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TOWARDS DIGITAL FUTURE: UNLOCKING STRATEGIES TO INTEGRATE E-TENDERING IN THE CONSTRUCTION LANDSCAPE

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Abstract

The advancement of technology has introduced the electronic tendering process commonly known as e-tendering, as a promising approach in the construction industry. Despite its potential benefits, the adoption of e-tendering remains limited in Malaysia. This article intends to reveal the reasons behind the poor adoption of e-tendering in view of integrating improvement in the construction procurement process. Suitable strategies for successful e-tendering adoption will be proposed to transform the Malaysian construction industry into a digital future. Semi-structured interviews were conducted with 15 experienced construction industry players, each with at least five years of experience using the e-tendering system. The snowball sampling technique was employed to identify suitable respondents. Data collected were analysed using thematic analysis, revealing six main groups of strategies: people, process, work environment, service provider, cost and technology. These proposed strategies can serve as a practical guideline for the construction industry players seeking to adopt e-tendering systems. Additionally, they offer valuable insights for construction companies and policymakers in planning, revising, and prioritising appropriate strategies and practices for the future development or upgrading of e-tendering systems within the construction landscape. This study significantly contributes to the knowledge on e-tendering adoption, particularly in Malaysia, and provides valuable support for researchers, construction industry players, and policymakers in their efforts to embrace a digital future in the construction sector.

Keywords: e-tendering, construction industry, successful strategy

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INTRODUCTION

A wide range of technologies has dominated every sector, including the construction sector, to embark on the digital process. Tendering is one of the important processes in the construction life cycle. This process involves the submission of bids or proposals by contractors seeking to undertake a construction project after being selected by the client based on a qualifying offer (Chew, 2018). The introduction of e-tendering replaced the conventional paper-based tendering approach and offered substantial benefits such as improving the process and efficiency. Numerous researchers around the world have reported the benefits of the e-tendering (Mangitung *et. al.*, 2022; Mehdipoor, 2022; Sisofe *et. al.*, 2022). According to Tung *et al.*, (2021), digitisation has improved production in the construction industry.

By implementing the e-tendering system, the cost of preparing the tender documents has decreased as all the documents can be uploaded and downloaded through online platforms. It is estimated to save the tendering cost up to 42% of the original cost (M. Ashaari *et al.*, 2018). Tenderers can view the tender documents at anytime, anywhere, giving all users a sense of flexibility and convenience. In conventional tendering, every stage was carried out manually, increasing the chances of human error, like, inaccurate costing, incorrect formatting and late submission. Applying the e-tendering process can reduce the occurrence of unnecessary human error and increase the tendering process's efficiency (Tan & Suhana-Kamarudin, 2016). The concept of e-tendering has been introduced in the construction industry for years. According to Tan & Suhana-Kamarudin (2016), research shows that 57% of the respondents have experienced using the e-tendering system in Malaysia. Other researchers carried out a study to identify the reason for the lack of adoption of the e-tendering system from many different aspects such as the high initial cost (Lee, 2019; Wimalasena & Gunatilake, 2018), securities concern (Lee, 2019; Chew, 2018), reluctant to changes (Tan & Suhana-Kamarudin, 2016 and Lee, 2019) and lack of government standard and policies (Lee 2019; Wimalasena & Gunatilake, 2018). Researchers have proposed several improvement strategies in guiding the construction industry to migrate to the digital world; however, the implementation of e-tendering is still inadequate (Lee, 2019; Chew, 2018 and Yahya, *et.al.*, 2018).

Thus, this study was undertaken to understand the root cause of the low adoption of e-tendering, specifically in the Malaysian context, and to propose appropriate strategies to help the construction industry move towards the digital era.

E-TENDERING

E-tendering is a digital system designed to facilitate the tendering process by utilizing an online platform for the exchange of necessary electronic

documentation. Its operational procedure closely mirrors the conventional tendering process, but with all processes conducted virtually through an internet. The key advantages of e-tendering adoption include shortened tender durations, enhance communication among stakeholders, high transparency through the tendering process, improved accuracy and quality of work, and reduced manual labour requirement (Chew, 2018). Figure 1 illustrates a comparative analysis of the timeframes involved using the e-tendering and conventional tendering system.

