A Comprehensive Analysis of Public E-Procurement System: The Case of Bahrain

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Abstract:

Within the framework of countries' policies towards building a digital society that embraces new emerging information technologies, which have become of utmost importance at present the world is witnessing radical change in the emerging new technology. Governments throughout the world started the digital transformation and started employing emerging technologies tools. Governments realized that technology and digital data have become indispensable tools for government agencies. In this study, we review the current e-procurement system in the Kingdom of Bahrain and investigate its gap from the model suggested by the World Bank for Public Sector E-procurement system. Furthermore, this study reviews the current tendering process of the Bahrain Tender Board, identifying its digitalization level, and further exploring the opportunities in employing the digitalization technologies in the tendering process. This study is aimed to suggest improvements to Bahrain's current e-procurement system, hence contributing to Bahrain's government's digital transformation strategy.

Keywords: E-procurement, Digital transformation, Digitalization technologies, Procurement 4.0, Strategic planning, Artificial intelligence, Public Sector.

1. Introduction

With the advancement and rapid development of technology, in recent decades we have witnessed a massive digital transformation that radically affects various aspects of our lives. The era of digital transformation has brought about tremendous changes in the way we deal with information and carry out our daily actions (Kraus, Jones, Kailer, Weinmann, Chaparro-Banegas, & Roig-Tierno, 2021). Therefore, the Public in particular can benefit hugely from digital transformation in the form of efficient, faster, and reliable services provided to communities (Shaughnessy, 2018). Therefore, applying the transformation Digital contributes to facing market changes and constantly changing customer requirements. Beyond merely procurement processes, public procurement includes other aspects as well. Information, staff, procedures, and protocols, as well as the organization's strategy and policy, must all be included in its design. It works well as a tool to promote economies, cut public spending, and improve government efficiency (Thai, 2009). The goal of public service organizations is

to give citizens the best overall "value for their money." This necessitates considering factors like client happiness, the general welfare, integrity, fair play, justice, and equity (Barrett, 2000). The Internet technology platforms and services known as e-procurement solutions, which increase the effectiveness and cost-efficiency of corporate purchasing operations, are rapidly gaining traction among mainstream businesses, having transitioned from early adopter status. By lowering transaction costs, improving decision-making, and obtaining greater value, electronic procurement—the buying and payment of products and services—can help the government improve how it conducts business (Panayiotou, Gayialis, & Tatsiopoulos, 2004).

2. Study Problem

Many different government departments, especially in developing countries, realized the benefits of the digital transformation. The employment of digital tools such as AI, the Internet of Things, cloud computing, blockchain, and other tools, can be very rewarding for the public sector, in particular. To achieve efficiency and effectiveness in three areas—transparent and responsible governance, efficient use of public resources, and conditions for fair competition among enterprises and balanced growth of all regions—e-influence procurement is essential (Pekolj, Hodošček, Valjavec, & Ferk, 2019). E-procurement offers a stringent and transparent framework for public entities to electronically acquire goods and services from their vendors by transforming the conventional procurement framework into an internet-based system (Bienhaus & Haddud, 2018). As a result, it is evident from this advantage that the providers also profit from having their services available on the Internet, which is accessible to everyone. Suppliers could receive, administer, and take part in government tenders using the e-procurement system. They could also receive payment from government agencies online (Wimalasena & Gunatilake, 2018). The level of digital maturity can reflect the potential benefits of the e-procurement system. Accordingly, in this study few questions emerged:

RQ1 What is the level of digitalization in Bahrain Tendering Board

RQ2 What are the gaps in the current e-procurement system- with a focus on the Tendring process?

RQ3 How Bahrain Public Procurement Can benefits from the Digitalization Technologies

3. Literature Review:

The topic has been the focus of numerous studies because of its significance on a worldwide scale. The study (Reis, Amorim, Melão, & Matos, 20118) addressed the future of digital transformation and the need for an artificial intelligence-information systems connection. The study suggested that for any

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institution to embark on the digitization journey, a massive database must be created. While research (Verina & Titko, 2019) provided clarification on the definition of digital transformation and its significance. A study of (Kraus, Jones, Kailer, Weinmann, Chaparro-Banegas, & Roig-Tierno, 2021) indicated that digital transformation is necessary to keep up with technological advancement and that digitization of all government institutions is necessary. Meanwhile, a study (Matt, Hess, & Benlian, 2015) provided global mechanisms, strategies, and methods for digital transformation. While the study by (Soto Setzke, Riasanow, Böhm, & Krcmar, 2023) explained the role of digital transformation in digital services innovation paths and its role in digital transformation strategies in government organizations and existing business establishments, the study (Shaughnessy, 2018) confirmed the role of digital transformation in the strategic steps of leadership and performance regulation.

