially. The governance is used to ensure applying the needed controls to achieve the educational goals in compliance with the regulations and laws. The controls will be different from case to case according to the cloud computing service type and the deployment model of these services.

In this paper, the authors tried to illustrate the main needed knowledge for E-learning, cloud computing services, and governance concepts and its common frameworks to increase the awareness of IT staff and different types of stakeholders in the educational field.

References

Al-Dhuraibi, Y., Paraiso, F., Djarallah, N., & Merle, P. (2018). Elasticity in cloud computing: State of the art and research challenges. *IEEE Transactions on Services Computing, 11*(2), 430–447. https://doi.org/10.1109/TSC.2017.2711009

Aljoumah, E., Al-Mousawi, F., Ahmad, I., Al-Shammri, M., & Al-Jady, Z. (2015). SLA in cloud computing architectures: A comprehensive study. *International Journal of Grid and Distributed Computing, 8*(5), 7–32. https://doi.org/10.14257/ijgdc.2015.8.5.02

Ashraf, I. (2014). An overview of service models of cloud computing. *International Journal of Multidisciplinary and Current Research, 2*, 779–783. http://ijmcr.com/wp-content/uploads/2014/08/Paper18779-783.pdf

Bernard, P., & Jane, C. (2011). Passing the ITIL Intermediate Exams: The Study Guide. Van Haren Publishing, 2011.

Bhatt, S., Ieee, A. T., Member, S., Chhetri, P., & Bhatt, P. (2019). Authorizations in cloud-based internet of things: Current trends and use cases. *2019 Fourth International Conference on Fog and Mobile Edge Computing (FMEC), 1*, 241–246. https://doi.org/10.1109/FMEC.2019.8795309

Bora, U. J., & Ahmed, M. (2013). E-Learning using cloud computing. International Journal of Science and Modern Engineering (IJISME). ISSN: 2319-6386. *2*, 9–13.

Carroll, M., Van Der Merwe, A., & Kotzé, P. (2011). Secure cloud computing benefits. *Risks and Controls*.

El Mhouti, A., Erradi, M., & Nasseh, A. (2019). *Application of cloud computing in E-learning : A basic architecture of cloud-based E-learning systems for higher education*. Springer. https://doi.org/10.1007/978-3-030-11196-0

Feltus, C. (n.d.). *Corporate Governance in ICT Introducing ISO/IEC 38500 : Corporate Governance in ICT Christophe Feltus*.

Gamundani, A. M., Rupere, T., & Nyambo, B. (2013). *A cloud computing architecture for e-learning platform , supporting multimedia content*. *February 2014*.

Ghani, A., & Azizi, N. (2016). *www.econstor.eu*.

Kim, W., Kim, S. D., Lee, E., & Lee, S. (2009). Adoption issues for cloud computing. In *IiWAS2009 – The 11th international conference on information integration and web-based applications and services* (pp. 3–6). https://doi.org/10.1145/1806338.1806341

Kumar, S. (2018). A review of cloud computing environment and security challenges*, 7*(2), 174–182.

Kumar, P. R., Raj, P. H., & Jelciana, P. (2018). ScienceDirect procedia computer science exploring data security issues and solutions in cloud computing. *Procedia Computer Science, 125*(2009), 691–697. https://doi.org/10.1016/j.procs.2017.12.089

Lainhart, J. W. (2012). COBIT 5: A business framework for the governance and management of enterprise IT COBIT 5. In *United States of America*. ISACA.

Li, Y., Dong, M., & Huang, R. (2010). *Developing a collaborative E-learning environment based upon semantic wiki : From design models to application scenarios*. https://doi.org/10.1109/ICALT.2010.68

Lourenço, J., Santos-Pereira, C., Rijo, R., & Cruz-Correia, R. (2014). Service level agreement of information and communication Technologies in Portuguese Hospitals. *Procedia Technology, 16*, 1397–1402. https://doi.org/10.1016/j.protcy.2014.10.158

Mente, R., & Kale, A. (2018). *Cloud computing and its effects in various fields cloud computing and its effects in various fields*. November 2017.

Mhouti, A. E. (2018). Using cloud computing services in e-learning process : Benefits and challenges, 893–909. https://doi.org/10.1007/s10639-017-9642-x

Mircea, M., & Andreescu, A. I. (2011). Using cloud computing in higher education : A strategy to improve agility in the current financial crisis. https://doi.org/10.5171/2011.875547

Modi, C., Patel, D., & Borisaniya, B. (2012). A survey on security issues and solutions at different layers of cloud computing. https://doi.org/10.1007/s11227-012-0831-5

Naik, B., Soudagar, M. E. M., Zhou, X., Li, J., Boulay, F., Bastin, B., & Santos, F. D. O. (2020). Types of cloud deployment types of cloud deployment. https://doi.org/10.1088/1742-6596/1582/1/012085

Neelakantan, P. (2018). *A study on e-learning and cloud computing., 3*(1), 1534–1539.

Nguyen, T. D., Nguyen, D. T., & Cao, T. H. (2014). Acceptance and use of information system : E-learning based on cloud computing in Vietnam*, 4960*, 139–149.

Patel Managing Director, K., & Alabisi, A. (2019). Cloud computing security risks: Identification and assessment. *ERA Journal ID #: 40840 Patel & Alabisi, 17*(2), 11–19.

Quadri, N. N., & Ahmad, N. (2019). Critical success factors (CSFs) for cloud-based E-learning critical success factors (CSFs) for cloud-based. *January*. https://doi.org/10.3991/ijet.v14i01.9170

Ramachandra, G., Iftikhar, M., & Khan, F. A. (2017). A comprehensive survey on security in cloud computing. *Procedia Computer Science, 110*(2012), 465–472. https://doi.org/10.1016/j.procs.2017.06.124

Rashid, A., & Chaturvedi, A. (2019). Cloud computing characteristics and services : A brief review. *International Journal of Computer Sciences and Engineering Open Access*. https://doi.org/10.26438/ijcse/v7i2.421426

Sharma, P. K., Kaushik, P. S., Agarwal, P., Jain, P., Agarwal, S., & Dixit, K. (2017). Issues and challenges of data security in a cloud computing environment. In *2017 IEEE 8th annual ubiquitous computing, electronics and Mobile communication conference, UEMCON 2017, 2018-Janua* (pp. 560–566). https://doi.org/10.1109/UEMCON.2017.8249113

Siddiqui, S. T., Alam, S., & Khan, Z. A. (2019). *Cloud-based E-learning : Using cloud computing platform for an effective E-learning*. Springer. https://doi.org/10.1007/978-981-13-2414-7

Singh, S., Jeong, Y. S., & Park, J. H. (2016). A survey on cloud computing security: Issues, threats, and solutions. *Journal of Network and Computer Applications, 75*, 200–222. https://doi.org/10.1016/j.jnca.2016.09.002

Sneha, J. M., & Nagaraja, G. S. (2013). Virtual learning environments – A survey, *4*(6), 1705–1709.

Taylor, P. (2011). EDPACS: The EDP audit, control, and security newsletter, 37–41. https://doi.org/10.1080/07366981.2011.599278

Wibowo, W., & Astriawati, N. (2019). *Cloud computing-based E-learning system architecture in education 4*. 0 Cloud Computing-Based E-Learning System Architecture in. 0–7. https://doi.org/10.1088/1742-6596/1196/1/012038.

Mohamed Gamal is a MSc researcher in Faculty of Computers and Artificial Intelligence, Cairo University. His research focuses on auditing, governance and cloud computing.

Iman M. A. Helal is an assistant professor of Information Systems at Faculty of Computers and Artificial Intelligence, Cairo University since August 2017. She received her Ph.D. degree in Information Systems in March 2017. Her research focuses on the area of Business Process Management, Business Process Monitoring, Information System Auditing, Rule-based Systems, and Database Systems. She is also interested in big data analysis in process mining and process monitoring, detecting events streams in cloud context for monitoring and auditing, and cybersecurity in information system auditing.

Sherif A. Mazen is an Emirat Associate Professor in Cairo University. Doctorat D'Etat (Ph.D) in Information Systems, from University of Toulouse I, France, December 1982. Doctorat 3eme Cycle (Master Degree) in Management – from University of Toulouse I – France, November 1980. Diploma in Computer Data Processing, Stage PF3 (6 months) From "Centre Prive d'Etudes Pratiques d'Informatique et d'Automatique (CEPIA) ", Rocquencourt, Le Chesnay, France, November 1979. Diplome d'Etudes Approfondies (D.E.A.) (Post Graduate Studies in Management) – From University of Toulouse I, France, March 1979. Diploma in Computer Sciences, Seminaire E6, from International, IRIA, Rocquencourt, France, Jan.- July 1975. B.Sc. in Accounting, Faculty of Commerce, Cairo University, June 1973. His research focuses on the area of Information Security, Information Systems Auditing, and Network Security. He is also interested in Big data and cloud computing.

Sherif Elhennawy is a Ph.D. holder since 2009. His study is specialized in IT auditing. He is the Group IT auditing manager in a multinational company since 2015. He is also interested and worked as a consultant in Information Systems auditing, and cybersecurity auditing.

IT Governance vs Information Governance

Muhamet Gërvalla and Edmond Hajrizi

1 Introduction

The organizational environment is constantly changing and becoming increasingly complex. Organizations are under pressure to force themselves to respond quickly to changing conditions and be innovative in how they offer services and products. Such activities require an organization to be agile and to make frequent strategic, tactical, and operational decisions. Making such decisions may require significant amounts of relevant data, information, and insights. Those are dependent on the organization's environment, workplace, and stakeholder engagement. Nowadays, the organization's success is very much related to the environment they create by considering the application of governance frameworks to create a stable and prosperous organization. The need of organizations to maintain a good position in a competitive environment requires constant adoption of the market's requirements. As a result, organizations need to manage many assets: people, customer relationships, money, and plants, where information and technologies may classify as the asset that perplex them the most (Weill & Ross, 2004).

Many studies are focused on analyzing IT governance and information governance separately and analyzing their relationship in the context of organizational behavior. Previous studies declared that IT governance is part of the strategic approach within corporate governance, which has to do with the identification and prioritization of IT investments in line with business objectives (IT Governance XE "Governance" Institute, 2004; National Computing Centre, 2005; Weill & Ross, 2004). On the other hand, information governance is presented as a concept that

M. Gërvalla (✉) · E. Hajrizi
University for Business and Technology, Pristina, Kosovo
e-mail: muhamet.gervalla@ubt-uni.net; ehajrizi@ubt-uni.net

M. Alaali (ed.), *COVID-19 Challenges to University Information Technology Governance*, https://doi.org/10.1007/978-3-031-13351-0_15

supports the organization to treat information as a valuable asset for an organization to support the availability of data by valuation, creation, storage, usage, archiving, and deletion of information (Gartner; Robinson & Cole; Weill, 2004).

This chapter aims to present definitions and analyses of IT governance and information based on secondary data and the relationship between these two concepts and working in the virtual environment. The objectives are:

1. Identify and analyze definitions of IT governance and information governance and their relationship.
2. The role of IT governance and information governance on remote work and virtual teams with a focus on education.

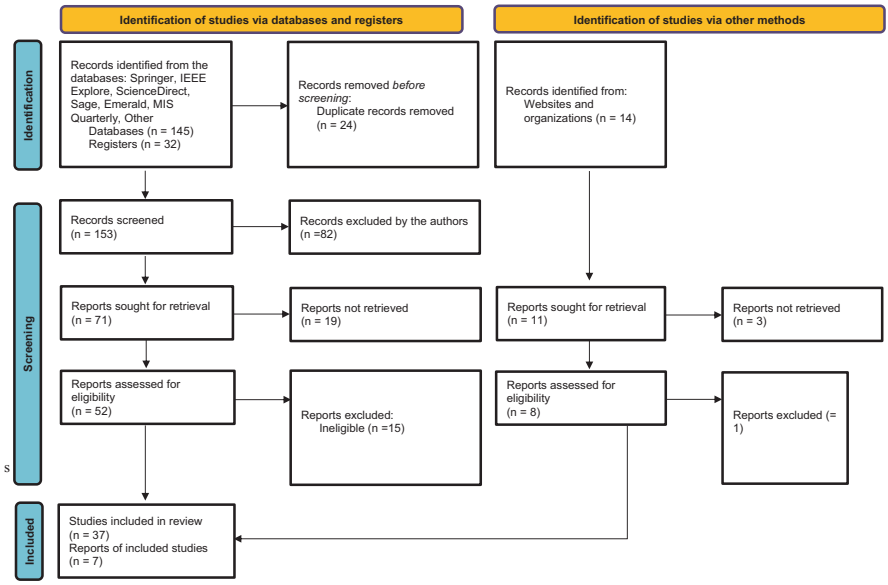
The literature review supported the investigation of IT governance by identifying how previous studies have defined this concept, what IT governance frameworks are and how they support it, and the derivation of IT governance with a focus on the organization's performance. On the other hand, it analyzes information governance and its definition, including the principles that should be applied to information governance. The study of IT governance, IT governance frameworks, information governance, information governance principles, and remote work and virtual teams supported this study to answer the aim and objectives of this chapter.

2 Methodology

This study is done based on a systematic review of the secondary data collected from academic databases and reports generated by industry leaders in the study field. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) is an evidence-based minimum set of items applied in support of improving the reporting of systematic reviews and meta-analysis in line with the aim and objectives of the study (Page et al., 2021). As presented in Table 1, a three-stage of systematic review is applied. In the first stage, there are identified electronic databases and reports related to the research topic; in the second stage, the screening of the identified studies, journal articles, papers, and reports; and in the third stage, the final decision with regard to the studies and reports included in this study.

In line with this study's aim and objectives, the secondary data was collected from electronics databases such as Springer, IEEE Explore, ScienceDirect, Sage, Emerald, and MIS Quarterly. The terms used for search in electronic databases are: "governance," "IT governance," "information governance," "governance frameworks," "remote work," "virtual environment," "higher education," and other terms related to the aim and objectives of the study. Before the screening, papers and reports that did not include the mentioned terms were removed. Selected papers and reports were classified depending on the research objectives; then, they were divided as eligible or ineligible for the study based on their content. This approach supports this topic's investigation by enabling it to achieve the aim and objective of this chapter.

Table 1 Application of PRISMA for systematic reviews of the literature



3 Background

Governance is a well-known terminology in the academic area. There are many studies that present definitions of this concept from academia and industry as well. Earlier studies define governance as the concept that is focused on the identification, explication, and mitigation of possible contractual risks (Williamson, 1996). According to Rhodes, governance is referred to as a new process, method, or a changed condition of ordered rule or process by which a society is governed (Rhodes, 2007). Kaufmann et al. define governance as the traditions and institutions that describe the authority that rules a country, including (1) The process of how governments are selected, monitored and replaced; (2) the ability of government to formulate and implement policies effectively, (3) The reputation of institutions with regard to the respect by the citizens and state in support of government economic and social interaction between them (Kaufmann et al., 1999). World Bank defines governance as a concept that represents the rule of rulers within a given set of rules by which the authority is controlled by the rulers in support of making rules to enforce and modify the rules (World Bank, 2009).

In line with the governance terminology, the ICSA defines corporate governance as "a toolkit that enables management and the board to deal more effectively with the challenges of running a company". Moreover, corporate governance ensures that businesses have appropriate decision-making processes and controls in place so that the interests of all stakeholders are balanced" (ICSA The Governance XE "Governance" Institute, 2021). As a part of an IT governance framework,

governance is presented as how an organization is directed and controlled (Axelos, 2019). Considering these definitions, governance is viewed as the approach that can be applied to govern at various levels of authority in order to control, manage and lead an authority. Governance supports the organization in the selection of the appropriate decision-making in order to fulfill the interests of all stakeholders of an organization.

3.1 IT Governance

The application of information technology by organizations plays an essential role in creating and delivering services and products. In a competitive environment, organizations should always seek to identify the potential IT investments in order to maintain or create a good positioning in the market. These investments should be in line with the corporate governance and aligned with the business strategy in order to increase the benefits of the investments. Governance processes with a focus on information technology support the businesses in achieving the business values by taking into consideration the information technology investments with a focus on providing roadmaps and mechanisms that enable different levels of management to integrate business and technology planning, implementation, and monitoring (Weill & Broadbent, 1998). IT governance is an integral part of enterprise governance in defining leadership, organizational structures, and processes to achieve the planned objectives and to increase the sustainability of enterprises, with the focus on improving the management and control of information technology (Gërvalla et al., 2018; IT Governance XE "Governance" Institute, 2004; National Computing Centre, 2005).

According to Moeller, IT governance aims to support the organization in controlling and managing IT-related projects, starting from the prioritization and justification of IT investments, controlling, budgeting, and authorization levels (Moeller, 2013). Furthermore, Moeller emphasizes that IT Governance is a process of aligning IT investments with the organization's processes, governmental legislation, and standards focusing on IT services. Weill and Ross define IT governance as:

> … specifying the decision rights and accountability framework to encourage desirable behavior in the use of IT. (Weill & Ross, 2004)

According to Weill, top-performing enterprises are proactively focused on increasing their enterprise values from IT in five ways: (1) How IT can support the achievement of the identified business strategies; (2) Support the measurement and management of the amount spent and value received from the IT; (3) Design of organizational practices to match the IT and business strategies; (4) Identify the responsible bodies for organizational changes with regard to the benefits of the IT capabilities; (5) The know-how generated by the implementation experience is in support of the adoption of the sharing and reusing of IT assets (Weill, 2004).

