

# E-Tendering Adoption in the Malaysian Construction Industry: Contractors' Perspectives on Benefits, Challenges and Solutions

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## **ABSTRACT**

The conventional paper-based tendering method commonly used by contractors in the Malaysian construction industry has several shortcomings, such as limited transparency and excessive bureaucratic procedures. Despite these flaws, it remains the standard approach for project bidding. To address these inefficiencies, the government introduced the E-Tender system in 2008 as part of the Government Application initiative. This initiative aims to replace the manual tendering practices in public agencies with a more systematic Internet-based procurement platform. However, similar to any transition project, the shift to e-tendering in the Malaysian construction sector has encountered various challenges. This study aims to identify both the advantages and challenges faced by contractors when implementing the e-tendering system and to suggest potential solutions to overcome these challenges. The research is based on a survey involving 144 respondents, who evaluated and ranked the challenges according to their significance. The findings reveal that the top three benefits of adopting e-tendering are lower costs in procurement, reduced service expenses, and overall cost savings. On the other hand, the most significant challenge identified is the high initial implementation cost. To address this, the study recommends ensuring a user-friendly interface, system usability, compatibility with low-speed Internet connections, and strong support from top management as effective solutions.

*Keywords:* E-tender; E-procurement; challenges; benefit

## **INTRODUCTION**

The Malaysian construction industry is undergoing significant transformation driven by the integration of advanced technologies and innovative practices. One such advancement is the implementation of e-tendering platforms, which play a pivotal role in streamlining procurement activities. E-tendering leverages digital systems to enhance the efficiency, transparency, and accountability of the tendering process, ultimately leading to improved project execution and reduced costs. Tendering is a critical component in construction, involving the invitation of bids from contractors for specific projects. However, the conventional paper-based method has long

been criticized for its inefficiencies. According to Khalil and Waly (2015), the manual tendering process is both time-consuming and resource-intensive, requiring substantial effort to manage and organize extensive documentation. These limitations can lead to project delays, errors, and increased costs. Similarly, Hashim et al. (2020) highlighted that Malaysia's traditional tendering system often involves excessive paperwork and manual procedures, further amplifying inefficiencies. Additionally, paper-based tendering is susceptible to malpractice, as it lacks the transparency and control mechanisms necessary to prevent fraud and corruption.

In response to these issues, the Malaysian construction industry has begun to adopt e-tendering solutions. Tan and Suhana (2016) found that many construction firms have embraced e-tendering due to its potential to reduce the time and costs associated with traditional methods. E-tendering allows for the digital creation and submission of tender documents, eliminating the need for physical copies and significantly accelerating document handling and distribution. Moreover, the digital platform ensures secure information exchange between contractors and clients, safeguarding data privacy and maintaining the integrity of the process. The study also highlights that e-tendering enhances transparency and accountability, as all relevant information is digitally stored and readily accessible to authorized stakeholders. This digital transformation aligns with international best practices and contributes to more efficient and secure procedures.

Despite its advantages, the adoption of e-tendering in Malaysia does not stray away from challenges. Many contractors remain hesitant due to several challenges, including the need for reliable Internet access, the availability of appropriate technological tools, and adequate training in digital systems. There is also limited research that specifically explores into these implementation hurdles. Addressing these issues is critical to the full realization of the benefits of e-tendering—such as improved operational efficiency, reduced costs, and increased transparency.

Therefore, this study seeks to explore the advantages of e-tendering, identify the key challenges faced during its implementation, and propose potential solutions. By addressing these challenges, stakeholders within the Malaysian construction industry can work collaboratively toward a more efficient, transparent, and technologically advanced procurement system.

## LITERATURE

### **An overview of e-tendering system in Malaysian construction industry**

The Malaysian construction industry has undergone significant digital transformation, particularly with the adoption of e-tendering platforms. These systems have modernized the procurement process by enhancing the operational efficiency, transparency, and security (Hashim et al., 2020a). Various researchers have examined different aspects of e-tendering, identifying its key benefits, challenges, and areas for improvement.