The concept of digital transformation

The term "digital transformation" describes how digital technology is used in all facets of life and work (Verina & Titko, 2019), resulting in significant changes to the way value, services, and goods are provided to clients or citizens. Enhancing productivity, creativity, innovation, and inclusivity in a variety of fields, including industry, education, health, and agriculture, is made possible by the digital transition. However, there are hazards and obstacles associated with digital change as well, like rising inequality and dangers to security, privacy, and human rights. Because of this, digital transformation necessitates a well-thought-out plan that starts with a diagnosis of the current situation and then identifies goals, opportunities, and obstacles (Hess, Matt, Benlian, & Wiesböck, 2016). The strategy must then be put into action by allocating the necessary funds and forging alliances, and the results must be monitored and evaluated. According to (Bonnet & Westerman, 2020), digital transformation is the use of digital technology in all facets of our lives, including business, education, communications, health, and so on. It improves our access to information and gives us interactive tools for learning, working with data, and communicating.

E-Procurement in the Public Sector

Most governments have embraced it for online company registration and tenders, especially those in developing countries like Bahrain. Notably, vendors can easily take part in government tendering activities by signing up for the e-procurement system and using e-procurement (Molla & Licker, 2005). By utilizing information and communications technology, it has transformed the conventional procurement process into an electronic one (ICT) (Nandankar & Sachan, 2020). E-procurement technology has many benefits, some of which are frequently listed. These benefits include lower operating costs, increased accountability and effectiveness within the system, improved transparency, monitoring and enhancing the quality of service delivery, and improved supplier

integration (Odulana & Oyewobi, 2019).

Procurement 4.0

Procurement 4.0 is the combination of Industry 4.0 and the supply chain's procurement function, as per (Bag, Dhamija, Gupta, & Sivarajah, 2020). (Philippart, Verstraete, & Wynen, 2005) state that the main advantage of e-sourcing is that it supports the traditional process by providing a system that collects all actions and data, allowing for "one-to-one" communication between the buyer and the provider. The highest level of using smart technology in procurement is known as Procurement 4.0. According to (Klunder, Niklas, & Steven, 2019), Procurement 4.0 technologies fall into four categories: (1) data, intelligence, and analytics, which covers BD, data analytics, and AI; (2) connection and communication, which includes cloud, cybersecurity, and IoT; (3) human-to-human (H2M) and machine-to-machine (M2M) interaction, encompassing manufacturing technologies and virtual/augmented reality (VR/AR); (4) logistics, encompassing advanced robots and autonomous vehicles. Technologies like the Internet of Things (IoT), Big Data (BD), Artificial Intelligence (AI), and Blockchains (BC) have emerged as potential solutions by enabling instrumented data capture, real-time information exchange, and global interconnectivity. This has prompted the development of new SC models and concepts to maintain competitiveness (Bienhaus & Haddud, 2018). (Bank, 2021) states that the following three areas ought to be included in the e-procurement system:

1. The pre-award phase, from planning the project through the results of the bid evaluation process.
2. The post-award-phase, from the award of the contract till completion.
3. The supporting features.

Functional coverage

Pre-awarding phase	Post-awarding phase	Suppporting features
e-Procurement Planning	Contract management	e-Registration
e-Publication/Notification	e-Catalogues	Supplier management
e-Tendering	Catalogue management	Transverse search
e-Reverse Auctions	e-Purchasing	Monitoring and reporting
e-Evaluation/Awarding		e-Complaints
		e-Signature
		Integrity filters

Figure 1: E-procurement Functional Coverage. Source (World Bank, 2021)

For any e-procurement system to be advanced enough to handle any government procurement activity, it must include the e-procurement activities listed in Table 1. For any e-procurement system to be advanced enough to handle any government procurement activity, it must include the e-procurement activities listed in Table 1. For any e-procurement system to be advanced enough to handle any government procurement activity, it must include the e-procurement activities listed in figure 1.

a. Furthermore, the new e-procurement systems are becoming more intelligent due to digital technologies. These technologies give public e-procurement platforms extraordinary features like:

b. Digital Procurement Platforms: By streamlining supplier identification, bidding, and contract administration, online platforms improve productivity and cut down on paperwork (Afolabi, Oyeyipo, Ojelabi, & Tunji-Olayeni, 2017).

c. Internet of Things (IoT) in Supply Chain: IoT devices allow for predictive asset maintenance, real-time tracking of items, and inventory level monitoring, all of which improve supply chain operations (Kumar, et al., 2016).