Weill in his paper emphasizes that IT Governance matters because it has the power to influence the benefits that can be achieved from IT investments by

supporting the practical approach starting with business process redesign and well-designed governance mechanisms in matching IT investments with the business objectives (Weill, 2004) This approach presents that IT governance has a direct impact on the benefits that an organization achieves through the IT investments, at the same time this approach increases the return rate of IT investments for the organizations.

National Computing Centre emphasizes that IT governance supports the organization in the effective management of IT resources by applying different frameworks (National Computing Centre, 2005). These frameworks can address different domains of IT governance, such as:

- Value delivery;
- Strategic alignment;
- Performance management;
- Resource management;
- Risk management (IT Governance XE "Governance" Institute, 2004).

IT governance takes place at the top of the organization hierarchy, focusing on the value delivery for the organization stakeholders by determining the directions for the management to fulfill the tactical and operational objectives for the IT Service Management. IT Service Management is a set of processes and functions in support of the organization to align IT with the organization's goals to deliver services to the end-users with the right amount of utility (fitness for purpose) and warranty (fitness for use) (IT Governance Institute). IT Service Management focus is mainly concerned with the operational excellence of IT-related services, whereas IT Governance focuses on enabling, controlling, and assisting the decision-making at the strategic level.

As presented in Fig. 1, different frameworks support the organization on different levels of IT functions, starting from IT Governance to IT operations (Calder,

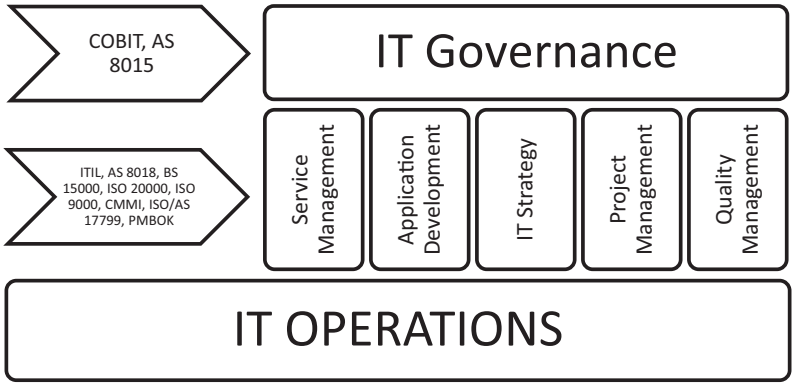


Fig. 1 IT Governance and frameworks related to the IT functions. (Source: Adapted from Cater-Steel et al., 2006; Ratcliffe, 2004)

2008; Cater-Steel et al., 2006; Ratcliffe, 2004). In this chapter, the focus will be on the IT Infrastructure Library (ITIL), Control objectives for information and related Technologies (CobiT), and Capability Maturity Model Integration (CMMI). Also, there are other relevant frameworks in support of IT functions, such as Project Management Body of Knowledge (PMBOK), IT security techniques (ISO 17799), Quality Management System (ISO 9001), and other frameworks in line with the different IT Governance pillars. These frameworks offer the best practice approach for the management of IT services where each of them has its specific strength compared to the pillars of IT Governance. According to Parvizi et al., CobiT and ITIL can link the bridge between the operational and head managers of the organization (Parvizi et al., 2013).

3.1.1 IT Infrastructure Library (ITIL)

IT Infrastructure Library (ITIL) is a framework that describes the best practices in IT Service Management. ITIL was published in the 1980s by the Central Computer Telecommunications Agency (now Office of Government Commerce). The first version of ITIL has 31 associated books covering all aspects of IT services. In the year 2000, the second version of ITIL was published as a set of revised books that became universally accepted for effective IT service provision, ITIL V2 was enhanced and consolidated to the third version of ITIL, which covers the IT service lifecycle. ITIL V3 introduces a framework for the IT service management life cycle and gives the best practices to support the organization in successfully implementing and managing services (ItSMF, 2011). These best practices are presented in a set of five books that describes the processes and provide a systematic approach in the area of IT governance with a focus on IT service management that should be followed and implemented by an organization. ITIL V3 framework contains five phases: Service Strategy, Service Design, Service Transition, Service Operation, Continual Service Improvement (ItSMF, 2011; Table 2):

The latest version of ITIL was published in 2019, named ITIL 4. Key components are the ITIL Service Value System (SVS) and the four dimensions model. ITIL 4 focuses on the establishment of IT service management practices to support the organizations on customer experience, value streams, and the digital transformation of the organizations to apply new ways of working (Axelos, 2019). According to Axelos, the core components of ITIL SVS are the ITIL service value chain, ITIL practices, ITIL guiding principles, governance, and continual improvement. Considering the core components that ITIL 4 offers; it is outlined in the four-dimensional service management model: (1) organizations and people; (2) information and technology; (3) partners and suppliers; (4) value streams and processes (Axelos, 2019).

Table 2 ITIL V3 phases and processes

Phases	Processes
Service strategy	Strategy management for IT services.
	Service portfolio management.
	Financial management.
	Demand management.
	Business relationship management.
Service design	Design coordination.
	Service catalog management.
	Service level management.
	Supplier management.
	Capacity management.
	Availability management.
	IT Service continuity management.
	Information security management
Service transition	Transition planning and support.
	Change management.
	Service asset and configuration management.
	Release and deployment management.
	Service validation and testing.
	Change evaluation.
	Knowledge—Management.
Service operation	Incident management
	Problem management
	Access management
	Event management
	Request fulfillment
Continual service improvement	Seven Step Improvement process – Responsible for identifying and evaluating institution needs and implementing improvements to IT services to support institutional goals

3.1.2 Control Objectives for Information and Related Technologies (CobiT)

Information is a crucial asset for all organizations; at the same time, technology plays a strategic role (ISACA, 2012). This leads to the need to apply frameworks that support the organizations in risk management of technology used for information management. In this context, CobiT supports the organizations as a controlling method that focuses on risk management. CobiT is a framework that aims to empower the organizations in five directions: to meet stakeholders' needs; cover enterprise end-to-end; apply a single integrated framework; enable a holistic approach; and separate governance from management (ISACA, 2012). Furthermore, it supports the organizations in value creation, user satisfaction, compliance with different standards, and better alignment of business needs and IT objectives

(ISACA, 2012). According to ISACA, below is presented a description of its five principles:

- Meeting Stakeholders Needs – CobiT 5 helps transform stakeholder's needs into specific objectives on all the levels of the organization to fulfill the stakeholder's overall goals and requirements in support of IT and Business Alignment;
- Enterprise End to End Coverage – support the integration of governance of the organization with the IT governance, while it sees IT not only as an IT function but as an organization asset. This principle is supported by identifying the governance enablers and governance scope, which are followed by the description of the roles, activities, and relationships between them;
- Applying a Single Integrated Framework – enables the organization to integrate different frameworks and standards. CobiT is used as a framework integrator as called CobiT 5 Knowledge Base by mapping the current situation and giving content filtering based on CobiT 5 family to provide up-to-date guidance and good practices for management and governance of IT resources;
- Enabling a Holistic Approach – here are applied seven categories that are described as the factor that leads to the achievement of organization objectives. Starting by identifying policies and frameworks, processes, organizational structure, culture, information, service and infrastructure, people skills and competencies;
- Separating governance from the management – this principle aims to make a clear distinction between management and governance. Management is responsible for achieving governance objectives by planning, building, running, and monitoring organization activities, while governance is responsible for evaluating, directing, and monitoring performance to make sure that stakeholders' needs are being met (ISACA, 2012).

The application of CobiT 5 helps identify, manage, and eliminate risks that could potentially impact enterprise systems implementations (Parvizi et al., 2013; Tsai et al., 2016). In addition, the application of COBIT supports organizations on different levels, such as: aligning IT with the business strategy, resource allocation, and risk management.

3.1.3 Capability Maturity Model Integration (CMMI)

The Capability Maturity Model (CMM) is designed for the support of software organizations to analyze the software development process to improve the organizations' business processes and support the evaluation of processes from ad hoc to mature processes (SEI, 2010).

Initially, it was applied as a tool to evaluate software development for government contractors (Greiner, 2007). It provides a guide to achieving the maturity of

processes by providing the best practices in the process of development and maintenance of software (Paulk et al., 2011). Paul et al., in their paper, declare that CMM can be used by four levels of an organization: (1) Assessment teams; (2) Evaluation teams; (3) Upper management; (4) Technical staff and process improvement groups will help the organization identify strengths and weaknesses, identify risks in the contractor selection process and monitoring them, identify activities to start a software process improvement, and define the improving processes in their organization. The result of CMM is categorized into five levels to evaluate the maturity of the processes where each of the levels is measured based on five Key Process Areas (KPA) such as (1) goals, (2) commitment, (3) ability, (4) measurement, and (5) verification (Greiner, 2007; Paulk et al., 2011).

According to Paulk et al., organizations categorized on the first level apply ad hoc or chaotic processes, so they need to establish the basic business processes; in cases where maturity level is 2–5, they must focus on achieving a higher level of maturity by creating standard processes and procedures, on the same time continually improving their business processes based on best practices (Paulk et al., 2011). Based on the Greiner and Paulk et al., below are presented the five levels of CMM (Greiner, 2007; Paulk et al., 2011):

- Initial – the organization started to apply new processes for software development, but they lacked in providing a stable environment. The processes in this level are classified as ad hoc or chaotic;
- Repeatable – application of new processes is established, and the organization has control over the processes. It has managed to create a basic process management environment. The process is repeated based on previous similar projects;
- Defined – the organization created standardized processes for developing and maintaining products and services in the level of managers and technical staff. The standardization of business processes supports them in better visibility of the ongoing projects;
- Managed – the organization managed to set in place quantitative methods to measure the performance of business processes and for project management; These assessments allow them to create criteria for managing processes;
- Optimized – the organization is focused on improving and optimizing the business process performance by applying new innovative processes and the latest technological trends.

The upgraded version of CMM is Capability Maturity Model Integration (CMMI), developed by the same institution (SEI, 2010). The new version supports organizations in product and service development with the best practices to enable the organizations to achieve their business goals by integrating business processes into a single framework, to have a better view of the whole organization's levels, and improve its business performance (Greiner, 2007; SEI, 2010; Wendler, 2012).

Based on the previous studies, IT governance is seen as one of the critical components at a strategic level of the organizations related to information technology investments with the business processes to increase the organization's sustainability in support of achieving the organization's objectives. It can be used to support the prioritization of IT investments in line with organizational strategy. IT governance by the application of different frameworks supports service management, application development, IT strategy, project management, and quality management to increase the effectiveness and efficiency of IT operations.

3.2 Information Governance

Previous studies show that information governance is a phenomenon that is studied quite well by researchers, and there are different definitions of it. Weill and Ross, in their book, declare that information and IT assets are classified as crucial assets for an organization (Weill & Ross, 2004). They declare that the importance is the digitalized data, information, and generated knowledge for the customers, processes performance, finance, and information systems (Weill & Ross, 2004). According to Robinson and Cole, information governance is a holistic approach that supports treating information as a valuable asset by implementing processes, roles, controls, and metrics to make available information assets to those who need it (Robinson & Cole). While Gartner defines information governance as:

> …the specification of decision rights and an accountability framework to ensure appropriate behavior in the valuation, creation, storage, use, archiving and deletion of information. (Gartner)

According to Guetat and Dakhli, information governance is dependent on corporate governance and IT governance, where the main aim is a contribution to the creation of competitive advantages for the organization by the creation of a holistic approach to the management of organizational information and information assets (Guetat & Dakhli, 2015). Furthermore, they declare that information governance includes: (a) understanding the value of information assets, (b) definition, approval, and communication of strategies, standards, policies, and procedures related to information governance, (c) monitoring and conformance enforcement to the standards, policies, and procedures related to information governance, (d) management and resolution of information-related problems, and (e) managing information risks (Guetat & Dakhli, 2015).

Lajara and Maçada proposed a framework for Information Governance, which contains three dimensions: (1) Information Value (information sharing, user satisfaction with the information), (2) Information quality (completeness, accuracy, timelessness, accessibility), (3) Information Compliance (information security,

privacy) (Lajara & Maçada, 2013). This framework offers a wide perspective for information governance, covering the main key aspects of information such as application/value generation, quality, and data privacy concerns. ARMA International presents key principles concerning recordkeeping focused on records management, records and information management and information programs (ARMA International, 2017). These principles are: (1) Accountability, (2) Transparency, (3) Integrity, (4) Protection, (5) Compliance, (6) Availability, (7) Retention, (8) Disposition.

Furthermore, information governance ensures that the information must meet legal, ethical, political, and economic requirements. Smallwood states that information governance is a subset of corporate governance and must ensure "how an organization maintains security, complies with regulations, and meets ethical standards when managing information" (Smallwood, 2020). Smallwood, in his book, presents 11 principles that can be used as general guidelines as presented below (Table 3):

Table 3 Information Governance principles

Principles	Description
Value information as an asset	Information that is collected and analyzed is a value. The proper application of analytic tools could help an organization maximize the value of information, decrease poor decisions, improve customer satisfaction and operational efficiency, reduce legal costs, improve compliance capabilities, and other benefits. Furthermore, clear policies with regard to the use of information should be established to increase its value.
Stakeholder consultation	Considering that information governance is derivate from a cross-functional between business units, there is a need to have close consultation with them with regard to the policy development process with a focus on privacy and legal issues to ensure customer (and employee) privacy is protected.
Information integrity	Trust is a key component in a business-to-customer relationship. The organization should be focused on ensuring that the customer-generated data are accurate, and they must be kept secure to maintain trust and the quality of information. Proper selection of methods to create, retain, preserve, distribute and track information enables information integrity.
Information organization and classification.	Standardization of the ways how the information is organized by categorizing and linking the information by application of the semantic approach in support of end-users in conducting more complete and accurate searches and information.
Information security and privacy	Organizations should be focused on information security to make sure that information privacy can be assured. There is a need for organizing regular security awareness training to eliminate the risk that employees can be a target of potential cybersecurity threats that have an impact on information security. Furthermore, security information technologies such as access control methods, data encryption, deployment of information rights management (IRM) software, application of remote digital shredding capabilities, and legal requirements can ensure information privacy.

(continued)

Table 3 (continued)

Principles	Description
Information accessibility	In line with the security concerns, the organization should enable access to information as simply as possible by applying the right search principles, technologies and tools.
Information control	Application of control technologies to control the access, creation, updating, and printing of materials by implementing technologies such as enterprise content management (ECM), enterprise file sync and share (EFSS), document management, report management, etc. Security software focusing on data or document encryption should be deployed to protect and control the information.
Information governance monitoring and auditing	With the information, governance policies should be developed the key performance indicators that support measuring the program progress with regard to the information. The access and use of information should be monitored to make sure that customer privacy and cybersecurity issues are properly managed.
Executive sponsorship	Due to the different source of information generation, and cross-functional collaboration, it is very important to identify an accountable, responsible executive sponsor that establishes the budget, assemble the steering committee, drive the effort and monitor progress based on metrics and milestones.
Change management	Information should be considered an asset. Therefore, there is a need to apply the right approach to managing information, specifically by managing change to select the right way for users to interact with the systems with regard to information processing to increase productivity.
Continuous improvement	Information governance is an ongoing project that requires constant or periodical involvement in reviewing the information governance in line with the business environment, technology usage, or business strategy.

Adopted from Smallwood (2020)

Applying these principles as guidelines supports the organization in ensuring successful information governance.

Another study, focused on the information architecture model, presents three layers of information architecture: (1) Access and usage layer (gathering, processing, delivery, and use), (2) Content layer (modeling, functional content, design structure, meta-data, organization repository), (3) Infrastructure layer (storage, manipulation) (Guetat & Dakhli, 2015). The presented architecture contributes to information governance, focusing on offering a solution in levels to govern the access, definition, management, security, and information integrity within an organization. Hagman declares that information governance is focused on how the information is created, used and disposed to add value to an organization (Hagmann, 2013). According to Tallon et al., information governance can support the organization to unlock the value by using data generated within an organization, which helps

them boost its performance (Tallon et al., 2013). Another article presented by Joyce, focuses on the privacy of information, emphasizing that there should be followed seven principles as a foundation of information governance and privacy program for any organization (Joyce, 2021). These principles include (1) Know your information; (2) Know where you have it; (3) Know how it's being used; (4) Know how it is protected; (5) Know how to respond to external events, (6) Keep it only as long as you need; (7) Dispose of everything else.

3.3 Remote Work and Virtual Teams

Globalization is presented as the concept that reduces and removes physical, technological, political and social barriers between countries in support of creating an integrated global market (Chmielecki, 2021). Furthermore, the author presented the benefits of going global, such as access to talented people around the globe (new opportunities for virtual teams); diverse perspectives (new insights, thoughts and perspectives often lead to innovative and unconventional solutions); and local advantages (local team members can contribute in their international market) (Chmielecki, 2021). The creation of an integrated global market called globalization requires the elimination of many barriers, one of the communications of teams between different countries. These barriers can be eliminated by creating and managing virtual teams and remote working locally or globally. According to Chmielecki, the benefits of being virtual are presented in the table below (Table 4).