E-tendering streamlines procurement by automating critical tasks such as document submission, bid evaluation, and contract awarding (Hashim et al., 2020). According to Mehdipoor et al. (2022), digital tendering significantly reduces administrative burdens and transaction costs, while also enabling real-time communication among stakeholders. Furthermore, it minimizes human error often associated with traditional paper-based methods, resulting in a more accurate and efficient process. Lee and Wong (2021) also highlighted that e-tendering promotes transparency by maintaining digital records, thereby reducing the potential for corruption and bid manipulation. The ability to monitor and verify transactions electronically strengthens accountability and fosters greater trust among participants.

Despite these advantages, e-tendering poses challenges related to cybersecurity and data protection. Zamie (2020) explained that these platforms employ secure login systems, encrypted storage, and multi-factor authentication to prevent unauthorized access. However, Mehdipoor et al. (2022) argued that many Malaysian firms lack adequate cybersecurity capabilities, making them vulnerable to cyberattacks. Issues such as data breaches, phishing attempts, and system vulnerabilities threaten the integrity of the e-tendering process. To build greater confidence in these systems, it is crucial to strengthen cybersecurity measures, provide cybersecurity training to industry professionals, and enforce comprehensive data protection regulations.

Malaysia's e-tendering process, particularly through the e-Perolehan platform, includes several digital stages (Zamie, 2020). It begins with e-notification, where suppliers are electronically informed about available tenders. Through e-access, registered bidders can securely obtain tender details, submission requirements, and deadlines. During the electronic submission phase, bids are submitted in a standardized format to ensure compliance. This is followed by e-evaluation, where qualified personnel assess and compare submissions based on predetermined criteria. Finally, e-awarding completes the process with an electronic contract award, ensuring a fast and transparent decision-making process. These digital procedures enhance accessibility for contractors, reduce paperwork, and improve overall procurement efficiency.

Nevertheless, the implementation of e-tendering faces legal, technical, and user-related challenges. Legal issues such as the lack of comprehensive digital procurement policies and legal framework support hinder full adoption. Technical barriers, including system downtimes and difficulties integrating with existing procurement infrastructure, can affect performance and user experience (Inusah et al., 2025). Additionally, resistance to change, driven by limited digital literacy and preference for traditional methods, remains a significant hurdle. Promoting awareness, conducting training sessions, and enhancing system usability can help accelerate the transition to a fully digital tendering environment (Inusah et al., 2025).

E-tendering holds great potential to transform Malaysia's procurement landscape by delivering improved efficiency, transparency, and security. However, its success depends on addressing cybersecurity risks, refining regulatory structures, and fostering user acceptance. With the right strategies and commitment to technological innovation, the Malaysian construction sector can fully leverage the benefits of e-tendering and advance toward a more sustainable and modern procurement system.

### **Definition of e-tendering**

Electronic tendering, commonly referred to as e-tendering, is a digital approach to procurement that manages the issuance, submission, evaluation, and awarding of tenders through online platforms. This method has revolutionized traditional tendering practices by significantly improving the efficiency, transparency, and accessibility for both bidders and procurement personnel (Hashim et al., 2020). As a vital component of e-procurement, e-tendering simplifies the procurement of goods and services by reducing paperwork and administrative burdens, while simultaneously lowering the risk of corruption and manipulation of bids (Kumar et al., 2021). The transition from manual to digital tendering has greatly enhanced the speed, accuracy, and security of procurement activities, making e-tendering a key tool in modern governance and corporate operations.

Globally, both public and private sectors have widely implemented e-tendering systems to optimize procurement practices. Countries such as the United Kingdom, Australia, and Singapore have successfully adopted these systems, resulting in greater competition among suppliers, improved cost-effectiveness, and shorter procurement cycles (Srinivas & Rao, 2020). These outcomes highlight the pivotal role of e-tendering in updating procurement strategies and aligning with global digital transformation efforts.

In Malaysia's construction industry, e-tendering plays a central role in the government's push for digital modernization. The introduction of the e-Perolehan system, Malaysia's official electronic procurement platform, was aimed at simplifying tender submissions and increasing procurement efficiency (Ahmad et al., 2021). Government agencies, including the Public Works Department (JKR), have adopted e-tendering to align with international standards and address corruption concerns (Hashim et al., 2020). Additionally, the Construction Industry Development Board (CIDB) has actively promoted the use of e-tendering to widen the participation among contractors, particularly small and medium enterprises (SMEs) (Lee & Wong, 2021). This digital platform enhances inclusivity and encourages fair competition, contributing to the overall growth of Malaysia's construction sector and supporting the country's digital economy goals.