d. Artificial Intelligence (AI) in Spend Analytics: AI systems examine vast amounts of data to spot trends in spending, spot areas where money could be saved, and gain insights on supplier performance (Siciliani, Taccardi, Basile, Di Ciano, & Lops, 2023).

e. Procure-to-Pay Robotic Process Automation (RPA): RPA reduces human labor and errors by automating regular procurement operations like purchase order processing, invoice matching, and payment processing (Flechsig, Anslinger, & Lasch, 2022).

f. Blockchain in Supply Chain Traceability: Blockchain technology ensures supply chain integrity and traceability by offering an unchangeable, transparent ledger for tracking and confirming the legitimacy and provenance of commodities (Hastig & Sodhi, 2020).

Bahrain Tender Board (BTB)

In 2002, the Bahrain Tender Board was founded. BTB is in charge of all government procurement of goods, structures, and services (BTB, 2021). To ensure the highest standards of justice and equal opportunity, the Tender Board employs strict regulatory frameworks that support effective and successful government procurement practices and procedures. The Board ensures justice, transparency, and competition in all government procurement and tendering procedures by collaborating with public sector purchasing bodies and local, regional, and international suppliers and contractors. Public sector purchasing

authorities and local, regional, and international contractors and suppliers have formed cooperative connections to ensure quality, equity, and competitiveness in all government tendering and purchasing procedures. Solid alliance building has paved the way for an extraordinary regulatory environment that supports private sector growth and raises investor confidence in the Kingdom of Bahrain as a favorable global hub for business (Board, 2002); (Bahrain Tender Board, 2022) states that 1,618 tenders and auction values totaling about $3.6 billion were processed by BTB.

4. Research Methodology:

This analysis's secondary data came from the Bahrain Tendering Board (BTB). The primary source of data is the documentation and records related to the current E-procurement system that the BTB use. This includes all of the paperwork, policies, procedures, and guidelines pertaining to Bahrain's tendering process.

A comprehensive understanding of the current E-procurement operations was attained by studying the World Bank E-procurement activity table. The BTB's current policies and processes, together with any international standards or recommendations that are followed, are detailed in this table.

In addition to closely examining the available records, the tendering process flow chart was assessed. The various steps and processes in the bidding process, including pre-qualification, submitting a bid, evaluating it, and awarding a contract, include

A futuristic and digitally enabled E-procurement paradigm is also proposed, grounded in an understanding of existing practices and data analysis. This paradigm uses cutting-edge technologies like automation, data analytics, and artificial intelligence to try to increase the efficacy, transparency, and efficiency of the tendering process. When applicable, the recommended paradigm considers the particular requirements and specifications of the BTB while also conforming to international best practices and standards.

Relevant research and literature on Industry 4.0, e-procurement, and digital procurement were examined to support the suggested paradigm. These tools enable the creation of a well-informed and fact-based proposal by offering insights into the most recent trends, innovations, and successful case studies in the procurement industry.

It is important to keep in mind that all secondary data sources, such as relevant literature and BTB paperwork and records, are the sole source of information used in this study. There were no primary data-gathering methods used in this study, such as questionnaires or interviews. Some drawbacks of this approach include possible limitations or data gaps in the already available documentation and the lack of real-time perspectives from stakeholders involved

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in the tendering process.

By integrating the proposed digitally-enabled E-procurement paradigm with a thorough investigation of secondary data sources, such as BTB paperwork and relevant literature, this research aims to further comprehend prospective changes and innovations in the public bidding process.

5. Results and Findings

Therefore, table 1 shows the features of BTB E-procurement system.

Table 1: The features of BTB E-procurement System

E-Procurement Features	Availability (Yes/No)
Pre-Award Phase	
e-procurement Planning	Yes
e-Publication/Notification	Yes
e-tender	Partially
e-Reverse Auction	No
e-Evaluation / award	No
Post Awarding Phase	
Contract Management	No
e-Catalogues	No
e-Purchasing	No
Supporting Features	
e-Registration	Yes
Suppliers Management	No
Transverse Search	No
Monitoring and Reporting	No
e-complains	Yes
e-signature	No
Integrity Filters	Yes

Source: The author.

5.1 Evaluation of the E-Procurement System:

The current e-procurement system includes basic features including planning, notification, e-registration, e-complaints, and an integrity filter. Through an online portal, these features are conveniently accessible to both customers and providers. However, the system falls short in providing the basic features that one would expect from an electronic procurement system.

