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READINESS TO ADOPT THE PUBLIC E-PROCUREMENT SYSTEM IN BAHRAIN: A CASE STUDY OF THE ROADS SECTOR

Master Student:

Yusuf Ali Mohammed AlHasan

Academic Affiliation :

Aix Marseille University

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READINESS TO ADOPT PUBLIC E-PROCUREMENT SYSTEM IN BAHRAIN: A CASE STUDY OF THE ROADS SECTOR

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By: ALHASAN, Yusuf

Supervisor: Dr. Mazen ALI
Director, Associate Professor of Information Systems, College of Information Technology, University of Bahrain

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Summary

This study has been organized into seven chapters, as follows:

- Chapter 1: The chapter presents the background of the study, the problem statement, the significance of the study and its contribution to academia and industry, together with the main research question and sub-questions that guide the study.
- Chapter 2: The second chapter covers the relevant literature as well as recent studies about e-procurement. In addition, it describes the benefits and barriers to e-procurement, theories and models relevant to e-procurement adoption.
- Chapter 3: This chapter describes in detail the conceptual model of the study, and highlights the chosen constructs and factors to answer the study's main research question and sub-questions.
- Chapter 4: This chapter lays out the design of the research methodology. It also discusses the research methods and the rationale behind choosing said methods, the data collection instruments, and finally discusses the methods of analysis used in the study.
- Chapter 5: This chapter discusses the study findings, both qualitative and quantitative data after conducting the data analysis.
- Chapter 6: This chapter presents the research findings based on the results of the data analysis, and interprets the findings to answer the main research question and sub-questions.
- Chapter 7: This chapter concludes the study by summarising the findings, and highlights the research limitations. This chapter also highlights further research that can be done in relation to this study, while also discussing the implications of this study.

READINESS TO ADOPT PUBLIC E-PROCUREMENT SYSTEM IN BAHRAIN: A CASE STUDY OF THE ROADS SECTOR

Chapter 1: Introduction

1.1 Background

Procurement is a strategic framework that streamlines complex activities to ensure an organisation's acquisition of goods or services (Thai, 2001). With the movement towards digital transformation and the usage of smart technological tools, e-tendering and e-procurement were developed and adopted by many governmental institutions to automate parts of the procurement process (Kajewski and Weippert, 2004). E-procurement has the potential of providing several benefits for public and private entities; through savings in procurement costs up to 15% (Kajewski and Weippert, 2004), reducing the procurement cycle time (Subramaniam and Shaw 2004), lowering inventory levels (Subramaniam, and Shaw, 2004), reducing the administrative costs of procurement (Subramaniam, and Shaw, 2004), and more. However, e-procurement processes require integrating an organisation's complex functional processes and purchase management systems (Shukla, Khan, and Shah, 2016).

The Bahrain Tender Board (BTB), established in 2002 by legislative decree no. 36, is an independent entity that regulates public procurement practices in the Kingdom of Bahrain (Bahrain Tender Board, 2020). Through a stringent regulatory framework designed to assure fairness and equal opportunities, the BTB promotes effective and efficient government procurement practices and procedures. The BTB strives to ensure equality, transparency and competitiveness in its procurement practices by collaborating with governmental purchasing authorities, local and international construction companies and suppliers. The BTB introduced an e-tendering service in 2008, allowing bidders to view all public tenders on a website. Bidders can purchase and download the tender documents online while filling out the documents, evaluating the tenders, and managing the contracts manually (Bahrain Tender Board, 2020).

Nevertheless, BTB is developing its services to a more comprehensive one that allows full automation of the procurement process, which should enhance the public administrative

procedures and enhance the government's efficiency in public tendering (Al-Watan Press and Publishing, 2020). This initiative aligns with Bahrain's Economic Vision for the year 2030 and its main pillars of sustainability, fairness and competitiveness. E-procurement should align with the aspirations no. 2.2 "*The public sector becomes more productive and is accountable for delivering better quality services via leaner organisations and operations*", aspiration no. 2.3 "*A predictable, transparent and fairly enforced regulatory system facilitates economic growth*", and lastly, no. 2.5 "*A world-class infrastructure links Bahrain to the global economy*" (Government of Bahrain, 2020).

1.2 Problem Statement

Although previous studies have examined the readiness to adopt e-procurement in the manufacturing sector (Li, 2008), and the imports sector (Scupola, 2003), a limited number of studies have investigated the adoption of e-procurement in the construction sector, which is more complex and managed by numerous regulations, across several entities. In addition, most studies in the literature were based on European (Scupola, 2003; Zhu, Dong, Xu, and Kraemer, 2006; Ramdani, Kawalek, and Lorenzo, 2009), East Asian (Hung, Yang, Yang, and Chung, 2011; Chandra and Kumar, 2018), or Southeast Asian contexts (Limthongchai and Speece, 2003; Tan, Chong, Lin, and Eze, 2009; Huy, Rowe, Truex, and Huynh, 2012). There is a lack of studies investigating the adoption of e-procurement in the construction sector of Gulf Cooperation Council countries, particularly in the Kingdom of Bahrain.

Evidently, the new technological tools and smart systems available to date can provide numerous benefits (Harink, 1999), which posits that the e-tendering system used in Bahrain is considered obsolete. The national e-procurement system would introduce automation of the procurement process, which can increase organisations' efficiency (Adjei-Bamfo, Domfeh, Bawole, Ahenkan, Maloreh-Nyamekye, Adjei-Bamfo, and Darkwah, 2020), create savings in administrative costs (Shukla, Khan and Shah, 2016), reduce the procurement cycle time (Subramaniam and Shaw, 2004), improve the communication process (Matsinhe and Kabanda, 2019), and increase the transparency of information (Chan, 2002). The Kingdom of Bahrain would greatly benefit from the technological transformation that e-procurement can provide (Al-Watan Press and Publishing, 2020).

The Bahraini Roads Sector has been chosen because there is a lack of studies investigating this sector and limited empirical studies investigating the adoption of e-procurement by one of the largest procuring entities in the country. The study's main objective is to develop a rich understanding of the business-to-business e-procurement technology adoption through a mixed-methods study that adopts a multi-model perspective to address the identified knowledge gaps. The study has employed Technology Organisation Environment (TOE) as an overarching framework, while Diffusion of Innovation (DOI) and Perceived eReadiness Model (PERM) to serve as the lens to answer the study's main question and sub-questions.

The Roads Sector, which is one of the largest procuring sectors in Bahrain (Bahrain Tender Board, 2019), was used as a single case study with two embedded units of design, which follows Yin (2017)'s approach in analysing case studies. The Ministry of Works, Municipalities Affairs and Urban Planning (MOWMAUP) as the first unit, and the road construction companies as the second unit. Both the ministry and the road construction companies are integral stakeholders of the procurement process, and the BTB would mandate them to implement the system once it is established. Therefore, Bahrain provides a unique context to investigate the extent to which the Roads Sector in Bahrain is ready to adopt the e-procurement system. Besides, the benefits of e-procurement adoption in the public sector, where a large portion of the GDP is spent, will only be gained if the concerned entities' readiness is addressed.

1.3 Significance of the Study

Although previous studies have examined the readiness to adopt e-procurement, very little is currently known about the adoption of e-procurement in the construction sector, especially since no study addressed the readiness of public e-procurement in the Roads Sector of Bahrain. The study's contribution is outlined as follows:

- Contribution to Research: While there are studies investigating e-procurement adoption in developed countries, this is amongst the first studies that investigate the readiness to adopt e-procurement for a public entity in the context of Arab countries in general, and in Bahrain specifically. The in-depth analysis of the Roads Sector's case study is unique in that the relationships between the BTB, the MOWMAUP and the road construction companies are assessed.

This study may be relevant to the extension of existing theories as there is still a gap in adopting technology innovations in a construction sector, because technology adoption mechanisms in the construction industry and the factors that influence them are not well known (Sepasgozar and Davis, 2018). The study should bridge the gap between identifying a comprehensive research model for those who intend on conducting research in a similar topic, therefore, adding to their existing stock of knowledge in the field of e-procurement adoption.

- Contribution to Industry: The study should raise the awareness of government public entities towards adopting e-procurement. Seeing the vitality of enhancing the e-tendering system, the Bahraini public administration took the initiative to develop the current system. Since there are limited empirical studies in the literature on the readiness of implementing e-procurement for the Roads Sector in Bahrain, the study can assist stakeholders in the Roads Sector to develop intervention strategies to overcome the obstacles of effective e-procurement implementation.

  As a result, the advantages of e-procurement can start to evolve in Bahrain, potentially increasing competitiveness and ensuring that more public projects are completed on schedule and within budget. This study may help the government of Bahrain in developing and refining the procurement policies, strategies, and procedures to adopt the e-procurement system at a national level, in all sectors of the economy.

  The study should also highlight what might get in the way of successful public administrative engagement of all relevant entities in the delivery chain since its performance is only as good as its weakest link. The study outcomes should also aid all executives in the procurement domain to plan for the implementation of the new system intelligently. Understanding the BTB's governing framework and the readiness of the MOWMAUP and the road construction companies can alert the public administration to devote more preparation, attention, and resources to potential areas of difficulties in order to better strategize the implementation of e-procurement in Bahrain.

1.4 Study Questions

This research addresses the following main research question:

What are the factors that influence the adoption of e-procurement in the entities of the Bahrain Roads Sector?

In addition, the study includes the following two sub-questions:

- How do the technical, organisational and environmental factors affect the entities of the Bahrain Roads Sector's readiness to adopt e-procurement?
- What is the relationship between the size of the road construction companies and their readiness to adopt e-procurement?

1.5 Study Structure

This study consists of seven chapters, the following chapter presents the literature review of the study subject and describes the benefits and berries of e-procurement, the Roads Sector in Bahrain, then the chapter goes on to explore the available theories and models that measure e-procurement adoption. This is followed by the conceptual model chapter that describes the used constructs and factors to create a conceptual model that answers the research questions. Then comes the methodology chapter, which lays out the design of the research used, and identifies the research methods chosen and the reasons the methods were chosen, in addition to the data collection instruments and methods of analysis. Also, the findings chapter captures the study findings for both qualitative and quantitative data findings. Then, the subsequent chapter presents the discussion stemming from the data analysis to answer the study questions. The conclusion chapter offers an overall conclusion, limitations and further research.

Chapter 2: Literature Review

2.1 Introduction

This chapter presents a literature review concerning the study topic. A sufficient literature review enables the development of quality insights related to the study topic and identifies existing research gaps in previous studies (Snyder, 2019). Identifying research gaps is essential in the study since it enables researching and obtaining a new set of knowledge related to the present study.

The literature review explores the available theories and models that measure e-procurement adoption. Moreover, it identifies the relevant factors, the relationship between the factors and the readiness to adopt e-procurement in developing countries. Lastly, it generates synthesis to create a conceptual model that addresses the scope of the study. This study's scholarly sources were drawn from various databases such as google scholar, Emerald, ResearchGate and ScienceDirect.

2.2 Procurement

Procurement encompasses all operations related to acquiring products, services, and works (Novack and Simco, 1991); it can range from buying minor assets such as office furniture to contracting a multi-million project. The procurement procedures are complicated and are more than just the execution of a single process, but rather the efficient completion of a set of processes that span across the organisation's boundaries (Novack and Simco, 1991).

Accordingly, Shukla, Khan, and Shah (2016) state that although the terms procurement and purchasing are often used interchangeably, the two terms have district implications and scope. Fung (1999) maintains that the overall objective of purchases made by an organisation is to ensure it buys quality materials at competitive prices, in bulk quantities, at the required time, and from reliable sources. Chan (2002) states that procurement is more than just purchasing goods and services to many people's understanding. For example, in an organisation, procurement incorporates all activities involved in obtaining material and services and managing their inflow into an organisation toward the end-user (Gebauer and Segev 1998). Procurement includes "*the business management function that ensures the identification, sourcing, access and management of the external resources that an organisation needs or may need to fulfil its*

strategic objectives" (Kidd, 2013, para. 2). Fairness, competitiveness, efficiency and transparency are some of the procurement values (Gebauer and Segev 1998). Procurement may also be defined as "*the process of managing external resources in order to make sure that the supply of all goods, services, capabilities and knowledge which are necessary for running and maintaining the company's primary and support activities are safeguarded*" (Weele, 2010, p. 147). As a result, protocols, regulations and laws must be practised, as they should apply to the procurement of all goods and services (Weele, 2010).

2.3 Public Procurement

The term public procurement can be defined as the

> *"Overall process of acquiring goods, civil works and services, which includes all functions from the identification of needs, selection and solicitation of sources, preparation and award of contract, and all phases of contract administration through the end of a services' contract or the useful life of an asset*." (UNDP, 2010, p. 5).

Harink (1999) stressed that public procurement encompasses more than just procurement procedures. Its design must contain components such as the organisation's strategy and policy, processes and protocols, personnel, and information. It is an effective instrument for increasing government efficiency, reducing public expenditure, and fostering economies (Thai, 2009). During the last decade, the field of public management has grown exponentially, creating the discipline of new public management (Pollitt and Bouckaert, 1999), which focuses on how a public sector can increase its efficiency. As a result of its widespread influence in global and local economies, public procurement is becoming a topic that is evolving theoretically and in practice (Thai and Piga, 2007).

A study found that governments utilise public procurement as a domain to introduce economic, technological or social reforms (Vaidya, Sajeev and Callender, 2006). According to Burton (2005) and Thai (2001), public procurement is the government's primary tool and vital element for properly managing public resources. During times of crisis, public procurement has been seen as an internal driver for economic growth and employment (Murray, 2009), as well as a means of achieving strategic goals, including sustainable economic growth and social justice (McCrudden, 2007).

2.4 The Electronic Procurement (E-Procurement) Paradigm Shift

The use of ICT, such as web-based systems, by governmental entities in undertaking procurement-related duties, such as acquiring products and services, and the assignment of work to bidders, is referred to as public e-procurement (Davila, Gupta and Palmer, 2003). Public e-procurement, according to Vaidya (2007), is an Internet-based interorganisational system that combines and automates several aspects of procurement operations. The internet provides comprehensive information about bidding at a single web portal that all the potential registered bidders can access. Governments all around the globe have made it a priority to reduce corruption and ensure competition in government procurement (Henriksen and Andersen, 2003). In recent years, Asia and the Pacific countries have embraced ICT technologies to improve government services and economic activities (Wescott, 2001).

The Invention and subsequent adoption of new technologies and ideas have continued to increase the productivity of public organisations. The increase in public activities translates to high economic growth across different nations worldwide (Shukla, Khan and Shah, 2016). Notably, the recent technological advancements in information and communication technologies (ICT) have occasioned a paradigm shift in public processes (Shukla, Khan and Shah, 2016). Electronic procurement (e-procurement) is an effective technological solution developed over time to facilitate corporate buying through tendering. The simulation of e-procurement relates to the electronic sale and purchase of goods and services. Therefore, procurement supports a delivery relationship between buyers and sellers (Subramaniam and Shaw 2004; Saeed, Malhotra and Grover, 2005). E-procurement was defined as

> *"The electronic acquisition of goods and services including all processes from the identification of a need to purchase of products, to the payment for these purchases, including post-contract and payment activities such as contract management, supplier management."* (Shukla, Khan, and Shah, 2016, p. 2).

Conventionally, procurement procedures involved the activity of numerous parties, which were conducted by mail, phone, fax, electronic data exchange, and, more recently, the internet (Shukla, Khan, and Shah, 2016). The use of emerging technological advances to expedite and facilitate an organisation's procurement processes has evolved into the domain of e-procurement (Shukla, Khan, and Shah, 2016). From the aforementioned definition of Shukla, Khan, and Shah, 2016, it is evident that e-procurement leverages technology to ensure smooth procurement processes.

2.5 Public E-Procurement Benefits and Barriers

One of the most important competitive goals for supply chain management in the 21st century is to embrace e-procurement initiatives, which includes developing internet-based information and communication technologies. To modernise traditional procurement in order to consistently identify ways to save costs, boost productivity, and shorten the processing time amongst supply chain stakeholders (Tebeka and Yessuf, 2019).

According to Tindsley and Stephenson (2008), E-procurement systems can resolve the issues associated with traditional procurement methods. E-procurement technologies improve traditional procurement procedures to provide organisations and potential bidders with a coherent approach. Previous studies confirmed that e-procurement platforms optimise supply chain productivity while allowing stakeholders to carefully oversee the procurement process (Oyediran and Akintola, 2011). Furthermore, their research revealed the cost-cutting benefits of dealing with fewer paper-based transactions and increased flexibility. Interestingly, e-procurement systems would boost the competition in the private sector and generate significant opportunities (Kajewski and Weippert, 2004).

Previous studies show that e-procurement adoption would affect both the public and private entities, in which the tenderers and the owner should both be ready for this digital transformation. The growth in small and medium-sized enterprises (SMEs) has provided job

opportunities, especially for the younger population (Huy, Rowe, Truex and Huynh, 2012). As such, many developing countries are devoting their resources to support the growth of SMEs. The e-commerce platform is one of the mechanisms supporting SMEs' growth and the creation of job opportunities. The development of e-procurement provides a salient approach through which business organisations can overcome traditional barriers that limit the professional growth of enterprises. Hence, e-procurement platforms reduce transaction costs, increase efficiency, profitability, and gain access to new markets.

2.5.1 Benefits in E-Procurement Implementation

E-procurement is an emerging field. Most governments have implemented it for tendering and online registration of businesses and companies within their countries, especially in developing countries such as Bahrain. It is important to note that by using e-procurement, suppliers could easily take part in the government proffering procedures through subscribing to the e-procurement system (Molla and Licker, 2005). The entire system eradicates the traditional procurement measures and offers reliable upshots in a multifaceted milieu like government launches (Mahdy, 2018). Supportively, it, therefore, benefits the businesses in simplifying regulatory processes as well as law-complaint. In addition, there are high chances of improving the overall marketing amongst the suppliers through e-procurement (Jaafar, Aziz, Ramayah and Saad, 2007). Additionally, e-procurement increases the number of marketing strategies, as most suppliers can use multiple forms of advertisements (Matsinhe and Kabanda, 2019). An important example, in this case, is the use of green advertisement, whereby most suppliers have adopted the use of online platforms to market their activities and products (Mahdy, 2018). E-procurement is more beneficial in its endeavours as it increases efficiency amongst suppliers (Adjei-Bamfo, Domfeh, Bawole, Ahenkan, Maloreh-Nyamekye, Adjei-Bamfo, and Darkwah, 2020). For instance, through e-procurement platforms, the overall qualities of communication and transactions are improved. Suppliers communicate effectively with their respective contractors as well as when participating in the government tenders.

The advantages of procurement contributed significantly to savings many companies' bottom line costs; hence, procurement is a practical strategic management tactic in most companies (Shukla, Khan and Shah, 2016). According to Shukla, Khan and Shah (2016) and El Ghazaly (2005), companies that engage in e-procurement have the potential of cutting their

procurement costs by a margin of 8 to 15%. Thus, e-procurement practices remain driven by automation of procurement processes by integrating an organisation's functional processes and purchase management (Shukla, Khan, and Shah, 2016). The rise in growth and expansion of web-based e-procurement is expected to have significant implications. For instance, e-procurement will reduce the order fulfilment cycle time (Subramaniam and Shaw, 2004), lower the inventory levels (Subramaniam and Shaw, 2004), reduce the administrative cost of procurement (Subramaniam and Shaw, 2004), and enhance the order fulfilment and performance of suppliers (Subramaniam and Shaw, 2004).

Besides, through a clearly defined implementation of comprehensive and integrated e-procurement solutions, it will enhance public procurement systems' efficiency and transparency (Shukla, Khan, and Shah, 2016). As the world transitions to a more technological business environment, business organisations also focus on aligning their activities to focus on using technology to reap the maximum benefit (Ramkumar, Schoenherr, Wagner and Jenamani, 2019; Shukla, Khan, and Shah, 2016). The internet has continuously opened up avenues beyond geographical boundaries. For instance, with the rise in e-procurement, business organisations can remain connected with their suppliers from around the globe (Shukla, Khan, and Shah, 2016). Organisations have realised several benefits related to using technology and implementing e-procurement in their tendering processes. For example, businesses have realised a paradigm shift in terms of dearth of suppliers, cost competitiveness, and better quality due to enhanced competition and leveraging the advantages that accompany new technologies (Shukla, Khan, and Shah, 2016; Ramkumar, Schoenherr, Wagner, and Jenamani, 2019).

By converting the traditional procurement framework into an internet-based system, e-procurement provides a strict and transparent framework for public entities to electronically acquire products and services from their vendors (Bienhaus and Haddud, 2018). Therefore, according to this benefit, it is clear that the suppliers, in turn, profit by presenting their services on the internet, which is accessible worldwide. Using the e-procurement system, suppliers could receive, manage, and participate in government tenders, as well as receive payment from government agencies online (Wimalasena and Gunatilake, 2018). Most of the e-procurement systems have an online payment method that increases the profits to the suppliers. Therefore, despite the mere advantages of e-procurement, its associates, like online modes of payment, benefit the suppliers (Matsinhe and Kabanda, 2019). For instance, through e-procurement,

suppliers can transact despite the challenges juxtaposed by the COVID-19 pandemic. Suppliers who implemented e-procurement within their endeavours had tremendous benefits (Adjei-Bamfo, Domfeh, Bawole, Ahenkan, Maloreh-Nyamekye, Adjei-Bamfo, and Darkwah, 2020). Additionally, with the automation of the e-procurement cycle, suppliers benefit suggestively from the opportunity to reach a comprehensive base of purchasers (Saleh and Alshawi, 2005). This is ever before united with subordinate operating costs, little improvement time, additional revenue, and augmented customer gratification.

Another crucial benefit for e-procurement is the increment of the realised profits amongst the suppliers. When dealing with online-based platforms, suppliers experience many profits since there are fewer risks in capital losses (Adjei-Bamfo, Domfeh, Bawole, Ahenkan, Maloreh-Nyamekye, Adjei-Bamfo, and Darkwah, 2020). Every transaction is electronically recorded, reducing instances of lost transaction tracks (Bienhaus and Haddud, 2018). For instance, when using traditional procurement approaches, the overall time wastage in delivering services is reduced. It is important to note that the e-procurement system makes better use of time since more transactions can be made simultaneously, unlike in the traditional procurement system. Additionally, when bidding tenders, it alludes that practising e-procurement offers quality bidding, efficient timeliness, finally increases competition in the market, amongst other benefits (Tan, Tyler, and Manica, 2007).

Kalakota and Robinson (2001) posit that the adoption of e-procurement is likely to increase efficiency and effectiveness. In perspective, advantages from efficiency are substantial, including lower procurement costs, shorter cycle times, reduced unauthorised purchasing, greater information management, and closer integration of the procurement platform with critical back-end systems (Chan, 2002). Besides, Chan (2002) maintains that accrue benefits from enhanced effectiveness include better control over the supply chain, rigorous monitoring of procurement data, and improved purchasing decisions of an organisation (Chan, 2002). In addition, because of the enhanced transparency of information resulting from electronic tendering, public sectors are one of the best contexts for implementing e-procurement for acquiring goods and services.

2.5.2 Barriers to E-Procurement Implementation

Despite the increase in the advantages that accrue due to the adoption of e-procurement, organisations face significant challenges that somehow limit their use of information technology

in procurement or tendering (Shukla, Khan, and Shah, 2016). For example, conservativeness is seen through the unwillingness of organisations and individuals to change. The inflexibility to adapt to new technological development changes reduces their ability to explore the numerous positive impacts of technology in procurement processes (Feizollahi, Shirmohammadi, Kahreh and Kaherh, 2014). The second limitation concerns the security of the portal in dispensing procurement processes. The use of technology is prone to hacking and other related cyber-crime activities. The potential of organisations facing hacking problems informs some organisations and individuals' rigidness to reject aligning or transforming their activities using e-procurement techniques in their tendering processes (Feizollahi, Shirmohammadi, Kahreh, and Kaherh, 2014). Thirdly, businesses experience challenges with acquiring the digital signature certificate for transacting online. Hence, business organisations need to ensure they follow the necessary legal procedures to align their tendering models to use technology.

External factors in the organisational industry, marketplace, government, and technology alteration are beyond the control of the suppliers (Saleh and Alshawi, 2005). However, most of these barriers can be curtailed as well as wholly alleviated. Technology barrier to the suppliers comprises consideration and commitment to an expert software and the inauguration fee beyond the aptitudes of the companies obligatory by the salespersons (Yevu and Yu, 2019). The emphasis of backing for the systems is more on the bigger companies. The system's expediency and safety issues are significant apprehensions for probable adoptive parents (Tan, Tyler, and Manica, 2007). Besides, the widespread use of e-procurement systems is contingent on the obtainability of subsidiary substructures, such as sufficient wideband exposure. The entire e-procurement system needs an IT expert to maintain it since it is IT-based.

In addition, inadequacies in government policies and legislation are the extents to be emphasised in adopting a technological system. The typical practice for the governmental tendering procedure that decrees printed tender pamphlets in offices by absorbed parties is an exciting example (Gökalp, Şener and Eren, 2017). Significantly, this forbids the use of the e-tendering system and presents an enormous hindrance to the government in launching an electronic government system (Nandankar and Sachan, 2020). Additionally, the lack of ordinary in advance of e-procurement system marks in operators of one system cannot communicate automatically with users of other systems, generating a diverse but disjointed e-procurement environment (Tan, Tyler, and Manica, 2007). This calls for a homogenous implementation of the

e-procurement platform, which should imbed the requirements of all public entities. Additionally, based on this challenge, it is clear that top management support and cohesive coordination to implement and maintain the e-procurement systems is a challenge to overcome (Yevu and Yu, 2019).

2.6 Case Description: Bahrain Roads Sector

This section and its subsections describe the Roads Sector in Bahrain, including the main stakeholders, the governing framework, the procurement procedure and the proposed development of the e-procurement system.

2.6.1 Roads Infrastructure Construction and Maintenance

Roads play a critical role in the economic development and growth of the Kingdom and provide significant social benefits. The roads infrastructure is critical to a country's growth and development (Ivanova and Masarova, 2013). The Roads Sector in Bahrain encompasses the infrastructure and construction of streets, roads and bridges that connect the Kingdom's cities. It provides accessibility and growth of the Kingdom. Furthermore, the road network is critical in providing access to employment, social, health, and education services (Ivanova and Masarova, 2013). Roads connect more people and places, promoting economic and social growth. As a result, it is argued that the roads infrastructure is one of the most valuable assets of a country (Ivanova and Masarova, 2013).