The integration of e-tendering in Malaysia offers several key benefits, including reduced procurement costs, increased operational efficiency, and stronger data protection. The use of automated evaluation tools and digital audit trails further improves accountability and ensures

adherence to regulatory requirements. However, several challenges must still be addressed such as limited digital literacy, cybersecurity vulnerabilities, and issues with system integration to fully realize the potential of e-tendering.

Overall, e-tendering represents a significant advancement in procurement practices, providing a more effective, transparent, and secure system for managing tenders. Continued development and adoption of these systems will be essential in advancing procurement modernization within Malaysia's construction industry and beyond.

### **Benefit of e-tendering system**

The adoption of e-tendering systems has revolutionized procurement processes by enhancing efficiency, reducing costs, and promoting greater transparency. Scholars have explored the positive impacts of digital procurement, particularly in the construction industry, where e-tendering has significantly streamlined bidding activities. This section highlights key benefits such as improved cost-effectiveness, increased transparency, enhanced operational performance, and broader supplier engagement.

(i) **Cost efficiency and financial benefits**

One of the main reasons for adopting e-tendering systems is their potential to reduce costs. By eliminating paper-based processes, digital procurement minimizes administrative workload and reduces errors caused by manual data entry (Kumar et al., 2021). Voon and Lee (2025) identified key benefits such as cost and time savings, apart from challenges like software limitations and security concerns. According to Hashim et al. (2020), e-tendering allows for more economical procurement of goods and services through automation that streamlines bid evaluation and contractor selection. Mehdipoor et al. (2022) further highlighted that e-tendering significantly cuts down on the administrative, ordering, and lead time expenses, thereby improving overall financial efficiency. These cost-saving benefits make procurement more accessible, particularly for small and medium enterprises (SMEs) seeking to participate in public sector projects (Srinivas & Rao, 2020).

(ii) **Enhancing transparency and reducing corruption risks**

Traditional procurement processes have often been criticized for their vulnerability to favoritism and political interference. E-tendering helps address these issues by incorporating features like audit trails, compliance verification, and secure digital records that enhance both accountability and transparency (Ahmad et al., 2021). Reducing human input in the evaluation process also minimizes the risk of biased decisions (Lee & Wong, 2021). Additionally, open-access digital platforms encourage healthy competition among bidders, ensuring fair market access and more competitive pricing strategies (Hashim et al., 2020). Nawi et al. (2017) emphasized that the move from manual to electronic tendering has significantly improved the integrity of the bidding process. By eliminating the physical handling of documents, e-tendering prevents tampering and unauthorized changes, ensuring a level playing field for all participants. The transparency offered by digital procurement has also encouraged broader industry participation, fostering a more dynamic and efficient market.

(iii) **Operational efficiency and timeliness**

Timeliness is critical in managing construction projects, and e-tendering significantly accelerates procurement timelines. Features such as real-time bid tracking, instant notifications, and rapid contract approvals reduce delays and streamline the procurement workflow (Mehdipoor et al., 2022). These efficiencies lead to faster order processing and shorter lead times, contributing to more effective project delivery (Kumar et al., 2021). Moreover, e-tendering relieves procurement personnel from routine administrative tasks, allowing them to focus on higher-level strategic planning (Ahmad et al., 2021). Studies show that digital systems not only improve the -workflow efficiency but

also enhance the accuracy and reliability of project management processes (Srinivas & Rao, 2020). Aziz (2024) proposed technological enhancements and process improvements for certain areas that have software limitations and security concerns.

- (iv) **Supplier competition and market expansion**  
E-tendering has played a significant role in increasing supplier participation and promoting competitive bidding. Transitioning to digital platforms has enabled contractors from various regions to compete more easily by eliminating bureaucratic barriers and the need for physical submissions (Lee & Wong, 2021). This expansion has led to more competitive pricing, better service delivery, and improved supplier outcomes (Hashim et al., 2020). Furthermore, e-tendering provides a more structured evaluation process, ensuring that procurement decisions are based on the most cost-effective and high-value options (Kumar et al., 2021). However, some studies caution that inconsistencies in bid quality and the risk of opportunity loss remain to be the problems, highlighting the need for ongoing improvements in supplier evaluation and training systems (Mehdipoor et al., 2022).