Technology can support the elimination of distances between an individual from different cultures and societies, which enables more accessible communication within seconds in the virtual environment (Dumitraşcu-Băldău & Dumitraşcu,

Table 4 Main benefits of virtual teams and remote working (Chmielecki, 2021)

Reduced costs	With the application of smart work and global virtual teams, international travel, dining and accommodation fees are minimized or non-existent while maintaining the benefits of having team members from different locations and with different perspectives.
Quicker and smarter responses	Communicating via email or other text-based technologies gives team members enough time to respond in a more thoughtful way.
Greater responsiveness and flexibility	Globally linked technology solutions give rapid access to the required information.

2019). One of the key factors in communication in a team is to keep the information flow transparent, which supports building a bond of trust among the team members (Turaga, 2013). Furthermore, information sharing plays an important role in motivating people and has a positive impact on team performance (Greenberg et al., 2007).

3.3.1 Digital Transformation in Higher Education

Digital education in higher education institutions involves the application of technological solutions for the purpose of teaching and learning in the classroom or online environment with the aim to apply the best approach for the collaboration between teaching staff and students or vice versa. In line with technological development, the number of students accessing the internet through mobile devices increased, impacting the rising interest of universities in accepting new communication technologies in the teaching context (Santos et al., 2019). Bilyalova et al. state that digital technology offers the creation of new opportunities for continuing education. Their study results show that applying electronic educational resources to student test groups resulted in better achievement than the traditional way (Bilyalova et al., 2020). Furthermore, they state that digital technology in the modern world should not be considered only a tool. According to Alenezi, higher education institutions need to transform digitally if they want to be in line with the requirements of the industry scenarios and trends in support of different dimensions of these institutions such as: teaching, learning and curriculum, infrastructure, and administrative and management (Alenezi, 2021).

Even previous studies stated that universities, before taking any action regarding IT investments, should primarily analyze their actual situation of IT governance (Jairak & Praneetpolgrang, 2013). Considering the COVID-19 pandemic, educational institutions were forced to find new ways of delivering educational services. In this case, they were not able to perform the necessary analysis with regard to the IT investments according to the IT governance domains. Alenezi, in his study, presents that COVID-19 has pushed higher education institutions to digital transformation by implementing and applying digital tools and technologies to sustain the education delivery for teaching and transform their operations digitally (Alenezi, 2021). Even though the pandemic forced the organization to respond fast in a new virtual environment, a study presented by Bogdandy et al. shows that digital education can be considered successfully, students enjoyed the digital education and half of them are willing to continue with the application of digital education in the future (Bogdandy et al., 2020).

4 Findings and Discussions

4.1 IT Governance and Information Governance Relationship

The study shows that IT governance supports the organizations in identifying IT investments, focusing on integrating business processes with technology planning, implementation, and monitoring (Weill, 2004). It enables the definition of leadership, organization structure and processes, focusing on management and control of information technology projects, starting with the prioritization and justification of IT projects (IT Governance XE "Governance" Institute, 2004; Moeller, 2013; National Computing Centre, 2005). IT governance takes place at the top of the organization's hierarchy to generate value for the stakeholders. IT governance is focused on ensuring risk and compliance with IT architecture, systems, and infrastructure (Hagmann, 2013).

On the other hand, information governance is focused on how the information is created, used, and disposed of to add value to an organization (Hagmann, 2013). Information governance processes support the organization by valuation, creation, storage, use, archiving, and deletion of information (Gartner). It is dependent on corporate governance and IT governance (Guetat & Dakhli, 2015), or as a subset of corporate governance (Smallwood, 2020). It is classified as a critical asset for an organization (Robinson & Cole; Weill, 2004) that includes digitalized data, information, and generated knowledge (Weill & Ross, 2004).

Considering that IT governance is the part of corporate governance that supports an organization for IT investments, this leads to the role of IT governance in the organization's environment that contributes to the organizational performance. The study shows that information governance is influenced by IT governance and corporate governance. In addition, the establishment of IT governance mechanisms and information governance impacts the benefits for the entire organization environment.

4.1.1 IT Governance and Information Governance Characteristics

Studies differentiate these two concepts by categorizing their specific characteristics. Considering that information governance has a relationship with IT governance and different researchers categorize it as a subset of IT governance, below is presented a table with their characteristics Table 5.

The study results show that IT governance is focused on the strategic level while information governance is more on the operational level with regard to the data and information processing within an organization.

The study shows that different frameworks such as CobiT, ITIL and CMMI are closely related to IT governance and Information governance. These frameworks support the organizations starting from the strategic level by prioritization and

Table 5 IT governance and information governance characteristics

IT governance	Information governance
IT is an integral part of corporate governance	Is a subset of IT governance
Support organization strategy	Support in understanding the information (where it comes, how to use, how to protect, how to keep, when to dispose)
Enable aligning IT investments with business objectives	Support information classification
Prioritization of IT investments in support of value generation	Identification of information indicators (governance level, monitoring, auditing)
Support the identification of responsible bodies for IT capabilities	Determining information architecture (access and control layers)
Influences the benefits to achieve from IT investments	Support to ensure the information quality (completeness, integrity, accuracy, timelessnes, availability, retention, disposal)
Support measurement and management of investments in line with the value generated by IT	Support information security and privacy (legal and ethical issues, meeting ethical standards)
Resource allocation and risk management for IT investments	
Different frameworks in support of covering IT governance domains	

justification of IT investment and controlling, business process management, and risk management to the IT operations levels focused on information management. Considering that in a virtual environment, a lot of data are exchanged between different stakeholders, it is crucial the application of these frameworks for the management of IT infrastructure and services with the proper definition of roles, policies and standards focused on information management.

4.2 Role of IT Governance and Information Governance on Remote Work and Virtual Teams with a Focus on Education

Considering the current transition phase as a result of the COVID-19 pandemic situation, the organizations were forced to respond quickly to adapt to it. The adoption required the organizations to find and apply solutions as a response to the situation. In this context, the pandemic has forced higher education institutions to focus on offering digital services for teaching and learning as a response to COVID-19. Digitalization of these institutions supported them in applying a new approach with regard to the creation of new collaboration and communication between teaching staff and students for teaching and learning, as well as the operation level of institutions to perform administrative activities. The collaboration and communication on new online platforms and programs in a virtual

environment require the adoption of the best approach in order to maintain or increase the social connection, interaction and engagement between different stakeholders such as teachers, students, administrative officers and management. In addition, remote work and virtual teams were identified as a solution. A successful application of remote work and virtual teams requires the involvement of an IT governance mechanisms within the organization to identify and prioritize IT investments in line with the requirements of remote work and virtual teams. Applying these concepts supports the elimination and reduction of physical, technological, political and social barriers between countries (Chmielecki, 2021). This was a solution to the pandemic situation to enable the organization to offer their services or products by enabling the application of a virtual working environment by remote work and virtual teams to support quicker and smarter response to the organization's needs with greater responsiveness and flexibility specifically in higher education institution on enabling them to fulfill their vision and mission. At the same time, it enabled communication within the organization for information sharing in a virtual environment (Dumitraşcu-Băldău & Dumitraşcu, 2019). According to Turaga, information sharing is key to motivating people (Turaga, 2013). Considering that there was a need to apply different communication channels in the virtual environment, there was a necessity for the application of information governance. Information governance was a solution to ensure that the information is managed in the right way considering the information governance characteristics presented in Table 5.

5 Future Research Directions

This chapter presents results that are focused on the relationship between IT governance, information governance, and working in a virtual environment. Considering that the investigation is done based on secondary data, it would be great to undertake a study with primary data to validate the relationship between these two concepts and work in a virtual environment by considering the characteristics presented in this study.

6 Conclusion

The study aims to investigate the information technology impact on organizations by focusing on exploring IT governance and information governance as two concepts that impact working in a virtual environment with a focus on higher education institutions. The study shows that other researchers have widely studied these concepts for a long time. IT governance as a strategic approach focuses on enabling, controlling, and assisting the decision-making about the IT projects by the five domains of IT governance with different frameworks. On the other

hand, information governance supports organizations in understanding, classifying, measuring, and ensuring information quality, security, and privacy. Study shows that even though organizations should primarily analyze their IT governance with a focus on prioritization and justification of IT investments, a pandemic situation such as COVID-19 can contribute to force the organizations to move forward with the implementation and application of technological solutions in order to be able to deliver their services, e.g., in higher education institutions.

It is investigated the role of IT governance and information governance in a virtual organization environment by applying information technology and information management between virtual teams and remote working. Considering the results, IT governance is part of corporate governance, while information governance is a subset of information governance. By applying their specific characteristics, these two concepts support the organizations in the creation of working virtual environment for virtual teams and remote work. Furthermore, the application of IT governance frameworks and information governance enable the organizations in effective and efficient service and product management in a virtual environment with the proper IT investment in line with the organization's objectives and supports the definition of roles, policies, and standards focused on information management.

References

Alenezi, M. (2021). Deep dive into digital transformation in higher education institutions. *Education Sciences, 11*(12). https://doi.org/10.3390/educsci11120770

ARMA International. (2017). *The principles*. ARMA. https://www.arma.org/page/principles

Axelos. (2019). *ITIL ® Foundation ITIL 4 Edition* (4th Edn.). TSO (The Stationery Office). https://www.axelos.com

Bilyalova, A. A., Salimova, D. A., & Zelenina, T. I. (2020). Digital transformation in education. In *Lecture notes in networks and systems* (Vol. 78, pp. 265–276). Springer. https://doi.org/10.1007/978-3-030-22493-6_24

Bogdandy, B., Tamas, J., & Toth, Z. (2020). Digital transformation in education during COVID-19: A case study. In *11th IEEE international conference on cognitive Infocommunications, CogInfoCom 2020 – proceedings* (pp. 173–178). https://doi.org/10.1109/CogInfoCom50765.2020.9237840

Calder, A. (2008). *It governance:* https://www.itgovernanceusa.com/it_governance

Cater-Steel, A., Toleman, M., & Tan, W.-G. (2006). Transforming IT service management-the ITIL impact. *17th Australasian conference on information systems*. https://www.researchgate.net/publication/252238122

Chmielecki, M. (2021). Leading intercultural virtual teams during the COVID-19 pandemic – Research results. *Journal of Intercultural Management, 13*(1), 69–87. https://doi.org/10.2478/joim-2021-0003

Dumitrașcu-Băldău, I., & Dumitrașcu, D. D. (2019). Intercultural communication and its challenges within the international virtual project team. *MATEC Web of Conferences.* https://doi.org/10.1051/matecconf/20192

Gartner. *Information governance*. Information Techniology, Gartner Glossary.

Gërvalla, M., Preniqi, N., & Kopacek, P. (2018). IT infrastructure library (ITIL) framework approach to IT governance. *IFAC-PapersOnLine.* https://doi.org/10.1016/j.ifacol.2018.11.283

Greenberg, P. S., Greenberg, R. H., & Antonucci, Y. L. (2007). Creating and sustaining trust in virtual teams. *Business Horizons, 50*(4), 325–333. https://doi.org/10.1016/j.bushor.2007.02.005

Greiner, L. (2007). *Capability Maturity Model Integration (CMMI)*. Definition and Solutions.

Guetat, S. B. A., & Dakhli, S. B. D. (2015). The Architecture Facet of Information Governance: The Case of Urbanized Information Systems. *Procedia Computer Science, 64*, 1088–1098. https://doi.org/10.1016/j.procs.2015.08.564

Hagmann, J. (2013). Information governance – Beyond the buzz. *Records Management Journal, 23*(3), 228–240. https://doi.org/10.1108/RMJ-04-2013-0008

ICSA The Governance Institute. (2021). *What is corporate governance?* https://www.cgi.org.uk/about-us/policy/what-is-corporate-governance

ISACA. (2012). A business framework for the governance and management of enterprise IT. In *Trust and partnership*. https://doi.org/10.1002/9781119203919.ch11

IT Governance Institute. (2004). IT Governance Global Status Report. In *IT Governance Institute*. ISBN 1-893209-32-6

IT Governance Institute. *What is ITSM (IT Service Management)?* Retrieved April 8, 2022., from https://www.itgovernanceusa.com/itsm

ItSMF. (2011). An introductory overview of ITIL 2011. *ItSMF UK*.

Jairak, K., & Praneetpolgrang, P. (2013). Applying IT governance balanced scorecard and importance-performance analysis for providing IT governance strategy in university. *Information Management & Computer Security, 21*(4), 228–249. https://doi.org/10.1108/IMCS-08-2012-0036

Joyce, J. (2021). *Why information governance is more important than ever for privacy*. EY..

Kaufmann, D., Kraay, A., & Zoido-Lobatón, P. (1999). *Governance matters*. http://www.worldbank.org/wbi/governance/working_papers.htm

Lajara, T. T., & Maçada, A. C. G. (2013). Information governance framework: The defense manufacturing case study. *Proceedings of the Nineteenth Americas Conference on Information Systems*, *1*. https://www.researchgate.net/publication/287950635

Moeller, R. R. (2013). *Executive's Guide to IT Governance*. https://doi.org/10.1002/9781118540176

National Computing Centre. (2005). *A best practice guide for decision makers in IT the UK' s leading provider of expert services for it professionals*. https://www.isaca.org/Certification/CGEIT-Certified-in-the-Governance-of-Enterprise-IT/Prepare-for-the-Exam/Study-Materials/Documents/Developing-a-Successful-Governance-Strategy.pdf

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., et al. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ, 71*. https://doi.org/10.1136/bmj.n71

Parvizi, R., Oghbaei, F., & Khayami, S. R. (2013). Using COBIT and ITIL frameworks to establish the alignment of business and IT organizations as one of the critical success factors in ERP implementation. In *IKT 2013–2013 5th Conference on Information and Knowledge Technology* (pp. 274–278). https://doi.org/10.1109/IKT.2013.6620078

Paulk, M. C., Curtis, B., Chrissis, M. B., Weber, C., & v. (2011). The capability maturity model for software. *Software Process Improvement*, 1–26.
Ratcliffe, D. (2004). *The world of IT service management – The past, present & future of ITIL*.
Rhodes, R. A. W. (2007). Understanding governance: Ten years on. *Organization Studies, 28*(8), 1243–1264. https://doi.org/10.1177/0170840607076586
Robinson, S., & Cole, B. *Information governance*. TechTarget. Retrieved April 25, 2022., from https://searchcompliance.techtarget.com/definition/information-governance
Santos, H., Batista, J., & Marques, R. P. (2019). Digital transformation in higher education: The use of communication technologies by students. *Procedia Computer Science, 164*, 123–130. https://doi.org/10.1016/j.procs.2019.12.163
SEI. (2010). CMMI for Development, Version 1.3: Improving Processed for Better Products and Services. *Carnegie Mellon University, Software Engineering Institute*, *November*.
Smallwood, R. (2020). *Information governance concepts, strategies, and best practices* (2nd ed.). Wiley.
Tallon, P. P., Ramirez, R. V., & Short, J. E. (2013). The information artifact in IT governance: Toward a theory of information governance. *Journal of Management Information Systems, 30*(3), 141–178. https://doi.org/10.2753/MIS0742-1222300306
Tsai, W. H., Hsieh, C. L., Wang, C. W., Chen, C. T., & Li, W. H. (2016). The impact of IT management process of COBIT 5 on internal control, information quality, and business value. In *IEEE International Conference on Industrial Engineering and Engineering Management, 2016-Janua* (pp. 631–634). https://doi.org/10.1109/IEEM.2015.7385724
Turaga, R. (2013). *Building trust in teams: A leader's role*. http://prathamthinking.blogspot.in
Weill, P. (2004). Don't just lead, govern: How top-performing firms govern IT *EMIS Quarterly xecutive*, *3*(1), 1–17. www.itgi.org
Weill, P., & Broadbent, M. (1998). *Leveraging the new infrastructure: How market leaders capitalize on information technology*. Harvard Business School Press.
Weill, P., & Ross, W. (2004). *IT governance – How top performers manage IT decision rights for superior results*. Harward Business School Press.
Wendler, R. (2012). The maturity of maturity model research: A systematic mapping study. *Information and Software Technology, 54*(12), 1317–1339. https://doi.org/10.1016/j.infsof.2012.07.007
Williamson, E. O. (1996). *The mechanisms of governance*. Oxford University Press.
World Bank. (2009). *What is governance?*

Muhamet Gërvalla is an Assistant Professor at the University for Business and Technology in Kosovo, with more than eight years of teaching experience in bachelor's and master's studies courses related to information systems. The domain of research interest includes Digital Transformation, IT Governance, Information Management, ERP systems, Industry 4.0, IT-business alignment, and Maturity Models focusing on IT. He holds a Ph.D. in Information Technology from the Corvinus University of Budapest, has several research papers listed in academic databases in his research interest, and has participated in several Erasmus projects. Outside the teaching experience, he has also intensively worked in designing curriculum development, science conferences, certification programs in project management, trainings, ISO 9001 standards, and more than 12 years of software programming and project management experience in various technologies in real solutions for the industry needs.

Edmond Hajrizi possesses about 30 years of experience in education and more than twenty years of experience in managing higher education institutions, teaching, research, and managing international research and capacity development projects. Prof. Hajrizi is the founder and Rector

of UBT – University for Business and Technology, Dukagjini College and, as of 01.10.2019, serves as a President of the Management Board of College ESLG, as an independent higher education institution being part of UBT Ecosystem Group. His experience is mostly focused on entrepreneurship in higher education, management, teaching, research, development, training, consulting, certification and publishing. He holds a Ph.D. degree from Vienna University of Technology and a Post Doc from City University London. The specialization fields of Prof. Hajrizi are Complex Systems Design and Management, Intelligent Systems, Sustainable Development, Quality Management, Project Management, Leadership and Business Management, Knowledge Management, Information Systems, Mechatronics Management, Entrepreneurship and Innovation.