The Roads Sector is developed and maintained by the MOWMAUP. The ministry is responsible for the Kingdom's road network, in compliance with the objectives outlined in the National Strategic Master Plan for Bahrain (Ministry of Works, Municipalities Affairs and Urban Planning, 2021). The ministry is Bahrain's infrastructure developer, which handles infrastructure development, strategic planning, project design, construction and maintenance of the public road network (Ministry of Works, Municipalities Affairs and Urban Planning, 2021). It also seeks to improve the quality of life for all road users by creating and sustaining a secure, reliable, efficient and appropriate road network (Ministry of Works, Municipalities Affairs and Urban Planning, 2021).

The procurement of roads projects is sought by the MOWMAUP from experienced road construction companies, and financed by the Ministry of Finance and National Economy

(MOFNE), under the laws and regulations of the BTB. According to BTB's 2019 annual report, the infrastructure sector had the highest number of tenders awarded and the highest value across all eight main sectors of the government, with a total value of €1,097,441,689 (Bahrain Tender Board, 2019).

2.6.2 BTB's Tendering System

The BTB of the Kingdom of Bahrain was established by legislative decree no. 36 in the year 2002, is an independent body to bring transparency and eradicate corruption in government procurement (Bahrain Tender Board, 2020). BTB regulates the purchasing operations of all government goods, constructions and services for all Ministries, Consultative Council, House of Representatives, government organisations, government authorities, public institutions and all companies wholly owned by the government (Bahrain Tender Board, 2021). The main objectives of the BTB include promoting efficient and effective ethical governmental procurement practices systems and using strict regulatory mechanisms that promote fairness and equal opportunities (Bahrain Tender Board, 2002).

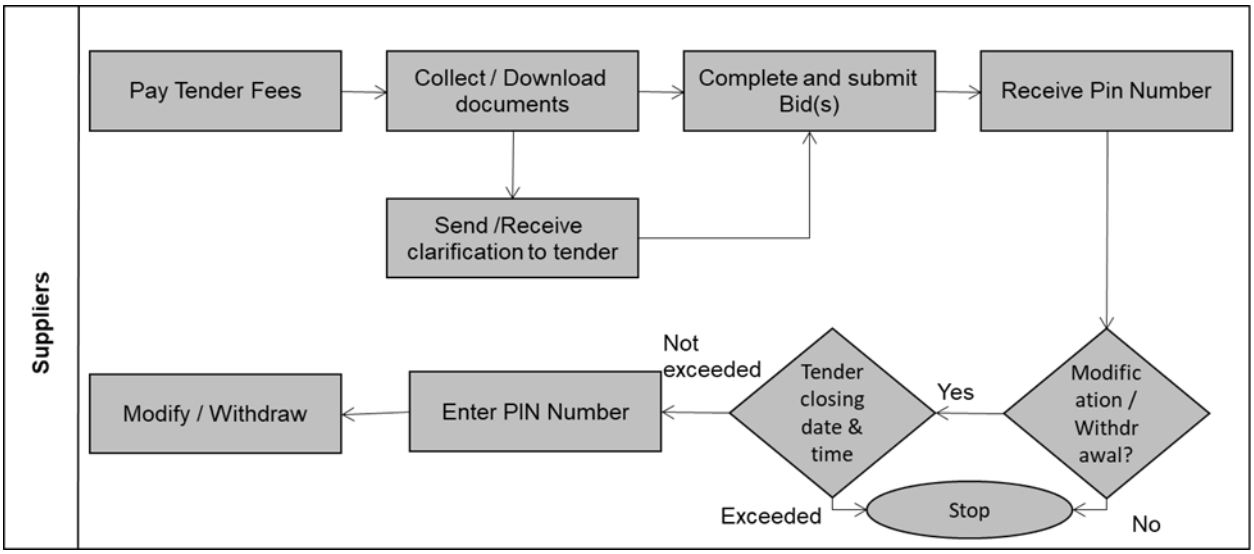
Moreover, the BTB aims to ensure proficient collaboration with public entities, private contractors and suppliers to induce transparency, equality and healthy competition in all governmental purchasing practices. Such strict mechanisms provide the opportunity to achieve the Bahraini Government Action Plan 2019-2022, such as "*Securing an Environment Supportive of Sustainable Development*" (Government of Bahrain, 2019). Additionally, the enhancement of government procurement practices maximises the use of public funds. It supports economic sustainability that is in line with the objectives of the Fiscal Balance Program (Government of Bahrain, 2018); by inviting a large number of companies to bid for a project, it likely results in a lower cost due to the high level of competition. Moreover, this aids in ensuring efficient use of value for money in addition to strengthening the foundation for a regulated environment to facilitate the private sector growth and develop an open market to do business, which attracts international investments in the Kingdom.

With the worldwide advancement of technologies and smart systems, BTB introduced several initiatives in 2008. E-tendering was one of them, and it is the centralised e-tendering system for the Kingdom of Bahrain (Legislation and Legal Opinion Commission, 2010). It is mandated on all authorised government entities under the tendering law (Bahrain Tender Board,

2020). E-tendering was upgraded to provide more automation of the procurement processes for all auctions and tenders in 2020 (Bahrain Tender Board, 2020). The upgraded e-tendering is a web-based system hosted at the Amazon Web Services; hence, it is accessible by all authorised government entities to prepare their tenders and publish them using the system (Bahrain Tender Board, 2020). The potential bidders, including construction companies or suppliers, also view the tenders and purchase tender documents online as shown in Figure 1. The e-tendering system has been the official central platform to announce all public tenders in the Kingdom of Bahrain.

Figure 1

E-Tendering Workflow of Purchasing Tender Documents



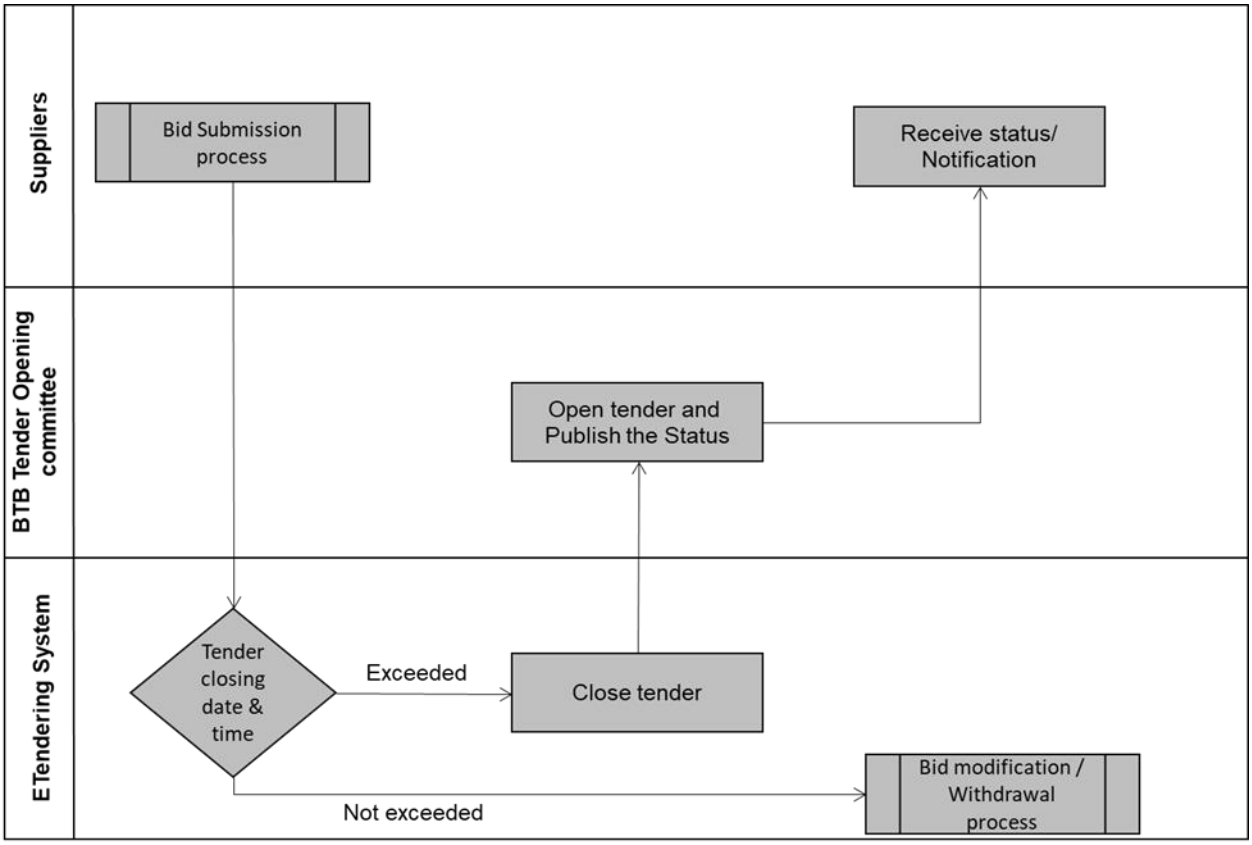
Note. Extracted from the BTB's e-tendering system website (Bahrain Tender Board, 2020).

As shown in Figure 1, the suppliers; also referred to as bidders, participate in bidding for the tenders, can register to purchase tender documents and access all the latest information of tenders online. However, filling out the documents is still carried out in the traditional manner; bidders will require to print the tender documents, attach the required documents, write the prices of their bids, scan and upload them on the e-tendering system.

Once all the bids are submitted and the tender period has elapsed, the BTB opens the bids and transfers all the bids in PDF format to the MOWMAUP through the e-tendering system for evaluation as shown in Figure 2.

Figure 2

E-Tendering Workflow of Opening Bids

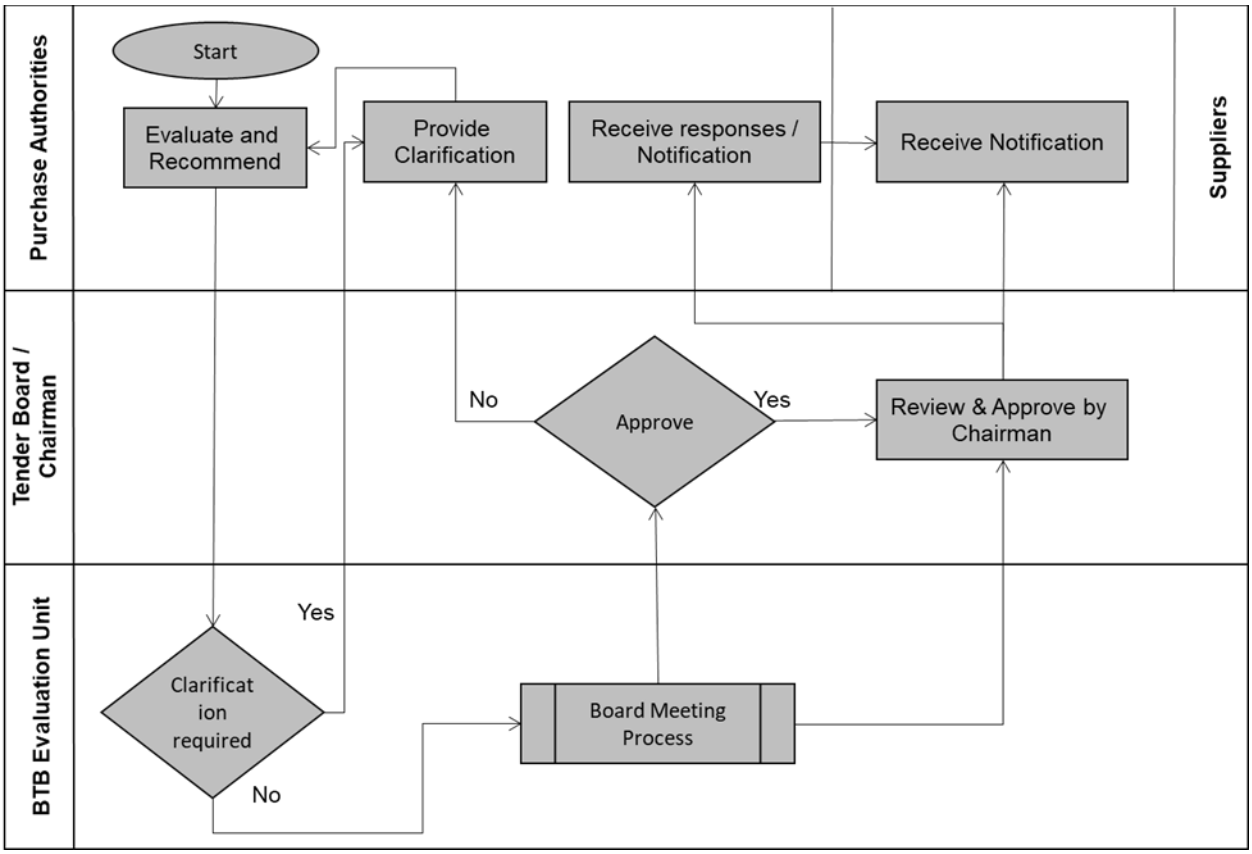


Note. Extracted from the BTB's e-tendering system website (Bahrain Tender Board, 2020).

Following the opening of bids, the MOWMAUP should download and start the evaluation of the bids. A tender evaluation report accompanied by an official letter from the ministry is forwarded to the BTB with a recommendation to award the tender to the winning bidder, and the BTB would review the recommendations given and approve the recommendation once accepted by the board members as shown in Figure 3. Nevertheless, the e-tendering system's automation stops at this stage, leaving manual paper-based activities of the award process, contract signing and contract execution phases, as the ministry implements them. The ministry would implement these procedures, and the BTB would have oversite on its proceeding activities.

Figure 3

E-Tendering Workflow of Bid Evaluation and Award



Note. Extracted from the BTB's e-tendering system website (Bahrain Tender Board, 2020).

With the new era of technologies available, BTB started an initiative to automate more than half of the procurement process by implementing an e-procurement system by 2023 (Al-Watan Press and Publishing, 2020). The potential for this project is not only digitalisation; instead, it is automation using several emerging technologies, including robotic process automation, machine learning, and advanced artificial intelligence programs (Al-Watan Press and Publishing, 2020). In addition, BTB is aiming to lower procurement costs, generate savings, and more opportunities to pursue the next reinvention of its digital platform (Bahrain Tender Board, 2020). It means creating a system that digitalises the process from project initiation to project payment and closeout.

2.7 Theories and Models for Public E-Procurement Adoption

E-commerce has supported the diffusion of innovation within the tendering process in Bahraini organisations. The following sub-sections discuss the prevailing theoretical models available that assess the adoption of e-procurement to determine the factors that influence the ability of a public entity to implement and adapt to the new e-procurement platform.

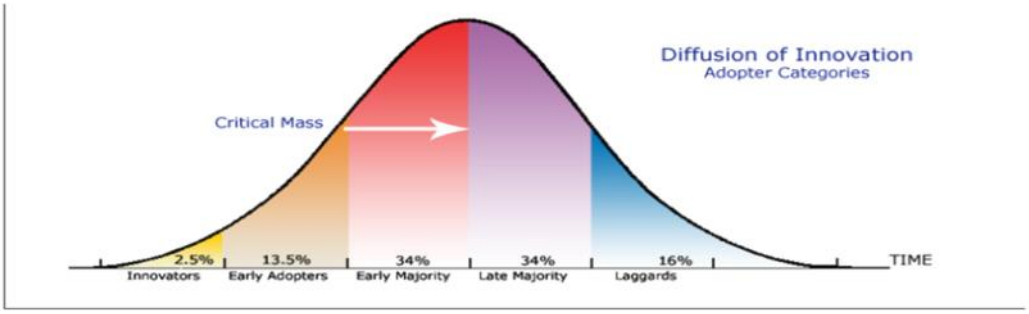
2.7.1 Diffusion of Innovation Theory

The concept of DOI was advanced in the early 1903s by French sociologist Gabriel Tarde (Toews, 2003). Gabriel Tarde drew an S-shaped innovation curve to explain how technology is modified and presented in ways that meet the needs across all levels of adopters (Kaminski, 2011; Toews, 2003). The theory focuses on the importance of communication and peer networking within the adoption process (Kaminski, 2011; Toews, 2003). The diffusion of innovation theory primarily aims to discuss the factors that accrue when people adopt a new idea, product, practice, philosophy, or policies.

Accordingly, this theory has gained popularity by Everett Rogers in the year 1962, creating a model to explain the stages people undergo before adopting a new idea and transitioning their minds to using the adopted idea (MacVaugh and Schiavone, 2010). It identifies the different phases of adopting innovations in a social domain, with a sequence of actions in a given timeframe. For instance, once innovators develop a new idea, it spreads to other team members to become a critical mass (Kaminski, 2011). The innovative idea evolves and becomes diffused in the organisation until a saturation point is achieved over a given period. However, there are five adopters to new technology: innovators, early adopters, early majority, late majority, and laggards (Kaminski, 2011). However, there exists a rare sixth category of non-adopters (Kaminski, 2011). Figure 4 below shows the five main stages of the innovation model.

Figure 4

Diffusion of Innovation Adopter Categories



Note. This figure was extracted from previous research (Kaminski, 2011).

From the bell-shaped curve of Figure 4, the innovation developer estimated the percentages of each category towards their propensity to adapt to new ideas (Rogers, 2003; Kaminski, 2011). The proportions seem almost similar, meaning that new ideas have a high acceptance rate if they leverage technology to bring forth efficiency, effectiveness and spur innovation in organisational processes. Thus, business organisations have to streamline their activities to align with new technologies to incorporate each innovation category in the change process. However, Kaminski (2011) states that each business organisation has to assess the internal factors that enhance or reduce their innovations' success rate. For instance, the main factors influencing the success of innovation processes amongst organisations include observability, relative advantage, compatibility, trialability, and complexity.

The diffusion of technology has led to the formulation and implementation of the technological theories that explain the factors influencing an organisation's adoption of information and technology systems such as spreadsheet software and office automation (Brancheau and Wetherbe, 1990; Moore, 1987). However, the authors argue that the model lacks integration of the diverse contexts wherein new technologies operate (MacVaugh and Schiavone, 2010), as it does not describe the social and contextual aspects in developing countries (Lawrence, 2010; Parker and Castleman, 2009). Hence, the DOI theory might not be able to address all contextual issues independently. Notably, it is not the objective of the study to identify if the MOWMAUP Roads Sector is an early adopter, innovator or otherwise, but rather, it aims to identify the contextual factors that impact its implementation of e-procurement.

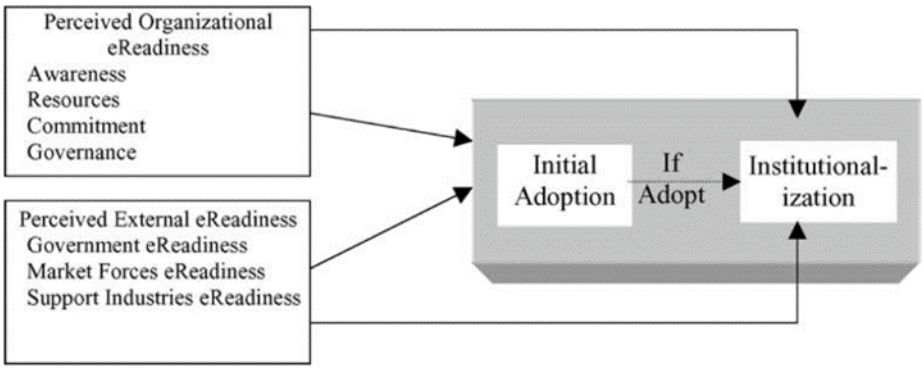
2.7.2 Perceived eReadiness Model

Molla and Licker (2005) developed the PERM, which aims to identify the external contextual and internal organisational factors that affect e-commerce adoption in developing countries. This model assumes that assessing the interaction of all these perspectives creates a dynamic framework to understand the unique environment of organisations in developing countries. The PERM includes two primary constructs, namely the Perceived Organisational eReadiness (POER) and Perceived External eReadiness (PEER) (Molla and Licker, 2005).

The POER comprises the elements that form the management's perspective and assess their organisation's readiness to implement e-commerce in terms of awareness, resources, commitment, and governance (Molla and Licker, 2005). While the PEER includes the components that comprise the management's evaluation of the market forces, government and other supporting industries are ready to aid in their organisation's e-commerce implementation (Molla and Licker, 2005). The PERM conceptual model is shown in Figure 5.

Figure 5

PERM Conceptual Model



Note. This figure was extracted from previous research (Molla and Licker, 2005).

A study was done by the researchers Tan, Tyler, and Manica (2007) utilised the PERM to distinguish between adoption and non-adoption of e-commerce in developing countries, which allowed in identifying adoption patterns in developing countries and enabled reaching an understanding behind the success of some organisations in achieving this goal. The PERM constructs are validated in an empirical study done in China to assess the current standing of SMEs to adopt e-commerce in business-to-business activities (Tan, Tyler, and Manica, 2007).

Hence, PERM allows for a multi-perspective assessment of the managerial, organisational and external factors to provide meaningful predictors of e-commerce adoption in developing countries, as it includes extensive internal organisational and external environmental issues, which examines an organisation's initial adoption of e-commerce, as well as institutionalisation (Molla and Licker, 2005).

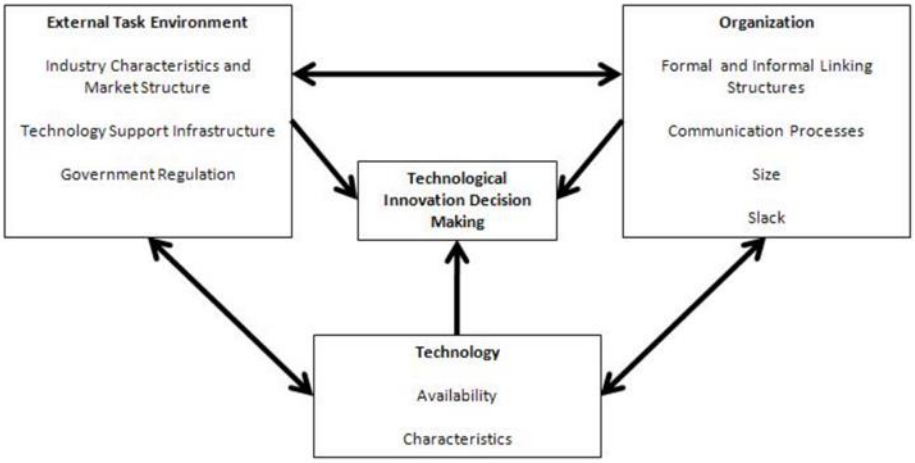
Although PERM provides a comprehensive approach to understanding e-commerce adoption in developing countries, one of its main limitations is that the model does not consider the sector-specific attributes, such as the organisation's size and activity (Idris, Edwards and Mcdonald, 2017). In addition, PERM's usage in previous research is limited, with minimal empirical implementation to test its validity and generalisability when compared with other models.

2.7.3 Technology Organisation Environment

Tornatzky and Fleischer (1990) developed the TOE framework. The TOE framework explains the factors that affect a firm's decision to adopt innovation. As shown in Figure 6, the TOE framework suggests three factors that drive technological innovation in organisations: technology, organisation, and the external environment (Lippert and Govindarajulu, 2006). The theory posits organisational factors consist of informal and formal linking structures, communication processes, and the organisation's size (Lippert and Govindarajulu, 2006). Environmental factors include government regulations, market structure, and technology support. The availability of IT infrastructure and technology attributes are included in the technological factors (Lippert and Govindarajulu, 2006).

Figure 6

Conceptual Model of TOE



Note. This figure was extracted from previous research (Baker, 2012).

TOE has been used in business organisations to assess technology adoption. For instance, Huy, Rowe, Truex, and Huynh (2012) assessed the TOE framework's impact to identify the main factors influencing e-commerce adoption in 926 Vietnamese SMEs. Huy, Rowe, Truex, and Huynh (2012) found that the primary challenges affecting e-commerce adoption in Vietnam were the shortage of experienced staff, shortage of resources, communication hurdles between stakeholders, limited alternatives for online payment, and a cultural barrier to online purchasing. Therefore, Huy, Rowe, Truex, and Huynh (2012) applauded the TOE framework providing a platform for understanding the internal and external elements that may impact e-commerce adoption in Vietnamese businesses.

2.7.4 Integrated Models

The existing literature shows that TOE is flexible enough that it can be used as an overreaching model, and has the capabilities to examine a wide array of factors, especially in the adoption of new technologies (Mishra, Konana, and Barua, 2007). Several studies research e-procurement and e-commerce adoption using a framework that integrates both TOE and DOI, and each study is formulated depending on the factors and conditions of the respective organisation as shown in Table 1.

Table 1

TOE and DOI in Technology Adoption Studies

Model	Author(s)	Year	Context	Remarks
DOI	Limthongchai and Speece	2003	SMEs adoption of e-commerce in Thailand	• Relative Advantage, compatibility, complexity, were found significant, • Trialability was found insignificant.
DOI	Tan, Chong, Lin, and Eze	2009	SMEs adoption of ICT in Malaysia	• Relative Advantage, compatibility, complexity were found significant factors in adopting e-commerce, • Trialability was found less significant.
TOE + DOI	Scupola	2003	SMEs adoption of e-commerce a Italy	• Technology: e-commerce benefits, • Organisation: innovation champion, employees' knowledge, • Environmental: competitive pressure, government role had a significant influence on adoption.
TOE + DOI	Ramdani, Kawalek, and Lorenzo	2009	SMEs adoption of e-systems in England	• Technology: relative advantage, • Organisation: top management commitment and organisation size had an influence on adoption.

Model	Author(s)	Year	Context	Remarks
TOE + DOI	Hung, Yang, Yang, and Chung	2011	Adoption of e-commerce in Taiwan	• Technology: compatibility, centralisation, • Organisation: organisation size had an influence in distinguishing between adopters and non-adopters.
TOE + DOI	Huy, Rowe, Truex, and Huynh	2012	SMEs adoption of e-commerce Vietnam	• Technology: compatibility and complexity had an influence in distinguishing between adopters and non-adopters. • Organisation: employee's e-commerce knowledge, firm size, top management support, • Environment: government support.
TOE + DOI	Al-Zoubi, Thi, and Lim	2011	E-government adoption in the business sector of Jourdan	• Technology: Relative advantage, IT infrastructure, • Organisation: organisation resources, organisation adaptability, • Environment: competition, government support had an influence on firms' adoption.
TOE + DOI	Chandra and Kumar	2018	E-commerce adoption of firms in Asia	• Technology: relative advantage and technological competence, • Organisation: top management support, • Environment: customer readiness had a significant influence on adoption.