### **Challenges to implementing e-tendering system**

Despite the numerous advantages offered by e-tendering systems, their implementation in the construction industry faces several notable challenges. Research has highlighted various issues such as insufficient support, budget limitations, resistance to change, inadequate infrastructure, and a lack of technical knowledge. This section explores key studies related to these challenges and their impact on the successful adoption of e-tendering.

- (i) **Lack of Support**  
A key challenge in implementing e-tendering is the limited support from system developers and vendors. Organizations require a robust ICT infrastructure and expert knowledge to adopt the system effectively, yet small and medium-sized enterprises (SMEs) often struggle with the high initial costs (Alofia et al., 2016). Poor Internet connectivity, especially in digitally under-served regions, further complicates the adoption (Ngatman et al., 2020). Without proper training and technical assistance, many contractors find it difficult to navigate e-tendering platforms effectively (Kaliannan et al., 2007). Furthermore, CIDB Malaysia (2025) reported that many construction companies, including contractors, are discouraged by digital transformation due to various challenges, underscoring the need for targeted interventions.
- (ii) **Resistance to change and preferences for traditional methods**  
Resistance to transitioning from traditional tendering methods remains a significant barrier. Procurement professionals and contractors accustomed to paper-based systems may perceive digital platforms as overly complex or unnecessary (Smith et al., 2021). Ahmad (2020) noted that the hesitation to embrace new technologies often stems from uncertainty, which hinders digital adoption. Additionally, entrenched organizational habits and the reliance on existing systems necessitate comprehensive training and change management efforts to facilitate a smoother shift (Hassan & Lee, 2021). Affendy et al. (2022) also pointed out that resistance to change serves as a significant barrier. In the context of public-private partnerships, Mat Aron et al. (2024) discussed the institutional challenges that hinder e-tendering implementation.
- (iii) **High initial costs and financial constraints**  
Cost is a major challenge, especially for SMEs. The adoption of e-tendering involves substantial investments in software, hardware, and workforce training. In Malaysia, users of the e-Perolehan system must bear the expenses for registration, smart card issuance, and software maintenance, all of which impose financial strain (Zamie, 2020). Studies

indicate that these financial burdens discourage many firms, particularly in developing economies, from transitioning to digital procurement (Ali et al., 2021; Rahman & Ismail, 2020).

- (iv) **Human capital and knowledge gaps**  
A skilled workforce is essential for the successful deployment of e-tendering systems. However, many organizations lack the expertise in digital procurement, making implementation difficult (Zhang et al., 2020). Limited training opportunities and a general lack of awareness about the benefits of e-tendering hinder its adoption. To overcome these gaps, companies must invest in training and upskilling to ensure that their staff can effectively utilize e-tendering tools (Rahim et al., 2019).
- (v) **Lack of supporting infrastructure and internet connectivity**  
Reliable Internet access and strong cybersecurity measures are fundamental to the functionality of e-tendering. Research shows that poor digital infrastructure, especially in rural or less developed areas, significantly limits adoption (Chong & Tan, 2021). Concerns about cybersecurity such as data theft or unauthorized system access further discourage organizations from fully committing to digital tendering platforms (Wu et al., 2022). Without robust protection, companies are hesitant to engage in online procurement.
- (vi) **Organizational culture and institutional barriers**  
An organization's internal culture plays a vital role in shaping its approach to digital procurement. Companies with rigid hierarchies or resistance to technological change are typically slower to embrace e-tendering solutions (Mahmood & Abdullah, 2021). Additionally, ongoing operational costs including software updates and technical support can present long-term financial challenges that hinder sustained usage (Yusuf et al., 2022).

### **Possible solution for the challenges to implementing e-tendering system**

While e-tendering systems offer substantial benefits, their implementation within the construction sector faces several challenges. To address these, targeted strategies are required to improve usability, accessibility, and user acceptance. Various studies have explored key factors that can help overcome these challenges and enhance the effectiveness of e-tendering systems.