Does Poor Governance Compromise Value Delivery of ICT Deployments

Mehdi Asgarkhani

1 Introduction

Investment in Information and Communication Technology (ICT) in most organisations (regardless of the industry) forms the most significant capital expenditure component. Moreover, organisations commit considerable funds to the operational expenses of ICT solutions. ICT is seen as a business-enabling tool to facilitate the transformation of how business is conducted and organisations operate. Recent technology advancements in hardware, networks, and applications/software (for instance, state of the art electronics, fast and sophisticated mobile 5G networks, and advanced intelligent software solutions such as artificial intelligence) have pushed the use of tech solutions beyond merely improved business functions. The new and emerging technologies aim at providing a superior user/client experience beyond business functionality. Highly automated processes allow the users of services to be empowered and achieve most of what needs to be done without being onsite or requiring assistance from organisations' staff.

In addition to challenges introduced by rapid advancements and developments in information and communication technologies, recent challenges caused globally due to the global COVID19 pandemic highlighted the value of some automated and/or virtual solutions supported by advanced tech solutions.

At the same time, introducing tech solutions that are based on rapid technological advancements can be associated with risks. Technology deployment requires high-level governance drivers and competency in managing tactical and operational matters. Unfortunately, despite significant technology advancements offering extraordinary opportunities alongside more awareness of technology management principles, over the last decade, there have been increasing cases where the

M. Asgarkhani (✉)
Ara Institute of Canterbury, Christchurch, New Zealand
e-mail: mehdi.asgarkhani@ara.ac.nz

M. Alaali (ed.), *COVID-19 Challenges to University Information Technology Governance*, https://doi.org/10.1007/978-3-031-13351-0_16

deployment of ICT solutions failed to deliver value. In addition, the experiences of some organisations in adopting technologies during the pandemic highlighted gas in preparedness for technology deployment.

The investment (both capital and operational) in ICT continues to grow. But, at the same time, the COVID-19 pandemic since 2020 has to some extent, accelerated technology adoption in less tech-savvy and less willing and prepared organisations.

ICT executives, planners, and strategists are expected to develop and put into practice effective decision-making models that improve processes for the deployment and use of technology in organisations. As a result, there is an expectation that every effort is being made to optimise the investment in IT deployment. Moreover, in addition to optimising IT deployment investment, it is also critical to avoid the many drawbacks and risks associated with the rapid introduction of technological change.

A review of the history of the development and rollout of IT solutions (including recent tech deployment initiatives) reveals several IT projects involving considerable investment in technology did not deliver outcomes. In addition, there have been several high profile cases of colossal IT deployment failures in New Zealand and Australia throughout the last decade. Therefore, rapid deployment of ICT due to the pandemic alongside cases of failed tech deployments in recent times demonstrated a need to revisit ICT or IT governance practices.

The principal aim of this chapter is to determine the effectiveness of Information Technology Governance (ITG) approaches and practices. More specifically, whether or not the failure of IT deployments can be related to poor governance practices and decisions.

The chapter primarily targets an audience with an interest in technology deployment across various sectors of the industry. However, some broad knowledge of Information technology and related tech solutions can facilitate a better understanding of some of the discussions presented in this chapter.

2 Background

Today, Information Technology (IT) solutions play a significant role in enabling businesses. Organisations commit considerable funds to both capital and operational expenses to deploy and operate IT solutions (Lovelock et al., 2016; McLellan, 2014). Deploying technology is often associated with significant organisational change. The change can be associated with significant risks (Davis et al., 1997; EDUCASE centre for applied research, 2008; Gauld & Goldfinch, 2006; Laudon & Laudon, 2014).

There have been significant technological advancements and increased awareness of technology management. Regardless, some IT deployment cases fail to deliver expected organisational outcomes (Gauld & Goldfinch, 2006; Gole & Shinsky, 2013). For instance, some of the recent case studies of challenged IT

deployment initiatives (where the deployment of technology failed to deliver the expected outcomes) include the Queensland Health project (Chesterman, 2013), the WINZ NZ kiosk security failure (Deloitte, 2012) and the NOVOPAY project (NZ Government, 2013).

Increased investment in IT has meant that there is an expectation by organisations that they not only maximise the benefits of adopting IT but also avoid the drawbacks and risks that are often associated with the rapid introduction of technological change (Laudon & Laudon, 2014; Myers, 2012). As a result, IT managers, planners, and strategists have continuously developed and put into practice decision-making models that improve decision-making processes.

Previous studies have shown that IT is expected to add value to the organisation through improved productivity, increased efficiency, profitability, better communication, more effective decision-making, and customer satisfaction (Larcker & Tayan, 2008). Moreover, studies show that to maximise benefits and value gained from investment in IT, it is universally acknowledged that IT must be fully aligned with overall business strategies and direction (Asgarkhani, 2013; Van Grembergen, 2004). Therefore, considerable organisational resources are consumed to manage how IT is acquired and diffused in organisations (Weill & Ross, 2004; Wu et al., 2015).

The term ‘governance‘relates to the establishment of policies, and continuous monitoring of their proper implementation, by the members of the governing body of an organisation. It includes the mechanisms required to balance the powers of the members (with the associated accountability) and their primary duty of enhancing the prosperity and viability of the organisation. Governance determines who has power, makes decisions, how other organisation members (business) make their voices heard and how accountability is justified and established.

Information Technology Governance (ITG) is the responsibility of the board of directors and executives. ITG consists of leadership, organisational structures, and processes that ensure IT sustains and extends its strategies and objectives (ITGI, 2007). ITG frameworks and standards were introduced to organisations in the 1990s (Brown & Magill, 1994; Cater-Steel et al., 2006; De Haes & Van Grembergen, 2006; Van Grembergen & De Haes, 2009).

Recent rapid advancements in IT platforms, such as networking technologies and cloud computing solutions, have introduced increased complexity in IT planning and decision-making processes (Asgarkhani, 2012; Venkata et al., 2012; Wen & Hsu, 2012). The literature on ITG provides advice and recommendations on models and frameworks for ITG implementation (De Haes & Van Grembergen, 2010; Van Grembergen & De Haes, 2009; Weill & Ross, 2004; Weill & Vitale, 2002; Williams, 2012).

The literature outlined in this section suggests that previous studies on ITG tend to assume that recommended models and practices lead to effective governance. However, we could find no empirical evidence to support this assumption. More specifically, despite the number of prescriptive models and ‘best practice frameworks‘available and increased uptake of ITG in organisations, achieving key

ITG outcomes is consistently ranked as one of the top concerns of management (Gartner, 2016).

The research problem that motivated this study can determine why, despite numerous recommended 'best practice frameworks and models of effective ITG, many IT deployment projects fail to deliver value.

The review of previous ITG research indicates two prominent theories are applied to provide a theoretical foundation: Agency Theory and Stewardship Theory. Most ITG practices and approaches are grounded in Agency Theory (Bonazzi & Islam, 2007; Jensen & Meckling, 1976; Jensen & Meckling, 1994; Licker, 2007; McColgan, 2001). Agency Theory suggests that the interests of owners and managers are inherently conflicting.

Consequently, the theory motivates monitoring and control mechanisms by owners to protect interests. The second theory, Stewardship Theory, debates that assumptions made under Agency Theory do not always hold. In conjunction with ideas on best practices in ITG from Weill and Ross (2004), Stewardship Theory offers a variety of effective governance models. However, the theoretical foundations of Agency Theory, with a strong focus on control, predominantly underpin the current ITG practices.

Both models of governance discussed above are based on strict controls and lack agility (reference). At the same time, the rapid advancements in technology require a more agile approach to the governance of technology deployment. The timelines (often years) risk that the planned technologies at the start can become obsolete and may not deliver planned outcomes. The recent worldwide pandemic due to COVID19 also highlighted the need for revised tech deployment governance.

To explore the role of effective governance in technology deployment, this study concentrates on three broad questions:

1. What influences or constitutes the effectiveness of ITG practices?
2. How do poor ITG practices contribute to the failure of IT deployment initiatives?
3. Do poor ITG practices align with the absence of the effectiveness factors (question 1).

The approach to seeking an answer to the first question was conducting a systematic literature review while case study analysis (failed It deployment projects) determined the answer to question two. The case study analysis results were mapped to the outcome of the systematic literature review to answer question three.

Therefore, this chapter presents the results of a systematic literature review to determine influencers (or indicators) of ITG effectiveness. The proposed model of ITG effectiveness is followed by the results of multiple case study analysis of six IT deployment initiatives. Finally, based on the outcomes of the research, the chapter examines the connection between poor ITG and failed IT deployment projects to broaden the preliminary results reported in 2017 (Asgarkhani et al., 2017).

The next section of the chapter outlines the approach (methodology) for the study. Next, the systematic literature review discusses the outcomes of the review of existing research from various practitioners with views on the effectiveness of

ITG – including both the views of systems-focused practitioners alongside business-alignment focused strategists. Following the literature review discussions, the case study analysis results are discussed. Finally, the chapter brings together the outcome of the literature review and the analysis of case studies to establish a connection between failed IT initiatives and poor ITG practices. Finally, the chapter conclusion summarises and discusses the contribution, limitations and future planned research.

3 Phases of the Study – The Methodology

Two approaches were adopted to explore answers to the three questions that formulated this study. Therefore, the research methodology constituted a systematic literature review followed by a case study analysis. Both approaches were based on qualitative or thematic analysis of identified resources.

3.1 Systematic Literature Review

A Systematic Literature Review was conducted to establish a theoretical model of parameters likely to influence effective ITG. (Ardito, Messeni Petruzelli & Albino, 2015; Bakker, 2010; Baumeister & Leary, 1997; Bem, 1995; Okoli, 2015).

The first step of the systematic review involved the selection of eligible articles. It included scoping, planning, identifying resources, screening, and determining the eligibility of resources in the study (Ardito, Messeni Petruzelli & Albino, 2015; Okoli, 2015; Moher et al., 2009). The screening process, the inclusion criteria, and the exclusion criteria used to determine the final pool of eligible articles are discussed in detail later in this section.

The preliminary search for resources included journals and quality assured conference proceedings repositories (such as Science Direct, Springer Link, IEEE Xplore Digital Library, Emerald, Taylor & Francis), books, reports by IT sector professional bodies (for instance, ITP NZ, ACS, and BCS), government-commissioned reports, google scholar, and universities'investigative reports.

Key phrases used for the initial search included: (1) Information Technology Governance, (2) IT governance, (3) IT solutions deployment, (4) IT deployment success, (5) IT Deployment failure, (6) IT Governance Effectiveness, (7), IT Governance Practices, (8) IT Governance Standards/Models, (9) IT Governance Success Factors, (10) IT Governance Mechanisms, (11) IT solutions success/failure, (12) IT Governance theory, (13) IT development, (14) IT platforms changes, (15) Technology changes, and (16) Technology solutions.

The systematic literature review process and the results are outlined in the 'systematic literature review' section.

3.2 Case Study Analysis

Multiple case studies were considered to assess if IT initiatives fail due to poor ITG. Case study analysis has been recommended as a suitable methodology for qualitative studies where contextual analysis adds value to the study (Baxter & Jack, 2008; Ritchie & Lewis, 2003; Stake, 2006; Yin, 2011). Sources for the selection of the case studies included MIS Quarterly, Gartner Research (www.gartner.com), publications by the British Computer Society, Australian Computer Society, Institute of IT Professionals NZ, New Zealand and Australian Government (IT projects publications), and the CIOIndex (www.cioindex.com). The selection criteria included:

1. The complexity of the project: assessed by the impact of the project on both significant strategic and operational functions (for instance, financial systems, human resources management functions, data and information management functions for strategic decision making);
2. The cost of the project is at least $50 M (Australian): reflecting on complexity and financial implications of deployment failures;
3. Geographic location: projects from various English speaking countries to be able to observe the possible impact of cultures in managing and adopting ITG (New Zealand, Australia, Europe, and North America);
4. Failed projects were identified as missing targets (timelines, cost, and functionality) by approximately 20%.

The reason for considering the criteria outlined above was to ensure projects present sufficient complexity and size (financial resources, functionality and requirements) for a more likely observation of challenges beyond tactical and operational matters.

A cloud-based qualitative analysis tool (Dedoose) was used to analyse and identify themes that contributed to a lack of successful delivery of outcomes in IT projects represented in the six selected case studies. Compared with traditional qualitative tools installed on individual computers and storing data on local storage devices, Dedoose uses cloud technology to deliver the application and data storage in cloud space. Moreover, Deddose allows for mixed-method data analysis, which can significantly benefit the continuation of this study in the future. Selected sources (documentation) representing the case studies were uploaded to Deddose. The tool allows for qualitative/thematic analysis performed by recording themes/codes plus keeping track of valuable data such as themes dependencies and frequencies of observations. The tool was also used to determine theme/code applications across the resources.

4 Systematic Literature Review

The overwhelming majority of the proposed practices, standards, approaches, and measures of ITG effectiveness observed in the selected literature for this study seem to be based on principles of ‘monitoring and control.’ It appears that the theoretical

foundations of Agency Theory (Bonazzi & Islam, 2007; McColgan, 2001), with a strong focus on control, predominantly underpin the current ITG practices. The selected literature on ITG in this study suggests that effective ITG via monitoring and control is more likely to secure value delivery of IT deployment (Weill & Ross, 2004). At the same time, despite a general agreement that effective ITG ensures value from IT, there are different schools of thought regarding how the effectiveness of ITG can be established. The review of the selected literature in this study demonstrates that evidence of effective governance can be sought, taking into consideration two different views:

- ITG's effectiveness is evident from the success of deployed information solutions and applications;
- ITG's effectiveness is evident from the use and application of recommended strategies, frameworks, processes, and standards.

Information Systems (IS) academics and practitioners have previously developed models to measure the success of IS solutions. However, these models are designed to assess the success (effectiveness) of the specific solution, and their direct applicability to assessing strategic ITG practices is questionable. Led by DeLone and McLean (1992, 2003), a group of researchers (Delone & McLean, 2003; Esteves & Joseph, 2008; Halonen et al., 2009) argued that successfully deployed information systems and applications could indicate effective strategic management of technology deployment. They focussed on operational and tactical issues and recommended models to measure the success of information systems to reflect effective ITG.

The initial search of qualifying publications and articles resulted in 171 articles. After screening the resources and applying inclusion and exclusion criteria, eligible articles were reduced to 71. Table 1 demonstrates the inclusion and exclusion criteria considered during the screening process. The breakdown of the categories of the eligible publications is outlined in Table 2.

The approach for the analysis of the selected articles involved a concept-centric qualitative analysis performed in two stages (Webster & Watson, 2002; Okoli, 2015):

- The first stage involved the analysis of a subset of 10 selected articles. The criteria for determining the subset of 10 articles included: representing the views of both practitioners and strategists, published within the last 5 years, published within Information Systems discipline journals and quality assured conferences, title and section headings showed a direct connection with the topic of this chapter. The concept-centric qualitative analysis of the selected ten articles identified factors seen as influencers and indicators of effective ITG. The influencers were sorted into two categories of internal and external influencers.
- Next, the remaining articles (61) underwent a similar qualitative analysis to validate, reduce, enhance (identify factors that were not included in data from step 1 of the research) and categorise the data (indicators and influencers). The set of factors (indicators and influencers) identified in the first phase of analysis seemed to cover most of the identified factors in the remaining papers. However, in the second phase, a small number of new factors were observed and considered.

Table 1 Inclusion and exclusion criteria for the selection of the final set of literature resources

Inclusion criteria	Description	Exclusion criteria	Description
Research focus	Studies that seem relevant to the scope of the review. They represent the main interest of the review by identifying the various factors that seem to help answer the research questions outlined earlier in this section.	Structure of contents presented	Publications that were not sufficiently structured in arguments to allow for a systematic analysis of contents.
Methodology and focus	Articles that clearly outline the research methodology. Both quantitative and qualitative studies were taken into consideration.	Information available	Publications that did not provide sufficient information relevant to the topic of the study.
Publication recognition, quality, and type	Articles were considered if they were quality assured articles. More specifically, papers had been formally reviewed or commissioned by international agencies and governments.		
Language	Only publications in English were considered.		
Currency	Only publications within the last decade were considered – unless articles discussed relevant theoretical models that do not age.		

Table 2 Final breakdown of eligible publications/resources

Sources	Number of selected studies
Government-commissioned reports and reports from recognised professional bodies	14
Journals	18
Books and book chapters	23
Conference proceedings	13
Universities'publications	3

In general, the analysis of the literature suggested that:

- The theoretical foundations of Agency Theory (Bonazzi & Islam, 2007; McColgan, 2001), with a strong focus on control, predominantly underpin the current ITG practices.
- Effective ITG practices are more likely to secure value delivery of IT deployment (Weill & Ross, 2004). Led by DeLone and McLean (1992, 2003), a group of researchers (Delone & McLean, 2003; Esteves & Joseph, 2008; Halonen et al., 2009) argued that successfully deployed information systems and applications could indicate effective strategic management of technology deployment. They focussed on operational and tactical issues and recommended models to measure the success of information systems to reflect effective ITG.

Another group of researchers led by Van Grembergen, Weill, and Ross (Van Grembergen, 2004; Van Grembergen & De Haes, 2009; Weill & Ross, 2004) argue that factors that can be examined to assess ITG effectiveness are related to strategic approaches, relational mechanisms, and use of standards and frameworks that are expected to lead to ITG effectiveness. Accordingly, they examined and recommended strategic factors that could influence the effectiveness of ITG.