Model	Author(s)	Year	Context	Remarks
TOE + DOI	Li	2008	E-procurement adoption for manufacturing companies in China	• Technology: relative advantage, compatibility and complexity, • Organisation: resources, top management commitment, • Environment: external pressure, external support, government promotion had a significant influence on adoption.
TOE + DOI	Zhu, Dong, Xu, and Kraemer	2006	E-business adoption of firms in Europe	• Technology: Relative advantage, compatibility, technology competence, • Organisation: organisation size, • Environment: competitive pressure; business partners' readiness had a significant influence on adoption.

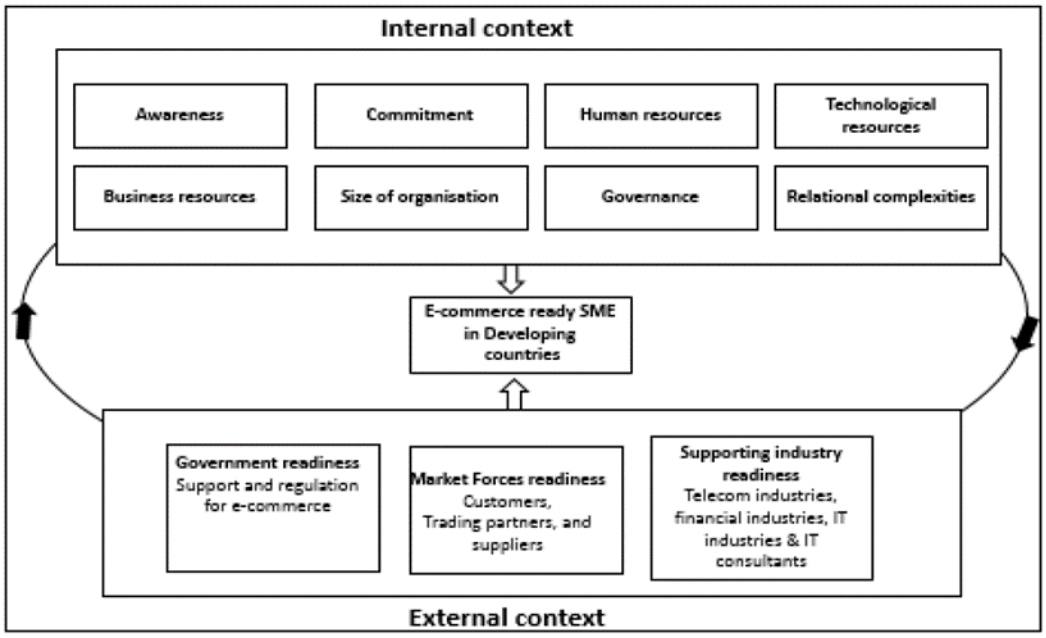
Both TOE and DOI share a number of similarities, and numerous studies were conducted based on an integration of both TOE and DOI frameworks, which were found to be positive for the adoption of e-commerce and e-procurement systems as shown in Table 1. Nevertheless, each study utilised slightly different adaptations of the framework, which is due to the unique conditions of the respective organisation. Correspondingly, it can be argued that the TOE framework provides rich data when paired with other theories and models.

As with the integration of TOE and DOI, a study done by Idris, Edwards and Mcdonald (2017) put forth an integrated model that combined TOE and PERM in studying the adoption of e-commerce in developing countries. Although PERM is useful for understanding e-procurement adoption in developing countries, it can be further supported by TOE to cover the relevant sector specifications, such as the sector activity and firm size.

Furthermore, PERM includes a perspective to assess the managerial, organisational and external issues to predict e-procurement adoption in developing countries (Idris, Edwards and Mcdonald, 2017). The integrated model is shown in Figure 7.

Figure 7

Integrated Model of PERM and TOE



Note. This figure was extracted from previous research (Idris, Edwards and Mcdonald, 2017).

What was common in some of the aforementioned studies was that the researchers used the predominant factors of technology, organisation and environment, but differed in using the sub-factors depending on the context of the study. In other words, the specific context of the study's parameter dictates the sub-factors to be used within each of the main three constructs of the TOE. Zhu, Dong, Xu, and Kraemer (2006) argued that TOE was a holistic theory, which aligned in comparison with DOI and PERM. In addition, Gangwar, Date, and Raoot (2014) stated that using TOE creates a more simplified approach to understanding the factors that support technology adoption and use in organisations. Subsequently, this study evaluated the theoretical models and their usage in relation to the adoption of e-commerce and e-procurement.

2.8 Summary

From the review of the literature, e-procurement has transformed the procurement and purchasing activities in many countries. Overall, these studies highlight the benefits and challenges of e-procurements for both public and private entities. In the Bahraini context, the MOWMAUP is the governmental entity responsible for contracting with road construction companies to construct and maintain the road network, which must conform with BTB's rules and regulations. BTB manages the procurement of road projects through the e-tendering system and is planning on introducing an e-procurement system to provide smart tools that automate the majority of procurement processes. Considering all of this evidence, the chapter explored the available theories and models that measure e-procurement adoption, including TOE, DOI, PERM. The evidence presented in this chapter advocates using predominant factors of technology, organisation and environment, but specific sub-factors depending on the context of the study. The following chapter describes developing a conceptual model that captures the contextual elements in assessing the readiness of adopting e-procurement in Bahrain's Roads Sector.

Chapter 3: E-Procurement Readiness Model Development

3.1 Introduction

This chapter describes the research gap, which necessitates the development of a conceptual model for the study. It includes the model development, which consist of the technological, organisational and environmental constructs. It then explains the factors that fall under each respective construct and the postulated hypotheses to measure the correlation between the size of the road construction companies and their readiness to adopt e-procurement.

3.2 Research Gap

While previous studies have investigated the readiness to implement e-procurement, limited studies have investigated the readiness to implement e-procurement in the construction sector, especially since no study has looked into the readiness of adopting public e-procurement in Bahrain's Roads Sector. Therefore, the developed conceptual model for this study integrates the relevant theoretical models; TOE to act as the overarching model, while DOI and PERM to be the lens for contextualising the interactions that take place inside and outside the Roads Sector's organisations. The rationale here is that understanding e-procurement adoption of previous studies (Ghobakhloo, Arias-Aranda, and Benitez-Amado, 2011; Huy, Rowe, Truex, and Huynh 2012), concludes that Bahrain's Roads Sector requires a flexible model to capture changes.

3.3 Conceptual Model Development

Although previous research examined the adoption of e-commerce and e-procurement, there is still little understanding of the adoption of e-procurement in the construction sector. To this end, a conceptual model was developed in this study to examine the readiness of the Roads Sector in Bahrain to adopt the public e-procurement system. DOI, PERM and TOE frameworks are often used at a firm level. For this study, the PERM could complement TOE by explaining the main structural components in which organisations in Bahrain would operate predominantly since studies have applied or modified PERM for measuring e-commerce adoption readiness (Tan, Tyler, and Manica 2007; Al-Hudhaif and Alkubeyyer 2011; Idris, 2015). Because both models contain technological, organisational, and environmental analyses of an organisation to establish its readiness for e-commerce adoption, there appears to be a convergence between PERM and

TOE. Unlike TOE, PERM evaluates the interaction of several factors and captures findings that are significant to organisations in developing countries rather than each factor independently. DOI can also support the conceptual model in studying the relative advantages, compatibility, complexity and trialability of the innovation. Therefore, the conceptual model considers the interaction and structural aspects that impact e-commerce adoption in developing countries; it provides a valuable lens to analyse the adoption of e-procurement in Bahrain.

Therefore, E-Procurement Readiness Model, which is the developed conceptual framework for this study, integrates the relevant theoretical models; TOE to act as the overarching model, while DOI and PERM to serve as the lens for contextualising the various interactions that take place within the Roads Sector's entities. The rationale here is that understanding e-procurement adoption for Bahraini suppliers requires models that are flexible enough to capture changes (Ghobakhloo, Arias-Aranda, and Benitez-Amado, 2011; Huy, Rowe, Truex, and Huynh, 2012). The following subsections describe the factors that form the conceptual model for this study as shown in Table 2 and Figure 8.

Table 2

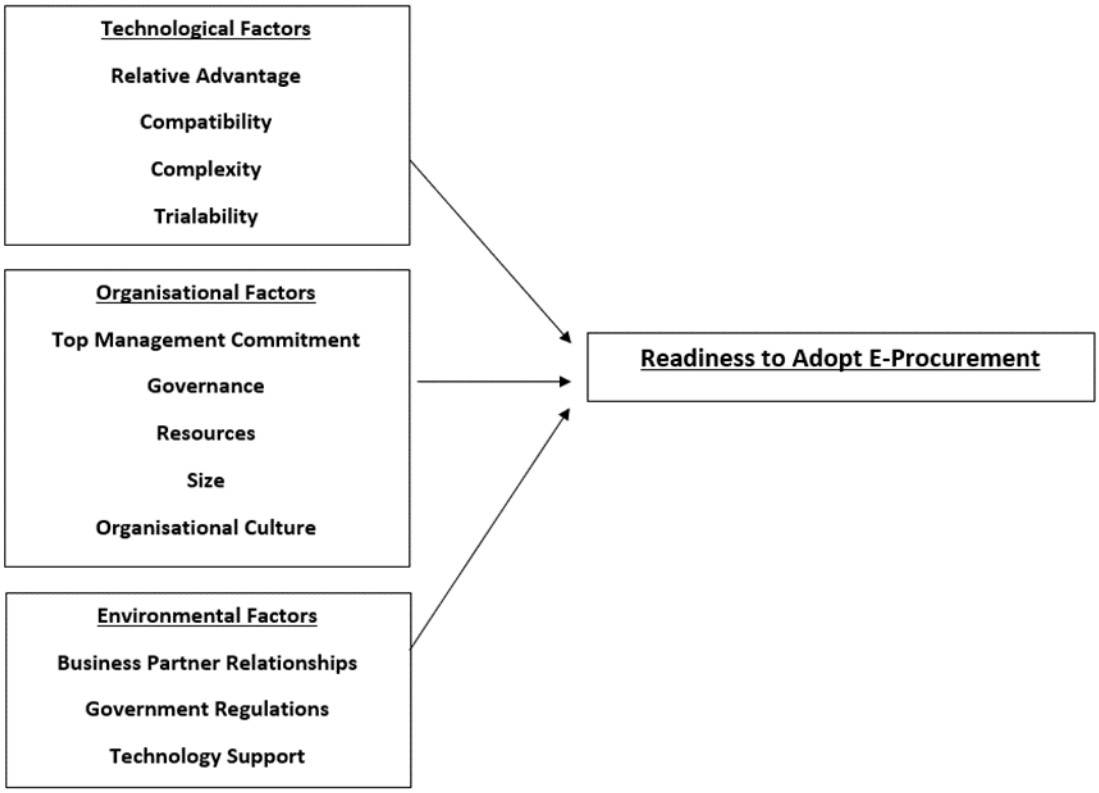
The E-Procurement Readiness Model

Construct	Factor	Theories and Models
Technological	Relative Advantage	Derived from DOI, and is addressed in TOE under the Characteristics
	Compatibility	Addressed in TOE under the Characteristics
	Complexity	Addressed in TOE under the Availability and Characteristics
	Trialability	Addressed in TOE under Availability

Construct	Factor	Theories and Models
Organisational	Top Management Commitment	Derived from PERM, and is implicitly addressed in TOE
	Governance	Derived from PERM, and in TOE under Formal and Informal Linking Structures
	Resources	Both PERM and TOE address this factor
	Size	Derived from TOE
	Organisational Culture	Derived from DOI
Environmental	Business Partner Relationships	Addressed in PERM under Market Forces E-Readiness, and in TOE under Market Structure
	Government Regulations	Derived from TOE
	Technology Support	Derived from TOE, and is addressed in PERM under Support Industries E-Readiness

Figure 8

The E-Procurement Readiness Model



Note. The above figure shows the developed conceptual model of the study.

3.3.1 Technology

The technologies that are important and available in the organisation are included in this context, including the technologies that are currently in use, as well as those that are available in the organisation but are not currently in use. Current technologies are critical in the implementation process because they widen the scope of the organisation and sets the pace of the digital transformation the organisation can handle (Tornatzky and Fleischer, 1990). The technologies that are unimplemented affect the organisation's capabilities to adopt innovations, both by limiting the technological capabilities and the organisation's knowledge (Chan 2002). Similarly, incompatibility of innovations with a firm's current infrastructure, software, networking communications design, or current IT infrastructure may stymie adoption at the technological level (Beatty, Shim, and Jones, 2001; Chan 2002). As a result, the new system should integrate seamlessly with the current ones, requiring minimal hardware and software expenditure.

3.3.1.1 Relative Advantage. According to some studies, the relative advantage is the extent to which adopters perceive the innovation to be desirable to the current conditions (Li, 2008; Ramdani, Kawalek and Lorenzo, 2009). A positive view by suppliers of the benefits of e-procurement increases the opportunity to embrace its adoption (Li, 2008). The various studies have indicated a positive relationship between the benefits and the relative actions of adoption (Al-Zoubi, Thi and Lim, 2011; Chandra and Kumar, 2018). Relative advantage includes not only cost savings but also saving effort, time and other advantages that bring benefits to adopting e-procurement (Ramdani, Kawalek and Lorenzo, 2009). Studies have shown a positive relationship between relative advantage and e-commerce adoption (Zhu, Dong, Xu and Kraemer, 2006; Li, 2008; Chandra and Kumar, 2018; Ramdani, Kawalek and Lorenzo, 2009). Integrating this factor from DOI enables studying the main contextual factors influencing e-procurement adoption, as well as capturing the organisations' awareness of the perceived advantages regarding the innovation.

3.3.1.2 Compatibility. Compatibility is the degree to which an innovation is perceived to be in line with the current experience values of a firm and supports the requirements for potential adoptors (Grover and Goslar, 1993; Teo and Tan, 1998). Organisations prefer adopting innovations that are compatible with certain internal principles and allows them to minimise their risks while making minor modifications to their existing processes; making these choices, in turn, lead to lower resistance to adoption (Huy, Rowe, Truex, and Huynh, 2012). A significant positive relationship was found between compatibility and e-commerce adoption (Hung, Yang, Yang and Chung, 2011; Huy, Rowe, Truex, and Huynh, 2012; Li, 2008).

3.3.1.3 Complexity. Complexity is the degree to which an innovation is viewed as difficult to implement (Li, 2008). A high degree of the complexity of an innovation would have a negative impact on the organisation's decision to adopt an innovation (Seyal and Rahman, 2003; Grover and Goslar, 1993). Prior studies have found that complexity has a negative relationship with the implementation of e-commerce and e-procurement, since it is difficult for some organisations to recruit workers and experienced IT employees with the required competence (Huy, Rowe, Truex, and Huynh, 2012; Li, 2008).

3.3.1.4 Trialability. According to DOI, both trialability and observability were viewed as significant factors for adoption (Kaminski, 2011). Nevertheless, it is interesting to note that most previous studies omitted these factors (Limthongchai and Speece, 2003). The limited empirical data suggested that trialability is not a significant factor for the adoption of a technology, especially in Southeast Asia (Limthongchai and Speece, 2003; Tan, Chong, Lin, and Eze, 2009). However, in order to adopt e-procurement by all of the relevant entities in Bahrain, the system could require a phased implementation or pilot testing (Tan, Chong, Lin, and Eze, 2009).

3.3.2 Organisation

The structure and capabilities of the organisation, such as the top management's support and commitment, governance, employees' administrative mechanisms, organisation's size, and the resources, are all part of the organisational factors(Lippert and Govindarajulu, 2006).

3.3.2.1 Top Management Commitment. . The support and commitment for the adoption of an innovation championed by the top management have been found to be a significant factor for an organisation's acceptance of an innovation (Molla and Licker, 2005). Top management can encourage the adoption of new innovations by supporting and implementing the organisational values and strategy by a well-articulated organisational vision (Molla and Licker, 2005). Several studies found the top management a significant factor in the adoption of new technologies (Li, 2008; Ramdani, Kawalek, and Lorenzo, 2009; Huy, Rowe, Truex, and Huynh, 2012; Chandra and Kumar, 2018).

3.3.2.2 Governance. Researchers have been able to define governance as "*the strategic, tactical and operational model organisations put in place to govern their business activities and e-procurement initiatives*" (Molla and Licker, 2005, p. 882). This factor outlines the administrative, procedural and interorganisational framework that manages the organisation's practices and e-procurement projects (Molla and Licker, 2005).

3.3.2.3 Resources. The available resources and slack of an organisation, including the human resources, financial resources and technological resources, are frequently discussed in previous research as a significant factor within the organisational factorsthat affects the

organisation's adoption of an innovation (Molla and Licker, 2005; Li, 2008; Al-Zoubi, Thi, and Lim, 2011). Although there was evidence in previous research to indicate that an organisation's resources encourage adoption, Tornatzky and Fleischer (1990) argued that an organisation's adoption of an innovation could occur regardless of the resources of the organisation. Thus, while an organisation' resources are beneficial (Lippert and Govindarajulu, 2006), it was noted that resources are "*neither necessary nor sufficient for innovation to occur*" (Tornatzky and Fleischer 1990, p. 161).

3.3.2.4 Size. The size of the organisation refers to the total number of employees (Molla and Licker, 2005), which was frequently found a significant factor in previous studies for the adoption of e-commerce and e-procurement (Ramdani, Kawalek, and Lorenzo, 2009; Hung, Yang, Yang, and Chung, 2011; Huy, Rowe, Truex, and Huynh, 2012). These findings claim that SMEs often face a lack of human, technological and financial resources (Hung, Yang, Yang, and Chung, 2011). However, large enterprises (LEs) have a recognised the compatibility of IT infrastructure, resources and culture for adopting technological innovations (Hung, Yang, Yang, and Chung, 2011). This study followed a similar identification between SMEs and LEs, in accordance with the Ministerial Decision no. 922 for the year 2017 issued by the Ministry of Industry, Commerce and Tourism's identification of SMEs and LEs, where it identifies SMEs as companies that employ fewer than 100 employees, whilst LEs are companies that employ over 100 employees (Ministry of Industry, Commerce and Tourism, 2017).

Based on the above, the factors of compatibility, human resources, organisational culture, and readiness to adopt e-procurement appear to be some of the determining factors between SMEs and LEs to adopt e-procurement (Ramdani, Kawalek, and Lorenzo, 2009; Hung, Yang, Yang, and Chung, 2011; Huy, Rowe, Truex, and Huynh, 2012). Hence, the following hypotheses were postulated to provide important insights in Bahrain regarding the size of SMEs and LEs' when correlated with the above factors:

- *H1:* There is a positive significant relationship between company size and the government's IT infrastructure.
- *H2:* There is a positive significant relationship between company size and utilisation of advanced IT tools.

- *H3:* There is a significant positive relationship between company size and compatibility of e-procurement with preferred work practice.
- *H4:* There is a significant positive relationship between company size and the computer literacy of the employees.
- *H5:* There is a significant positive relationship between company size and the available human resources.
- *H6:* There is a significant positive relationship between company size and the available IT resources.
- *H7:* There is a significant positive relationship between company size and ability to deal with rapid changes.
- *H8:* There is an overall significant positive relationship between the size of the company and the readiness to implement e-procurement.

3.3.2.5 Organisational Culture. Organisations are more likely to adopt a novel technology if they perceive that it is consistent with their culture, values, and preferred work practices (Beatty, Shim, and Jones, 2001; Chan, 2002). Organisational culture includes the behaviours of the organisations, their tendency for openness, trust and sharing information, as well as their behaviours in dealing with changes (Chan, 2002).

3.3.3 Environment

The environmental construct refers to the external factors that affect an organisation's adoption of an innovation (Molla and Licker, 2005). Organisations often have little control over these external factors (Tornatzky and Fleischer, 1990); the environmental factors include business partner relationships, government regulations, and technology support.

3.3.3.1 Business Partner Relationships. This factor includes the assessment of an organisation's business partners, including its suppliers and customers, in terms of their readiness and consent to adopt a technological innovation (Molla and Licker, 2005). Previous studies identified that business partner relationships are significant to the organisation's readiness for adopting e-commerce (Zhu, Dong, Xu, and Kraemer, 2006; Chandra and Kumar, 2018).

3.3.3.2 Government Regulations. Polices, laws and regulations for governing the procurement process, the internet services, e-processing functions, and other regulations that provide the governing framework for e-procurement were included in this factor (Guo, 2001). Government regulations may have a positive or negative impact on the organisation's adoption of an innovation (Molla and Licker, 2005). When governments impose new electronic procedures, such as requiring submission of e-invoices, innovation is essentially mandated for those firms and must be controlled by laws or regulations (Guo, 2001).

3.3.3.3 Technology Support. This factor includes the presence or absence of technology service providers and support-giving institutions such as the telecommunications and IT industry, whose activities might affect e-procurement initiatives (Molla and Licker, 2005). Technology support entities can affect the organisation's capabilities for adopting e-commerce, since the technology service providers obtain the knowledge, expertise and support to foster innovation (Li, 2008; Al-Zoubi, Thi, and Lim, 2011; Huy, Rowe, Truex, and Huynh, 2012).

3.3.4 Readiness to Adopt E-Procurement

This study focused on establishing the readiness of adoption of public e-procurement in the Roads Sector of Bahrain. Consequently, this study postulated seven hypotheses to determine the causal relationship between the size of the road construction companies and the relevant factor extracted from the E-Procurement Readiness Model regarding the readiness to adopt the e-procurement system.

3.4 Summary

In this chapter, the research gap from the literature was highlighted. Based on the identified theories and models, a conceptual model of e-procurement readiness was developed, which consists of three main constructs; namely technology, organisation and environment, with four, five and three factors under each construct, respectively. Moreover, eight hypotheses were postulated to measure the causal relationship between the size of the organisations and their readiness to adopt e-procurement. The next chapter describes the method used to address the study's main question, and the sub-questions.

Chapter 4: Methodology

4.1 Introduction

This chapter describes the research design used for this study. It includes the research method, which consisted of two units of analysis, the MOWMAUP Roads Sector and the road construction companies. It then explains the two qualitative instruments and one quantitative instrument used. Each with an identification of how the data was collected, analysed and interpreted.

4.2 Study Design

A case study is defined as "*an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident*" (Yin, 2017, p. 13). Moreover, another researcher defines case studies as an issue to be investigated by conducting an in-depth understanding of the respective case, along with its particular activities and processes (Creswell, 2002). This study aimed to understand the extent to which the Roads Sector is ready to adopt public e-procurement in Bahrain. To address the study questions, a single case study is chosen with embedded units of design (Yin, 2017), which provides in understanding the respective findings for two main stakeholders of the Roads Sector.

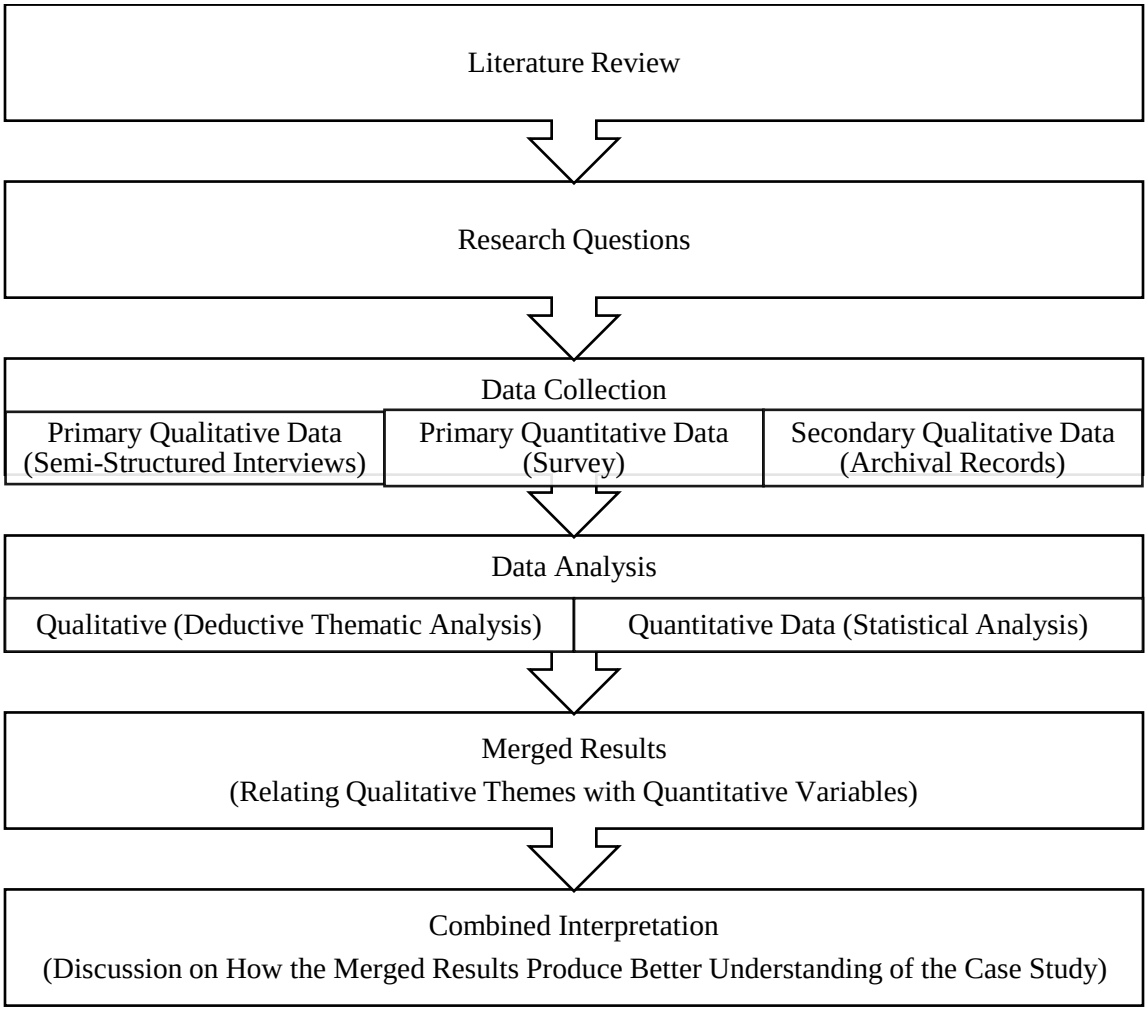
The first unit of analysis focuses on the MOWMAUP's readiness to adopt the e-procurement system, as it is the main public entity that procures projects and facilitates the preparation of the tender documents, the evaluation of the bids, the selection of the construction company, the signing of the contract, and the contract management of the roads projects. The second unit of analysis focuses on the road construction companies' readiness to adopt the e-procurement system, as they would be one of the main users of the e-procurement system, as well as being responsible for submitting bids for the roads tenders, interacting with queries and clarifications on the e-procurement platform, signing contract agreements with the MOWMAUP to construct roads projects, and submitting invoices for payments against completed work.