- (i) **Technology readiness**  
Technological preparedness refers to an organization's capacity to adopt and integrate digital tools into its operations. Adequate IT infrastructure including computers, data systems, and communication networks is essential for effective e-tendering adoption (Zamie, 2020). However, the absence of universally accepted coding standards, technical requirements, and procedural frameworks continues to hinder efficient implementation (Li et al., 2021). Moreover, the compliance with regulatory frameworks set by government bodies and industry regulators is critical to avoid legal or administrative complications. The use of cost-effective open-source solutions can help address budget limitations. Additionally, platforms should feature user-friendly interfaces to reduce barriers for users with limited technical expertise (Mohamed et al., 2018).
- (ii) **User-friendly design and ease of use**  
An easy-to-use interface plays a key role in ensuring successful system adoption. Research shows that systems with clear navigation and simplified processes lower resistance and improve user engagement (Davis, 1989; Venkatesh & Bala, 2008). Since many construction professionals have limited digital skills, intuitive design and simplified workflows are necessary (Ismail et al., 2021). Providing accessible support resources like FAQs and live assistance can further enhance the user experience.

- (iii) **Government influence**  
Governments can play a pivotal role in promoting e-tendering by leading through example. By successfully implementing e-tendering systems, the public sector has demonstrated tangible benefits—such as reduced procurement costs, streamlined processes, and improved contract management—which can serve as a model for private enterprises (Yahya et al., 2018). Additionally, by replacing traditional barriers in the tendering process, e-tendering systems introduced by the government encourage broader participation from service providers, thereby fostering a more competitive and transparent procurement environment. (Gregoire, 2020).
- (iv) **Top management support**  
Leadership support is critical in addressing resistance and allocating adequate resources for implementation (Zamie, 2020). Organizations with committed leadership are more likely to adopt and efficiently utilize e-tendering technologies. Research shows that leadership involvement significantly influences the successful deployment of digital systems in various industries (Mehdipoor et al., 2022). Senior management must take an active role in digital procurement projects, providing strategic guidance and fostering a tech-forward culture (Ngatman et al., 2020).
- (v) **Support for low-speed internet connectivity**  
Limited Internet infrastructure, especially in rural or developing areas, continues to be a major barrier to system adoption (Rahman & Ismail, 2020). It is crucial that e-tendering systems are optimized for use in low-speed Internet conditions. Studies emphasize the importance of lightweight platforms with offline capabilities to accommodate users in remote areas (Zhang et al., 2020).
- (vi) **Simple navigation and basic coding knowledge**  
Simplified navigation helps users feel more confident and boosts productivity. Research indicates that well-structured interfaces with clear instructions minimize mental effort and accelerate adoption (Chong & Tan, 2021). Even basic coding literacy can empower users to resolve minor technical issues independently, enhancing overall system efficiency (Ali et al., 2021).
- (vii) **Technical knowledge and specification process**  
A certain level of digital competence is necessary for users to operate e-tendering systems effectively. Procurement professionals and contractors must be familiar with digital tools to use these platforms efficiently (Rahim et al., 2019b). Additionally, understanding tender specifications is key to accurate submissions and minimization of errors or disputes (Wu et al., 2022).
- (viii) **System manual adoption**  
Providing comprehensive user manuals and training materials can improve user adoption by offering step-by-step guidance (Smith et al., 2021). Structured on-boarding resources, including video tutorials and interactive guides, can significantly improve user capability and reduce frustration during system usage (Zamie, 2020).

## **METHODOLOGY**

This study employed a quantitative research approach. The target population comprised Quantity Surveyors (QS) or consultants employed by Grade G6 contractors based in Selangor and registered with the Construction Industry Development Board (CIDB). A total of 659 individuals was identified in this category. A random sampling technique was utilized to select participants. To determine an appropriate sample size, the Raosoft sample size calculator was used, setting parameters at a 5% margin of error, a 90% confidence level, and a 50% response distribution.