The absence of e-catalogs is one major disadvantage, making it more challenging to manage product and service information efficiently. With the use of e-catalogs, consumers may quickly access and compare products and services offered by vendors by creating and maintaining a central database more easily. The lack of this feature restricts buyers' capacity to make informed decisions and

hinders the procurement process as a whole.

Similarly, contract management faces challenges due to the absence of e-contracts. Because e-contracts streamline the processes of contract creation, negotiation, and implementation, they reduce paperwork and offer faster, more efficient contract administration. The absence of them in the current system increases the administrative burden and delays the procurement schedule.

Moreover, the lack of e-purchasing facilities limits the system's functionality. E-purchasing includes features like online buying, order tracking, and electronic payment processing, all of which significantly increase the efficiency and transparency of the procurement process. The absence of these components reduces the overall effectiveness of the system by necessitating laborious, manual purchase procedures.

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Furthermore, the lack of e-evaluation and awards functionality hinders the effectiveness and transparency of the tendering process. E-evaluation ensures fairness and reduces human work while streamlining the bid review process with automated scoring and analysis. Without this component, the tendering process is more laborious and challenging to manage. On the other hand, the absence of e-auction functionality represents a missed opportunity to reduce expenses, particularly for commodities and general services where competitive bidding may yield significant savings.

Furthermore, evaluating suppliers' performance objectively and promoting a cooperative culture is made difficult, if not impossible, by the e-procurement system's lack of a supplier management function. By using supplier management tools, one may monitor the performance of suppliers, evaluate key performance indicators, and create long-lasting alliances based on respect and benefit. Strategic supplier collaboration opportunities are limited and supplier performance evaluation becomes more challenging in the absence of supplier management functions.

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5.2 Advanced Digital Technologies in BTB E-Procurement System

In addition to the limitations already discussed, it is crucial to stress that the current e-procurement system is devoid of smart technologies, which form the cornerstone of digital transformation. Smart technologies such as artificial intelligence (AI), machine learning, and data analytics have the power to revolutionize procurement processes by facilitating advanced automation, predictive analytics, and the capacity for informed decision-making.

The development of the e-procurement system is impeded by the absence of these intelligent technologies, which also limits its ability to fully reap the benefits of digital transformation. AI-powered algorithms and machine learning models can evaluate enormous volumes of data, automate repetitive tasks, and provide valuable information for decision-making. In addition to other essential procurement duties, these technologies can enhance the efficiency and accuracy of

The proactive identification of cost-saving opportunities, the identification of patterns and trends, and the optimization of procurement strategies can all be aided by the e-procurement system's use of data analytics. The system can leverage sophisticated analytics techniques like predictive modeling and prescriptive analytics to enhance procurement outcomes by providing recommendations that are actionable and bolstering evidence-based decision-making.

The absence of smart technology limits the system's capacity and makes it more challenging for it to adapt to changing market conditions and emerging trends. Businesses now want adaptable, future-ready e-procurement solutions that can keep up with the lightning-fast advancements in technology. By utilizing intelligent technology, the system can continually stay abreast of business changes, leverage innovation, and

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6. Conclusion

The current e-procurement system used by the BTB, has a lot of flaws and may be improved. It lacks components that are vital to raise productivity, lower costs, and increase customer satisfaction. The low level of digitalization in the system creates challenges for the digital transformation of public procurement.

Users are unable to maximize the efficiency of the procurement process when electronic contracts, catalogs, and purchasing tools are absent. Furthermore, the lack of advanced search capabilities and intuitive tools in the system hinders user adoption and experience, which further impedes the transition to a digital procurement environment.

The problems related to the digital transformation of public procurement are made worse by the poor integration of smart technologies. Machine learning, data analytics, and artificial intelligence are unable to provide the deeper analytical capabilities that system decision-makers can. This impedes the process of moving towards digital transformation even if the current system lacks these technologies, which can automate activities, analyze data, and provide insightful information for well-informed decision-making.

If BTB wants to strengthen the e-procurement system and get over these challenges, it has to undertake big changes. By raising the digitization of public procurement, incorporating smart technologies, and providing essential features, BTB can hasten the process of digital transformation (Urbinati, Manelli, Frattini, & Bogers, 2022). In addition to boosting customer satisfaction, cutting costs, and boosting productivity, this modification will position BTB as a leader in the modernization of procurement practices.

It is crucial to acknowledge that achieving a high level of digitization and successfully implementing digital transformation in the public procurement sector are complex tasks. Strategic planning, robust infrastructure, building capacity, and involving stakeholders are all essential (Tekic & Koroteev, 2019). To properly integrate digital solutions into the e-procurement system, potential privacy, data security, and regulatory compliance concerns must also be addressed.

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