The study design puts forth the appropriate method used to address the study questions and objectives, in addition to ensuring the reliability, validity, and trustworthiness of the results. A study design requires careful consideration of the different types of data to be collected, as

they would differ in size and could create difficulties in interpreting the data (Creswell and Clark, 2011). Therefore, this study prudently considers the sample types and sizes in addressing the topic of the study, which allows a smooth integration of the results to reach a final consensus. The following subsections identify the methods used for this study, including qualitative and quantitative instruments, summarised in Figure 9.

Figure 9

Research Design



Note. This design was implemented by following prior research (Creswell, 2002).

4.3 Data Collection

Data was collected by employing qualitative and quantitative approaches. The qualitative data employed semi-structured interviews and archival records, while the quantitative data was sought by a web-based survey. The data collection took place from February 2021 until April 2021. During this time, the participant organisations were not involved in the project, as the e-procurement system is still in the planning and design stage by the BTB.

This case study was analysed using mixed-methods, as mixed-methods enable a researcher to gain a comprehensive understanding of the study problem, as well as obtaining diverse angles of the study problem by using both quantitative and qualitative data collection methods (Creswell, Clark, Gutmann, and Hanson, 2003). The collection of quantitative and qualitative data is done concurrently, using a convergent parallel approach. This method entails gathering various but complementary data on the readiness of the MOWMAUP Roads Sector to adopt public e-procurement in Bahrain. The study used both the qualitative and quantitative findings to generate an in-depth understanding of the phenomenon; a deductive approach was used based on the conceptual model to test the hypotheses generated from the theories and investigate the data from particular to general (O'Dwyer and Bernauer, 2013).

The collection of qualitative data provides an in-depth understanding of the study at hand. It includes conducting interviews, observations and analysis of documents (Creswell, 2002); this data is collected to produce interpretations of the problem based on its respective contextual settings. Qualitative data is primarily analysed based on particular themes, attributes, and properties to generate interpretations, gaining understanding and developing propositions. Qualitative methods generate data in terms of words rather than numerical data. Qualitative data collection methods also include field research, observations, in-depth interviews and focus groups. Each data collection instrument has its respective advantages and limitations, which should be chosen carefully depending on the study's setting.

In contrast, quantitative data measures variables by using statistical methods, which are presented numerically, and the relationships between the variables can be tested and assessed using statistical techniques. Quantitative studies often start with a proposed or predetermined theory, leading to hypotheses that are tested through measuring the relevant variables quantitatively (O'Dwyer and Bernauer, 2013). The findings of quantitative studies are mostly representative and can be generalised on a larger population, as it comprises the selection of a

larger sample when compared with qualitative data collection instruments (Creswell, 2002). Additionally, quantitative data analysis is aided with modern technological tools, such as IBM Statistical Package for Social Science (IBM SPSS) 26.0, making it a less time-consuming instrument.

Quantitative and qualitative data were collected and analysed independently in a single stage, as data collection was done concurrently. Ideally, both types of data should have equal prioritisation and weight, but in practice, either the quantitative or qualitative approach will take precedence (Creswell, Clark, Gutmann, and Hanson, 2003). After completing the data collection, the interpretation is made by mixing both types to understand how they both converge and deviate. The convergent parallel approach was chosen as it enables a researcher to balance the limitations of one approach with the benefits of the other. It efficiently enables the collection of both strands of data simultaneously, allowing shorter data collection time when compared with other mixed-methods designs. Moreover, quantitative and qualitative data analysis were done concurrently to be compared, contrasted, and interpreted to answer the study questions (Creswell and Clark, 2011).

While this is a widely used mixed-methods study design, it requires substantial effort and expertise in both types of data collection and analysis. The following sections provide clear identifications of each instrument, its data collection, analysis, and validity.

4.4 Archival Records

The study used two qualitative instruments: semi-structured interviews and an analysis of archival records. The secondary data collected for this study included archival documents from government reports obtained from the MOWMAUP's Roads Sector in Bahrain, and a review of the BTB laws, circulars and decisions.

Secondary data is the existing data retrieved, such as archival records or documents provided by organisations, which are used by researchers to make use of and present useful findings and further strengthen the chosen methodology (Rabianski, 2003). Secondary data includes archival records and published documents collected and analysed in the specific field of the study (Heaton, 2018). Secondary data is a flexible approach but is often underutilised (Smith, Ayanain, Covinsky, Landon, McCarthy, Wee and Steinman, 2011). Its main advantages include the convenience and effectiveness it offers and can provide an extensive database for the

researcher to provide representative findings of the area of the study (Smith, Ayanain, Covinsky, Landon, McCarthy, Wee and Steinman, 2011). It is also used as a triangulation technique and a central aspect of case study research design for further data analysis and interpretation (Yin, 2017). Nevertheless, secondary data requires a systematic approach to avoid its limitations, which include confidentiality of the records and the limited knowledge of how the secondary data was obtained (Heaton, 2018).

4.4.1 Type of Archival Records

This study utilised the MOWMAUP Roads Sector's official records, collected for the years 2018, 2019, and 2020. These provide additional data on the current road projects and their relevance to this study, as well as providing data that corresponds to the existing timeframe of the study. The records can be used to generate interpretations that are relevant to the current procurement environment for the Roads Sector in Bahrain. Additionally, the BTB laws, decisions and circulars were reviewed to generate findings regarding the procurement framework in Bahrain. Table 3 highlights the reviewed archival documents.

Table 3

Archival Records List

Type	Name	Owner
Annual Report	2018 MOWMAUP's Annual Report	MOWMAUP
Annual Report	2019 MOWMAUP's Annual Report	MOWMAUP
Annual Report	2020 MOWMAUP's Annual Report	MOWMAUP
Laws	Legislative Decree No. 36 of 2002 with Respect to Regulating Government Tenders and Purchases	Tender Board
Laws	Legislative Decree No. 37 of 2002 with Respect to Promulgating the Implementing Regulations of the Law Regulating Government Tenders and Purchases	Tender Board

Type	Name	Owner
Circulars	2003: Circular No. 1, 2 2004: Circular No. 1, 2, 3, 4, 5, 6, 7 2005: Circular No. 1, 2, 3, 4 2006: Circular No. 1, 2, 3, 4 2007: Circular No. 1, 2, 3 2008: Circular No. 1, 2, 3 2009: Circular No. 1, 2 2010: Circular No. 1 2012: Circular No. 1, 2, 3, 4, 5, 6 2013: Circular No. 1 2014: Circular No. 1, 2, 3, 4 2015: Circular No. 1 2016: Circular No. 1, 2, 3 2017: Circular No. 4, 5 2018: Circular No. 1 2019: Circular No. 1, 2, 3 2020: Circular No. 1, 2, 3, 4, 5, 6 2021: Circular No. 1, 3, 4, 5	Tender Board
Decisions	2003: Decision No. 1 2004: Decision No. 3, 6 2010: Decision No. 1 2014: Decision No. 1 2015: Decision No. 1 2017: Decision No. 1 2020: Decision No. 1	Tender Board

Note. This table refers to documents which were accessible from the official websites of the entities.

4.4.2 Data Analysis

These documents were analysed by deriving main findings from BTB's laws, decisions and circulars. Moreover, MOWMAUP's annual reports included the tenders issued and awarded, which were recorded and analysed to gain further understanding of the Roads Sector and the common methods used to procure road construction projects. This aided in triangulating the findings and in confirming the interview data. In addition, simple statistics were derived, which presented data of procuring roads projects using the current governmental procedures. Similar studies, such as Neubert (2016), employed this strategy in a case study design that employed archive data to triangulate interview findings to address the study's objectives.

4.5 Semi-Structured Interviews

The semi-structured interviews collected primary data to address the study's aim. Primary data includes the researcher's original data collected for the study questions. Hence, new information is obtained and added to the existing knowledge of the field of the conducted study (Rabianski, 2003).

A researcher can use semi-structured interviews to collect an in-depth understanding of the interviewees' thoughts and expertise on a particular subject. The selection of the interview type can differ, from conducting unstructured interviews to structured interviews. Unstructured interviews are chosen when the researcher has limited control and knowledge of the particular study; this type could gain rich data but require a longer timeframe than the other types of interviews (Yin, 2017). Structured interviews are the most controlled type, where the questions are predetermined and asked in a specific sequential manner; they are usually used in collecting data from large samples to generalise the results for a larger population (Yin, 2017).

Semi-structured interviews gain the benefits of both structured and unstructured interviews. Often the main guide with a set of questions to be covered with each interviewee is followed, and while the questions do not have to follow a fixed order, they are often standardised (Creswell, 2002). This type of interviews follows a more conversational attempt to collect the required data and gain a rich understanding of the answers provided.

4.5.1 Interviewee Selection

Semi-structured interviews were conducted with MOWMAUP Roads Sector managers who were most familiar with the relevant field of procurement and their understanding of the complex nature of road projects' tenders and contract management. The interviews will provide rich insights from experts with proven knowledge and skills in the field of public e-procurement (Anaekwe, 2007). This sampling method will be effective in evoking the opinions of public officials who have specialised knowledge and would also provide support for the validity of the other methods used in this study. Purposive sampling is used (Ilker, Musa, and Alkassim, 2016); this means that individuals from the MOWMAUP were deliberately chosen based on their expertise in the relevant field.

The participants were all public managers who possessed knowledge of the construction industry in Bahrain and had a minimum of 10 years of experience in MOWMAUP road construction and procurement in Bahrain. The participants were screened against these criteria, and those that met the criteria were primarily chosen for the interviews. Three of the MOWMAUP's public officials were selected for the semi-structured interviews, since large sample sizes could weaken in-depth investigation of the phenomenon of the study (Patton, 2002). Similarly, conducting interviews was continued for the three participants until data saturation was reached, which is reached when further interviews do not collect new data and do not generate new insight into the field of the study (Patton, 2002). The participants were selected carefully based on their overall years of experience, their involvement in the current tendering and construction processes, resulting in obtaining participants with extensive knowledge of the existing laws and regulations governing the tenders and purchases in Bahrain.

Table 4 describes the information of the interviewees, including the approximate duration of each interview. The thematic analysis of the data required transcribing the interviews, including the notes and observations, the interviews were coded using the pre-defined codes of the conceptual model of this study, and emerging themes were assigned with new codes. Interpretive phenomenological analysis was used in deciding the level of analysis, which accepted words, sentences and phrases to create a concept.

Table 4

MOWMAUP's Interviewees

Interviewee	Role	Years of Experience	Place	Duration
Interviewee 1	Middle Management	43	Physical	≈ 80 mins
Interviewee 2	Top Management	21	Physical	≈ 75 mins
Interviewee 3	Top Management	35	Virtual	≈ 60 mins

4.5.2 Interviewee Protocol

An interview protocol was developed based on the constructs and variables of the E-Procurement Readiness Model. The interview protocol contains 17-18 questions as shown in Appendix A. This study used semi-structured interviews to collect the perceptions and views of the MOWMAUP Roads Sector experts on the readiness to adopt public e-procurement in Bahrain by the identification of their views stemming from the main constructs of the model.

The first section of the interview focused on the technological factors; to obtain information related to the technologies and smart systems used, which can aid to the adoption of e-procurement, as well as the capabilities of the IT infrastructure concerning the required adoption of e-procurement, then moving to questions related to the compatibility of the current systems and the additional technological tools needed to support the adoption of the e-procurement system.

The second section focused on the organisational factors, including questions related to the top management's support for digital transformation initiatives, how the strategy and goals of the MOWMAUP aligns with the initiative of the e-procurement system, as well as the public entity's ability to analyse and manage change as a result of the implementation of the e-procurement system. The participants were also asked about the current resources and capabilities of the employees to use Information and Communications Technologies, in addition to asking about the organisational culture and the respective directorates' attitudes towards following rules and collaborating towards the main goal.

The third section of the interview focused on the external environmental factors by asking the interviewees about their views on how ready their business partners are to achieve e-procurement implementation, as well as their perceived challenges in collaborating with the

business partners, if any. The interviewees were also asked how the existing government regulations and laws support the Roads Sector's e-procurement functions and how the technology support entities currently function to aid digital transformation and e-procurement.

The interviews generally end on closure questions related to the interviewee's general view of the readiness of the MOWMAUP Roads Sector to adopt the e-procurement system and to seek any further comments that can add to this study.

The questions aimed at obtaining the interviewees' views on how the e-tendering system affected the Roads Sector's procurement process. Then the interview was centered on the TOE constructs of the Perceived E-Readiness Model to explore the entity's readiness to adopt the e-procurement system in Bahrain. The interviewees received the interview questions a few days before the meeting, which incorporated the aim of the study and its significance to the development of the procurement processes in Bahrain. All of the interviewees were informed that their participation was voluntary and by consenting to participate in this study would guarantee their anonymity in the study processes.

All interviews were recorded for transcription and took between 60 and 80 minutes each. The semi-structured questions were asked during each interview, and probe questions were added to gain richer knowledge of a particular aspect (O'Dwyer and Bernauer, 2013). The semi-structured interviews were conducted with the MOWMAUP Roads Sector officials; the sessions were conducted using face-to-face interviews, as well as virtual sessions using Microsoft Teams for officials that we're unable to physically meet due to the current restrictions brought by the pandemic of COVID-19. Each interview required four hours on average for transcription. The interviewees were sent an email with the transcribed contents of their transcribed interviews to approve or correct their contents.

4.5.3 Data Analysis

The analysis of qualitative data was an iterative process. An interactive process allows the researcher to achieve a greater grasp of the information and analysis of the findings by moving back and forth between the analysis stages (Creswell, 2002). The qualitative analysis of interviews and archival records were based on thematic analysis. It included steps that started with the exploration of the data by being familiarised with the transcripts, then the data is coded by labelling the text, the codes are then used to develop common themes. This type of analysis

includes accumulating similar codes together, and lastly, connecting the codes to generate themes and construct a narrative (Creswell, 2002). The use of thematic analysis in studies is recognised as a versatile instrument for analysing text documents and data, as it refers to a specific set of analytic techniques, which aim to transform data using interpretive phenomenological analysis to qualitative findings (Patton, 2002). The thematic analysis starts with dividing the texts into meaningful segments, then each of the segments is further condensed, labelled using codes, which are then used to formulate categories and common themes (Weber, 1990). A deductive approach is used when a theory concerning a particular phenomenon exists. The analysis aims to expand or test a theoretical concept. Utilising the existing hypotheses is important to narrow the scope of the study (Mayring, 2000). Thematic analysis can also provide assumptions regarding the variables and creating themes to further elucidate and add to the body of knowledge (Creswell, 2002).

Thematic analysis is used for qualitative research designs; it includes steps to analyse textual data and determine common patterns or themes (Mayring, 2000). The structured method of coding aids in deriving the categories of the context to create a theme as a defining feature (Patton, 2002). Thematic analysis is often used to explore patterns from interview transcripts or records of qualitative data. Themes are the predominant classifications of common data across multiple records or interviewees, wherein the textual data in a theme connects different elements and reflects various dimensions of a phenomenon (Willing and Stainton-Rogers, 2017).

The advantages of this approach are that it enables the researcher to expand and investigate existing theories (Willing and Stainton-Rogers, 2017), and would direct the study on a clear path to avoid deviation and weaknesses in the trustworthiness of the study.

This study provided a detailed description of the context of the case before the data analysis phase, which assisted in ensuring efficient interpretation of the findings (Creswell, 2002), and strengthened the repeatability of the study if it was conducted by another researcher under the same setting (Creswell and Clark, 2011). The codes were developed after the initial screening of the transcribed interviews, utilising two phases of coding. The first coding stage provides the basis of the codes. The second coding merges all relevant codes to generate categories for the thematic analysis. The emerging categories provided themes and patterns identified in a deductive sense from the TOE theory derived from the literature review.

This study also interpreted the analysis of the archival records; including official records and documents of the MOWMAUP, particularly the annual reports, the roads projects tendered and awarded, in order to identify the common themes and characteristics of the current processes and how they would be impacted by the e-procurement system. This method compares the emerging themes and the secondary data to strengthen the case study findings (Yin, 2017).

4.6 Ensuring Reliability and Rigour of Qualitative Instruments

Qualitative studies have been criticised for their subjectivity and lack of generalisability compared with quantitative studies that include objective and experimental techniques. Despite these views, other researchers argue that qualitative studies are merely a different approach to conducting research. It provides data that explores specific interactions of a phenomenon to generate theories and extend existing theories. Credibility, transferability, dependability, and confirmability increase the method's reliability and rigour, which in turn will increase the quality of qualitative methods (O'Dwyer and Bernauer, 2013).

4.6.1 Credibility

This includes the confidence in the study's findings, which requires the researcher to demonstrate that the findings are accurate representations of the phenomenon and can also be compared with internal validity (O'Dwyer and Bernauer, 2013). To strengthen the credibility of qualitative instruments, triangulation, member checking, and prolonged engagement should be used.

Triangulation is an analytic approach and a key component of case study research design that is used during the investigation of a phenomenon, as well as for data analysis (Yin, 2017). Triangulating is a methodological strategy for verifying or contradicting thoughts and facts throughout the qualitative research process (Creswell, 2002). The results of the interviews are corroborated with the archival records and the survey findings. The utilisation of the interviews, web-based survey and archival records form the three data sources for methodological triangulation to answer the research question and add credibility to the study results.

Prolonged engagement requires the researcher to invest an adequate amount of time in the field of the case to obtain a thorough understanding of the context of the phenomenon, especially since this method allows the researcher to be immersed in the study to comprehend the

environment and its context to provide appreciated findings (Gibbert, Ruigrok, and Wicki, 2008). Prolonged engagement in this study provided an in-depth understanding of the case study's settings and the factors influencing the adoption of e-procurement.

Member checking is a technique that involves obtaining the interviewees' review, validation and infirmity of the interview transcripts, thus, assisting the researcher in establishing validity (Gibbert, Ruigrok, and Wicki, 2008). In this case study, the interview protocol (refer to Appendix A) was pilot tested with one interviewee, and the refined interview protocol contained 17-18 open-ended questions. In addition, all interviewees were requested to review and confirm the statements provided in the interview transcripts, in which they have confirmed that the information reflects their actual perceptions during the interviews.

4.6.2 Transferability

This refers to the degree to which a study's results can be applied in other contexts, which can also be compared with external validity (O'Dwyer and Bernauer, 2013). In this study, sufficient description of the study process, including the methodology, the context, the sampling of the data, the analysis and interpretation of the data to provide results of the adoption factors of e-procurement, can be used in other sectors Bahrain.

4.6.3 Dependability

To strengthen qualitative findings, the readers should expect that if other researchers conducted the same study, similar results would emerge (Gibbert, Ruigrok, and Wicki, 2008). In this study, a detailed description is shown for data collection procedures, data analysis, data interpretation, and findings. The transcription of the interviews was based on recoding each interview to ensure the accuracy of the sessions with obtaining the interviewees' confirmation before the coding stage. Moreover, this study explains in detail how the data was gathered and analysed, in addition to the choices taken to reach the findings and interpretations.

In addition, the researcher went over the processes to ensure that the steps were implemented correctly, and an academic researcher was also engaged to objectively review the processes of this study to determine the accuracy of the findings.

4.6.4 Confirmability

To achieve the trustworthiness of the case study, specific steps should be taken to verify that the interpretations were based on the interviewees' perspectives and not the researcher's prejudice or subjective views (Gibbert, Ruigrok, and Wicki, 2008). This study achieves this by presenting a detailed description of the processes of the study's methodology, as well as clear transcripts that show the processes of coding, categorising, and generating themes and findings of the data.

4.7 Web-Based Survey

In addition to the used qualitative instruments, this study also used a quantitative instrument, namely a web-based survey. Including the identification of the used instrument, its data collection, analysis and validity.

4.7.1 Instrument Development

A web-based survey as shown in Appendix B, was designed to gather information to assess the readiness of the road construction companies that were participating in tenders and contracts with the government. This allowed the researcher to understand pertinent problems or the extent of the readiness of the construction companies to adopt public e-procurement in Bahrain, as the readiness to implement the e-procurement can only be investigated if all main stakeholders' readiness is assessed.

The first section of the survey included the demographic questions. This provided data regarding the organisation's size, years of experience in construction, familiarity with the e-tendering system and participation in tenders with the MOWMAUP. Most of the questions are dichotomous yes and no answers, with one multiple-choice question to identify the organisations' years of experience.

The second section included the technological factors items, focusing on the organisations' assessment of the current IT infrastructure, as well as the characteristics and compatibility of their IT tools and systems to accommodate the adoption of e-procurement. These survey items were measured on a four-point forced-choice Likert scale from "Strongly disagree" to "Strongly agree".

The third section measured the organisational factors and their impact on the adoption of e-procurement; they provided survey items on the support of the top management, the available

resources, organisational governance and culture. These items were measured on a four-point forced-choice Likert scale from “Strongly disagree” to “Strongly agree”.

The fourth section focused on the external or environmental factors that influence the organisations’ adoption of e-procurement, including survey items that measured the relationship with their business partners, the government regulations, and the existing IT support-giving entities. These items were measured on a four-point forced-choice Likert scale from “Strongly disagree” to “Strongly agree”.

The last and fifth section included closure items regarding the organisation’s general assessment of their readiness to implement the e-procurement system in Bahrain measured on a four-point forced-choice Likert scale from “Strongly disagree” to “Strongly agree”, as well as an optional open-ended question to write their challenges and any further comments.

A forced-choice Likert scale was chosen for most of the assessment items. This scale of ratings does not allow for neutral responses (Bartram, 2007), and aims to force the sample to express their opinions about the extent of readiness to adopt e-procurement. To mitigate the limitations of this rating scale, the selection of respondents was made by ensuring their familiarity with the topic of the study and their engagement with the BTB and road construction. This instrument allowed for obtaining more actionable data.

Moreover, the survey findings were likely to be generalised on the population of road construction companies in Bahrain, which further aided in understanding the various factors of the TOE and how they affect the readiness to adopt e-procurement in the complex domain of construction works.

4.7.2 Sampling

In order to determine the population of the road’s construction companies, the study used the list of prequalified construction companies registered in the MOWMAUP and the BTB, under the category of Road Works. This list entails all construction companies that are participating in the public road construction tenders and projects. The population included 84 construction companies (refer to Appendix C).

In generating generalisable findings, a random sample must be of a suitable size relative to the population (Taherdoost, 2016). The sample size for construction companies that would reflect a representative sample is determined using Krejcie and Morgan (1970) ’s table. The

sample size is chosen based on a confidence of 95%, and a 5% margin of error. The required sample size for the survey is 70 (Krejcie and Morgan, 1970), and a total of 71 responses were received.

4.7.3 Data Collection

The collection of quantitative data was through a Google Forms' web-based survey, based on the main constructs of the E-Procurement Readiness Model in Section 3.3 and its subsequent subsections. The survey contained different formats to gather the required answers, including dichotomous yes and no answers, multiple-choice, and assessment items. The web-based survey consists of 25 survey items, organised into five sections. The web-based survey was distributed to 84 road construction companies through emails, with a brief overview of the survey and the importance of their input for this study. This will aid in mitigating low response rates. Moreover, to further increase the response rates, three follow-up emails were sent with a reminder to participate in the survey highlighting the importance of their inputs for the study.

4.7.4 Method of Data Analysis

The collected data was analysed to identify the factors affecting the road construction companies to adopt the e-procurement system in Bahrain. This involved statistical analysis to describe the results, which was done by classifying the data, noting the common patterns to derive explanations of the case study. The data was analysed using IBM SPSS 26.0. The content validity of the survey refers to how the items accurately measure the required data to produce actionable findings (O'Dwyer and Bernauer, 2013). The survey items were reviewed by four academic experts in the field and agreed that the number of items, the scale for measurement, and the phrasing of the survey items were suitable for distribution. The quantitative data analysis was presented using descriptive statistics using tables and figures to provide clear comparisons to show the independent variables of the TOE and their influence on the dependent variable of the readiness to adopt e-procurement in Bahrain.

Descriptive statistics were provided for all the items of the survey by running the frequency and percentage for each factor. For all Likert-type scale factors, means and standard deviations were calculated. Between factors, the chi-square test of independence and Fisher's exact test were used in order to examine if there were any correlation between certain sets of

responses. The purpose of the using the chi-square test of independence and Fisher's exact test were to verify whether there were any statistical significance between factors used in the conceptual model to assess the readiness and the difference of the size of the road construction company in terms of their readiness to adopt and use e-procurement. In addition, Cramer's V was also used to determine the strength of the association after the chi-square test of independence determined the significance of the relationship.

4.8 Summary

This study design aimed to use mixed-methods to address the Roads Sector's readiness to implement e-procurement in Bahrain. A convergent parallel mixed-method is used, including a simultaneous collection of qualitative and quantitative data, analysed distinctly and then combined for interpretation.

The semi-structured interviews of the MOWMAUP Roads Sector's public officials explored the entity's readiness to implement e-procurement in Bahrain. The survey developed an E-Procurement Readiness Model, which was derived from TOE, DOI and PERM that predicts how the technology, organisation and environmental factors influence the road construction companies to adopt e-procurement in Bahrain. The reason for the collection of both qualitative and quantitative data is to obtain in-depth knowledge of the case study's contextual elements and respective units of the case, where the MOWMAUP Roads Sector was examined through interviews, and representative data from the road construction companies were obtained from a survey to consider their readiness to adopt the e-procurement system in Bahrain.

Chapter 5: Findings

5.1 Introduction

In this chapter, the research findings of both the quantitative and qualitative methods is presented. The following subsections first present the findings of the qualitative analysis of the archival records, followed by the findings of the thematic analysis of the semi-structured interviews conducted with the MOWMAUP personnel, which is followed by the quantitative analysis of the online survey addressed to the road construction companies.

5.2 Qualitative Data Findings

This section includes the analysis of the archival records, which consisted of the MOWMAUP's annual reports for the years 2018, 2019 and 2020, as well as the BTB's laws, decisions and circulars. In addition, this section contains the thematic analysis of the interviews conducted with the MOWMAUP's officials, which included interview transcription, data coding, categorisation, and generation of themes. The data from the interviews were analysed using MAXQDA Analytics Pro.