Based on these settings, a recommended sample size of 243 respondents was obtained. According to Yong and Mustafa (2012), a typical response rate in construction-related studies ranges from 20% to 30% to yield reliable and credible findings. Out of the 243 questionnaires distributed, 144 were returned completed and deemed valid for data analysis. The remaining responses were either incomplete, invalid, or not returned. This resulted in a response rate of 59%. The questionnaires were gathered via an online form utilizing Google Forms for the survey. The questionnaire survey comprises the following- Section A-Demographics, Section B- The benefit of implementing the e-tendering, Section C- The challenges to implementing the e-tendering system faced by the contractor and Section D- Solution for the Challenges to implementing the e-tendering system. A descriptive analysis, including the mean scores and frequencies related to respondents' demographic profiles and survey answers, was conducted using SPSS version 22.

## RESULTS AND DISCUSSION

### Section A: demographic of the respondent

Table 1. Demographics of the respondents

Respondent's	Characteristic				
Gender	Male	Female			
	88	56			
	61.10%	38.90%			
Age	25-30 years	31-35 years	36-40 years	41-45 years	>45 years
	52	40	30	15	7
	36.10%	27.80%	20.80%	10.40%	4.90%
Qualifications	Diploma	Degree	Master	PHD	Other
	87	48	3	1	5
	60.40%	33.30%	2.10%	7%	3.50%
Years of Experience	< 5 years	5-10 years	10-15 years	15-20 years	> 20 years
	40	50	24	18	12
	27.80%	34.70%	16.70%	12.50%	8.30%
Field of Profession	Engineer	QS	Other		
	7	134	3		
	4.90%	93.10%	2.10%		

A total of 144 respondents participated in the study. The majority were male (61.1%), while female respondents made up 38.9%. In terms of age, the largest group was between 25–30 years old (36.1%), followed by those aged 31–35 years (27.8%) and 36–40 years (20.8%). Smaller proportions were recorded for the 41–45 years (10.4%) and above 45 years (4.9%) age groups. With regard to educational background, most respondents held a Diploma (60.4%), followed by Bachelor's degrees (33.3%), while a smaller number held a Master's degree (2.1%), PhD (0.7%), or other qualifications (3.5%). In terms of professional experience, the largest segment had 5–10 years of experience (34.7%), followed by less than 5 years (27.8%). Other groups had 10–15 years (16.7%), 15–20 years (12.5%), and more than 20 years (8.3%) of experience. Regarding professional roles, the vast majority of respondents were Quantity Surveyors (93.1%), with Engineers (4.9%) and others (2.1%) comprising the remainder.

## Section B: The benefit of implementing the e-tendering system

This section presents findings regarding the benefit of implementing the e-tendering system. There were fourteen (14) attributes of benefits of implementing the e-tendering system, as shown in Table 1. The low cost of purchasing goods; low cost of services; and cost savings are the three (3) benefits that rank first among twelve (12) benefits in implementing the e-tendering system (mean=5.00, SD=0.000). The low political engagement ranked second (mean=4.92, SD=0.277), according to the findings. Efficient timeliness (mean=4.86, SD=0.347) is ranked third. In the meantime, the top three mean values with the lowest totals are the reduction in business effort (mean=3.70, SD=0.845), the quality bidding (mean=3.24, SD=0.939) and the opportunity cost (mean=2.98, SD=0.401) respectively.

Table 2. Benefits of implementing the e-tendering system.

Benefit of Implementing The E-Tendering System	Mean	Standard Deviation	Rank
Low-Cost Purchasing Goods	5.00	0.000	1
Low Cost of Services	5.00	0.000	1
Cost Savings	5.00	0.000	1
Low Political Engagement	4.92	0.277	2
Efficient Timeliness	4.86	0.347	3
Administrative Cost	4.58	0.495	5
Order Cost	4.22	0.639	6
Lead Time Cost	4.18	0.816	7
Openness	4.10	0.855	8
Increase Supplier Competition	4.05	1.006	9
Fairness	3.87	0.553	10
Reduction in Business Effort	3.70	0.845	11
Quality Bidding	3.24	0.939	12
Opportunity Cost	2.98	0.401	13

Note: Scale: Strongly Disagree (1.00 average mean <1.50), Disagree (1.50 average mean <2.50), Neutral (2.50 average mean <3.50), Agree (3.50 average mean <4.50), Strongly Agree (4.50 average mean <5.00).