Throughout this chapter, the term 'practitioner' applies to those who take a deployed system (solution) view when examining effectiveness. 'Strategists' discuss the future direction of an organisation concerning IT deployment and the role and impact of ITG in securing value from future IT deployments.

The analysis of the selected articles (related to both practitioners' and strategists' views) identified eight key themes that could be used to determine the effectiveness of ITG, including: (1) Decision-Making Structure, (2) Formalised systems and processes, (3) Effective communication, (4) Business outcome orientated IT, (5) Alignment of organisational quality-orientated strategies with strategies for the use of IT solutions, (6) The history and the current state of IT deployment, (7) Awareness of organisations financial performance supported by IT solutions, and (8) Operational excellence influenced by the deployment of IT.

Table 3 demonstrates the themes of influencers of ITG effectiveness and summarises the analysis of the selected articles bringing together both practitioners' and 'strategists' views.

The purpose of the literature review is to identify factors that influence ITG. The emphasis is on governance. As outlined in the introduction, governance is mainly concerned with establishing policies and monitoring that policies are adhered to. Governance has a strategic focus.

Despite the focus on governance, the study does not lose sight of tactical and operational matters. For example, in addition to ITG effectiveness influencers outlined in Table 3, project management practitioners and professional bodies (such as the project management institute – PMI, www.pmi.org) advocate for a specific body of knowledge that contributes to IT deployment projects' success. The Project Management Body of Knowledge (PMBOK) highlights the project management processes that could impact IT projects (PMI, 2013).

PMBOK recognises five primary process groups and ten knowledge areas related to almost every project. The basic concepts apply to projects, programmes and operations. The five primary process groups are: (1) initiating, (2) planning, (3) executing, (4) monitoring and (5) controlling & closing.

PMBOK is mainly concerned with tactical and operational matters focusing on individual IT projects. On the other hand, ITG is concerned with strategic technology deployment issues and not necessarily with specific IT projects (Van Grembergen & De Haes, 2009; Weill & Ross, 2004).

The inclusion of PMBOK and consideration of tactical and operational matters assisted with the triangulation of data to determine dependencies between governance level decisions and tactical and operational processes. For instance, at the operational level, poor resource management could be connected with a specific governance domain such as *risk management* (Asgarkhani et al., 2018). Moreover,

Table 3 Themes of the influencers/indicators of ITG effectiveness (A theoretical model)

Themes	Influencers/Indicators of ITG effectiveness	References
Group A – ITG maturity: The experience and rigour in implementing ITG best practice		
Decision-making support structure	IT steering committee	De Haes and Van Grembergen (2010), DeLone and McLean (1992), Delone and McLean (2003), Van Grembergen (2004), Weill and Ross (2004), Weill and Vitale (2002)
	Strategic information systems planning steering committee	
	Reporting structure (IT directors to CEO)	
	Monitoring and the assessing value returned from decisions made on deploying IT	
Formalised ITG systems and process	ITG standards and framework	
	Business and IT partnership in decision making	
	Formalised portfolio management	
	Formalised information strategy planning	
	A formal process for strategic information systems planning	
	Formalised IT deployment project governance	
Effective communication of strategic issues	IT director or CIO involved in executive decision-making and represented on the executive committees.	
	IT strategy committee (or similar) tasked with reporting and discussing IT issues.	
	A CIO or a similar role is to raise awareness and articulate a vision for IT's role.	
Group B – strategic Alignment of IT and business: The connection and coherence between fulfilling business strategy and the IT strategy.		
Business outcome-orientated alignment of IT and business	IT strategies recognise and support new business outputs (products and services) Technology support for business outcome diversification strategies Technology and service support for business outcome differentiation.	De Haes & Van Grembergen (2010), Kaplan (2010), Kaplan & Norton (2004), Myers (2012), Prasad et al. (2008), Ramgovind et al. (2015), Van Grembergen (2004), Van Grembergen & De Haes (2009), Weill (2004)

(continued)

Table 3 (continued)

Themes	Influencers/Indicators of ITG effectiveness	References
Alignment of organisational quality-orientated strategies with strategies for the use of IT solutions.	Adoption of IT solutions supports business outcomes (products and services quality), including production and marketing.	
Group C – Organisational performance influenced by technology deployment: Organization's overall performance and delivery of outcomes supported by IT relative to its competition		
The history and the current state of IT deployment within an organisation	The current level of process automation via IT	DeLone & McLean (1992), Delone & McLean (2003), Esteves & Joseph (2008), Halonen et al. (2009), Hellsten & Karkove (2006), Zaied (2012)
	User acceptance of technology solutions	
	Support mechanisms for IT solutions	
	Timely delivery of relevant information for effective decision making	
	Effective service management of IT solutions	
Awareness of the organisation's financial performance supported by IT solutions	Processes for monitoring an organisation's performance	
	Metrics such as return on investment are used to assess the value delivery of IT	
The deployment of IT influences operational excellence	The existence of processes and metrics for operational performance	
	Seeking ongoing productivity improvements via the deployment of technology solutions	
	Service level agreements and the timeline for service delivery	

some of the five primary process groups (for instance, initiation and monitoring) directly align with IT Governance domains outlined in COBIT version 4 – mainly resource management and *strategic alignment* (Asgarkhani, 2013; Asgarkhani et al., 2017).

5 Analysis of Case Studies

As outlined earlier, the case study analysis comprised the analysis of six reported cases of IT deployment as secondary data. This section of the chapter elaborates on the process and discusses the results.

5.1 Thematic Analysis

Thematic analysis was applied to establish the dominant contributing factors to IT deployment success or failure. The study's broad methodological aspects were outlined earlier in the 'methodology section'. In addition, this section outlines more specific elements of the methodology related to the case study analysis.

Thematic analysis is relevant for analysing secondary data (IT deployment reported case studies). The thematic analysis provides this study with a flexible tool through its theoretical freedom, providing an in-depth and detailed yet complex account of data from the case studies (Creswell, 2015; Elliott, 2018).

Thematic analysis is accompanied by a process referred to as coding. According to Creswell, "Coding is the process of analysing qualitative text data by taking them apart to see what they yield before putting the data back together in a meaningful way" (Creswell, 2015). Justifying the need for coding is straightforward: "Text data are dense data, and it takes a long time to go through them and make sense of them" (Creswell, 2015). Coding is essentially indexing data about the contributors to the success or failure of IT deployment. Coding in this study refers to indexing data to highlight significant contributing factors to the success or failure of IT deployment.

Another consideration for the thematic analysis of case studies was the number of codes/themes representing the phenomenon being studied appropriately. The number of codes is a question on which many scholars have a firm opinion. For example, Friese (Friese, 2014; Friese, 2016) warns that the number of codes should not swell into the thousands – a phenomenon potentially due to the context of qualitative analysis software enabling such proliferation. Other figures about the number of codes discussed by other scholars such as Saldana (Saldana, 2016) range between 50–300 codes; for instance:

- 80–100 codes divided into 15–20 categories, eventually grouped into 5–7 significant concepts(Lichtman, 2013); or
- 30–40 codes (MacQueen et al., 2009).

Creswell (Creswell, 2015) has a more modest figure suggesting that he would code all of the text data (whether a small database of a few pages or a large one of thousands of pages) into about 30 to 50 codes. Creswell further suggests that by collapsing overlapping codes into one and eliminating the redundant codes, it should be possible to reduce the number of codes to about twenty. The final twenty or so codes should then be grouped into five to seven categories to shape the write up of the

results of the qualitative analysis. The coding process for this study and the number of themes seem consistent with Creswell's approach. The final analysis included twenty two factors (codes) in eight categories.

5.2 The Process of Coding

A continuum of designs can be considered to determine the process of coding. At one end of the continuum, we have prespecified codes. At the other end, we may start coding for thematic analysis with no prespecified codes, thus letting the data suggest the initial codes. The decision on the coding style was directed by the research question and the epistemology of the design. For example, a design related to testing theory against empirical data fits well with preset codes.

On the other hand, researchers with a deeply held philosophical view of qualitative research are likely to favour emergent or priori codes. Creswell (J. W. Creswell, 2014) emphasises that the use of emergent coding opens up the coding to reflect the view of participants in a traditional qualitative way. Furthermore, he encourages the researchers to be open to additional codes even if a 'prefigured' coding scheme is used. According to Creswell (J. W. Creswell, 2014), the most pragmatic researchers typically use both approaches in a single research project.

The case study analysis (secondary data) utilised emergent coding for a start – Phase I – initial two case studies. The method is consistent with the research design and the expectation of a deeper understanding of contributing factors to IT deployment failure, considering practitioners' views in a traditional qualitative way.

5.3 Stages of Data Analysis

Guided by the approach recommended/prescribed by Braun and Clarke (Braun & Clarke, 2006), the thematic analysis of the case studies followed six stages – including:

- Familiarisation with the data – This involved actively engaging with the data to develop an in-depth understanding of the data. Case studies were read several times, and the initial thoughts about the influencers of IT deployment success or failure were noted. This step also included examining how data can be analysed using Deddose, the qualitative analysis tool used by this research. The first step provided the foundation for the subsequent analysis.
- Generating initial codes/themes – The second step had two purposes. Firstly, it involved identifying preliminary features of the data that seemed interesting and meaningful. Considering that the approach to analysis was emergent coding, it was essential to practice a certain degree of scrutiny and validity check of the emerging concepts before launching into a complete analysis of all the cases.

The process was not necessarily intended at the wording of themes but to ensure the process, logic, and reasons for selecting data from the text and indexing the data to certain concepts. Two case studies were used as test cases, and the identified themes were considered in alignment with broad themes identified in the systematic literature review for relevance.

- Searching for themes and completing the qualitative analysis – The interpretive data analysis from all six case studies was conducted.
- Reviewing themes – once the thematic analysis was completed, a deeper review of identified themes was conducted to determine whether to combine, refine, separate, or discard initial themes (J. Creswell, 2015). At the end of this step, data within themes connected meaningfully, while there were clear and identifiable distinctions between themes.
- Refining the terminology and categories of themes – This step involved 'refining and defining' the themes and potential subthemes within the data. First, subthemes were identified and grouped into broad categories of themes. The outcome of this step was eight categories of themes outlining a unified story of the data derived from the case studies.

5.4 Case Studies: Data Analysis

This study aimed to analyse six cases of IT deployment. The purpose of the study was to fine-tune perceived influencers of ITG effectiveness for future studies and to validate the preliminary alignment of literature review analysis with the outcomes of actual IT deployment initiatives that had been established previously in 2018 (Asgarkhani et al., 2018).

An initial search for case studies of IT deployment resulted in identifying eighteen projects. The investigation was further refined to select six case studies based on:

- The timeframe for the project within the last decade: cases that took place in 2007 or later;
- The case study provides sufficient data to be suitable to identify ITG influencers;
- The six cases represent New Zealand, Australia, Europe (UK), and North America (Canada).

The analysis of case studies was carried out in three steps:

- Two case studies were analysed in step I to identify a preliminary list of factors that contributed to project failures.
- In step II, the remaining four cases underwent similar analysis to validate and enhance the outcome of step I. At the end of step II, it was confirmed that twenty-six factors had contributed to the failure of IT deployment projects in the case studies.

- In step III, the identified contributors to project failures were mapped against the outcome of the literature review (influencers of ITG effectiveness) to establish a connection to the conceptual model and secondly group the twenty-six contributors to failure into eight groups or themes.

A concept-centric thematic analysis was performed (Webster & Watson, 2002; Okoli, 2015) to analyse the main contributors to IT deployment projects' failure. The main contributing factors were developed as the six cases underwent analysis. There were no assumptions before the coding process started – the 'emergent' coding approach when the study began (Fereday & Muir-Cochrane, 2016).

The six case studies that were selected for analysis included:

- New Zealand's NovoPay (NZ Government, 2013)
- Victoria's (Australia) HealthSMART (Brouwer, 2011)
- UK's IT in NHS (Campion-Awwad et al. 2014)
- Canada's Phoenix project (Barnhart et al. 2013)
- HP's ERP Implementation (Chaluverdi & Gupta, 2005)

Two case studies (UK's IT in NHS and HP's ERP implementation) were selected to preliminary analyse the contributors to IT projects failures. In addition, events and developments contributing to the project's outcome were extracted and added as excerpts into Dedoose (a web-based qualitative analysis tool).

The excerpts were further analysed and coded into factors that contributed to the failure of projects. The prelimanry analysis of the two projects resulted in identifying the initial set of 19 factors or contributors: (1) lack of sufficient training or inadequate IT skills, (2) inadequate test planning and testing, (3) data migration failure, (4) poor technology governance and executive oversight, (5) lack of role clarity and confused roles accountability, (6) lack of stakeholder involvement, (7) poor users' understanding of technology, (8) poor day to day tactical and operational project management, (9) conflicting or dysfunctional leadership, (10) poor risk and contingency planning, (11) poor IT and Business alignment (business case) for the technology deployment concerned, (12) unrealistic goals and expectations, (13) poor scope definition and scope creep, (14) poor relationship management of parties involved (including external parties), (15) unprofessional, poor processes and practices, (16) lack of flexibility of models or frameworks applied, and (17) complexity of design and functionality – possibly ending with poor design of functionality & usability.

As discussed earlier, Phase I (the first two case studies) was completed without assuming any preset coding (themes) – applying the 'emergent' coding (Creswell, 2014).

In Phase II, the remaining four case studies (NovoPay, HealthSMART, Phoenix, and JetSmart) were analysed to validate further and enhance the identified factors in Phase I. The thematic analysis and coding approach in Phase II was a '*hybrid'* (Creswell, 2014) approach – started with the factors identified in Phase I during the emergent coding and identified new themes plus fine-tune codes/themes.

In the end, the analysis of all six case studies resulted in identifying 22 factors that contributed to IT deployment failure – including: (1) lack of adequate implementation and rollout planning (resulting in implementation difficulties), (2) lack of sufficient training for IT personnel (inadequate technical know-how), (3) inadequate test planning and poor testing processes, (4) lack of sufficient technology and people resource, (5) data migration failures (prior to implementation and rollout), (6) poor or slow adoption of technology by the organisation (including the user community), (7) poor technology governance and executive oversight, (8) lack of role clarity and confused roles accountability, (9) lack of stakeholder involvement, (10) complexity of design and functionality – possibly ending with poor design of functionality & usability, (11) poor day to day tactical and operational project management, (12) conflicting or dysfunctional leadership, (13) poor IT and Business alignment (business case) for the technology deployment concerned, (14) unrealistic goals and expectations, (15) poor scope definition and scope creep, (16) poor risk and contingency assessment/planning, (17) poor relationship management of parties involved (including external parties), (18) poor business processes and practices, (19) ineffective communication, (20) lack of flexibility of models or frameworks applied, (21) unrealistic and unnecessary pressure on project teams, and (22) inadequate change management.

At the end of the case study analysis stage, the study provided two outcomes. First, a theoretical framework/model for ITG effectiveness (Table 3) via the review of the previous studies. And second, 22 themes/factors that led to IT deployment projects' failure.

This study's second broad research question is concerned with the connection between IT deployment failures and poor IT governance. The case study analysis results were mapped with the theoretical framework of ITG effectiveness developed via the systematic literature review to answer this question. The details of the extended analysis are covered in the following section.

6 Concluding Analysis and Discussions

This section considers the systematic literature review results (Table 3) and the case study analysis (twenty two contributors to IT deployment failure) to investigate a possible connection between poor IT governance and IT deployment failures.

The first step of the extended analysis of the case studies involved the establishment of broader categories of factors/contributors to IT project failures (J. Creswell, 2015). The establishment of more general themes/factors is expected to ease the establishment of high-level connections between IT failure and poor IT governance (J. Creswell, 2015). The grouping resulted in identifying eight broader categories that embodied the 22 factors which contributed to IT deployment failure: (1) Implementation and rollout factors, (2) resource management issues, (3) Accountability and role clarity matters, (4) IT and business alignment considerations, (5) IT leadership factors, (6) Design and functionality issues, (7) Risk and

change management contributors, and (8) the existence and the utilisation of standardised frameworks and processes.

The eight categories of factors (contributors to failure) seemed consistent with the identified critical domains of IT governance or known key stages of project development and rollout (Allassani, 2013; Fahrenkrog et al., 2004; ITGI, 2007; Von Solms, 2005). For instance, the five ITG domains as considered by COBIT 4 (ITGI, 2007) show connection/relevance with the eight broad categories of IT deployment failure contributors – Table 4.

Next, the connection between the identified categories of eight contributors to IT deployment failure (the results of case study analysis) and the theoretical model of influencers/indicators of effective ITG (the results of the systematic literature review – Table 3) are investigated and mapped. The method for indicating a connection between a category of failure contributors (case studies) and a specific group of influencers/indicators of effective IT government was as follows:

If any contributor to IT deployment failure (Table 5 – the middle column) is likely to be influenced by any indicator in Table 3 (either the first or the centre column), then the research establishes a connection between the broad theme (Table 4 – the left column) and the general (heading) category of indicators of Table 3.