5.2.1 Analysis of Archival Records

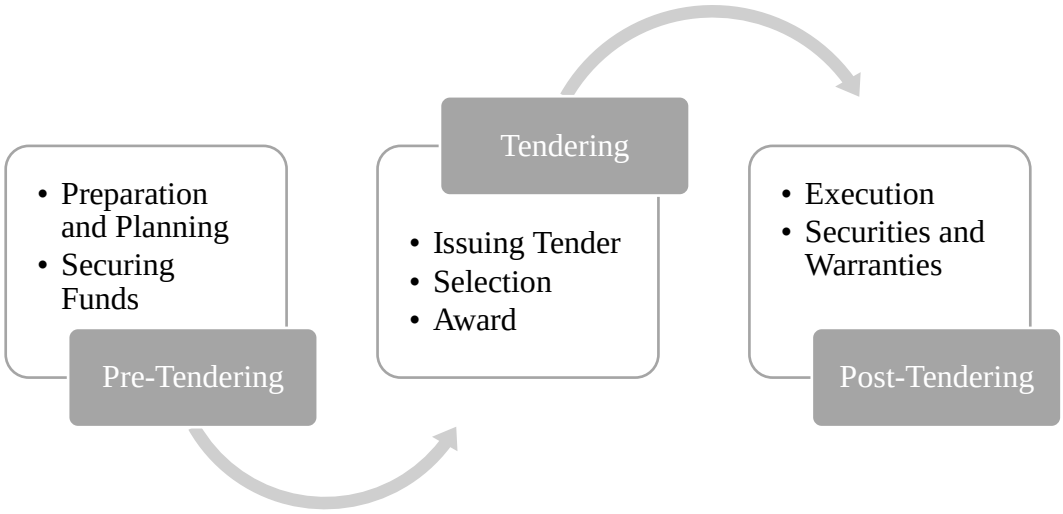
This study obtained archival records to assist in understanding the characteristics of the BTB's e-tendering system and the procurement framework for road projects. The following subsections show the findings of the MOWMAUP's annual reports, as well as the thematic analysis of the BTB's laws, decisions and circulars.

5.2.1.1 Analysis of Archival Records. The following subsections present the findings resulting from the interpretation of the BTB's laws, decisions, circulars, the MOWMAUP's annual reports to identify the characteristics of the procurement procedure in Bahrain, and specifically related to the construction sector. Furthermore, analysing the BTB's laws, decisions and circulars provided further understanding of the individual processes that governed the procurement processes for road projects and validated the interview findings. In contrast, the MOWMAUP's annual reports generated the tendering timeframe for road projects.

5.2.1.1.1 Procurement Stages for Road Projects. Public contracts are used to execute road projects, which the government of Bahrain funds. The BTB developed a legislative framework for public procurement that provided transparency, fairness and quality (Bahrain Tender Board, 2020). All of the stakeholders, including the MOWMAUP, the road construction companies, the MOFNE, and BTB, collaboratively work within the legal framework to publish, award, and execute road projects (Bahrain Tender Board, 2002). There are three main stages in Bahrain's public procurement process, as summarised in Figure 10.

Figure 10

Bahrain's Public Procurement Stages



Note. This figure is created from the analysis of the BTB's laws and regulating framework.

Figure 10 presents an overview of the main stages of procuring public road projects. Pre-tendering was the first stage in the process, which included identifying the project's scope and objectives, preparing the cost estimate, and acquiring prior approval of the budget needed from the MOFNE (Bahrain Tender Board, 2021). Tendering was the second stage in the process, which comprised of publishing the tender on the e-tendering system to search for potential bidders, selection of the best bid after evaluation of the received bids, and awarding the successful bidder with a contract between the MOWMAUP and the bidder for the project (Bahrain Tender Board, 2021). The third stage is the post-tendering stage, which also includes the contract management of the project. During the third stage, the road construction company

would execute the project, under the supervision of the MOWMAUP, as well as the warranty period, which is the provision of guaranteeing the quality of the work for an agreed period of time after the completion of the project (Bahrain Tender Board, 2021).

5.2.1.1.2 Communicating with BTB. According to the BTB's circular no. 4 of 2020, all communications with the BTB were conducted by sending them emails that contained the required documents in PDF format, signed by the authorised personnel of the MOWMAUP.

Therefore, this indicated that the e-tendering system is only used for publishing tenders, receiving the bids, and transferring the bids to the MOWMAUP. However, the procedures of seeking the BTB's approval to award a tender are conducted by preparing the tender evaluation report in PDF format, along with the official letter signed by the MOWMAUP's representative and sent electronically to the BTB's email. The BTB will review the submitted tender evaluation report and issue a decision to award a tender. The awarded tenders are accessible on the BTB's website, and a report is published every month in the official gazette (Bahrain Tender Board, 2021).

5.2.1.1.3 Preference for SMEs. The BTB issued circular no. (2) of 2019 regarding the implementation of a preference for SMEs. This circular includes a regulation that provides a preference for SMEs that participate in public tenders, which entails that registered SMEs will be offered a preference of 10% in tenders and auctions.

5.2.1.1.4 Contract Management. Following the tender award, the purchasing authority, which is the MOWMAUP, will sign a contract with the awarded road construction company to execute the project. According to the BTB's circular No. 2 of 2020, the requirements for issuing variation orders were established, including the need to seek the BTB's approval prior to issuing any variation order that is more or less than 15% of the original contract sum. The BTB is a regulatory body that oversees the implementation of the contracts of the MOWMAUP.

5.2.1.1.5 MOWMAUP Annual Report – Tendering Timeframe. Data obtained from the MOWMAUP's annual reports for the years 2018, 2019 and 2020 (refer to Appendix D) was analysed to show the timeframe for awarding tenders, the MOWMAUP's annual reports

identified the road projects awarded, then their records were tracked from the BTB's website to determine the date each project was issued in a tender. This activity indicated the overall number of days on average for a tender to be awarded. The list of awarded tenders shown in the MOWMAUP's annual reports was identified (Ministry of Works, Municipalities Affairs and Urban Planning, 2021), which included 22 road tenders (refer to Appendix D). It was found that the average time between the tender closing and tender award was more than two and half months (M = 74.64 days). What was interesting about the data was that the lowest reported timeframe was 22 days, and the longest timeframe reached 213 days. The majority of the tenders were awarded within 30-99 days (72.00%). This timeframe included the activities of transferring the electronic bids from the BTB's e-tendering system to the MOWMAUP, conducting the evaluation of the bids, and submitting the tender evaluation report to the BTB to award the respective tenders (Bahrain Tender Board, 2021). The road tenders differ in terms of scope and specifications, and accordingly, the MOWMAUP would select the procuring method that suits the road project's requirements (Bahrain Tender Board, 2021).showed that the average timeframe between tender closing and tender award was almost two and a half months, meaning that the activities of evaluating the tenders, and submitting the recommendation for the award were taking almost 75 days on average, reaching to a maximum of 213 days.

5.2.2 Thematic Analysis of Semi-Structured Interviews

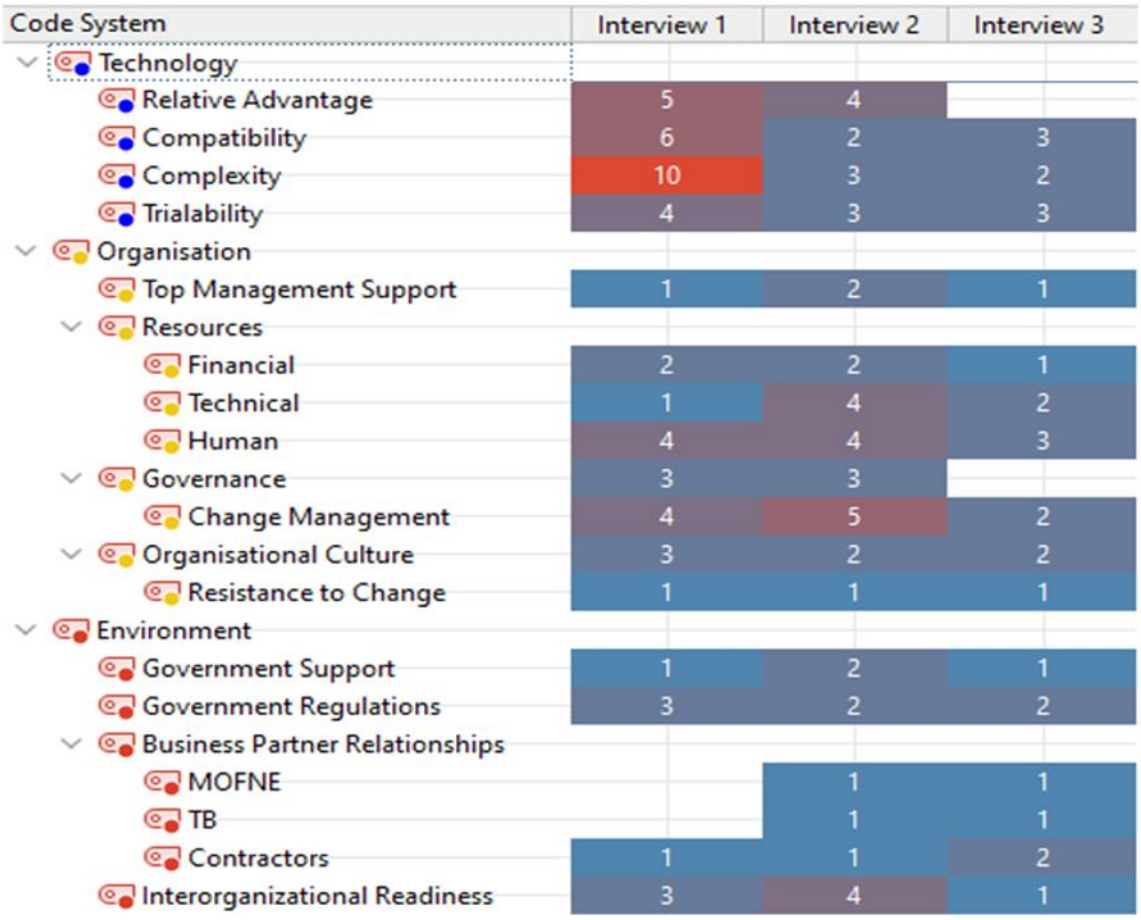
This section provided the findings of the semi-structured interviews, which aimed to accumulate in-depth knowledge from the MOWMAUP's experts on their readiness to implement e-procurement in the Roads Sector, which is investigated under the conceptual model of this study. The following subsections present the main themes, the emerging observations and opposing viewpoints from the thematic analysis of the interviews.

Despite the fact that there were pre-defined codes of the conceptual model, new ideas and concepts were considered by assigning them with new codes. As a result, the conceptual model of this study consisted of three constructs and 11 factors, which was extended to three constructs, 12 factors and eight sub-factors as shown in Figure 11. The identification of the frequency of codes to establish the importance of the respective code was not emphasised in this study, especially since the interviewees are executives and procurement experts, frequent codes and codes with limited reoccurrence were evaluated equally. The transcribed interviews were

analysed using MAXQDA Analytics Pro. The full text of the transcribed three interviewees is shown in Appendix E, and the coding system is shown in Appendix F.

Figure 11

Thematic Analysis Coding System



Note. This figure was produced from MAX Analytics Pro.

5.2.2.1 Technological Construct. This section describes the technological theme derived from the interviewees' views on the technological factors and how they affect the MOWMAUP Roads Sector's readiness to adopt public e-procurement. The themes followed the literature review and the study's conceptual model, including relative advantage, compatibility, complexity, and trialability.

5.2.2.1.1 Relative Advantage. Interviewee 1 and Interviewee 2 identified several potential benefits and advantages of implementing public e-procurement in the MOWMAUP Roads Sector. In relation to the alignment of e-procurement with the goals and aims of the MOWMAUP, Interviewee 2 stated that

> *"It aligns perfectly, of course, our goal as a ministry is to execute the project on time and within budget. We also have to do that by transparently procuring these works by providing the required competitiveness, fairness, efficiency and effectiveness."*

It was evident that e-procurement can provide modern tools to advance the MOWMAUP Roads Sector's performance, especially since e-tendering was already in use. E-procurement was found to impact several areas of the procurement process, as Interviewee 1 commented

> *"The e-procurement system, it seems to me, is based upon the Project Management concept. So you've got the initial phases, and you've got the actual construction, and then you've got closeout phase, all of which the e-procurement system will be handling simultaneously."*

In the pre-tendering and tendering stages, e-procurement could allow in synchronising the process of seeking budget approvals, as well as incorporating a digital tender document that could be priced by the bidders electronically, as Interviewee 1 put it

> *"For example, uploading a digital tender document will allow contractors to price it without the possibility of an arithmetic error, which would save us a lot of time. Or a smart tool for evaluations so you already have metrics and formulas to do your evaluations to select the successful bidder."*

This means that e-procurement can reduce the timeframe of evaluating tenders and ease the process of submitting bids for road construction companies. In addition, e-procurement could eliminate the multilayers of approvals in forwarding official letters and communications between the relevant entities, as Interviewee 2 commented

"The communication process between the ministry, the contractor, the BTB, MOFNE can all be done faster with e-procurement… For example, issuing official letters requires several layers of approvals and the involvement of the administrative personnel to organise the documents and make sure they are in order; therefore, e-procurement can decrease the timeframe and ensure that the process will run more smoothly."

In the post-tendering stage, e-procurement was also found capable of providing several benefits to the MOWMAUP Roads Sector in terms of payment processing and contract management; the comment below from Interviewee 2 illustrates some of these advantages

"E-procurement should select the awarded contractor, pay the contractor, process variation orders, and settle the final account digitally. And this is what e-procurement can be of great help. Also, it should provide a communication tool to track the minute details and deadlines to each project to ensure the compliance of the project with the laws and regulations."

Interviewee 1 alluded that the e-procurement system has great potential to advance the MOWMAUP Roads Sector. However, these benefits can only be achieved if there was enough room for strategising this implementation; as stated "*The e-procurement system would significantly enhance the ministry's objectives and capabilities only if planned and executed intelligently*". The interviewees expressed opinions on the strengths of the e-tendering system. The e-tendering system included electronic publishing, purchasing, and submitting tenders. The benefits of using the current system are shown in Table 5.

Table 5

E-Tendering System Benefits

E-Tendering System Benefits	Interview Source
Reducing the tendering timeframe	Interviewee 2, 18 February 2021
Providing an online database for studying market rates for road construction	Interviewee 2, 18 February 2021
Reducing transaction cost	Interviewee 2, 18 February 2021
Easing the communication between entities	Interviewee 2, 18 February 2021, Interviewee 3, 25 February 2021
Reducing human errors	Interviewee 2, 18 February 2021
Securing and documenting the information of the tenders	Interviewee 2, 18 February 2021, Interviewee 3, 25 February 2021

5.2.2.1.2 Compatibility. The interviewees were asked regarding the compatibility of e-procurement with the current procedures and systems of the MOWMAUP. The interviews illustrated that the e-tendering system process was partially electronic; the BTB's e-tendering system combined electronic and paper-based processing at different stages. Commenting on the e-tendering system, Interviewee 1 stated

"First of all, the e-tendering system was initiated a few years back by TB, which helped in many ways compared to the standard manual process. Currently, the tender documents are accessible online, and the contractors purchase the documents from anywhere around the world in PDF format. But then they will have to print the documents, stamp them, price them, compile the additional documents, scan them and upload them in the system electronically."

The majority of the interviewees commented that there were several systems used to manage the different procurement activities of road projects, but they were created to serve a specific purpose and were difficult to be integrated; Interviewee 1 stated

> *"There needs to be more flexibility built into our systems… It seems like there is there are these completely separate systems that are incompatible with each other. And because all*

of them have their independent objectives, serving a particular entity or specific goal, they could miss achieving the main objective, which is the project to be procured."

Table 6 summarises the MOWMAUP's systems used to manage the procurement of road projects and their main objectives.

Table 6

MOWMAUP's IT Systems

System	Objective
Masterbill	Creating Bill of Quantities for tendering purposes
Contract Awarding System (CAS)	Seeking project budgets, issuing letters of award
CED Information System (CEDIS)	Creating payment certificates, reporting the cost of contracts, closing the project
Central Financial System (CFS)	Securing project budgets, cost monitoring of the project
Project Management Information System (PMIS)	Project management
Contract Information System (CIS)	Contractor performance monitoring, project reporting

5.2.2.1.3 Complexity. The interviewees were asked how they perceived e-procurement implementation to be complex or challenging to implement. It was found that the interviewees viewed e-procurement for construction projects as more complex than the purchasing of materials or goods, where road construction must conform with the conditions of contract, the laws and regulations of the MOWMAUP, the BTB, and the MOFNE, Interviewee 3 stated

"Purchasing materials or goods is more straightforward than the complex nature of construction projects. Construction involves the components of variation orders,

disputes, timely construction of works, and more, governed by contract conditions. The e-procurement should ensure that all of these phases can be compatible with the system."

Concerns were expressed regarding the design of e-procurement for road construction, Interviewee 1 believed that a qualified IT consultant must implement the design of e-procurement, but that consultant must be adequately guided to produce an efficient system, Interviewee 1 also had the following comment

"I'm thinking now, particularly from a contractual view, we have to recognise that you can understand a process by breaking it down into its component parts, but if by making each individual component more efficient, you actually damage the process. Then, you're doing harm, not good. And that has to be a concern. That's why you need to take a very high-level look at this and make sure it works."

The majority of the interviewees agreed that the existing systems, laws and regulations that govern the procurement of road projects could pose a challenge to the implementation of e-procurement. Whereas Interviewee 1 had an interesting view on the development of the system to serve road construction, as he reported

"If you leave it to an IT consultant who has no knowledge of Bahrain, perhaps no knowledge of procurement, no knowledge of contracting to make decisions, and then you're going to end up with a system that is entirely like a straitjacket."

There was an agreement amongst all of the interviewees that the e-procurement system requires careful planning to accommodate all of the governmental procedures and laws regarding procuring road construction projects. However, a prevalent view amongst the interviewees were the challenges in using the e-tendering system for road tenders, especially since tender documents were communicated between the different parties in PDF format, which involved challenges on the MOWMAUP and the road construction companies as shown in Table 7.

Table 7

E-Tendering System Challenges

E-Tendering System Challenges	Interview Source
Slow tender document review for publishing (PDF format)	(Interviewee 1, 8 February 2021), (Interviewee 3, 25 February 2021)
Need to print the tender documents to be filled manually, scanned and uploaded on the system	(Interviewee 3, 25 February 2021)
Slow tender evaluations	(Interviewee 3, 25 February 2021)
Lack of smart tools to evaluate tender bids	(Interviewee 2, 18 February 2021), (Interviewee 3, 25 February 2021)
Human error mistakes in pricing tender bids	(Interviewee 3, 25 February 2021)
Lack of provisions for e-award of tenders	(Interviewee 3, 25 February 2021)
Lack of provisions e-payments to road contractors	(Interviewee 3, 25 February 2021)

By discussing the benefits and challenges of e-tendering, the gaps of the e-tendering system were revealed, as Interviewee 2 commented

> *"The tendering process requires a lot of enhancement and improvement… There has to be a digital format where roads contractors can submit tenders, which can be read and analysed in a smart domain, so there are areas of improvement… But overall, the e-tendering system already prepared them to shift to a digital platform, so the BTB can implement the e-procurement implementation in a relatively smooth manner."*

Based on the experience from the MOWMAUP's procurement experts, e-tendering provided numerous benefits to the overall procurement process. The system's limitations could be addressed in the development stage of the e-procurement system to facilitate the effective administration of the different procedures of the delivery chain.

5.2.2.1.4 Trialability. The interviews identified the need for testing e-procurement prior to its full deployment, and that was to detect the problems with the interface and allow the entities to determine how user-friendly the system is and how simple it is for the users to work through its features, as Interviewee 1 stated

> *"There needs to be a much better understanding of how all of the stakeholders involved in this operate… We all want the process to be complete instantly, with no mistakes, and we should not forget that humans are still required in this process. So I think we should be wary of just accepting that new technology without properly understanding how it affects our day to day work."*

All interviewees agreed that training sessions are an essential part of the pilot phase to train the employees and road construction companies to use the e-procurement system. Interviewee 3 suggested that "*There has to be a planning stage and pilot test. However, with enough training and practice, we believe e-procurement can be implemented with ensuring all of the other entities' coherence.*". The interviewees reported that the primary goal of e-procurement's trialability was to assess the viability, timeliness, cost, and efficiency of the e-procurement system under real-world conditions.

5.2.2.2 Organisational Construct. This section defines the organisational theme resulting from the interviewees' views on the MOWMAUP Roads Sector's organisational factors and how they affect the entity's readiness to adopt public e-procurement. The theme includes top management support, resources, governance, and organisational culture.

5.2.2.2.1 Top Management Support. The interviews reported that the MOWMAUP's top management were leading the development of emerging technologies and aiming to re-engineer the current administrative procedures to improve the efficiency and effectiveness of government service delivery. Interviewee 3 responded to the survey item related to the top management's role towards digitalisation, in which it was stated "*Our top management are always supporting digitalisation. They push for implementing this type of change, especially since it would aid the ministry in achieving its projects and better managing its projects and contracts.*".

From the interviewees' perspective, the top management of the MOWMAUP were aware of the value of digitalisation and were committed and supportive of the initiative regarding e-procurement implementation.

5.2.2.2.2 Resources. One of the primary factors were the available resources of the MOWMAUP and how they can adapt to the implementation of the e-procurement system. The findings from the interviews were divided based on the financial, technological and human resources.

In terms of financial resources, concerns were expressed regarding the need for securing adequate funds to provide the relevant personnel of the MOWMAUP with the necessary tools that conform with e-procurement, as Interviewee 2 stated "*We need large spaces for data storage for archiving and storage. We also need smart tools and programs, such as REVIT or equivalent systems, that could process digital bills of quantities and e-signature tools for roads construction.*", and Interviewee 3 also stated "*We might require additional tools for the employees who will be required to sign electronically, which might need additional funding.*". In digitalising the different processes of procuring road projects, set-up costs are required to aid the MOWMAUP Roads Sector in adhering to its implementation, which includes e-authentication tools, data storage, and modern software, which are shared across the entity and can provide valuable data to generate electronic tenders.

Regarding the technological resources, the interviewees all agreed that the employees were equipped with computers and laptops with built-in systems; however, they would require additional tools which would bridge the gap as a result of e-procurement implementation, Interviewee 2 commented

"I think we are equipped with the essential tools, like computers, printers, scanners, but we will need the tools to facilitate e-signature and e-processing of signed documents. If you want something all paperless, you have to provide the new tools. At this point, we need more support."

The capacity and capabilities of the human resources of the MOWMAUP Roads Sector were also investigated, as Interviewee 1 commented "*Employees here are reasonably competent to use ICT systems, but they will need time to adjust to the new requirements.*", it is essential that the employees can work efficiently and understand the requirements of e-procurement, and the distribution of responsibilities. It was argued by Interviewee 3 that

"Any system requires training and practice, and our employees are generally knowledgeable on how to operate in a digital platform, so it will not be a significant hurdle. Still, it will require a transition phase and practical training sessions to make all employees learn and operate successfully."

A commonly reported theme amongst the interviewees was that they all agreed that the MOWMAUP's financial, technical and human resources are sufficient for implementing the e-tendering system but would require additional tools to aid in the readiness to adopt the e-procurement system.

5.2.2.2.3 Governance. The interviewees were asked regarding the rules and regulations that govern the procurement of road projects and how e-procurement would impact this governing framework. The interviewees agreed that the e-procurement system aligns with the goals and objectives of the MOWMAUP Roads Sector. There was an agreement amongst the interviewees that this initiative would foster a system that enables the MOWMAUP to better achieve its goals and successfully procure road projects. Interviewee 1 stated "*The e-procurement system would significantly enhance the ministry's objectives and capabilities only if planned and executed intelligently*".

Some interviewees felt that the e-procurement system would enhance the administrative processes of procuring road projects, while other interviewees reported that there were complex

sets of rules and regulations from various entities that must be adhered to concerning road projects, and e-procurement should create a domain that accommodates to all of these requirements, Interviewee 1 reported

> *"I firmly believe there are too many rules and too many laws and regulations to adhere to, whether it's ISO 9000, whether it's the Legislation and Legal Opinion Commission, MOFNE, BTB as stakeholders in the procurement process. And in the middle, you have this ministry."*

In terms of the power distribution, it was found that the BTB was the entity that mandated the e-tendering system, and Interviewee 2 added "*the BTB has the authority here; if they instruct this change, everyone will comply without question.*". It was also found that in terms of managing change, the process of change management was seen as an essential task for implementing e-procurement, which would include introducing new procedures, whilst some procedures would be removed or replaced. Interviewee 1 stated "*If we're going to develop e-procurement, it probably means that some or all of those systems will become obsolete.*". However, other interviewees seemed to be more optimistic; as it was found that the MOWMAUP has begun the process of digitalising other parts of the procurement process, such as e-payment; Interviewee 2 reported "*We are also currently working on digitalising the payment signature and process with MOFNE, making it easier to adopt e-procurement*". The MOWMAUP Roads Sector seemed prepared and able to re-engineer the administrative procedures as a result of e-procurement implementation, especially since the COVID-19 pandemic was a driver behind many of the digitalisation initiatives of the MOWMAUP, Interviewee 3 commented

> *"This ministry already conducted this task as a result of COVID-19, which was a primary driver for digitalisation and e-processing. This will make it easier to transition to e-procurement and highlight the processes that the ministry should add and the processes that the ministry should remove. This ministry has a team capable of handling this task, and they have been managing it successfully."*

5.2.2.2.4 Organisational Culture. By understanding the organisational culture and its impact on e-procurement, it was found that the global advancement in technologies and innovations, including the e-tendering system, had an impact on the MOWMAUP's organisational culture. In terms of attitudes toward following rules and collaborating with the different units of the Roads Sector, the majority of the interviewees agreed that there is a collaborative spirit towards the implementation of road projects; Interviewee 2 commented

> *"Within the Roads Sector, there is a strong relationship between the different units, and there are regular meetings to coordinate the efforts and achieve the strategic goals, as well as the detailed goals related to the respective roads projects. So without a doubt, they are well communicated with one another."*

Moreover, in terms of sharing information and attitude towards a unified goal, the interviewees highlighted that the Roads Sector was working as a holistic unit to procure road projects; Interviewee 1 added

> *I think you can look at our top management's recent actions in managing our strategic projects. They have managed to develop a collaborative environment between the different directorates in achieving the goal, which is the project, so I believe that the information-sharing culture is essential for e-procurement implementation. Our ministry would encourage e-procurement development and support it as most directorates and units openly share information and are fairly transparent with their data and procedures.*

The interviewees raised points concerning the cultural concerns and challenges for e-procurement implementation, including resistance to change and lack of knowledge and awareness. Interviewee 3 stated "*Employees' resistance is also something we should consider; the employees who have minimum interaction with online systems will have a more challenging time adhering to the new requirements.*", and Interviewee 2 mentioned "*We still require to do several workshops with other units to inform them of the anticipated change resulting from the e-procurement's implementation.*".