## Section C: the challenges in implementing the e-tendering system faced by the contractor

This section examines the challenges in implementing the e-tendering system faced by the contractor. The nine (9) variables of the challenges in implementing the e-tendering system faced by the contractor are presented in Table 2. The majority of respondents gave a mean score of 4.92 for "strongly agree" and SD= 0.267 value as the top-ranked reason that the challenge in implementing the e- tendering system faced by the contractor is high initial cost. The resistance to change ranked second (mean= 4.77, SD= 0.655). The contractors are comfortable with outdated procedures (mean = 4.76, SD = 0.430) as the third-ranked challenge in implementing the e- tendering system they face. The top three (3) lowest-ranked challenges are the lack of knowledge, organizational culture and financial constraints. The first lowest ranked challenge is lack of knowledge (mean= 4.14, SD= 0.936). The second lowest ranked challenge is organizational culture (mean=3.98, SD=1.000). The third lowest ranked challenge is financial constraints (mean=3.02, SD=1.314).

Table 3. The challenges in implementing the e-tendering system faced by the contractor

The Challenges in Implementing The E-Tendering System Faced by the Contractor	Mean	Standard Deviation	Rank
High Initial Cost	4.92	0.267	1
Resistance To Change	4.77	0.655	2
Comfort With Outdated Procedures	4.76	0.430	3

Table 3. (continued)

Human Capital	4.60	0.491	4
Lack of Supporting Infrastructure	4.33	0.757	5
Adequate Internet Networking	4.17	1.194	6
Lack of Knowledge	4.14	0.936	7
Organizational Culture	3.98	1.000	8
Financial Constraints	3.02	1.314	9

Note: Scale: Strongly Disagree (1.00 average mean <1.50), Disagree (1.50 average mean <2.50), Neutral (2.50 average mean <3.50), Agree (3.50 average mean <4.50), Strongly Agree (4.50 average mean <5.00).

#### Section D: solutions for the challenges in implementing the e-tendering system faced by the contractor

This section examines the solutions for the challenges in implementing the e-tendering system faced by the contractor. The eleven (11) variables of the solutions for the challenges in implementing the e-tendering system faced by the contractor are presented in Table 3. The user-friendly design, ease of system use, suitable for low-speed Internet and top management support are the four (4) solutions that rank first among eleven (11) solutions for the challenges in implementing the e-tendering system faced by the contractor (mean=5.00, SD=0.000). The straightforward navigation ranked second (mean= 4.96, SD= 0.201). The basic coding knowledge (mean=4.94, SD=0.243) as the third rank of the solutions for the challenges in implementing the e-tendering system faced by the contractor. The top three (3) lowest-ranked solutions are technology readiness, following government's trend and system manual adoption. The first lowest ranked solution is technology readiness (mean= 4.57, SD=0.537). The second lowest ranked solution is following government's trend (mean=4.51, SD=1.159). The third lowest ranked solution is system manual adoption (mean=4.36, SD=0.781).

Table 4. Solution for the challenges in implementing the e-tendering system faced by the contractor

<b>Solution for The Challenges in Implementing The E-Tendering System Faced by The Contractor</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>Rank</b>
User-friendly Design	5	0	1
Ease of System Use	5	0	1
Suitable For Low-Speed Internet	5	0	1
Top Management Support	5	0	1
Straightforward Navigation	4.96	0.201	2
Basic Coding Knowledge	4.94	0.243	3
Basic Technical Knowledge	4.88	0.324	4
Specification Process	4.88	0.418	4
Technology Readiness	4.57	0.537	5
Following Government's Trend	4.51	1.159	6
System Manual Adoption	4.36	0.781	7

Note: Scale: Strongly Disagree (1.00 average mean <1.50), Disagree (1.50 average mean <2.50), Neutral (2.50 average mean <3.50), Agree (3.50 average mean <4.50), Strongly Agree (4.50 average mean <5.00).