Table 4 ITG Domains considered by COBIT aligned with the groups of contributors to IT deployment failure

ITG Domains (COBIT 4 Manual)	Categories of contributors to failure (Case Study Analysis)
Strategic alignment	IT and business alignment considerations
	The existence and the utilisation of standardised frameworks and processes.
Value delivery	Accountability and role clarity matters
	IT and business alignment considerations
	IT leadership factors
	Design and functionality issues
Risk management	Implementation and rollout factors
	Accountability and role clarity matters
	IT and business alignment considerations
	IT leadership factors
	Risk and change management contributors, and the existence and the utilisation of standardised frameworks and processes
Performance management	Implementation and rollout factors
	Resource management issues
	Accountability and role clarity matters
	IT leadership factors
	Design and functionality issues
	The existence and the utilisation of standardised frameworks and processes
Resource management	Resource management issues
	IT leadership factors
	Risk and change management contributors

Table 5 Mapping the outcome of the case study analysis to the results of the literature review

Identified categories of themes (eight broad contexts for failure – from six analysed cases)	Relevant or connected contributors to failure (the original list of twenty-two factors)	Corresponding category of indicators/contributors to effective ITG (Table 3 – literature review)
Implementation and rollout factors	Lack of adequate implementation and rollout planning (resulting in implementation difficulties)	*ITG – Organisational maturity*
	Inadequate test planning and poor testing processes	
	Lack of sufficient training for IT personnel (inadequate technical know-how)	
	Data migration failures (prior to implementation and rollout)	
	Unrealistic and unnecessary pressure on project teams	
	Inadequate change management	
Resource management issues (including people)	Lack of sufficient training for IT personnel (inadequate technical know-how)	*ITG – Organisational performance*
	Lack of sufficient technology and people resources	
	Unrealistic and unnecessary pressure on project teams	
	Poor or slow adoption of technology by the organisation (including the user community)	
Accountability and role clarity matters	Lack of role clarity and confused roles accountability	*ITG – Organisational maturity* *ITG – Business alignment*
	Poor technology governance and executive oversight	
	Poor relationship management of parties involved (including external parties)	
IT and business alignment considerations	Slow adoption of technology by the organisation (including the user community)	*ITG – Business alignment* *ITG – Organisational maturity*
	Poor technology governance and executive oversight	
	Lack of role clarity and confused roles accountability	
	Conflicting or dysfunctional leadership	
	Lack of stakeholder involvement	
	Poor risk and contingency assessment/planning	

(continued)

Table 5 (continued)

Identified categories of themes (eight broad contexts for failure – from six analysed cases)	Relevant or connected contributors to failure (the original list of twenty-two factors)	Corresponding category of indicators/contributors to effective ITG (Table 3 – literature review)
	Poor business processes and practices	
	Lack of flexibility of models or frameworks applied	
	Unrealistic and unnecessary pressure on project teams	
	Poor relationship management of parties involved (including external parties)	
IT leadership factors	Poor technology governance and executive oversight	I*TG – Organisational maturity* *ITG – Organisational performance*
	Poor or slow adoption of technology by the organisation (including the user community)	
	Lack of sufficient technology and people resources	
	Lack of adequate implementation and rollout planning (resulting in implementation difficulties)	
	Poor IT and business alignment (business case) for the technology deployment concerned	
	Lack of flexibility of models or frameworks applied	
	Lack of role clarity and confused roles accountability	
	Poor business processes and practices	
	Conflicting or dysfunctional leadership	
	Poor day to day tactical and operational project management	
Design and functionality issues	Data migration failures (prior to implementation and rollout)	*ITG – Organisational maturity* *ITG – Organisational performance*
	Lack of stakeholder involvement	
	Poor or slow adoption of technology by the organisation (including the user community)	
	Unrealistic goals and expectations	
	Poor scope definition and scope creep	
	Ineffective communication	
	The complexity of design and functionality – Possibly ending with poor design of functionality & usability	

(continued)

Table 5 (continued)

Identified categories of themes (eight broad contexts for failure – from six analysed cases)	Relevant or connected contributors to failure (the original list of twenty-two factors)	Corresponding category of indicators/contributors to effective ITG (Table 3 – literature review)
Risk and change management contributors	Lack of adequate implementation and rollout planning (resulting in implementation difficulties)	*ITG – Organisational maturity* *ITG – IT and business alignment* *ITG – Organisational performance*
	Inadequate test planning and poor testing processes	
	Ineffective communication	
	Poor scope definition and scope creep	
	Unrealistic goals and expectations	
	The complexity of design and functionality – Possibly ending with poor design of functionality & usability	
	Lack of stakeholder involvement	
	Poor IT and business alignment (business case) for the technology deployment concerned	
	Poor day to day tactical and operational project management	
The existence and the utilisation of standardised frameworks and processes	Inadequate test planning and poor testing processes	*ITG – Organisational maturity* *ITG – Organisational performance*
	Slow adoption of technology by the organisation (including the user community)	
	Data migration failures (prior to implementation and rollout)	
	Poor technology governance and executive oversight	
	Lack of flexibility of models or frameworks applied	
	Inadequate change management	
	Poor risk and contingency assessment/planning	
	Poor day to day tactical and operational project management	

For instance, one of the contributors in the category of *resources management issues* is the *lack of sufficient training for IT personnel (inadequate technical know-how)* – Table 5. This factor could be influenced by the lack of *formalised information strategy planning* (including resources) and a *formalised IT deployment project*

governance (Table 3). Therefore, the category of *resource management issues* from case studies could be influenced by ITG organisational maturity (Table 3 – literature review).

The finalised investigation of possible connections between case study analysis and literature review is mapped out in Table 5.

Table 5 indicates that the sample of the projects analysed shows a connection between contributors to failure and the indicators of ITG effectiveness. Therefore, this sample of six projects suggests that the failure of IT deployment had relationships with ineffective or poor governance.

The factors and themes identified to have impacted project failures include strategic and governance issues and operational and management matters. However, even operational problems seem to indicate a connection to poor governance. For instance, poor governance policies related to risk management could influence implementation errors (such as data migration problems). Moreover, poor implementation management (the first main theme of contributors to failure) is mapped to organisational maturity – suggesting that organisational maturity in practising effective ITG (experience in previous deployments of IT) impacts project implementations.

Finally, the research investigated the most crucial contributors to failure related to the sample of case studies studied. The applied approach considered the theme or code presence (related to the eight categories of contributors to failure). For instance, NovoPay had experienced problems related to all eight types of contributors to project failures. Table 6 presents the summary of the analysis of theme/code presence.

The analysis presented in Table 6 suggests that problems associated with four themes were present in all six case studies: (the list). Therefore, this sample indicates that these four groups of contributors played a significant role in IT deployment failures. In addition, at least three of the four groups are concerned with high-level governance matters: (1) IT-Business alignment, (2) risk and change management, and (3) use of standardised processes and practices (Asgarkhani, 2011; Asgarkhani & Sitnikova, 2014; Wu et al., 2015). Consequently, the analysis suggests that ineffective or poor governance played a role in the failure of IT deployment.

To summarise, the analysis presented in Table 5 suggested that the case study analysis results verify the theoretical model of Table 3. Moreover, Table 5 indicates a connection between project failures and ineffective ITG. Furthermore, the analysis presented in Table 6 used a different approach to triangulate the results from Table 5. It looked at the dominant contributors to failure. The dominant contributors were connected to high level strategic and governance practices. Therefore, Table 6 also indicated IT deployment failure due to poor governance.

7 Conclusions

Governance is defined as establishing policies and continuous monitoring of their implementation. Governance determines who has power, who makes decisions, how various business units make their voice heard and how accountability is established. ITG consists of leadership, organisational structures, and processes that ensure that the enterprise's IT sustains and extends the organisation's strategies and objectives. In contrast, management is responsible for the implementation of decisions around strategy. In addition, management establishes operating processes and ensures proper implementation of policies that governance bodies approve. An initial review of the resources indicated that despite previous studies on ITG recommending options and approaches for improved deployment of IT, there is a lack of research on ITG effectiveness. In addition, there seems to be fragmentation in studies focusing on relevant but isolated issues (mechanisms, relationships, and system performance).

A systematic literature review was conducted to determine critical influencers (or indicators) of effective ITG. In general, the analysis of the selected publications indicated a consensus amongst both practitioners and strategists that effective ITG is more likely to secure value from IT deployment. However, the reasons and interpretation of value delivery and effectiveness varied. Further analysis determined that there are two schools of thought concerning the effectiveness of ITG. Information Systems (IS) academics and practitioners argued that successfully deployed information systems and applications could indicate effective strategic management of technology deployment. They focus on operational and tactical matters and recommend models for measuring the success of information systems to reflect effective ITG.

On the other hand, strategists suggest that the effectiveness of ITG can be assessed via strategic approaches, relational mechanisms, and the use of standards and frameworks. Therefore, all the various views of researchers were taken into consideration to develop a theoretical model of ITG effectiveness – Table 3.

The model outlined three broad groups of indicators or influencers – *ITG organisational maturity*, *strategic alignment of IT and business,* and *organisational performance influenced by technology deployment*.

Next, secondary data from six case studies of IT deployment were analysed. The analysis aimed at identifying the factors/contributors that led to IT deployment failure. The thematic analysis of the project case studies determined eight main factors contributing to the failure of the investigated IT deployment projects. The last stage of the study mapped the theoretical model of Table 3 to the identified groups of contributors to project failures. The mapping suggested a connection between IT deployment failure and poor governance (Tables 5 and 6).

This study was initially motivated by the significant failures of IT deployment initiatives. However, the emergence of the COVID pandemic in late 2019 further encouraged the study. The pandemic pushed less tech-savvy and small organisations to use technology to address the limitations caused by the pandemic – for

Table 6 Summary of Case Study Analysis by theme/code presence

Identified categories of themes (Areas of Failure)	NovoPay	JetSmart Project (Qantas)	ERP at HP	HealthSMART	IT in NHS	Phoenix
Implementation management	√	√	√	√	√	√
Resources management (including people)	√	–	√	–	√	√
Accountability and clarity of roles	√	√	–	√	√	–
IT-business alignment	√	√	√	√	√	√
Information technology leadership	√	√	–	–	√	√
Design and functionality	√	√	√	–	√	√
Risk and change management	√	√	√	√	√	√
Use of standardised processes and practices	√	√	√	√	√	√

instance, lockdowns. In addition, the adoption of IT and tech solutions in some cases seemed problematic lacking governance oversight.

This study contributes to the theory of ITG by identifying the influences of ITG effectiveness – as outlined in Table 3.

The proposed models of Tables 3 and 5 can benefit future studies to fine-tune and enhance indicators and influences of effective ITG. Moreover, the model in Table 5 can help practitioners in organisations when assessing ITG practices to determine the role and value of ITG within organisations.

It is recommended that the research be extended to consider the corporate governance and the assessment of IT-based risks alongside the influence of ITG on IT deployment. Moreover, a comprehensive study to use primary data (for instance, interviews) can strengthen the findings of this study. The case study analysis results discussed in this chapter can benefit from including additional case studies in the analysis of deployed IT initiatives – before they can be generalised to apply to all IT deployment scenarios. Future research involving the analysis of a larger number of cases can be beneficial to strengthen the theory and the correlation between poor ITG and technology deployment challenges.

References

Ardito, L., Messeni Petruzelli, A., & Albino, V. (2015). From technological inventions to new products: A systematic review and research agenda of the main enabling factors. *European Management Review, 12*(3), 113–147.

Allassani, W. (2013). The impact of IT governance on IT projects -the case of the Ghana rural bank computerisation and inter-connectivity project. *Journal of Information Systems and Technology Management, 10*(2), 271–286.

Asgarkhani, M. (2011). *A strategic outlook for managing information and communication technology: An overview.* Paper presented at the International Conference on Financial Management and Economics.

Asgarkhani, M. (2012). The effectiveness of E-service in local government: A case study. In F. Bannister (Ed.), *Case studies in E-government* (pp. 22–41). Academic Publishing International Ltd.

Asgarkhani, M. (2013). *Corporate ICT governance: A tool for ICT best practice.* Paper presented at the International Conference on Management, Leadership and Governance, Bangkok.

Asgarkhani, M., Cater-Steel, A., Toleman, M., & Ally, M. (2017). *Failed IT projects: Is poor governance to blame?* Paper presented at the Australia conference in information systems 2017, Hobart, Australia.

Asgarkhani, M., Cater-Steel, A., Toleman, M., & Ally, M. (2018). *A conceptual model to evaluate the effectiveness of information technology governance*. Paper presented at the International Conference on management, leadership, and governance, Bangkok.

Asgarkhani, M., & Sitnikova, E. (2014). Developing a strategic framework for managing security in SCADA systems. *Journal of Information Warfare, 13*(4), 70–84.

Bakker, R. M. (2010). Taking stock of temporary organisational forms: A systematic review and research agenda. *International Journal of Management Reviews, 12*(4), 466–486.

Barnhart, D., Sullivan, B., Hunter, R., Bruhn, J., Fowler, E., Hoag, L. M., . . . Vincent, K. (2013). Phoenix Program Status - 2013 AIAA SPACE 2013 Conference and Exposition, AIAA SPACE Forum (AIAA 2013-5341).

Baumeister, R. F., & Leary, M. R. (1997). Writing narrative literature reviews. *Review of General Psychology, 1*(3), 311–320.

Bem, D. J. (1995). Writing a review article for Psychological Bulletin. *Psychological Bulletin, 118*(2), 172–177.

Brouwer, G. E. (2011). Own motion investigation into ICT-enabled projects. V. O. Office. Retrieved from https://www.vgls.vic.gov.au/client/en_AU/search/asset/1267225/0.

Baxter, P., & Jack, S. (2008). *Qualitative case study methodology: Study design and implementation for novice researchers*. Retrieved from http://nsuworks.nova.edu/tqr/vol13/iss4/2.

Bonazzi, L., & Islam, S. M. N. (2007). Agency theory and corporate governance: A study of the effectiveness of the board in their monitoring of the CEO. *Journal of Modelling in Management, 2*(1), 7–23.

Braun, V., & Clarke, V. (2006). *Qualitative Research in Psychology, 3*, 77–101.

Brown, C., & Magill, S. (1994). Alignment of the IS functions with the enterprise: Toward a model of antecedents. *Management Information Systems Quarterly, 18*(4), 371–404.

Campion-Awwad, O., Hayton, A., L., S., & Vuaran, M. (2014). The National Programme for IT in the NHS: A Case History Cambridge]. Cambridge, UK.

Chesterman, R. N. (2013). Queensland Health Payroll System Commission of Inquiry. Retrieved from http://www.healthpayrollinquiry.qld.gov.au/?a=207203.

Cater-Steel, A., Toleman, M., & Tan, W. G. (2006). *Transforming IT service management – The ITIL impact*. Paper presented at the ACIS 2008. http://aisel.aisnet.org/acis2006/81. http://aisel.aisnet.org/acis2006/81

Chaluverdi, R., & Gupta, V. (2005). *ERP Implementation Failure at HP*. ICMR.

Creswell, J. (2015). *Educational research: Planning, conducting and evaluating quantitative and qualitative research*. Pearson.

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). SAGE.

Davis, J. H., Schoorman, D., & Donaldson, L. (1997). Toward a stewardship theory of management. *The Academy of Management Review, 22*(1), 20–47.

De Haes, S., & Van Grembergen, W. (2006). *Information technology governance best practices in Belgian Organisations*. Paper presented at the Proceedings of the 39th Annual Hawaii International Conference on System Sciences – Volume 08, Hawaii.

De Haes, S., & Van Grembergen, W. (2010). An exploratory study into IT governance implementations and its impact on business/IT alignment. *Information Systems Management, 26*(1), 123–137. https://doi.org/10.1080/10580530902794786

DeLone, W. H., & McLean, E. R. (1992). Information systems success: The quest for the dependent variable. *Information Systems Research, 3*(1), 60–95.

Delone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: A ten-year update. *Journal of Management Information Systems, 19*(4), 9–30.

Deloitte. (2012). Ministry of Social Development Independent Review of Information Systems Security. Retrieved from https://www.nbr.co.nz/sites/default/files/images/deloitte-phase-2-final-report.pdf.

EDUCASE Centre for applied research. (2008). *IT governance maturity and context*.

Elliott, V. (2018). Thinking about the coding process in qualitative data analysis. *The Qualitative Report, 23*(11), 2850–2861.

Esteves, J., & Joseph, R. C. (2008). A comprehensive framework for the assessment of e-government projects. *Government Information Quarterly, 25*, 118–132.

Fahrenkrog, S. L., Bolles, D., Blaine, J. D., & Steuer, C. (2004). *PMBOK® guide—Third edition: An overview of the changes*. In. PMI® Global Congress 2004—North America: PMI.

Fereday, I., & Muir-Cochrane, E. (2016). Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development. *International Journal of Qualitative Methods, 5*(1), 80–92.

Friese, S. (2014). *Qualitative data analysis with ATLAS.ti* (2nd ed.). Sage.

Friese, S. (2016). Qualitative data analysis with ATLAS.ti. Qualitative. *Research in Education, 5*(2), 226–228.

Gauld, R., & Goldfinch, S. (2006). *Dangerous enthusiasms: E-government, computer failure and information system development*. Otago University Press.

Gartner. (2016). Building the Digital Platform: Insights From the 2016 Gartner CIO Agenda Report. G. Research. https://www.gartner.com/imagesrv/cio/pdf/cio_agenda_insights_2016.pdf.