5.2.2.3 Environmental Construct. This section defines the environmental theme resulting from the interviewees' views on the environmental factors and how they impact the MOWMAUP Roads Sector to adopt public e-procurement. The theme includes government support, government regulations, business partner relationships. An emerging theme was reported, which was interorganisational compliance.

5.2.2.3.1 Government Support. When asked about the government support, which consists of the public telecommunication institutions, whose activities could impact the initiative of e-procurement, the interviewees unanimously agreed that the Information and eGovernment Authority (IGA) digitalised many public services successfully, Interviewee 2 commented

> *"The IGA is spearheading e-government and is pushing for implementing digital transformation where possible, especially if the benefits will include less operational costs, savings in time, providing an environment that is efficient and effective, and would benefit all of the concerned parties."*

The MOWMAUP Roads Sector found the government support institution experienced and capable of supporting e-procurement, as they transformed many public services to a digital platform.

5.2.2.3.2 Government Regulations. The interviewees were asked about government procurement laws and rules, and also how they could address e-procurement. Interviewee 1 argued that there are many rules to be followed and had concerns that the e-procurement system might not be able to accommodate all of the different rules, as stated

> *"There are too many rules… The best way I can talk about this is in a musical sense; as somebody who appreciates jazz music, music a strict discipline, there are strict rules, this is how you play one cord, and this cord doesn't work with that note. So, music is a framework, a very disciplined framework within which an individual and as far as jazz is concerned, individuals can create without breaking the rules. It is fine to have rules, but we need to have the opportunity to work with, in, and around that framework."*

These concerns reflected the need for the e-procurement system to implement a domain that can be flexible for the different procurement forms of road projects. Other interviewees reported that the BTB and MOFNE's laws would require further additions to support e-processing functions; Interviewee 1 reported "*The BTB law also would need to be revisited depending on the proposed changes in the process, as well as MOFNE's Standard Financial Manual.*".

5.2.2.3.3 Business Partner Relationships. The readiness of the MOWMAUP Roads Sector's business partners plays a vital role in the success of e-procurement implementation, which includes the BTB, MOFNE, and the road construction companies. Various interviewees expressed positive views regarding the BTB's readiness; which Interviewee 2 stated "*I must say, in terms of the BTB, they are very ready, and we have proof of that in the current e-tendering system.*", however, Interviewee 3 expressed other views "*BTB are very efficient and are ready to implement this system. Still, they need to be aware of the different elements and the complexities of the differences in the purchasing activities for construction projects.*". It was found that the e-tendering system was implemented successfully and used by all public entities and the various private companies that wish to participate in the tenders of the government. Therefore, interviewees found the BTB ready with a strong desire to implement e-procurement.

In regards to the readiness of the MOFNE, Interviewee 2 reported "*Concerning MOFNE, they can adapt to e-payments and e-allocation of budgets, as they already utilise the Central Financial System to process and assign public funds.*", whereas Interviewee 3 argued that *"I don't believe MOFNE would be required to make any changes for this transition. Their involvement can be limited to the payment and establishing the budgets, which MOFNE can easily include without changing their procedures."*.

The interviewees viewed the MOFNE as ready for e-procurement implementation; even though some of the interviewees expressed their concerns regarding their stringent regulations, the actual processes that require their involvement were not found to require any changes for e-procurement implementation.

All of the interviewees indicated that road construction companies might not share the same level of readiness, as the size of the organisation and its resources could determine how ready they would be to adopt e-procurement. Interviewee 3 stated

"When we talk about contractors, I don't believe all contractors will be at the same level of readiness, as some contractors are more used to manual processes and physical interactions, whilst others are more advanced in moving towards a digital platform; this will also depend on the contractor's top management support, their size and resources."

5.2.2.3.4 Interorganisational Compliance. Interestingly, a new theme emerged from the findings of the interviews, which was related to the compliance of the main stakeholders to adopt e-procurement. Interorganisational compliance was found essential, as multiple entities must cooperatively decide on the e-procurement system's scope and minute details, especially since the failure of any of the main entities to adopt the system would mean that the system would not be successfully implemented. When asked regarding the various stakeholders' input in the implementation of e-procurement, Interviewee 1 stated "*Without including them in the design and planning stages, we can't be positive that e-procurement will not damage their performance or ours.*".

Interviewee 1 argued that the nature of procuring construction projects is complex; it was stated

The capabilities of the different entities might differ. Some entities might require drastic changes to be able to cope with e-procurement's requirements. Construction contracts have a wide array of complex functions and would vary from one project to the other, so the system might face challenges to include all possible scenarios.

The interviewees mentioned that the e-procurement system would require the involvement of the public entities and even the road construction companies to ensure that their needs are met before the system's deployment. Interviewee 2 commented "*Digitalising procurement for construction will be a difficult task, but not an impossible one. There needs to be sufficient coordination to provide the required facilities and cloud infrastructure to support this significant transformation.*".

5.2.2.4 Interviews Summary. The following Table 8 shows the summary of the interviews in relation to the constructs and factors of the E-Procurement Readiness Model.

Table 8

Summary of Interviews

Construct	Factor	Summary
Technology	Relative Advantage	• E-procurement aligned with the ministry's goals • E-procurement could increase the productivity of the ministry • E-procurement could provide several benefits regarding the procurement of road projects.
	Compatibility	• E-tendering uses several subsystems which are not compatible with each other • Existing systems would be affected by e-procurement implementation
	Complexity	• Procuring road projects is complex and involves numerous steps • Road projects involve conditions of contract, laws and regulations from both BTB and the MOFNE
	Trialability	• A pilot test of the e-procurement is essential to ensure its success • Training and workshops are necessary to understand how to utilise the system

Construct	Factor	Summary
Organisation	Top Management Support	• The top management support and drive the digital transformation for e-procurement
	Resources	• The ministry has adequate human resources • The ministry might require additional funding to purchase e-authorisation tools • The ministry has adequate financial resources
	Governance	• Road project procurement is governed by a complex legal framework • BTB has the authority to mandate the use of e-procurement • The administrative framework is being amended to accommodate electronic processing
	Organisational Culture	• The ministry collaborates with its partners effectively and follows the rules • The ministry shares information openly within its respective units • Employees' resistance is to be expected, advising a phased implementation

Construct	Factor	Summary
	Government Support	• IGA is spearheading the digital transformation of the government and can assist in e-procurement implementation
	Government Regulations	• The existing legal framework is rigid and complex • BTB laws would need revision to accommodate to e-procurement adoption • Standard Financial Manual would need revision to allow e-invoicing
Environment		
	Business Partner Relationships	• BTB is ready to implement e-procurement • MOFNE will require minimal changes resulting from e-procurement • Road construction companies might differ in their readiness depending on their size, knowledge and resources
	Interorganisational Compliance	• An emerging theme • E-procurement would require the compliance and readiness of all stakeholders to ensure its success

5.3 Quantitative Data Findings

This section includes the online survey analysis sent to the roads' construction companies in Bahrain, including data organisation, consistency and pattern identification, evaluation and deriving interpretations. Furthermore, these processes were frequently related to the conceptual model. The data from the survey was analysed using IBM SPSS 26.0.

A total of 71 companies completed and return the survey, with a response rate of 84.52%, and only 13 companies did not respond, with a rate of 15.48%. As mentioned in Section 4.7.2, the required minimum sample size for the survey is 70 using Krejcie and Morgan (1970)'s table, which was achieved.

In analysing the survey findings, descriptive statistics and inferential statistics were used. All sections of the survey were analysed using descriptive statistics, which included calculating the frequency and percentage of responses to each survey item. Standard deviations were also calculated for each item.

For the statistical identification of associations between the categorical data of this study, the chi-square test of independence and Fisher's exact test were used. The aim of using the chi-square test of independence and Fisher's exact test was to observe if there was statistical significance between the different variables in the context of this study; especially the relationship between the size of the companies and the conceptual model's constructs, to measure the readiness of road construction companies to adopt and use the e-procurement system in Bahrain.

5.3.1 Demographic Information of the Participants

The demographic information about the sample that the survey collected included the years of experience in the field, if they participated in tenders with the MOWMAUP, and if they used the existing e-tendering system of the BTB. This information was important to ensure that the participants were conversant with the survey and could provide valuable data for the analysis. The organisation's size is part of the organisational construct. However, it was shown in this section to identify the number of LEs, and SMEs, which were also used to distinguish any differences in the rest of the answers between LEs and SMEs.

5.3.1.1 Company Size. Table 9 shows that almost one-third of the participants were SMEs (35.21%), and over two-thirds of the participants (64.79%) were LEs.

Table 9

Size of Company by the Number of Employees

O_OS	*n*	%
1-100 Employees (Small and Medium-sized Enterprise (SME))	25	35.21
Over 100 Employees (Large Enterprise (LE)	46	64.79
Total	71	100.00

5.3.1.2 Years of Experience. Table 10 below illustrates the years of work experience amongst the participants. What stands out in Table 10 is that a minority of the participants (1.41%) had 1-5 years of experience, whereas over half of the participants (53.52%) had over 15 years of experience in the field. Almost a third of the participants had 6-10 years (21.13%) and 11-15 years of experience (23.94%).

Table 10

Years since Company's Establishment

D_OE	SME		LE		Combined	
	n	%	*n*	%	*n*	%
1-5 Years	1	4.00	0	0.00	1	1.41
6-10 Years	9	36.00	6	13.04	15	21.13
11-15 Years	7	28.00	10	21.74	17	23.94
Over 15 Years	8	32.00	30	65.22	38	53.52
Total	25	100.00	46	100.00	71	100.00

5.3.1.3 Participation in the E-Tendering and the MOWMAUP Tenders. Table 11 and Table 12 show the results obtained from the participants when asked if they used the e-tendering system of the BTB and if they participated in any tender with the MOWMAUP during the last seven years. All of the participants (100.00%) answered positively to these questions. Therefore, there were no answers that had to be omitted for the subsequent stages of the analysis.

Table 11

Company's Usage of the E-Tendering System of the BTB

D_TB	*n*	%
Yes	71	100.00
No	0	0.00

Table 12

Company's Participation in Tenders with the MOWMAUP

D_WA	*n*	%
Yes	71	100.00
No	0	0.00

5.3.2 Technological Variables

The technological variables from the conceptual model were presented, including the relative advantage, compatibility, complexity and trialability. The findings were presented for the total participants, as well as for SMEs and LEs individually.

5.3.2.1 Relative Advantage. The survey sought to seek the participants' perceptions of e-procurement's advantages. The findings in Table 13 shows that almost all LEs agreed that e-procurement would create better ways of managing and organising their business (93.47%, *SD* = 0.60), and a small portion of LEs disagreed with the statement as mentioned above (6.53%). What is interesting about the data in Table 13 is that more than two-thirds of SMEs disagreed with the statement that e-procurement would better organise and manage their business (76.00%, *SD* = 0.68), and only about a third of the SMEs agreed with the same statement (24.00%).

A closer inspection of Table 14 shows similar results, where the majority of LEs agreed that e-procurement should allow their organisations to improve their business performance (93.48%, *SD* = 0.59). In comparison, only a minority disagreed with the same statement (6.53%). SME's had differing views. Almost all SMEs disagreed with the statement mentioned above (80.00%, *SD* = 0.47), and only a third agreed with the same statement (20.00%).

Interestingly, the difference in the results between SMEs and LEs indicate that LEs were more aware of e-procurement's advantages than SMEs, which indicates that there might be barriers that prevent them from fully optimising the benefits of this technological transformation.

Table 13

Relative Advantage – Creating Better Ways of Managing the Business

T_RA1	SME		LE		Combined	
	n	%	*n*	%	*n*	%
Strongly Disagree	1	4.00	0	0.00	1	1.41
Disagree	18	72.00	3	6.53	21	29.58
Agree	4	16.00	24	52.17	28	39.44
Strongly Agree	2	8.00	19	41.30	21	29.58
Total	25	100.00	46	100.00	71	100.00
SD	0.68		0.60		0.81	

Table 14

Relative Advantage - Improving Business Performance

T_RA2	SME		LE		Combined	
	n	%	*n*	%	*n*	%
Strongly Disagree	1	4.00	0	0.00	1	1.41
Disagree	19	76.00	3	6.53	22	30.99
Agree	5	20.00	26	56.52	31	43.66
Strongly Agree	0	0.00	17	36.96	17	23.94
Total	25	100.00	46	100.00	71	100.00
SD	0.47		0.59		0.77	

5.3.2.2 Compatibility. The participants were asked to provide their answers on the compatibility of e-procurement and if the available technological tools are compatible with the preferred work practices of the road construction companies. As it can be seen from the data in Table 15, both SMEs and LEs reported an overall agreement with the reliability of the existing IT infrastructure to support e-procurement; the majority of SMEs agreed with the statement mentioned above (92.00%, *SD* = 0.60), and only a minority of SMEs disagreed (8.00%). The majority of LEs agree that the existing IT infrastructure is reliable to support e-procurement

implementation (97.83%, *SD* = 0.55), while only a minority disagree with the same statement (2.17%). This provides consistent answers concerning the government's IT infrastructure and its ability to support e-procurement and e-business implementation for roads construction companies in Bahrain.

Table 15

Compatibility – Reliability of the IT Infrastructure

T_CP1	SME		LE		Combined	
	n	%	*n*	%	*n*	%
Strongly Disagree	0	0.00	0	0.00	0	0.00
Disagree	2	8.00	1	2.17	3	4.23
Agree	15	60.00	22	47.83	37	52.11
Strongly Agree	8	32.00	23	50.00	31	43.66
Total	25	100.00	46	100.00	71	100.00
SD	0.60		0.55		0.57	

Table 16 presents the results obtained from the participants concerning the road construction companies' utilisation of advanced IT tools to manage and implement e-procurement. The findings show that the majority of the participants agreed with the statement that they have sufficient utilisation of advanced IT tools for e-procurement implementation (77.46%, *SD* = 0.80), and less than one-quarter of the participants disagreed with the same statement (22.54%). When looking at the table in more detail, around two-thirds of SMEs agreed with the statement (60.00%, *SD* = 0.87), while more than one-third of the SMEs disagreed (40.00%). Moreover, the majority of LEs agreed with the statement (86.96%, *SD* = 0.65), while around a tenth of the LEs disagreed (13.04%). As shown in Table 16, the majority of both LEs and SMEs agreed with the statement. However, the proportion of the agreement of LEs is more than SMEs in terms of their capabilities of utilising modern IT tools for e-procurement management and implementation.

Table 16

Compatibility – Suffecient Utilisation of Advanced IT Tools for E-Procurement

T_CP2	SME		LE		Combined	
	n	%	*n*	%	*n*	%
Strongly Disagree	4	16.00	0	0.00	4	5.63
Disagree	6	24.00	6	13.04	12	16.90
Agree	13	52.00	25	54.35	38	53.52
Strongly Agree	2	8.00	15	32.61	17	23.94
Total	25	100.00	46	100.00	71	100.00
SD	0.87		0.65		0.80	

Table 17 presents the findings that identify if e-procurement is compatible with the preferred work practices of the participants, the majority of the participants agreed (84.51%, *SD* = 0.78). In comparison, only 15.49% disagreed with the statement. This is consistent between both SMEs and LEs, with over two-thirds of SMEs who agreed (72.00%, *SD* = 0.85), and around one-third of SMEs disagreed (28.00%). Moreover, the majority of LEs agreed (93.31%, *SD* = 0.65), and 8.69% disagreed.

Table 17

Compatibility – Alignment of E-Procurement with Company's Preferred Work Practices

T_CP3	SME		LE		Combined	
	n	%	*n*	%	*n*	%
Strongly Disagree	2	8.00	0	0.00	2	2.82
Disagree	5	20.00	4	8.70	9	12.68
Agree	13	52.00	20	43.48	33	46.48
Strongly Agree	5	20.00	22	47.83	27	38.03
Total	25	100.00	46	100.00	71	100.00
SD	0.85		0.65		0.78	

5.3.2.3 Complexity. The survey sought to determine the complexity of implementing e-procurement. The findings as shown in Table 18, indicated that over two-thirds of the participants agreed that they were familiar with e-procurement activities (67.61%, *SD* = 0.80), and one-third of the participants disagreed with the statement (32.39%). However, a closer

inspection of the table showed that for SMEs, two-thirds of the participants disagreed with the statement (68%, *SD* = 0.68), while only one-third of the participants agreed (32%). LEs reported that the majority agreed with the statement (86.96%, *SD* = 0.73), and only 13.04% disagreed. In this context, the findings implied that SMEs and LEs differed in their familiarity with e-procurement activities and expert knowledge in the field.

Table 18

Complexity – Familiarity with E-Procurement Activities

T_CX1	SME		LE		Combined	
	n	%	*n*	%	*n*	%
Strongly Disagree	2	8.00	2	4.35	4	5.63
Disagree	15	60.00	4	8.70	19	26.76
Agree	7	28.00	28	60.87	35	49.30
Strongly Agree	1	4.00	12	26.09	13	18.31
Total	25	100.00	46	100.00	71	100.00
SD	0.68		0.73		0.80	

The second survey item that measures the complexity of e-procurement implementation as shown in Table 19, indicated that over two-thirds of the participants agreed that e-procurement implementation for construction projects is easy to implement (64.78%, *SD* = 0.78), and about one-third of the participants disagreed with the statement (35.22%). When looking at the results for SMEs and LEs individually, the findings showed an interesting contrast. The majority of SMEs disagreed with the statement (80.00%, *SD* = 0.78), and less than a quarter of the participants agreed (20%). LEs showed that most of the participants agreed with the statement (89.13%, *SD* = 0.78), while only 10.87% disagreed with the statement.

Table 19

Complexity – Ease of Implementing E-Procurement

T_CX2	SME		LE		Combined	
	n	%	*n*	%	*n*	%
Strongly Disagree	2	8.00	2	4.35	4	5.63
Disagree	18	72.00	3	6.52	21	29.58
Agree	2	8.00	21	45.65	23	32.39
Strongly Agree	3	12.00	20	43.48	23	32.39
Total	25	100.00	46	100.00	71	100.00
SD	0.78		0.78		0.92	

What stood out in Table 18 and Table 19 was that the majority of the participants agreed with the respective statements of the survey items. Though when the results are observed from SMEs and LEs individually, there were very clear differences. The majority of LEs agreed with the statements, where the majority of SMEs disagreed. This showed that specific attention must be taken into consideration regarding e-procurement implementation for SMEs in particular.

5.3.2.4 Trialability. The participants were asked to provide their answer in relation to the trialability of e-procurement, specifically in terms of the need for training sessions and workshops provided by the government for e-procurement implementation. As shown in Table 20, the majority of the participants agreed that they require workshops and training sessions to encourage them in implementing e-procurement (94.37%, *SD* = 0.60), while only 5.63% of the participants disagreed. This is consistent with the individual results of both SMEs and LEs, as all of the SMEs agreed with the statement (100.00%, *SD* = 0.44). The majority of LEs also agreed (91.30%, *SD* = 0.66), and only 8.70% disagreed with the statement.

Table 20

Trialability – Training and Workshops

T_TR	SME		LE		Combined	
	n	%	*n*	%	*n*	%
Strongly Disagree	0	0.00	0	0.00	0	0.00
Disagree	0	0.00	4	8.70	4	5.63
Agree	6	24.00	14	30.43	20	28.17
Strongly Agree	19	76.00	28	60.87	47	66.20
Total	25	100.00	46	100.00	71	100.00
SD	0.44		0.66		0.60	

5.3.3 Organisational Variables

The organisational variables from the conceptual model were presented, including the top management support, resources, governance, and organisational culture. The findings were presented for the total participants, as well as for SMEs and LEs individually.

5.3.3.1 Top Management Support. The survey sought to determine the top management support towards e-procurement implementation. Table 21 shows that almost three-quarters of the participants agreed that their top management thought about whether or not e-procurement would impact the way business is to be conducted in the construction sector (74.65%, *SD* = 0.75), and about one-quarter of the participants disagreed (25.35%). Notably, similar results were shown for SMEs, where almost three-quarters of the participants agreed with the statement (72.00%, *SD* = 0.88), and about one-quarter of the participants disagreed (72.00%). The results for LEs are also consistent with the results mentioned above, as three-quarters of the participants agreed with the statement (76.09%, *SD* = 0.67), and almost one-quarter of the participants disagreed (23.91%).

Moreover, Table 22 presents the participants' views on whether their top management supports e-procurement initiatives and implementations. The majority of the participants agreed that their top management support e-procurement initiatives and implementations (92.95%, *SD* = 0.61), whereas a minority disagreed with the statement (7.05%).

The results are consistent with the individual findings of SMEs and LES. More than three-quarters of the SMEs agreed (80.00%, *SD* = 0.54), and over a quarter of the participants disagreed (20%). The majority of LEs agreed (97.83%, *SD* = 0.54), and a minority of LEs disagreed with the statement (2.17%).

Table 21

Top Management Support – Impact of E-Procurement on Doing Business

O_TM1	SME		LE		Combined	
	n	%	*n*	%	*n*	%
Strongly Disagree	3	12.00	0	0.00	3	4.23
Disagree	4	16.00	11	23.91	15	21.13
Agree	14	56.00	26	56.52	40	56.34
Strongly Agree	4	16.00	9	19.57	13	18.31
Total	25	100.00	46	100.00	71	100.00
SD	0.88		0.67		0.75	

Table 22

Top Management Support – Support for E-Procurement Initiatives

O_TM2	SME		LE		Combined	
	n	%	*n*	%	*n*	%
Strongly Disagree	0	0.00	0	0.00	0	0.00
Disagree	4	16.00	1	2.17	5	7.04
Agree	18	72.00	18	39.13	36	50.70
Strongly Agree	3	12.00	27	58.70	30	42.25
Total	25	100.00	46	100.00	71	100.00
SD	0.54		0.54		0.61	

5.3.3.2 Governance. The participants were asked to provide their answer concerning governance, which includes assessing the possible changes to the current governing framework of procurement. Table 23 shows that more than three-quarters of the participants agreed with the statement (80.28%, *SD* = 0.64), and around a quarter of the participants disagreed (19.72%). These findings are somewhat consistent when comparing the individual findings of SMEs and LEs. Around two-thirds of SMEs agreed with the statement (68.00%, *SD* = 0.65), and one-third of the SMEs disagreed (32%). More than three-quarters of the LEs agreed with the statement (89.96%, *SD* = 0.62), and only 10.04% of LEs disagreed.

Table 23

Governance – Possible Changes in the Company and its Business Partners

O_GV	SME		LE		Combined	
	n	%	*n*	%	*n*	%
Strongly Disagree	0	0.00	0	0.00	0	0.00
Disagree	8	32.00	6	13.04	14	19.72
Agree	14	56.00	28	60.87	42	59.15
Strongly Agree	3	12.00	12	26.09	15	21.13
Total	25	100.00	46	100.00	71	100.00
SD	0.65		0.62		0.64	

5.3.3.3 Resources. The survey sought to determine the participants' available resources, including the availability of employees with adequate knowledge to implement e-procurement and the IT resources that would assist in e-procurement implementation. Evidently, Table 24 shows that more than three-quarters of the participants agreed that most of their employees were computer literate (83.10%, *SD* = 0.72), and less than a quarter of the participants disagreed (16.90%). These findings were consistent when looking at the individual results of SMEs and LEs. Almost three-quarters of SMEs agreed with the statement (72.00%, *SD* = 0.71), and around one-quarter of SMEs disagree (28%). The majority of LEs agreed with the statement (89.13%, *SD* = 0.66), and only 10.87% disagreed.

Table 24

Resources – Employees' Computer Literacy in the Company

O_RS1	SME		LE		Combined	
	n	%	*n*	%	*n*	%
Strongly Disagree	1	4.00	0	0.00	1	1.41
Disagree	6	24.00	5	10.87	11	15.49
Agree	15	60.00	22	47.83	37	52.11
Strongly Agree	3	12.00	19	41.30	22	30.99
Total	25	100.00	46	100.00	71	100.00
SD	0.71		0.66		0.72	

The Table 25 below illustrates the participants' views on whether they have sufficient human resources for e-procurement implementation. Over three-quarters of the participants agreed with the statement (84.50%, *SD* = 0.68), and less than one-quarter of the participants disagreed (15.50%). A closer inspection of Table 25 shows that over two-thirds of the SMEs agreed with the statement (76.00%, *SD* = 0.55), while around one-quarter of SMEs disagreed with the statement (24.00%). The large majority of LEs agreed with the statement (89.13%, *SD* = 0.68), and a minority disagreed (10.87%).

Table 25

Resources – Sufficiency of Human Resources in the Company

O_RS2	SME		LE		Combined	
	n	%	*n*	%	*n*	%
Strongly Disagree	0	0.00	0	0.00	0	0.00
Disagree	6	24.00	5	10.87	11	15.49
Agree	17	68.00	19	41.30	36	50.70
Strongly Agree	2	8.00	22	47.83	24	33.80
Total	25	100.00	46	100.00	71	100.00
SD	0.55		0.68		0.68	

Regarding the participants' views on whether they had sufficient IT resources for e-procurement implementation or not, Table 26 shows that three-quarters of the participants agreed that they have sufficient IT resources to implement e-procurement (76.06%, *SD* = 0.76), while around one-quarter of the participants disagreed with the statement (23.94%). A closer examination of Table 26 reveals that more than half of the SMEs agreed with the statement (56.00%, *SD* = 0.71), and less than half of SMEs disagreed (44.00%). While the majority of LEs agreed with the statement (86.96%, *SD* = 0.72), and only 13.04% of LEs disagreed.

Table 26

Resources – Sufficiency of IT Resources in the Company

O_RS3	SME		LE		Combined	
	n	%	*n*	%	*n*	%
Strongly Disagree	1	4.00	1	2.17	2	2.82
Disagree	10	40.00	5	10.87	15	21.13
Agree	12	48.00	22	47.83	34	47.89
Strongly Agree	2	8.00	18	39.13	20	28.17
Total	25	100.00	46	100.00	71	100.00
SD	0.71		0.72		0.78	

5.3.3.4 Organisational Culture. The survey sought to determine the organisational culture of the participants in terms of how information is shared in the organisation and if the organisation is capable of dealing with changes.

The participants' opinions were depicted in Table 27 below that measured the extent to which the organisation's employees are open and trusting with one another. An overwhelming majority of the participants agreed with the statement (98.59%, *SD* = 0.51), while only 1.41% of the participants disagreed. These results are consistent with the individual findings of SMEs and LEs. All of the SMEs agreed with the statement (100.00%, *SD* = 0.50). Almost all LEs agreed with the statement (97.82%, *SD* = 0.53), while only a minority disagreed (2.18%).