## DISCUSSION

This research concurs with prior studies that technology readiness is a vital determinant for the effective deployment of e-tendering. Organizations must have the requisite IT infrastructure, encompassing databases, communication networks, and hardware systems, to facilitate digital procurement (Zamie, 2020). Research demonstrates that the absence of standardization in coding and technical specifications persists in hindering adoption (Li et al., 2021). Adherence to legal and regulatory frameworks additionally influences the smooth incorporation of the e-tendering system (Rahim et al., 2019).

The user-friendliness and convenience of use were recognized as crucial factors influencing the adoption of e-tendering. The results indicate that construction workers, lacking substantial IT

proficiency, frequently encounter difficulties with intricate interfaces. Studies conducted by Davis (1989) and Venkatesh and Bala (2008) substantiated this assertion, demonstrating that systems featuring intuitive navigation achieve greater user acceptability. Offering assistance resources, such as FAQs and customer support, can alleviate resistance and promote acceptance (Ismail et al., 2021). A significant issue lies in the governmental involvement in facilitating the implementation of e-tendering. The research indicates that government-driven digital initiatives exemplify a framework for the private sector, enhancing procurement efficiency (Yahya et al., 2018). Research indicates that government-mandated e-tendering regulations augment transparency, diminish procurement expenses, and promote contract execution (Gregoire, 2020). These advantages correspond with the international initiatives to digitize public procurement procedures (Wu et al., 2022).

Support from top management is crucial in mitigating resistance to e-tendering. Organizations exhibiting robust leadership commitment contribute greater resources to digital procurement, facilitating a more seamless transition (Mehdipoor et al., 2022). Research indicates that leadership involvement is a vital determinant of success in IT adoption across several businesses (Ngatman et al., 2020). By cultivating a culture of innovation and digital change, senior management can motivate staff to adopt e-tendering (Smith et al., 2021). Moreover, limitations in Internet connectivity were recognized as a significant obstacle, especially in poor areas. The research indicates the need to enhance e-tendering platforms for low-bandwidth settings to support contractors in isolated regions. Zhang et al. (2020) provided evidence for the necessity of lightweight applications with offline functionality. Likewise, technical expertise and training are essential for facilitating seamless adoption. Contractors and procurement officers are required to acquire and master the digital literacy to proficiently handle e-tendering platforms (Rahman & Ismail, 2020).

The results underscore the significance of streamlined navigation and coding proficiency for users. Research indicates that software using organized layouts and explicit instructions reduces cognitive overload, facilitating quicker adoption (Chong & Tan, 2021). Furthermore, supplying user manuals and organizing training programs improve user proficiency and mitigate the frustration associated with system utilization (Smith et al., 2021). The report emphasizes that effective e-tendering implementation necessitates a comprehensive strategy, incorporating intuitive system designs, managerial backing, governmental regulations, and sufficient training. It is essential to address technological and infrastructural constraints to achieve broader acceptability in the construction industry. Future research should investigate the long-term impacts of e-tendering implementation on procurement efficacy and industrial competitiveness.

## **CONCLUSION**

E-tendering has become a game-changer in Malaysia's construction sector, significantly simplifying procurement procedures and enhancing operational efficiency. It helps reduce administrative workloads, boosts transparency, and encourages fair competition, creating a more efficient and corruption-resistant procurement system. However, the implementation of e-tendering in Malaysia still faces several challenges, including cybersecurity threats, technical limitations, and regulatory compliance issues. To address these challenges, it is essential to prioritize data security, improve user training, and enforce supportive policies. Moreover, adopting global best practices can help fine-tune Malaysia's e-tendering system. Moving forward, sustained investment in digital infrastructure and ongoing policy improvements will be key to fully realizing the potential of e-tendering, ensuring a stronger and more dependable procurement process in the construction industry.

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## CONFLICT OF INTERESTS

The authors are in consensus that this research was conducted in the absence of any self-benefits, commercial or financial conflicts and have declared the absence of conflicting interests with the funders.

## AUTHORS' CONTRIBUTION

The research was conducted by Suhaila Ali. The article was written and revised by the same author. The conceptualization of the central research idea and the theoretical framework were established by Norsyazwana Jenuwa. The design of the research and the supervision of the research progress were administered by Farhan Md Dahlan and Norsyazwana Jenuwa, while the data collection was performed, and the result analyzed by Norbaizura Abu Bakar and Noraini Md Zain.

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