Gole, T., & Shinsky, G. (2013). *Learning from failed ICT projects*. Retrieved from. https://www.lexology.com/library/detail.aspx?g=cca9ae3a-2fa7-4550-9445-39bc32a4c3ff

Halonen, R., Acton, T., Golden, W., & Conboy, K. (2009). *Delone & McLean's success model as a descriptive tool in evaluating a virtual learning environment*. Paper presented at the international conference on organizational learning, knowledge and capabilities (OLKC 2009), Amsterdam, the Netherlands.

Hellsten, S.-M., & Karkove, M. (2006). *The DeLone and McLean model of information systems success- original and updated models*. Paper presented at the SIGCHI Conference.

ITGI. (2007). *COBIT 4.1*. ITGI.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behaviour, agency costs and ownership structure. *Journal of Financial Economics, 3*, 305–360.

Jensen, M. C., & Meckling, W. H. (1994). The nature of man. *Journal of Applied Corporate Finance, 7*(2), 4–19. https://doi.org/10.1111/j.1745-6622.1994.tb00401.x.

Kaplan, R. S. (2010). *Conceptual foundations of the balanced scorecard*.

Kaplan, R. S., & Norton, D. P. (2004). Measuring the strategic readiness of intangible assets. *Harvard Business Review, 82*(2), 52–63.

Larcker, B. F., & Tayan, B. (2008). Models of corporate governance: Who's the fairest of them all? *Harvard Business Review, 33*.

Laudon, K. C., & Laudon, J. P. (2014). *Management information systems*. Pearson Education Limited.

Lichtman, M. (2013). *Qualitative research in education: A user's guide*. SAGE.

Licker, P. S. (2007). Stewardship models of IT governance: Beyond agency theory. School of Business Administration, Oakland University, Rochester.

Lovelock, J. D., Hale, K., Lewis, B., Hahn, W. L., Dornan, M., Atwal, R., … Gupta, N. (2016). *Forecast alert: IT spending, worldwide, 2016 update*.

MacQueen, K. M., McLellan, E., Kay, K., & Milstein, B. (2009). Codebook development for team-based qualitative analysis. In *The content analysis reader* (pp. 211–219). Sage.

McColgan, P. (2001). *Agency theory and corporate governance: A review of the literature from a UK perspective*.

McLellan, C. (2014). *IT budgeting in 2015: What the surveys tell us*.

Moher, D., Liberati, A., Telzlaff, J., & Altman, D. G. (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PloS Med Journal, 6*(7), 1–8.

Myers, J. (2012). *Strategic data management in the era of big data*. In.

NZ Government. (2013). *Report of the ministerial inquiry into the NOVOPAY project*. Retrieved from Wellington, New Zealand

Okoli, C. (2015). A Guide to Conducting a Standalone Systematic Literature Review. *Communications of the Association for Information Systems, 37*(1), Article 43.

PMI. (2013). *A guide to the Project Management body of knowledge* (5th ed.). Project Management Institute.

Prasad, A., Green, P., & Heales, J. (2008). *Towards a better understanding of information technology*. Retrieved from Brisbane

Ramgovind, S., Eloff, M., & Smith, E. (2015). *The management of cloud security in cloud computing*. uir.unisa.ac.za.

Ritchie, J., & Lewis, J. (2003). *Qualitative research practice: A guide for social science students and researchers*. SAGE.

Saldana, J. (2016). *The coding manual for qualitative research* (3rd ed.). Sage.

Stake, R. (2006). *Multiple case study analysis*. The Gulford Press.

Van Grembergen, W. (2004). *Strategies for information technology governance*. Idea Group Publisher.

Van Grembergen, W., & De Haes, S. (2009). *Enterprise governance of information technology*. Springer.

Venkata, M., Reddy, B., & Chandra, M. (2012). *Cloud computing organisational benefits a managerial concern*. www.bth.se

Von Solms, B. (2005). Information security governance: COBIT or ISO 17799 or both? *Computers & Security, 24*(2), 99–104.

Weill, P. (2004). Don't just lead, govern: How top-performing firms govern IT. *MIS Quarterly Executive, 3*(1), 1–14.

Weill, P., & Ross, J. (2004). *IT governance: How top managers manage IT decision rights for superior results*. Harvard Business School Press.

Weill, P., & Vitale, M. (2002). What IT infrastructure capabilities are needed to implement E-business models? *MIS Quarterly Executive, 1*(1), 17–34.

Wen, H., & Hsu, L. (2012). *Conceptual framework of cloud computing governance model- an educational perspective*. Retrieved 16 October 2015 http://itee-edsoccom.com/index.php/itee/article/viewFile/240/225

Webster, J., & Watson, R. T. (2002). Analyzing past to prepare for the future: Writing a literature review. *MIS Quarterly, 26*(2), 13–22.

Williams, P. A. (2012). *Optimising value creation from IT investments*.

Wu, S. P., Straub, D. W., & Liang, T. (2015). How information technology governance mechanisms and strategic alignment influence organisational performance: Insights from a matched survey of business and IT managers. *MIS Quarterly, 39*(2), 497–518.

Yin, R. K. (2011). *Qualitative research from start to finish*. The Guilford Press.

Zaied, A. N. H. (2012). An integrated success model for evaluating information systems in public sectors. *Journal of Emerging Trends in Computing and Information Sciences, 3*(6).

Mehdi Asgarkhani, as the Academic Leader and Principal Lecturer (Associate Prof) in strategic management of IT and Tech Deployment Governance, leads research direction, manages portfolio development, and leads industry connection strategies and initiatives. As the acting head of the department (various departments – IT and Business), he led the overall direction of IT education and introduced technology in business elements of a few qualifications. He has had the opportunity to work with tertiary academic institutions across Asia (Japan, Taiwan, Hong Kong, Singapore and Malaysia) to review the shape of IT qualifications and assist in developing models for closer tech sector engagements. He has held various roles in the IT sector, IT professional bodies (local and national boards), and editorial boards of journals. Presented keynote addresses and guest presentations at various conferences. As a Chartered IT Professional, he is familiar with international IT skills frameworks and plays a role in advising and mentoring startup entrepreneurs and emerging tech sector establishments.

Adapting IT Governance Policies and Technology to Cope with COVID-19 at Ahlia University

Subhashini Bhaskaran Sailesh

1 Introduction

IT governance seeks to align business objectives with IT strategy to deliver business value. Higher education institutions are a special type of organization that requires a variety of information technology such as software, academic system, cloud applications, wireless network, e-learning platforms, i.e., for supporting the activities of teaching, learning and research (Coen and Kelly, 2007). To control this heterogeneous set of technologies, effective IT governance is necessary making use of structures, processes and relational mechanisms. Each one of these mechanisms has a function and when implemented, should impact the organization positively. As evidenced in studies of Weill and Ross (2004) and Lunardi et al. (2014), the organizations have adopted formal mechanisms of IT governance to improve their performance and profit. Furthermore, as stated by Grama (2015), an effective IT governance helps an institution in achieving its goals by applying IT resources in optimal ways. It is quite notorious that every type of organization needs to have formal IT governance to get good results in the organizational performance.

In today's leading and profitable organizations, effective ITG structure is a top business priority (Gartner, 2013). Organizations that have effective ITG structures could have got more return from their assets in comparison with other without ITG practices (Weill, 2004). Effective ITG enables such superior business performance as they promote effective and efficient resource allocations (Weill, 2004). ITG permits an IT manager to focus on three essential requirements: reducing risks, controlling costs and extending the value of the information system (Tsai et al., 2015).

S. B. Sailesh (✉)
Ahlia University, PO, Manama, Kingdom of Bahrain
e-mail: sbhaskaran@ahlia.edu.bh

M. Alaali (ed.), *COVID-19 Challenges to University Information Technology Governance*, https://doi.org/10.1007/978-3-031-13351-0_17

In university settings, studies like (Creasey, 2008) discovered a positive relation between effective ITG and organizational performance in universities. As a consequence, ITG is key activity for universities (Khouja, et al., 2018). However, and in spite of the importance of the topic worldwide, with relevant actors like, for instance ISACA, the penetration of IT governance in universities is still scarce. Hence, it is important to consider IT Governance and the alignment with business strategy for HEI taking an HEI as case study to investigate how ITG helps in achieving business goals. In this case study integrated IT governance framework was adapted with the 6 steps of business strategy(demand management), IT strategy (demand management), IT plan execution (execution management), performance management (execution management), vendor management(execution management) and people development.

2 Case Study

Information Technology governance is an instrument to control and manage the IT resources such as infra-structure technology and people in any kind of organizations, including universities (Bajgoric, 2014; De Haes & Van Grembergen, 2009; Hicks et al., 2012). Besides, IT governance helps the corporate governance of the organization assisting the strategy and achieving objectives, goals and mission. In this case study we will see how the alignment of IT goals with the business goals help in the achievement of targets. In a private university in Strategic plan is made for every 4 years. The strategic plan, objectives, vision and mission of the university is translated to individual IT goals thereby attaining IT goals helps in attaining Business goals.

2.1 About the University in the Case Study

Ahlia University, the first private University licensed by Bahrain Government and enrolled its first students in February 2003. Ahlia University has grown in all aspects: more students, more courses, more international collaborations – while at the same time maintaining its reputation for the highest quality in higher education. Ahlia University has met the BQA and HEC requirements.

2.2 Overview of the Integrated IT Governance Framework at Ahlia University

Grounded in industry best practice research and required to plan, develop, deploy and sustain a cost-effective approach to IT Governance, the integrated IT governance framework consists of five (5) to six (6) critical IT Governance imperatives

(which leverage best practice models and are "must do's") and address the following work areas: -

1. **Business strategy, plan and objectives (Demand Management) -** This involves the development of the business strategy and plan which should drive the IT strategy and plan.

   Ahlia University decided to continue its operations and attracting students by moving to online education and give continuous support to students. So during COVID time to streamline the operations a steering committee was formed. The steering committee proposed the formation of a Call Centre and a Centre for Learning to facilitate smooth teaching and learning.

   As a part of efforts to ensure the sustainability of educational services the following actions were proposed by the steering committee

   (a) Activating the distance learning system, the technologies and platforms used, providing electronic learning resources, achieving information security and protecting intellectual property rights
   (b) Activating remote work for academics and administrators, especially mothers
   (c) Providing technical support services, training and support services to members of the academic and administrative bodies.
   (d) Providing technical support services, training and support services for students
   (e) Curriculum revision- In terms of content, objectives and learning outcomes
   (f) Conducting practical courses that require laboratories and field training
   (g) Evaluating the distance learning process and ensuring its quality measures to protect individuals and ensure social distancing
   (h) Procedures for admission of new students, registration and electronic payment
   (i) The institution's procedures in activating academic advising services for students
   (j) The Corporation's actions in its strategic plan that aims to confront future emergency situations
   (k) Scientific research activities that support the continuity of education in light of the pandemic

2. **IT strategy, plan and objectives (Demand Management)** – This should be based on the business plan and objectives and will provide the direction and priorities of the IT functions and resources.

   At Ahlia University, Teaching and Learning is managed by Information systems and Learning Systems.

   Learning System included Moodle which is course management system Moodle is a Learning Platform or course management system (CMS) - a free Open Source software package designed to help educators create effective online courses and to manage student assessments.

   Student Information system is a proprietary system developed in-house in the University which automates the processes of student admission, registration. In addition, all planning for course, faculty, rooms, departments, colleges timetables and course information including fees.

System helps the University in the following

- Increased efficiency of our operations and the management of student, faculty and of administration processes
- Improved decision making and better planning
- Improved resources efficiency and management including and time resources of students, faculty and administrators.
- Automation to reduce operation time
- Support the mission of The university by achieving KPIs, and its strategic objectives.
- Offer current technological services and remote access to students, faculty and administrators.
- Imbed business Intelligence to support critical decision making, planning and improved services.
- **Services:**
- The main aim is to improve the delivery of services to students and faculty by providing interactive services. Some examples of interactive services available in the system.
- For students:
- preregister to courses,
- add/drop to a course sections,
- Request of courses,
- Request to register in a sections of a course,
- Issue of exam cards,
- Request of withdrawal,
- Transcript retrieval
- Raise inquiry or a complaint,
- Check any outstanding amount and
- Online payment of fees.
- For faculty
- Advising – entry of meetings and complete access to advisee profile
- Automated Absence reminders to students based on faculty entry of attendance
- Supervision of Projects and Dissertations with automated reminders on supervision and meeting minutes entered in the system are sent by email to students and faculty.
- Curriculum plans and curriculum sheets
- Reports for course or programme management and for decision making

For administration

- Processes in the system helps in increasing efficiency and streamline operations.
- Effective service delivery
- Reports for decision making

At Ahlia University the governance of the system is managed as below (Fig. 1).

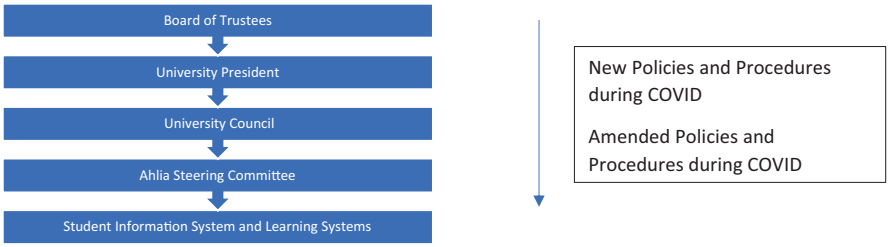


Fig. 1 Governance of the student information system

The Board of trustees along with University President make decisions along with University Council members who review the policies and procedures created by the Steering committee to run the operations smoothly during covid time. Some new policies and procedures were created during the COVID period. Some policies were amended to suit the COVID period. These new policies and amended policies were implemented in the systems.

During the COVID time there were amendments to policies and procedures catering to the needs of COVID time which were decided by the Management team which was discussed in the University Council and was given to the Student Information System team to be implemented.

Some of the policies and procedures that were amended during COVID time are:

- Choice of Pass/Fail/Grade option for Bachelor students
- Conducting online examinations

3. **IT plan execution (Execution Management) –** This encompasses the processes of program and project management, IT service management (including ITIL – IT Infrastructure Library), risk and threat management, change management, security, contingency plans, outsourcing, data management and others.

   Ahlia University Bahrain, the first private university of Bahrain, has effectively moved to online: teaching, academic advising, career development services, counselling services, digital library services, payment services, document management, internship, student activities and student complaint services. Choice of Open source and free Microsoft products were made and cheap licenses for some products. They can be easily downloadable and installed as well in the personal computers of students and faculties at home.

   The university prepared itself by taking the following steps for a period of 2–3 months

   1. Created Operating plans (Project plans, Capital plans and budgets)
   2. Created Management controls, guidelines and process
   3. Evaluated existing and required resources
   4. Business continuity plans
   5. Completed the infrastructure requirement for online education like internet speed, network upgrades and Microsoft open licenses for universities.

6. Many security policies were implemented to ensure the protection of information and privacy.

The Student Information system was updated with the following features.

- Choice of Pass/Fail/Grade option for Bachelor students so they can opt for the choice from their student page of the system.
- Based on the choice of Pass/Fail/Grade option chosen by the student the grading screen was modified to allow them to enter 'P' or 'F' or Grade.
- Payment of online application fees for new applicant
- Online exam card option for students
- Integration between Student Information System and Moodle for conducting online examination which checks for student courses, instructor and payment of fees from the system so only students belonging to that course and has paid fees will be allowed for the exam during the specific examination time.
- Integration between Student Information System and Teams which checks for student courses and instructor credentials so only students registered in the course only can enter into the online class.
- Updation to the Graduation module to allow the student to do all processes of graduation from home.

- **MS-Teams**, a collaborative tool to meet, chat, call, and share, is used in Ahlia University to conduct online classes. The time table and class lists from the Student Information System, which stores and tracks all student information, including grades, attendance records, and more., is linked to MS-Teams by the university's technical team using APIs to import the course section into MS-Teams which makes the faculty as administrator and students as members, giving a secured environment whereby no outsider is allowed to the teams. The classes are recorded for the students to review or recall the class. Furthermore, online advising, career development, and personalized counselling services to guide students on psychological issues are given to students on Teams.

- **MS-Teams and Zoom** have been utilized for online webinars and conferences with other industry specialists and other universities. Numerous online discussions were conducted with universities worldwide without travel, making the world shrink to a global village at the luxury of homes/offices. With 9 Webinars, 12 local conferences and 34 international debates and conferences (involving universities/industry specialists from Asia, UK, US and MiddleEast). As per the statistics, before virtual, international collaborations were only around 11/year which has almost tripled due to virtualization with reduction in laborious work, resources and expenses. Such online discussions contribute a lot to knowledge, reducing travel expenses, and facilitating knowledge exchange and academic contributions. These advantages have made the University to think of having future online conferences/forums.

- The course details and class list from Student Information System were linked with **Moodle** as it is open source, thereby creating mass enrollment and secured

authentication. The university uses Quizzes, chats, forums, workshops, upload course materials, assessments and surveys are used to help in collaborating with students with tracking and reminder options.

- **SharePoint**, a web-based cloud collaboration tool as detailed in the section below the case study used in document management and storage. It was implemented last year-end after parallel processing of online and hardcopy documents during the transition period of 6 months. It is used for maintaining and sharing up-to-date reliable information and to increase awareness to the students and faculty of the university's aims, plans, decisions, activities, events, rules, policies etc. building cohesion, harnessing collective knowledge and driving organizational efficiency by sharing common resources. It promotes liaison between the university internal units and external bodies.
- **MS-OneDrive**, personal cloud storage tool as detailed in the section below the case study, present on the web or mobile, links faculty and students to both their individual files and MS-Teams documents.
- **Student Information System**, was modified to accommodate the policy changes during COVID time to facilitate a lot of online operations and support to students like Pass/Fail grade option, linking with Ms-Teams, Moodle and Sharepoint. Also online application payment, course payments, exam card printing, exam schedule printing and class schedules. Based on the exam card conditions from the system Moodle was integrated to allow/disallow students from attending online exams (Fig. 2).