Table 27

Organisational Culture – Openness and Trust Between Company Employees

O_OC1	SME		LE		Combined	
	n	%	*n*	%	*n*	%
Strongly Disagree	0	0.00	0	0.00	0	0.00
Disagree	0	0.00	1	2.18	1	1.41
Agree	10	40.00	14	30.43	24	33.80
Strongly Agree	15	60.00	31	67.39	46	64.79
Total	25	100.00	46	100.00	71	100.00
SD	0.50		0.53		0.51	

Table 28 presents the participants' views on their capabilities of dealing with rapid changes. More than three-quarters of the participants agreed with the statement (84.51%, *SD* = 0.70), and less than one-quarter of the participants disagreed with the same statement (15.49%). A depiction of the individual findings of SMEs and LEs show relatively consistent results. Around two-thirds of SMEs agreed with the statement (68.00%, *SD* = 0.69), and one-third of the participants disagreed (32.00%). An overwhelming majority of LEs agreed with the statement (93.48%, *SD* = 0.62), and only a minority disagreed (6.52%).

Table 28

Organisational Culture – Company's Capabilities in Dealing with Rapid Changes

O_OC2	SME		LE		Combined	
	n	%	*n*	%	*n*	%
Strongly Disagree	0	0.00	0	0.00	0	0.00
Disagree	8	32.00	3	6.52	11	15.49
Agree	13	52.00	20	43.48	33	46.48
Strongly Agree	4	16.00	23	50.00	27	38.03
Total	25	100.00	46	100.00	71	100.00
SD	0.69		0.62		0.70	

5.3.4 Environmental Variables

Business partner relationships, government regulations, and government support are amongst the environmental variables of the conceptual model that are presented in this section. The results were presented for the total participants, as well as for SMEs and LEs separately.

5.3.4.1 Business Partner Relationships. The survey sought to determine the business partner relationships of the participants in terms of how they perceived the readiness of the BTB, MOWMAUP and subcontractors to do business over the internet.

The participants' opinions were depicted in Table 29 below that measured how they perceived the BTB was ready to do business on the internet. A sizable majority of the participants agreed with the statement (95.77%, *SD* = 0.62), and only a minority of the participants disagreed (4.23%). These results are consistent with the individual findings of SMEs and LEs. All of the SMEs agreed with the statement (100.00%, *SD* = 0.48). A large portion of the LEs agreed with the statement (93.48%, *SD* = 0.68), and only a small portion of LEs disagreed (6.52%).

Table 29

Business Partner Relationships – Readiness of BTB

E_BPR1	SME		LE		Combined	
	n	%	*n*	%	*n*	%
Strongly Disagree	0	0.00	1	2.17	1	1.41
Disagree	0	0.00	2	4.35	2	2.82
Agree	17	68.00	21	45.65	38	53.52
Strongly Agree	8	32.00	22	47.83	30	42.25
Total	25	100.00	46	100.00	71	100.00
SD	0.48		0.68		0.62	

Table 30 presents the participants' views regarding the readiness of the MOWMAUP to do business over the internet. More than three-quarters of the participants agreed with the statement (85.91%, *SD* = 0.65), and less than one-quarter of the participants disagreed (14.09%). The results are relatively consistent with the individual findings of SMEs and LEs. A sizable portion of SMEs agreed with the statement (88.00%, *SD* = 0.68), and around a tenth of the SMEs disagreed (12.00%). A large portion of LEs agreed with the statement (84.79%, *SD* = 0.64), and less than a third of the LEs disagreed (15.21%).

Table 30

Business Partner Relationships – Readiness of MOWMAUP

E_BPR2	SME		LE		Combined	
	n	%	*n*	%	*n*	%
Strongly Disagree	1	4.00	0	0.00	1	1.41
Disagree	2	8.00	7	15.21	9	12.68
Agree	17	68.00	27	58.70	44	61.97
Strongly Agree	5	20.00	12	26.09	17	23.94
Total	25	100.00	46	100.00	71	100.00
SD	0.68		0.64		0.65	

The participants' opinions are described in Table 31 below that measured how they perceived their suppliers and subcontractors were ready to do business on the internet. Around three-quarters of the participants agreed with the statement (77.46%, *SD* = 0.67), and around one-quarter of the participants disagreed (22.54%). A closer look at Table 31 for individual findings of SMEs and LEs showed relatively similar results. Over three-quarters of SMEs agreed with the statement (80.00%, *SD* = 0.62), and less than one-quarter of SMEs disagreed (20.00%). Similarly, around three-quarters of LEs agreed with the statement (76.09%, *SD* = 0.69), while around one-quarter of LEs disagreed (23.91%).

Table 31

Business Partner Relationships – Readiness of Company's Suppliers and Subcontractors

E_BPR3	SME		LE		Combined	
	n	%	*n*	%	*n*	%
Strongly Disagree	1	4.00	1	2.17	2	2.82
Disagree	4	16.00	10	21.74	14	19.72
Agree	18	72.00	27	58.70	45	63.38
Strongly Agree	2	8.00	8	17.39	10	14.08
Total	25	100.00	46	100.00	71	100.00
SD	0.62		0.69		0.67	

5.3.4.2 Government Regulations. The participants were asked to provide their answer concerning government regulations, which includes the current laws and regulations that would

ensure privacy and security for e-procurement implementation. Table 32 shows that more than three-quarters of the participants agreed with the statement (87.33%, *SD* = 0.59), and 12.67% disagreed. A closer examination of Table 32 shows that there were relatively consistent findings of SMEs and LEs individually. The majority of SMEs agreed with the statement (96.00%, *SD* = 0.47), and only a minority of SMEs disagreed (4.00%). The vast majority of LEs agreed with the statement (82.61%, *SD* = 0.65), and less than one-quarter of LEs disagreed (17.39%).

Table 32

Government Regulations

E_GR	SME		LE		Combined	
	n	%	*n*	%	*n*	%
Strongly Disagree	0	0.00	0	0.00	0	0.00
Disagree	1	4.00	8	17.39	9	12.67
Agree	19	76.00	27	58.70	46	64.79
Strongly Agree	5	20.00	11	23.91	16	22.54
Total	25	100.00	46	100.00	71	100.00
SD	0.47		0.65		0.59	

5.3.4.3 Government Support. The participants' opinions were described in Table 33 below that measured how they perceived the BTB's capability of providing support and assistance for their system. Most participants agreed with the statement (88.73%, *SD* = 0.69), and around a tenth of the participants disagreed (11.27%). The findings were consistent when observing SMEs and LEs individually. The majority of SMEs agreed with the statement (96.00%, *SD* = 0.66), and only 4% of SMEs disagreed. The majority of LEs agreed with the statement (84.78%, *SD* = 0.71), and only 15.22% disagreed.

Table 33

Government Support

E_GS	SME		LE		Combined	
	n	%	*n*	%	*n*	%
Strongly Disagree	1	4.00	0	0.00	1	1.41
Disagree	0	0.00	7	15.22	7	9.86
Agree	16	64.00	21	45.65	37	52.11
Strongly Agree	8	32.00	18	39.13	26	36.62
Total	25	100.00	46	100.00	71	100.00
SD	0.66		0.71		0.69	

5.3.5 Readiness to Implement E-Procurement

The survey sought to determine the participants' views on the extent they are ready to implement e-procurement as shown in Table 34. More than three-quarters of the participants agreed with the statement (81.69%, *SD* = 0.67), while less than one-quarter of the participants disagreed (18.31%). Upon further examination of Table 34 for the individual findings of SMEs and LEs, more than three-quarters of SMEs agreed with the statement (76.00%, *SD* = 0.50), and less than one-quarter of SMEs disagreed (24.00%). Whereas the majority of LEs agreed with the statement (84.78%, *SD* = 0.71), and less than one-quarter of LEs disagreed (15.22%).

Table 34

Readiness to Implement E-Procurement

CQ_G	SME		LE		Combined	
	n	%	*n*	%	*n*	%
Strongly Disagree	0	0.00	0	0.00	0	0.00
Disagree	6	24.00	7	15.22	13	18.31
Agree	18	72.00	21	45.65	39	54.93
Strongly Agree	1	4.00	18	39.13	19	26.76
Total	25	100.00	46	100.00	71	100.00
SD	0.50		0.71		0.67	

5.3.6 Online Survey's Open-Ended Question

The survey included one optional survey item to obtain the participants' potential challenges to adopt e-procurement or provide additional remarks. Table 35 shows the participants' open-ended answers in order to strengthen the validity and triangulate the interview findings.

Table 35

E-Procurement Challenges and Remarks

Finding	Categories	*n*
Training and workshops	Need for training and Workshops	6
	Need for pilot test	1
Financial Resources	Financial aid from government support institutions	1
Human Resources	Need for e-procurement experts	1
Technological Resources	Need for authentication tools	1
Laws and Regulations	Security concerns	1
	Need for e-procurement regulations and laws	1
Total		12

5.3.7 Inferential Statistics

This section aims to analyse the survey results by investigating how the size of the road construction companies affected their readiness to implement e-procurement. The relationship between the size of the companies (O_OS) and selected variables were measured; including the reliability of the government's IT infrastructure (T_CP1), utilisation of advanced IT tools (T_CP2), literacy of the company's employees (O_RS1), the available human resources (O_RS2), the available IT resources (O_RS3), the capability to deal with rapid changes (O_OC2), and lastly, the overall readiness to implement e-procurement (CQ_G) were investigated. The chi-square test of independence and Fisher's exact test were run using IBM SPSS (refer to Appendix G), with an alpha level of .05 for all statistical tests. The chi-square test

of independence was used to test the relationships between the variables, except for the correlations with more than 20% of the observed values having expected counts less than five, in which Fisher's exact test was used instead.

5.3.7.1 Relationship between Company Size and the Government's IT Infrastructure. The relationship between the size of the road construction company (O_OS) and the reliability of the government's IT infrastructure (T_CP1) was examined using Fisher's exact test, as the chi-square test of independence was invalid due to 33.30% of the observed values having expected counts less than five.

No significant difference was detected between the company size and the government's IT infrastructure (*p = .181*, two-sided Fisher's exact test*).*

5.3.7.2 Relationship between Company Size and Utilisation of Advanced IT Tools. The relationship between the size of the road construction company (O_OS) and the utilisation of advanced IT tools (T_CP2) was examined using Fisher's exact test, as the chi-square test of independence was invalid due to 37.50% of the observed values having expected counts less than five.

Primary outcome results indicated a significant relationship between the size of the company and the utilisation of advanced IT tools (*p = .004*, two-sided Fisher's exact test).

5.3.7.3 Relationship between Company Size and Compatibility of E-Procurement with Preferred Work Practices. The relationship between the size of the road construction company (O_OS) and the compatibility of e-procurement with the preferred work practices (T_CP3) was examined using Fisher's exact test, as the chi-square test of independence was invalid due to 37.50% of the observed values having expected counts less than five.

The relationship between company size and the compatibility of e-procurement with the preferred work practices was found significant (*p = .024*, two-sided Fisher's exact test). LEs were more likely than SMEs to perceive e-procurement as compatible with their preferred work practices.

5.3.7.4 Relationship between Company Size and the Computer Literacy of the Employees. The relationship between the size of the road construction company (O_OS) and the literacy of the company's employees (O_RS1) was examined using Fisher's exact test, as the chi-square test of independence was invalid due to 37.50% of the observed values having expected counts less than five.

The relationship between the company size and the computer literacy of the employees was significant ($p = .021$, two-sided Fisher's exact test). The employees of LEs were more likely than SMEs' employees to be computer literate.

5.3.7.5 Relationship between Company Size and the Available Human Resources. The relationship between the size of the road construction company (O_OS) and the available human resources (O_RS2) was examined using a chi-square test of independence. Additionally, the available sample size per cell was more than five; therefore, the assumptions for using the chi-square test of independence were met.

Primary outcome results indicated a significant relationship between the size of the company and the available human resources, $X^2\,(2,\ N = 71)\ = 11.68^{a}$, $p = .003$, $\phi_C = .41$. Cramer's V test indicated a very strong association between the two variables. The employees of LEs were more likely than SMEs to have sufficient human resources for e-procurement implementation.

5.3.7.6 Relationship between Company Size and IT Resources. The relationship between the size of the road construction company (O_OS) and the available IT resources (O_RS3) was examined using Fisher's exact test, as the chi-square test of independence was invalid due to 25.00% of the observed values having expected counts less than five.

The relationship between the company size and the availability of sufficient IT resources was significant ($p = .003$, two-sided Fisher's exact test). LEs were more likely than SMEs to have sufficient IT resources for e-procurement implementation.

5.3.7.7 Relationship between Company Size and Ability to Deal with Rapid Changes. The relationship between the size of the road construction company (O_OS) and the capability to deal with rapid changes (O_OC2) was examined using a chi-square test of

independence. Additionally, the available sample size per cell was more than five; therefore, the assumptions for using the chi-square test of independence were met.

Primary outcome results indicated a significant relationship between the size of the company and the available human resources, X^2 (2, N = 71) = 11.96[a], p = .002, ϕ_C = .41. Cramer's V test indicated a very strong association between the two variables. The employees of LEs were more likely than SMEs to be able to deal with rapid changes.

5.3.7.8 Relationship between Company Size and Readiness to Implement E-Procurement. The relationship between the size of the road construction company (O_OS) and their readiness to implement e-procurement (CQ_G) was examined using a chi-square test of independence. Additionally, the available sample size per cell was more than five; therefore, the assumptions for using the chi-square test of independence were met.

Primary outcome results indicated a significant relationship between the size of the company and the readiness to implement e-procurement, X^2 (2, N = 71) = 10.20[a], p = .006, ϕ_C = .38. The effect size of this finding, Cramer's V test indicated a very strong association between the two variables. LEs were more likely than SMEs to be ready for e-procurement implementation.

5.4 Summary

In this chapter, the findings of the three instruments were shown, which includes the findings from the archival records of the MOWMAUP annual reports and BTB's laws, decisions and circulars. The semi-structured interview findings were also identified, showing the themes related to the E-Procurement Readiness Model. Lastly, descriptive statistics were conducted from the web-based survey results for the road construction companies and inferential statistics that test the eight hypotheses of the study.

Chapter 6: Discussion

6.1 Introduction

This study's main focus was to investigate the readiness of the Roads Sector in Bahrain to adopt an e-procurement system. This chapter is dedicated to the discussions drawn from the findings established in Chapter 5 and making recommendations for the entities in the Bahraini Roads Sector. It then presents and discusses the answers to the research questions and hypotheses and with offering some thoughts on what the study portends for the Roads Sector in Bahrain.

6.2 Addressing the Research Questions

This section discusses how the study addressed the main research question and sub-questions postulated in Chapter 1. To address the main research question, the study had two sub-questions to guide the research process and further dig more information related to the readiness to adopt the public e-procurement system in the Bahraini Roads Sector. The answers to these questions are provided in the following subsections.

6.2.1 How do the Technical, Organisational and Environmental Factors Affect the Entities of the Bahrain Roads Sector's Readiness to Adopt E-Procurement?

This sub research question was addressed by conducting an extensive literature review to identify the important factors. A conceptual model was developed using TOE as the theoretical base. The DOI and PERM factors were also used to better understand the factors that are important in explaining the readiness for adopting e-procurement in Bahrain. From the findings of the interviews, the survey, and the archival records, the technological, organisational and environmental factors were all important in explaining the readiness of adopting e-procurement.

6.2.1.1 Technological Factors. From the outset, under the technological factors of adopting e-procurement by the MOWMAUP, there were many advantages. First was the relative advantage that included executing a project in time and within budget, providing modern tools that can advance the performance of the MOWMAUP Roads Sector, synchronising the process of seeking budget approvals, reducing the timeframe of evaluating tenders, and helping in managing payment processing and contract management in the post-tendering stage (refer to

Table 5). Previous studies correspond with the MOWMAUP's perception in that the adoption of e-procurement is desirable for achieving the strategic goals of the ministry (Al-Zoubi, Thi and Lim, 2011; Chandra and Kumar, 2018; Li, 2008; Ramdani, Kawalek and Lorenzo, 2009; Zhu, Dong, Xu and Kraemer, 2006). This will involve several aspects related to cost and efforts savings together with time savings. The procurement of road tenders has three stages, the pre-tendering stage (preparation and planning, securing funds), tendering (issuing tender, selection of bidders, tender award) and post tendering stage (execution, securities and warranties). Indeed, according to the Al-Watan Press and Publishing (2020) and the BTB (2021), all three stages can be automated using the e-procurement system to induce efficiency in the procurement of road projects. The intention is to lower procurement costs, generate savings, and offer ways through which the system can be further enhanced to ensure high-quality performance (Bahrain Tender Board, 2020). However, of the three stages, the last two stages have great potentials for improvement by using e-procurement.

From the research, the e-tendering system is operated and maintained by the BTB, whose main aim is to guarantee that there is transparency, equality and healthy competition in all governmental purchasing practices. For instance, in the qualitative interviews, both Interviewee 2 and Interviewee 3 noted the relative advantage of BTB's e-procurement system. The major highlights of the responses mentioned that; it provided an online database for studying market rates for road construction; it reduces transaction costs; communication easing between entities; securing and documenting the information of the tenders; reducing human errors. The same set of outcomes have been identified by Kajewski and Weippert (2004), Oyediran and Akintola (2011), and Tindsley and Stephenson (2008), who established that e-procurement increases efficiency, reduces costs and increases productivity, respectively. As a result, it is much more necessary to focus on efficiency, costs, and productivity advantages in adopting the e-procurement system by its users in Bahrain. The results of the quantitative survey analysis also revealed that road construction companies in Bahrain were also aware of the relative advantage of the e-procurement system. This is because it has a more considerable relative advantage compared to manual procurement procedures. The main advantages that were considered include creating better ways of managing and organising a business, particularly for the LEs who have already invested extensively in their IT systems. Such a finding indeed resonates with the findings established by Bienhaus and Haddud (2018) and Matsinhe and Kabanda (2019), who

outlined that big enterprises value e-procurement due to its efficiency translated in the form of increased profits, ease of maintaining connections with suppliers, and quick tendering process.

However, despite the positive perception of the relative advantages offered by e-procurement, the compatibility features of the technology caused the greatest concern. Respondents highlighted the relative lack of flexibility of the MOWMAUP procedures because of the many subsystems (CAS, CEDIS, CFS, PMIS, and CIS), which seem incompatible with each other as they serve different objectives (refer to Table 6). In studies investigating compatibility and e-commerce adoption by Hung, Yang, Yang and Chung (2011); Huy, Rowe, Truex, and Huynh (2012) and Li, (2008) established a causal relationship between compatibility and adoption. This, therefore, means that despite the enthusiasm of e-procurement, the compatibility issues may lead to the slow adoption and higher resistance of the system, which in turn might cause strategic concerns in the MOWMAUP in bringing on board all the stakeholders of the Roads Sector, to support e-procurement. The archival records' findings have also shown that according to BTB's circular no 4 of 2020, this study established that its communication with other authorities; which include reviewing tender evaluation reports or variation orders, amongst others, were communicated using official letters signed by the entities' representative and were forwarded in PDF formats, which were then transferred electronically through email (refer to Section 5.2.1.1.2). This introduces layers of bureaucracy that also causes a delay in the tendering process. A fully integrated e-procurement system can incorporate communication functions that allow various government departments to send and receive information or data and eliminate the need for sending official letters. Similarly, the e-procurement system can be structured in such a format that allows different levels of access to government officials where they can log in and view official documents without the need for document transfer between the MOWMAUP and the BTB. Looking at the preference for SMEs (refer to Section 5.2.1.1.3), the emerging discussion surrounds the regulation by the BTB circular no. 2 issued in 2019 mandates that a 10% preference is granted to SMEs when they participate in all tenders and auctions to boost the SME sector within the Kingdom. While this is a good policy move to ensure not all tenders and auctions are taken up by LEs, this is not matched by the e-tendering system in place. As a result, the system could be enhanced by designing the e-procurement to automatically implement this preference for SMEs and align the system's functionality with existing regulations. As it stands, such a function does not exist. It could be said that SMEs will benefit from automating the 10%

preference, as revealed by quantitative analysis that 72% of SMEs agreed that e-procurement aligns with their preferred work practices (refer to Table 17). Finally, under contract management, the e-tendering system can be improved by providing a smart system that can automate purchasing, invoicing, and payment processes. For instance, research by Huy, Rowe, Truex, and Huynh (2012) confirms that for an organisation, having an IT infrastructure that lacks options of online payments, riddled with communication barriers, and has a scarcity of resources can have a negative impact on its adoption and success. As such, the e-procurement system needs to be improved to ensure its success.

In terms of complexity, existing systems, laws and regulations governing the e-procurement of road projects could pose a challenge to implementing e-procurement (refer to Section 5.2.2.1.3), thus eroding the opportunity to make a successful system that meets its objectives. One can consider the outcome of studies by Li (2008); and Huy, Rowe, Truex, and Huynh (2012), who found complexity to have a negative relationship with the adoption of e-commerce systems while Grover and Goslar (1993); Seyal and Rahman (2003) found complexity issues to affect the final decision to adopt an innovative technology. This potentially would lead to the delay in adopting a fully integrated e-procurement system for the Roads Sector in Bahrain. Moreover, BTB's e-tendering system's functions do not include the evaluation, awarding, contract signing, and contract execution phases, which were conducted using manual paper-based activities. Therefore, if the whole process can be automated, including digital tender document creation and smart evaluation tools, the timeframe will be considerably reduced. Interviewee 1 shared this opinion in the interview as shown in Section 5.2.2.1.2, who believed that the e-procurement system could be further enhanced by doing away with the layers of approval and use of PDF documents. According to Saleh and Alshawi (2005), such challenges are minor and should not curtail the roll out and implementation of e-procurement systems, as such challenges can be addressed through organisational commitment to improve staff aptitude and skills through training and development.

Trialability was also found to be an essential factor in the implementation of e-procurement, as the interviewees of the MOWMAUP believed that it is important to assess the viability, timeliness, cost, and efficiency of the e-procurement system under real-world conditions. As shown in Section 5.2.1.1.5, the archival records looked at 22 road tenders and established the average time between tender closing and the tender award, which was

approximately three months.. The quickest time lasted 22 days, while the longest time was taking seven months. The time frame of awarding tenders is too long, being that shortening the time period was one of the touted principal efficiencies of e-procurement. In the case of the Bahraini Roads Sector, the time is primarily consumed by activities of transferring the electronic bids from the BTB's e-tendering system to the MOWMAUP, who will evaluate the bids and award the tenders to the winning bids. There is an opportunity to shorten this time frame using a fully automated e-procurement system. The system should incorporate automation right from the start and eliminate the need for using scanned PDF files when submitting tenders which are then uploaded into the system. Although some studies did not find a significant relationship between trialability and the adoption of a technology (Limthongchai and Speece, 2003; Tan, Chong, Lin, and Eze, 2009), it might be important to implement a phased implementation or pilot testing to ensure e-procurement's success (Tan, Chong, Lin, and Eze, 2009). The quantitative analysis supports the above interpretations as the vast majority of the road construction companies agreed that they require training sessions and workshops for e-procurement as shown in Table 20 and Table 35.

6.2.1.2 Organisational Factors. Under organisational factors, the interview findings' themes included; top management support, governance, resources, size, and organisational culture in accordance with the conceptual model used in the study. MOWMAUP top management are leading the push toward digitalisation and integrating emergent technologies meant to improve the efficiency and effectiveness of its service delivery (refer to Section 5.2.2.2.1). Similarly, in examining Table 21 and Table 22 of the quantitative analysis, the majority of road construction companies' top management have considered a transition to e-procurement (74.65%), and were supportive of this initiative (92.95%). Such findings are similar to the study by Molla and Licker (2005), who outlined that top management should support the adoption and the implementation of innovative technologies that are aligned with the vision and strategy of an organisation. As a result, this can lead to the successful adoption of such technology into the system (Ramdani, Kawalek, and Lorenzo, 2009; Huy, Rowe, Truex, and Huynh, 2012; Chandra and Kumar, 2018).

Interviewees expressed that, when considering resources, more funds were needed to hire experienced personnel and tools such as expanding the data storage of archived information.

Similarly, more resources should also be added to bridge the gap as a result of e-procurement implementation, such as necessary tools to facilitate e-signature and e-processing of signed documents. In addition, after examining Table 24, Table 25 and Table 26, the quantitative analysis identified that both SMEs and LEs had employees who are computer literate (83.10%), but SMEs were lacking and disagreed in terms of their sufficiency of human resources (24.00%) as shown in Table 25, and IT resources (44.00%) as shown in Table 26. Therefore, the findings indicate that SMEs are not as equipped as LEs to adopt e-procurement. However, BTB is still in the planning stage of the system, and BTB might be required to consider implementing a system that provides an easy to use interface to support SMEs' readiness for e-procurement adoption. Lippert and Govindarajulu (2006) point out that resources are beneficial while adopting innovations; however, resources alone are not the only factors as technology adoption should be an integrated process (Tornatzky and Fleischer 1990).

In terms of governance, the interviewees unanimously agreed that all the goals and objectives of the e-procurement processes are aligned with that of the MOWMAUP Roads Sector, such as improving the entity's efficiency and effectiveness that translates to successful procurement of road projects. Reflecting on Table 23, the quantitative analysis also confirms that the majority of road construction companies can assess the possible changes resulting from e-procurement implementation (80.28%). However, to ensure its success, MOWMAUP need to collaborate with other entities within Bahrain and push for a governing framework that would create a single domain, instead of having these different government entities with their rules and regulations (refer to Section 5.2.2.2.3). According to Molla and Licker (2005), systems require a procedural and interorganisational framework to govern organisational e-procurement initiatives.

In organisational culture, the interviewees agreed that there is a collaborative spirit towards the implementation of road projects. This covers information sharing between different units, having a positive attitude towards achieving the organisation's strategic goals and having a strong relationship between different units. This bodes well for the MOWMAUP Road Sector since Beatty, Shim, and Jones (2001), and Chan (2002) supported the idea that positive culture, values, and preferred work practice increases the successful adoption of new technology. Additionally, after examining Table 27 and Table 28 of the statistical analysis, the vast majority of the road construction companies agreed that their organisations share values of openness and trust (98.59%), and can deal with rapid changes which might result from e-procurement

(84.51%). However, change management should still be practised to ensure every team member at MOWMAUP is on board with the organisation's strategic goals. At the same time, the BTB has the authority to push for change management which can be used to introduce new procedures that MOWMAUP can implement to improve the efficiency of project procurement.

6.2.1.3 Environmental Factors. From the findings, the environmental factors present the external factors that affect MOWMAUP adoption of e-procurement. The findings' most important factors were governmental support, governmental regulations, business partner relationships and interorganisational compliance.

Government support involves expertise, knowledge and support from telecommunication organisations and public institutions such as the IGA. MOWMAUP drive to advance e-procurement has been fully supported by the IGA, and after examining Table 33, the vast majority of road construction companies confirmed that the government as represented by BTB is capable of providing support and assistance in managing the e-tendering system. Thus, governmental support can encourage the development of electronic systems and strengthen the organisations' readiness (Molla and Licker, 2005).

With regards to governmental rules and regulations, the majority of road construction companies agreed that the laws and regulations of Bahrain ensures their privacy and security for e-procurement implementation (87.33%) as shown in Table 32. Meaning that there would not be a trust barrier to adopt e-procurement. Concerns, however, arise from governmental rules and regulations, which interviewees agree should be streamlined for all different entities to make e-procurement a smooth process without any restrictions.

Business partner relationships is a significant factor that can signal the readiness of adopting technology innovation (Chandra and Kumar, 2018; Zhu, Dong, Xu, and Kraemer, 2006). When it comes to the current regulations and systems in place, and after examining Table 29, Table 30 and Table 31, the vast majority of road construction companies perceived that the BTB, MOWMAUP and their suppliers and subcontractors were ready to adopt e-procurement, with percentages of 95.77%, 85.91% and 77.46%, respectively. Interestingly, the analysis showed opportunities for improvement. In particular, the issue of law and regulation came up when evaluating the compatibility of the MOWMAUP IT systems. While several procurement processes have been automated by the MOWMAUP, including the CED Information System

(CEDIS) (refer to Section 5.2.2.1.2 and Table 6), the MOFNE still lags behind since it has no e-invoicing functionality is available within its IT infrastructure, as also indicated in Table 35. As a result, passing new regulations to mandate e-invoicing can further smoothen the process of public e-procurement and incentivise the MOFNE to adopt an innovation. The above findings conform with the study of Molla and Licker (2005) that established business partner relationships need to be addressed to support the readiness of adopting an innovation.

MOWMAUP Roads Sector workers interviewed for this study posit that there is high readiness as seen with the BTB's e-tendering system, what remains is the MOFNE to adapt its CFS to include e-allocation of budgets and e-invoicing, which will make seamless operations between these two entities by removing compatibility barriers. Moreover, Table 34 showed that the majority of road construction companies answered positively and agreed that they were ready to implement the e-procurement system; it should be noted that almost one-quarter of the SMEs disagreed that they were ready to adopt the e-procurement system. Therefore, the government could consider providing workshops and financial support to strengthen the capabilities of SMEs for the adoption of e-procurement. Lastly, the thematic analysis of the interviews revealed an unexpected finding: interorganisational compliance, which requires that all stakeholders play an active role in the development of the system to ensure its success.

6.2.2 What is the Relationship Between the Size of the Road Construction Companies and their Readiness to Adopt E-Procurement?

Since several studies had found a significant relationship between size and the readiness to adopt e-commerce and e-procurement (Hung, Yang, Yang, and Chung, 2011; Huy, Rowe, Truex, and Huynh, 2012; Ramdani, Kawalek, and Lorenzo, 2009), this study investigated if this was the case amongst road construction companies in Bahrain. It had been theorised that LEs would have higher readiness compared to SMEs.

In testing *H1*, no significant correlation was found between company size and the government's IT infrastructure. This investigated if the company size was affected by the IT infrastructure for put in place by the government. No significant difference was detected between the company size and the government's IT meaning the IT infrastructure put in place to enhance all the e-procurement processes in Bahrain has no relationship between the size of companies and deployed IT infrastructure to process the e-procurement. Governments investment in IT

infrastructure is significant since, according to good technology, support is a crucial part of adopting an innovative system (Huy, Rowe, Truex, and Huynh, 2012; Lippert and Govindarajulu, 2006). The BTB and MOWMAUP have invested in good IT infrastructure that supports the digitalisation of services for road construction companies.

In *H2* testing, the study established that there was a significant relationship between the size of the company and the utilisation of advanced IT tools where SMEs' utilisation is much lower than LEs' This is similar to Hung, Yang, Yang, and Chung (2011); Huy, Rowe, Truex, and Huynh (2012); and Ramdani, Kawalek, and Lorenzo (2009)'s findings which established that the difference in resource availability between SMEs and LEs is the biggest contributor. LEs can institute better IT innovations and hire skilled personnel to manage such systems (Hung, Yang, Yang, and Chung, 2011). This would perhaps explain why a higher ratio of LEs see the relative advantage of e-procurement compared to SMEs who see that e-procurement may not help them organise their business.

In answering *H3,* the outcome established that there was a significant relationship between company size and the compatibility of e-procurement with the preferred work practices. From the descriptive statistics, an overwhelming majority (more than 90%) of both the LEs and SMEs responded that e-procurement is compatible with their current procedures and systems together with values. This means that most road construction companies have a positive view of adopting e-procurement, just as Huy, Rowe, Truex, and Huynh (2012) outlined the same in e-commerce.

In *H4,* the results established that employees in LEs were more likely to be computer literate than SMEs. This would pose challenges in the implementation of e-procurement in SMEs compared to LEs. By digging deeper, descriptive statistics revealed that two thirds of LEs staff could handle e-procurement duties while only one third of SMEs staff can hand e-procurement duties. This can be explained in the difference in resource disparity between LEs and SMEs outlined by Huy, Rowe, Truex, and Huynh (2012). In addition, the experience could also be a factor because 65% of LEs staff have more than 30-year experience compared to 32% of SMEs.

In *H5*, company size had a significant relationship with the available human resources. This corresponds with other studies that point out that company size affects the availability of hiring more skilled human resources who are expensive to recruit and maintain (Hung, Yang, Yang, and Chung, 2011; Huy, Rowe, Truex, and Huynh, 2012; Ramdani, Kawalek and Lorenzo,

2009). As a result, SMEs have fewer human resources available to manage their e-procurement obligations than LEs. The descriptive statistics further revealed that amongst employees skilled to implement e-procurement, 68% of SMEs were better equipped compared to 90% of LEs. As a result, research argues that LEs will likely be at an advantage in their ability to gain a competitive edge (Hung, Yang, Yang, and Chung, 2011).

In *H6,* investigating the relationship between company size and IT resources, LEs were more likely than SMEs to have sufficient IT resources for adopting e-procurement. Al-Zoubi, Thi, and Lim (2011) set out that IT infrastructure availability led to better adaptability in the e-business environment; thus, such companies are more competitive. In Bahrain, this would apply since SMEs are not as equipped as LEs in taking advantage of their resources for e-procurement implementation. It can be recalled that BTB circular no 4 of 2019, it's now more evident why a 10% preference for SMEs is implemented in all of their tenders and auctions.

In *H7,* company size was associated with the ability to adapt to rapid changes. For instance, should the government entities suddenly expand the usage of e-procurement, LEs are better equipped to deal with such sudden changes than SMEs because of their having better IT infrastructure, more skilled staff and financial resources.

The results of the final hypothesis (*H8*) testing results confirm that there was a significant relationship between company size and readiness to implement e-procurement. This is no surprise, being that in the seven hypotheses, only company size and the government's IT infrastructure had no significant relationship.

6.1 What are the Factors that Influence the Adoption of E-Procurement in the Entities of the Bahrain Roads Sector?

The main research question sought to uncover the factors that would influence the implementation of e-procurement in Bahrain's Road Sector. The answers to this question would reveal the state of readiness of the Bahraini Road Sector in adopting e-procurement which BTB seeks to implement in the Kingdom. In particular, the analysed factors using the conceptual model are relevant in evaluating the readiness to adopt e-procurement in the Bahraini Roads Sector. It involved a thematic analysis of the interviews provided by the three respondents based on the conceptual model of the study. Thematic analysis was categorised according to technological, organisational and environmental factors. Moreover, archival records were

analysed to confirm the study findings. Additionally, the analysis of the web-based survey sent to the road construction companies aided in understanding the important factors that influence e-procurement adoption in Bahrain's Roads Sector.

6.1.1 Technological Construct

From the findings, amongst the factors that were significant in measuring the state of readiness to adopt e-procurement were relative advantage, compatibility, complexity and trialability. From both the thematic analysis and quantitative analysis, the relative advantage was a significant factor in the readiness to adopt e-procurement. The top management and middle management staff in the MOWMAUP Road Sector, and those from both LEs and SMEs in the road construction sector agreed that e-procurement would provide modern tools that can advance the performance of the respective entities and create better ways of managing and organising their business respectively. According to Ramdani, Kawalek and Lorenzo (2009); Al-Zoubi, Thi and Lim (2011); Chandra and Kumar (2018); Li (2008); and Zhu, Dong, Xu, and Kraemer (2006) all agreed that relative advantage could increase the adoption of new technology. As a result, the relative advantage is a factor that determines the Bahraini Roads Sector is ready to adopt e-procurement as it would reduce the amount of processing and the award of a tender and improve ways of doing business. At the same time, compatibility was seen as an important factor that can determine the readiness of e-procurement. This is because MOWMAUP Roads Sector experts cited aspects that would make their systems incompatible with e-procurement, such as having disparate systems and communication silos.

In addition, other compatibility aspects would have to address contract management and SMEs preference. When it comes road construction companies, SMEs' systems and practices are not fully aligned with e-procurement. Therefore, SMEs must improve their systems, and should have devoted attention from government institutions to support their development. Considering the complexity, the MOWMAUP Roads Sector staff agreed that e-procurement would be more complex in its operations, and thus, would require more planning before implementation. At the same time, one third of SMEs and LEs (refer to Table 18) perceived e-procurement to be more complex. According to Seyal and Rahman (2003), a high degree of perceived complexity would have a negative impact on the decision to adopt a new technology such as e-procurement or e-

commerce. As a result, deliberate efforts should be made to design a user-friendly system compared with staff training to ensure high affinity.

6.1.2 Organisational Construct

This study has established that top management support, resource availability, governance, and size were the main factors that would influence the implementation of e-procurement in the Bahrain Roads Sector. In both, the MOWMAUP and road construction companies (refer to Section 5.3.3.1 and Table 21), outlined that top management support was important, such as championing the adoption of new innovative technology as well as having a well-articulated organisational strategy that aligns the new technology and vision (Molla and Licker, 2005). From this study, top management support means that the roads sector in Bahrain can be quick to adopt e-procurement. In resource availability, there is some concern about adequate financial, technological and human resource availability at the MOWMAUP Roads Sector to cover full e-procurement. This may hinder the readiness of adopting e-procurement (Al-Zoubi, Thi and Lim, 2011). On the other hand, LEs and SMEs agree that the availability of human resources and IT infrastructure will be critical in the success of e-procurement. In terms of governance factor, there was a unanimous agreement in the MOWMAUP Roads Sector, LEs, and SMEs, that the framework includes complex procedures and subsystems that facilitate procurement activities, therefore, e-procurement will require the entities to amend the current administrative framework to govern the process of e-procurement. The size of the organisation was investigated and was associated with readiness to adopt e-procurement. As such, LEs are more likely to adopt e-procurement quicker than SMEs.

6.1.3 Environmental Construct

This study uncovered business partner relationships, government regulations, and interorganisational compliance. In business partner relationships, both MOWMAUP, LEs, and SMEs see that forming a close relationship with the BTB and the MOFNE will be important to ensuring the successful implementation of e-procurement. BTB is the most prepared organisation, while the MOFNE need to adapt e-invoicing and budgeting together with managing contracts and issuing payments. At the same time, all entities unanimously agreed that new harmonised government regulations concerning procurement laws and rules are needed to govern

e-procurement. Moreover, interorganisational compliance will be needed to ensure that all entities are compliant and cooperative to make sure e-procurement implementation succeeds in Bahraini Roads Sector. This finding was unexpected, and suggests that more examination is required to examine the boundaries of this factor, whereas the study has identified that procurement interlinks several organisations, and to adopt e-procurement, the failure of any of the main entities would mean the failure of the system.

6.2 Recommendations

From this study that sought to investigate the e-procurement readiness of the Bahraini Roads Sector, the study can make the following recommendations to the relevant entities;

- The e-procurement system should put together all the three stages of the procurement process; the pre-tender, tendering, and post-tender sections, and automate all the stages. It was identified that tender evaluation and managing contracts were done manually to reduce the tender timeframe.
- The e-procurement process should provide modes of communication between various entities involved in the process, which should be utilised to decrease processing time and ease the interaction process between all entities.
- The BTB laws should be amended to include regulations for using e-procurement, particularly in managing tenders, contracts, and issuing payments.
- The e-procurement system should have an inbuilt mechanism that gives a preference of 10% for SMEs in tenders and auctions.
- The BTB should incorporate features for contract monitoring.
- E-procurement for road construction tenders should be implemented in stages, and pilot tested to assess the performance of all relevant entities and the system's functionality.
- The BTB should provide training sessions and workshops for government entities and the road construction companies to be familiar with e-procurement's operations.
- All the Work Affairs' IT systems should be made compatible using flexible system designs with interrelated objectives.
- All the stakeholders should be included during the design and implementation of the e-procurement system.

- All entities should make a conscious effort to incorporate e-authentication tools and building a sufficient IT infrastructure that can cover all the e-procurement system's needs.

6.3 Summary

In this chapter, the study addressed the main research question, and the sub-questions. Including the identification of the factors that affect the entities of the Roads Sector in Bahrain to adopt e-procurement, and how the technological, organisational and environmental factors affect the Roads Sector's entities to adopt e-procurement. In addressing the relationship between the size of the road construction companies and their readiness to adopt e-procurement, seven out of the eight postulated hypotheses were proven to be significant, identifying that SMEs were not as ready as LEs to adopt e-procurement. Finally, the study discusses the implication of the findings and generates recommendations.

Chapter 7: Conclusions

7.1 Introduction

This chapter begins by stating the summary of the study and its main findings, describes the study's limitations, and offers alternatives for future research. It then closes by describing the implications relating to policies and procedures that the entities can adopt in the Bahrain Roads Sector.

7.2 Summary of Findings

This study has aimed at identifying the factors that influence the adoption of e-procurement in the entities of Bahrain's Roads Sector, and how each factor influences their readiness to adopt e-procurement. This section summarises the study findings based on the research questions and hypotheses. TOE, DOI and PERM have been identified as essential in accessing the readiness to adopt new technologies. This study developed a new conceptual model to assess technological, organisational, and environmental factors by including the factors of PERM, DOI, under the umbrella of TOE. In this study, the following main research question and sub-questions were developed and answered:

What are the Factors that Influence the Adoption of E-Procurement in the Entities of the Bahrain Roads Sector? Which includes the following two sub-questions:

- How do the Technical, Organisational and Environmental Factors Affect the Entities of the Bahrain Roads Sector's Readiness to Adopt E-Procurement?
- What is the Relationship Between the Size of the Road Construction Companies and their Readiness to Adopt E-Procurement?

The study has been addressed by triangulating three methodological instruments: archival records, semi-structured interviews, and a web-based survey. The semi-structured interviews have been conducted with three MOWMAUP experts with vast experience in road construction and procurement. Using the MAXQDA Analytics Pro, the data has been coded and analysed using thematic analysis. Steps have been taken to ensure the outcomes were credible and dependable. The archival records of the MOWMAUP's annual reports for the years 2018, 2019

and 2020 and BTB's laws, decisions, and circulars have been examined to generate more understanding of the procurement activities of road projects. The web-based survey has also been used with a four-point Likert-type scale sent to officials in 84 road construction companies, which received a sample of 71 participants (25 SMEs and 41 LEs). The survey data has been subjected to descriptive statistics using IBM SPSS 26.0 to examine the readiness of the road construction companies to adopt e-procurement. The survey data has also been subjected to the chi-square test of independence and Fisher's exact test for selected factors of the conceptual model. The two inferential tests were used to measure the correlation between the size of the company and eight selected factors.

In addressing the first sub-question, the outcomes have included the technological, organisational, and environmental factors of the developed conceptual model that influence the MOWMAUP Roads Sector's readiness in adopting e-procurement. The factors of technology, organisation and environment have been deemed important and can influence the readiness to adopt e-procurement in the Roads Sector. Relative advantage has been identified as an important factor that has immense benefits in aligning the goals of e-procurement with the strategic aims of the MOWMAUP. Similarly, the majority of road construction companies' LEs have also perceived e-procurement to provide better ways to manage their business activities. Moreover, the top management in both the MOWMAUP and the road construction companies have been supportive of the adoption of e-procurement. However, the MOWMAUP Roads Sector experts have expressed concerns that the ministry has several disparate systems which need to be put together under one system to ensure smooth operation of an e-procurement system. In addition, government regulations have been construed as lacking and would require revision to accommodate all e-procurement functions, including amendments to the BTB laws, and MOFNE's CFS. The study has been able to identify interesting findings related to e-procurement that warranted further exploration and discussion. These included reducing the tendering time frame; eliminating communication through emails, and introducing functions in the e-tendering system between various entities; new laws and regulations should be introduced that govern contracts and issuing of payments; e-procurement should automate the benefits of SMEs in line with the rule that guarantees SMEs 10% preference in all auctions and tenders, introducing a smart system that automates the purchasing activities, invoicing, and payment.

In addressing the second sub-question, the relationships between the size of road construction companies and the selected factors of the conceptual model have also been answered using the web-based survey findings and analysis. The road construction companies' size has been found to correlate with seven factors: the utilisation of advanced IT tools, the compatibility of e-procurement with preferred work practices, computer literacy of the employees, the available human resources, the available IT resources, and the companies readiness to implement e-procurement. However, the government's IT infrastructure has not been found to be correlated to the companies' size. All the hypotheses were confirmed from the study except for one that measured the relationship between company size and the government's IT infrastructure. As a result, it was evident that LEs were in a better state of readiness to implement e-procurement compared to SMEs.

The main research question has been addressed by interpreting the outcomes of the two sub-questions, which has identified the technological, organisational and environmental constructs. The results have indicated that all the factors within each construct influence the adoption of e-procurement in the MOWMAUP and road construction companies (relative advantage, compatibility, complexity, trialability, top management support, resource availability, governance, size, business partner relationships, governmental regulations, and interorganisational compliance). However, organisational culture was also found influential but was not found an element that requires attention at the study time. Seven of the eight hypotheses were confirmed to rest the correlation between the companies' size and the selected factors of the conceptual model. When compared to SMEs, LEs were shown to be more prepared to adopt e-procurement.

These outcomes have suggested a number of recommendations that add to the adoption of e-procurement for the Roads Sector in Bahrain. The manual stages of the procurement process have to be planned by the BTB and the MOWMAUP to put together all three stages of the procurement process in the e-procurement system. E-procurement should also provide advanced communication tools to decrease the processing time of road tenders. The BTB should utilise the system to incorporate features of contract monitoring and project closeout. Another important recommendation has been the need for a phased implementation of e-procurement to assess the system's reliability and accuracy, starting with full automation of the tendering stage.

7.3 Limitations of the Study

It is important to discuss the shortcomings of the study. This study's main focus was to analyse the readiness of the adoption of e-procurement by the various stakeholders in Bahrain, including large and small and medium-sized road construction companies, MOWMAUP Road Sector, and BTB. During the process, it used both qualitative and quantitative analysis. While these methods provided insightful views on the readiness of the entities evaluated, this study may have been exposed to some limitations, which are presented below.

- This study deals with MOWMAUP road projects information and data, which is restricted and subject to privacy laws. Therefore, some vital information that could have affected the flow of the study could not be accessed due to confidentiality.
- Implementing e-procurement in the Roads Sector in Bahrain involves a system-wide effort that would involve more stakeholders than the particular ones explored in this study. However, this was not possible due to time and space constraints first of all, and secondly due to the fact that such research would be beyond the capacity of a one-person research and a Master's thesis. As a result, future studies should involve more entities such as the BTB and MOFNE.
- The results of this study cannot be generalised to other sectors due to the contextual differences.

7.4 Further Research

The study exposed several important areas that needed to be further explored. These include;

- MOFNE is integral in the future implementation of an e-procurement system. Future research should focus on and evaluate the readiness of its employees to implement a fully automated e-procurement system that starts with the allocation of budget and ends with final payment.
- Future research should focus on qualitative interviews with top executives of the BTB and procurement managers to establish a more comprehensive picture of their level of readiness for e-procurement.
- It would be beneficial to support the results of this study with another that exclusively investigate more public entities to find out barriers to implementing e-procurement.

- Since this study was conducted in the early development stages of the e-procurement system, future studies could investigate the impact of post-adoption of the e-procurement system.

7.5 Implications of the Research

This study has identified important suggestions based upon findings and discussions that can be taken by both public and private entities as they seek to enhance their readiness for e-procurement together with future academic research. These include the following:

- This study adds to the growing body of theoretical information on the factors that determine e-procurement readiness and adoption. Because this procedure has not been thoroughly investigated in Bahrain, the findings offer a contribution to the subject of e-procurement in Bahrain.
- The studies that investigate the readiness of the implementation of e-procurement may consider using the conceptual model developed in this study.
- This study's findings indicate that the procurement system in Bahrain has three different parts functioning separately. The BTB, in conjunction with MOWMAUP, can create a system that merges all the three parts in one system, which would automate several systems, including tender evaluation. This will enhance the efficiency of e-procurement.
- The BTB is capable of having in-built mechanisms to automate the procurement procedures, including the 10% preference for SMEs in tenders as their relative lack of better resources compared to LEs means they can be outcompeted. As a result, the new e-procurement system would be fair to all companies in the Bahraini roads sector.
- It would be essential for the Road Sector's entities to provide adequate training, hire more qualified staff, and sufficient IT resources to enhance the implementation of e-procurement.

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Abstract

Public and private organisations worldwide are increasingly leveraging the power of IT to improve procurement services quality. The Bahrain Tender Board intends to implement an e-procurement system, which aims to automate the procurement processes of both the procuring entities and the bidders. This study aims to identify the factors that influence the Bahrain Roads Sector's readiness to adopt an e-procurement system. The study employs a multi-model perspective, making use of Technology Organisation Environment, Diffusion of Innovation and Perceived eReadiness Model. A mixed-methods approach is framed using a thematic content analysis of government archival records, three semi-structured interviews with MOWMAUP's experts, and statistical analysis of an online survey distributed to 71 road construction companies in Bahrain. The content analysis highlights that road procurement has three stages, including core activities being manually done. The survey participants and the MOWMAUP experts highlight that Road Sector entities perceive e-procurement to have several benefits and are supported by top management and that its implementation is aligned with the organisation's strategic aims. However, the MOWMAUP experts mention that lack of software upgrade, improved communication, digital invoicing, incompatible subsystems, and new laws and regulations may derail e-procurement adoption. The road construction companies' size is found to affect when correlated with the following: the utilisation of advanced IT tools, the compatibility of e-procurement with preferred work practices, computer literacy of the employees, the available human resources, the available IT resources, and the companies readiness to implement e-procurement. However, government's IT infrastructure was not found to be correlated to the companies' size. Additionally, the survey depicts that lack of adequate resources means Small and Medium-Sized Enterprises are not better prepared than large enterprises. The study recommends that the laws of BTB be amended for e-procurement implementation and features of contract monitoring and e-payment be incorporated.

Résumé

Les organisations publiques et privées du monde entier exploitent de plus en plus la puissance de l'informatique pour améliorer la qualité des services d'approvisionnement. Le Conseil des marchés de Bahreïn a l'intention de mettre en œuvre un système de passation des marchés en ligne, qui vise à automatiser les processus de passation des marchés à la fois des entités adjudicatrices et des soumissionnaires. Cette étude vise à identifier les facteurs qui influencent la volonté du secteur routier de Bahreïn d'adopter un système de passation des marchés en ligne. L'étude utilise une perspective multi-modèle, en utilisant la TOE, le DOI et le PERM. Une approche à méthodes mixtes est encadrée à l'aide d'une analyse de contenu thématique des documents d'archives du gouvernement, de trois entretiens semi-structurés avec des experts de MOWMAUP et d'une analyse statistique d'une enquête en ligne distribuée à 71 entreprises de construction routière à Bahreïn. L'analyse de contenu met en évidence que l'approvisionnement routier comporte trois étapes, dont les activités principales sont effectuées manuellement. Les participants à l'enquête et les experts des affaires des travaux soulignent que les entités du secteur routier perçoivent les achats électroniques comme ayant plusieurs avantages et sont soutenus par la haute direction et que sa mise en œuvre est alignée sur les objectifs stratégiques de l'organisation. Cependant, les experts des affaires des travaux mentionnent que le manque de mise à niveau du logiciel, l'amélioration de la communication, la facturation numérique, les sous-systèmes incompatibles et les nouvelles lois et réglementations peuvent faire dérailler l'adoption des achats électroniques. On constate que la taille des entreprises de construction de routes affecte en corrélation avec sept facteurs : l'utilisation d'outils informatiques avancés, la compatibilité de l'e-procurement avec les pratiques de travail préférées, les connaissances informatiques des employés, les ressources humaines disponibles, les ressources informatiques disponibles et la préparation des entreprises à mettre en œuvre l'e-procurement. Cependant, l'infrastructure informatique du gouvernement ne s'est pas avérée corrélée à la taille des entreprises. De plus, l'enquête montre que le manque de ressources adéquates signifie que les petites et moyennes entreprises ne sont pas mieux préparées que les grandes entreprises. L'étude recommande que les lois du BTB modifiées pour la mise en œuvre de la passation électronique des marchés publics et le suivi des contrats et le paiement électronique soient intégrées.

Appendices

Table 36 shows the relevant documents for this study and a summary of their content.

Table 36 List of Appendices

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Appendix A	Interview Protocol: Includes the introductory section sent to the interviewees and the list of questions for the interviews.
Appendix B	Web-Based Survey: Includes the introductory section sent to the participants and the list of questions for the survey.
Appendix C	Survey Population: The registered road construction companies with the MOWMAUP, obtained from the following link: https://www.works.gov.bh/English/Services/cost/Pages/CedApps2/Listing2.aspx
Appendix D	Analysis of Tendering Timeframe: Includes a table identifying the number of tenders, and the period between tender closing dates and their respective awards.
Appendix E	Interview Transcripts: Includes the full transcripts for the three interviewees.
Appendix F	Thematic Analysis: Includes the coding system used for the analysis of the interviews, using MAXQDA Analytics Pro.
Appendix G	SPSS 26.0 Results: Includes the chi-square tests of independence and Fisher's exact tests used to analyse the survey findings.