4. **Performance management, risk management and management controls (Execution Management)** – This includes such areas as the Balanced Scorecard, key performance indicators, CoBiT, and regulatory compliance areas.

   At Ahlia University, Risk Management and Mitigation plans were devised for all Directorates and Centres. Key Performance indicators were evaluated periodically during the COVID time. Cloud based disaster recovery plans were devised. The following KPIs were achieved (Fig. 3).

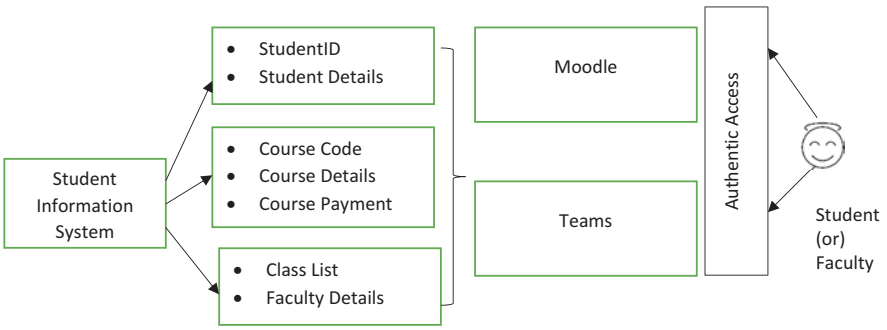


Fig. 2 Student information system integration with Moodle and MS-Teams

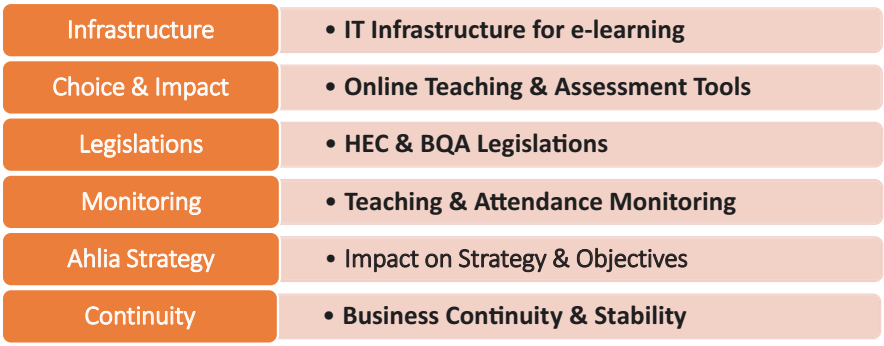


Fig. 3 Changes implemented for business continuity

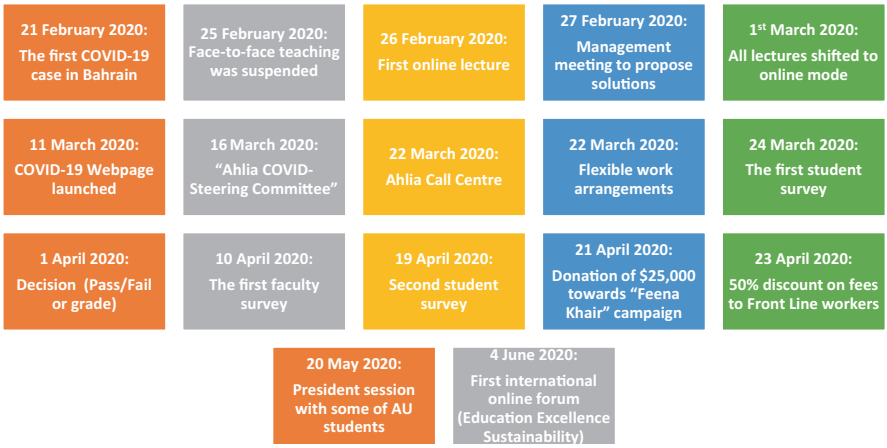


Fig. 4 Milestones achieved due to alignment of ITG and business objectives

The above figure illustrates the KPIs of building infrastructure for e-learning, online teaching and assessment tools, achieving legislations of HEC and BQA, teaching and attendance monitoring, impact on strategy and objectives and business continuity.

Below are some of the milestones achieved using the framework.

The Figs. 4 and 5 illustrates the milestones and business objectives that were achieved applying the IT strategy. 275 courses were successfully delivered online, 12,315 online class sessions were done, 93 online final exams, 24 online defenses, 10,700 MS Teams group call and around 4361 meetings. This made the university cater to business continuity and student satisfaction. Student satisfaction was achieved in the following ways as illustrated in the Fig. 6 by creating commitment, communication, support, readiness, experience, equality, health and finance.

Ahlia University also maintained and retained its stakeholders' satisfaction by ensuring the following.

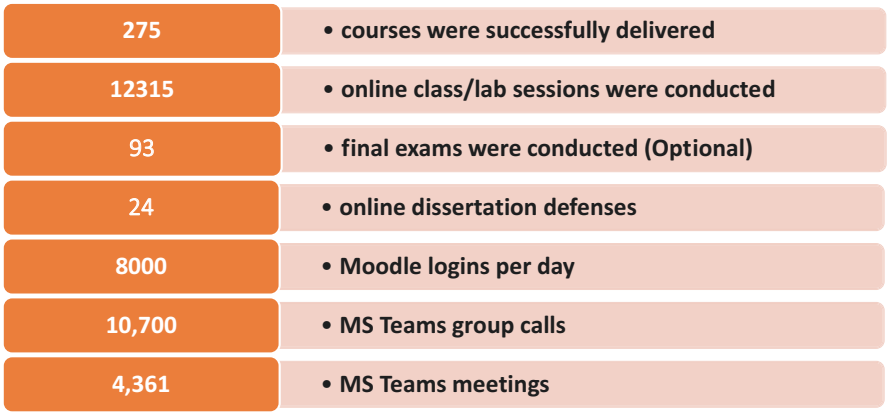


Fig. 5 Achieved business objectives

Fig. 6 Stakeholder satisfaction

5. **Vendor Management and Outsourcing Management (Execution Management)** – Since companies are increasing their outsourcing spending, selecting and managing the vendors and their deliverables has become critical.

   Ahlia University selected the following vendors and outsourced its operations to facilitate online teaching and learning.

   - Business Account Whatsapp – For students to contact and support
   - Office 365 – All Office applications to be freely downloadable in all gadgets for students and faculty for online teaching and learning
   - Teams-For online group calls to students in the course section
   - Moodle – For online course assessments and course materials
   - Zoom – For conferences
   - Facebook – For Business posts

Fig. 7 Tuning to online change and technology

The above Fig. 7 illustrates the various online technology and changes that were made to cope with the Covid situation like Teams, office 365, whatsapp business, zoom and making the website more interactive.

6. **People Development, Continuous Process Improvement and Learning** - It is critical to invest in people, knowledge management and sustain continuous process improvement and innovation initiatives. For each IT governance imperative, a description of the key components, select standards, guidelines and select references are identified.

   At Ahlia University the following steps were taken to invest in people and upgrade faculty and students to online teaching and learning

   - Continuous training of the educational body, to enhance the educational process, to ensure its continuity in the event of an emergency and to strengthen the learning process as a key pillar of education since its inception.
   - Short videos and manuals were prepared to help students, academic and administrative bodies on how to use techniques and e-learning platforms.
   - Online training and support were provided through a hotline, WhatsApp, E-mail, website, Social media, YouTube videos, and conducting virtual training courses.
   - The University provided all its members with a massive access to e-books, access to Office365 allowing use of free professional services of Microsoft.

Figure 8 illustrates a high level IT Governance framework and roadmap that identifies the major components (imperatives) of governance (e.g. strategic and

Areas of work	Description/Components	Ahlia University Actions
Business strategy, plan and objectives (Demand Management)	• Strategic Business Plan- Vision, objectives, financials, budgeting • Executive and other steering and review councils	• Created Steering Committee – to create business continuity plans, financial budgets, policies and procedures during COVID • Created Call Centre to support students and faculty • Established Centre for Learning – to do curriculum revisions and monitor teaching and learning • Established Centre for Information and Learning Systems – to integrate all Information Systems and Learning Systems.
IT strategy, plan and objectives (Demand Management)	• IT plan is aligned with Business Plan • IT capital/expense budget • IT performance management	• Business Policies created by Steering committee approved by Board of trustees and President in the University Council were implemented in the Information Systems and Learning Systems. • Some of the policies and procedures that were amended during COVID time are: o Choice of Pass/Fail/Grade option for Bachelor students o Conducting online examinations
IT plan execution (Execution Management)	• Program, project and operating plans and budgets • Business continuity	• Completed the infrastructure requirement for online education like internet speed, network upgrades and Microsoft open licenses for universities. • Sharepoint was used for document management online. • Ms-OneDrive was used for cloud storage to access documents wherever the faculty and staff were located(home) during Covid. • Completed the integration of all Information and Learning systems to give flawless secured learning environment from their homes. The Student Information system and learning systems were updated with the following features o Choice of Pass/Fail/Grade option for Bachelor students so they can opt for the choice from their student page of the system. o Based on the choice of Pass/Fail/Grade option chosen by the student the grading screen was modified to allow them to enter 'P' or 'F' or Grade. o Payment of online application fees for new applicant o Online exam card option for students o Integration between Student Information System and Moodle for conducting online examination which checks for student courses, instructor and payment of fees from the system so only students belonging to that course and has paid fees will be allowed for the exam during the specific examination time. o Integration between Student Information System and MS-Teams which checks for student courses and instructor credentials so only students registered in the course only can enter into the online class.

Fig. 8 Integrated IT Governance Framework adapted at Ahlia University Conclusion

		○ The course details and class list from Student Information System were linked with **Moodle** as it is open source, thereby creating mass enrollment and secured authentication ○ Updation to the Graduation module to allow the student to do all processes of graduation from home.
Performance management, risk management and management controls (Execution Management)	Manage and measure plans Define and track KPIs	○ Risk Management and Mitigation plans were devised for all Directorates and Centres. ○ Key Performance indicators were evaluated periodically during the COVID time. ○ Cloud based disaster recovery plans were devised. The following onjectives or KPIs were achieved ○ Courses were successfully delivered online ○ Online final exams were successfully conducted ○ Online dissertation defenses ○ MS Teams online meetings and conferences were conducted. ○ Moodle course assessments
Vendor Management and Outsourcing Management (Execution Management)	Outsourcing and vendor selection	○ Business Account Whatsapp – For students to contact and support ○ Office 365 – All Office applications to be freely downloadable in all gadgets for students and faculty for online teaching and learning ○ Teams-For online group calls to students in the course section ○ Moodle – For online course assessments and course materials ○ Zoom – For conferences ○ Facebook – For Business posts
People Development, Continuous Process Improvement and Learning	○ Human capital development ○ Knowledge Management ○ Managing Change and Transformation ○ Training and Certification	At Ahlia University the following steps were taken to invest in people and upgrade faculty and students to online teaching and learning • Continuous training of the educational body, to enhance the educational process, to ensure its continuity in the event of an emergency and to strengthen the learning process as a key pillar of education since its inception. • Short videos and manuals were prepared to help students, academic and administrative bodies on how to use techniques and e-learning platforms. • Online training and support were provided through a hotline, WhatsApp, E-mail, website, Social media, YouTube videos, and conducting virtual training courses. • The University provided all its members with a massive access to e-books, access to Office365 allowing use of free professional services of Microsoft.

Fig. 8 (continued)

tactical planning – business and IT); demand management (e.g. portfolio and investment selection and prioritization); execution management (e.g. program/project management, process management, resource management, service management); performance management, metrics and controls, vendor and outsourcing management, people development and continuous process improvements that must be addressed, resourced, steered, measured and, potentially changed in order for organizations to achieve improved alignment, satisfactory investment returns, and higher levels of customer satisfaction, performance accountability, compliance and maturity. For each IT governance imperative, a description of select key components is provided as well as the actions taken by Ahlia University. It is the intent of this chapter to provide an integrated framework and roadmap, to be used in conjunction with more detailed best practice frameworks in each area, as a guide for organizations to tailor and adopt the approach that will lead to continuous improvements and higher levels of effectiveness and maturity in their respective IT environments (Wang & Wu, 2021; Papadopoulos et al., 2020; Herath & Herath, 2020; Selig, 2015; De Haes & Van Grembergen, 2009; Debreceny & Gray, 2009; ISACA, 2012; Weill, 2004; Prasad et al., 2009).

During the current pandemic situations, organizations cannot afford any laxity. They must strengthen their existing IT governance frameworks or adopt new ones, if they have not already done so. These frameworks enable organizations to manage their IT risk effectively and ensure that their IT processes are well aligned with the overall business objectives.

Organizations should see this as an opportunity and a reason to convince their boards and senior management to align their IT governance framework with risk management and compliance frameworks, within the overall governance framework of the organization, before it is too late.

This paper investigated the use of IT governance in Ahlia University, Bahrain as a case study to see the effectiveness of ITG on HEI performance. This case study demonstrated how the HEIs can adapt to ITG during the time of crisis to prove business continuity and stability.

References

Bajgoric, N. (2014). Business continuity management: a systemic framework for implementation. *Kybernetes, 43*(2), 156–177.

Coen, M., & Kelly, U. (2007). Information management and governance in UK higher education institutions: bringing IT in from the cold. *Perspectives, 11*(1), 7–11.

Creasey, W. (2008). The influences of information technology organizational performance in higher education.

Debreceny, R., & Gray, G. L. (2009). January. IT governance and process maturity: A field study. In 2009 42nd Hawaii International Conference on System Sciences (pp. 1–10). IEEE.

De Haes, S., & Van Grembergen, W. (2009). An exploratory study into IT governance implementations and its impact on business/IT alignment. *Information Systems Management, 26*(2), 123–137.

Grama, J. L. (2015). Understanding IT GRC in Higher Education: IT Governance. EDUCAUSE Review.

Gartner. (2013). Gartner executive program survey of more than 2,000 CIOs shows digital technologies are top priorities in 2013. Retrieved June 19, 2013, from http://www.gartner.com/newsroom/id/2304615.

Herath, T., & Herath, H. S. (2020). Coping with the new normal imposed by the COVID-19 pandemic: Lessons for technology management and governance. *Information Systems Management, 37*(4), 277–283.

Hicks, M., Pervan, G., & Perrin, B. (2012). *A study of the review and improvement of IT governance in Australian universities*, International Conference on Information Resources Management (CONFIRM).

Information Systems Audit and Control Association. (2012). COBIT®5 – Enabling processes,

Khouja, M., Rodriguez, I. B., Halima, Y. B., & Moalla, S. (2018). IT governance in higher education institutions: A systematic literature review. *International Journal of Human Capital and Information Technology Professionals (IJHCITP), 9*(2), .52–67.

Lunardi, G. L., Becker, J. L., Maçada, A. C. G., & Dolci, P. C. (2014). The impact of adopting IT governance on financial performance: An empirical analysis among Brazilian firms. *International Journal of Accounting Information Systems, 15*(1), 66–81.

Papadopoulos, T., Baltas, K. N., & Balta, M. E. (2020). The use of digital technologies by small and medium enterprises during COVID-19: Implications for theory and practice. *International Journal of Information Management, 55*, 102192.

Prasad, A., Heales, J., & Green, P. (2009). Towards a deeper understanding of information technology governance Effectiveness: A capabilities-based approach. *International Conference on Information Systems (ICIS)*, 1–19.

Selig, G. J. (2015). *Implementing effective IT governance & IT management* (2nd ed.). Van Haren Publishers.

Tsai, W. H., Chou, Y. W., Leu, J. D., Chen, D. C., & Tsaur, T. S. (2015). Investigation of the mediating effects of IT governancevalue delivery on service quality and ERP performance. *Enterprise Information Systems, 9*(2), 139–160.

Wang, W. T., & Wu, S. Y. (2021). Knowledge management based on information technology in response to COVID-19 crisis. *Knowledge Management Research & Practice, 19*(4), 468–474.

Weill, P. (2004). Don't Just Lead, Govern: How Top-Performing Firms Govern IT. *MIS Quarterly Executive, 3*(1), 1–17.

Weill, P., & Ross, J. W. (2004). IT governance: How top performers manage IT decision rights for superior results. Harvard Business Press.

Weill, P. (2004). Don't Just Lead, Govern: How Top-Performing Firms Govern IT. *MIS Quarterly Executive, 3*(1), 1–17.

Subhashini Bhaskaran Sailesh is working as Assistant Professor at Ahlia University. She received her PhD from Brunel University in 2017. During her PhD journey and after she has published a lot of articles, book chapters and conference proceedings in the field of Data Mining, Data Science, Business Intelligence, Knowledge Management and Information Systems. She has published articles in Educational domain on using Data Mining for Decision making. She has taught courses in Management Information systems Department and in IT college. She is a member of IEEE and has published some articles in IEEE. Her professional career outside of academia includes Information Systems, DBMS and she has been in charge of Information systems of Ahlia from 2007.

Index

M. Alaali (ed.), *COVID-19 Challenges to University Information Technology Governance*, https://doi.org/10.1007/978-3-031-13351-0