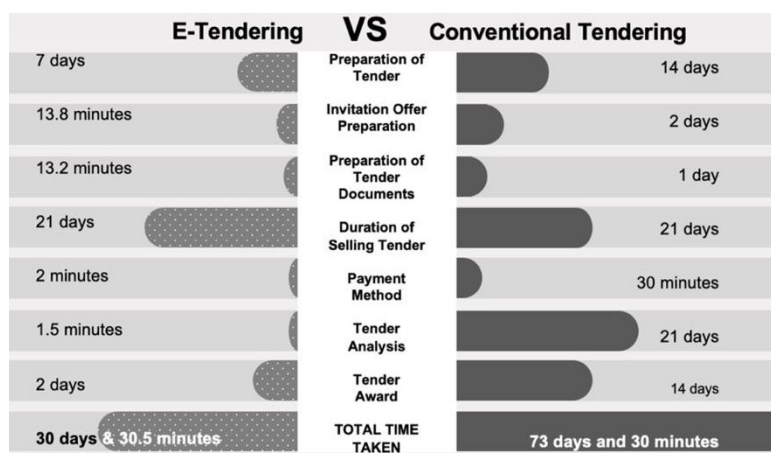


Figure 1: Average Tendering Process Duration for E-tendering System and Conventional Tendering

The use of e-tendering offers significant advantages in facilitating communication between clients and qualified tenderers. The digital platform enhances the sharing of essential project information, potentially reducing information leakage and minimising construction disputes (M. Ashaari et al., 2018). Chew (2018) added that e-tendering provides more accurate outcomes and ensure transparency compared to conventional tendering methods. This will potentially reduce computational errors, thereby enhancing the accuracy of work. Moreover, e-tendering reduced the usage of paperwork which lead to a decrease in labour-intensive tasks. Additionally, the automated system can improve the evaluation process, aiding in the selection of suitable tenderers for projects (M. Ashaari *et al.*, 2018). The advantages of e-tendering extend beyond improved communication and transparency. Research suggest that e-tendering can lead to cost savings and efficiency gains in the tendering process. By digitizing the procurement process, e-tendering can reduce the time and resources required for tender preparation, evaluation and award (Chan & Owusu, 2022). This an result

in lower administrative costs, and faster project delivery, benefiting both clients and contractors.

Furthermore, e-tendering can improve the overall governance and accountability of the tendering process. The digital nature of e-tendering platforms allows for the easy tracking and auditing of tender activities, ensuring decisions are made transparently and in accordance with regulations (Sunmola & Shehu, 2020). This can help reduce the risk of corruption and improve the overall integrity of the procurement process.

BARRIERS TO IMPLEMENT E-TENDERING

The slow adoption of e-tendering in developing countries, specifically Malaysia, has drawn the attention of researchers to find the factors behind this issue. A study by Mehdipoor *et al.*, (2022), revealed that inadequate technology infrastructure like slow and limited internet connection, has limited the usage of e-tendering systems. The data security issue is another concern usually raised by the construction industry players. According to Omran (2020), the e-tendering process involves classified information, which makes it vulnerable to digital threats such as data breaches and unauthorised access.

Resistance to change is another typical response faced by most organisations when transitioning to the e-tendering system. This issue arises as people are comfortable with the current process and fear the unfamiliarity and uncertainty (Sunmola and Shehu, 2021). Besides, digital literacy is another prevalent barrier during the implementation of e-tendering. Everyone involved in the tendering process, like contractors, consultants, and suppliers, must have the right skills to use the e-tendering system successfully. Therefore, this requires comprehensive training and technical support to use it effectively. With technological advancement, Malaysia's construction industry and other developing countries are at the right time to push e-tendering implementation into practice. Thus, understanding the underlying issue is the first step to adopting an e-tendering system successfully. Table 1 summarises the barriers to implementing e-tendering in the construction industry.

Table 1: Barriers To Implement E-Tendering System

Barriers	References
Lack of awareness	Mehdipoor <i>et al.</i> , (2022), Tran <i>et al.</i> , (2021), Sunmola and Shehu (2021) Kajendran (2022) Yevu <i>et al.</i> , (2021)
Lack of knowledge/skills	Mehdipoor <i>et al.</i> , (2022), Tran <i>et al.</i> , (2021), Yevu <i>et al.</i> , (2021)
Resistance to change	Lee (2019), Mehdipoor <i>et al.</i> , (2022), Sunmola and Shehu (2021), Kajendran (2022) Yevu <i>et al.</i> , (2021)
Legal issue	Kajendran (2022), Mehdipoor et al (2022), Omran (2020), Sunmola and Shehu (2021)

Barriers	References
Lack of government policies and standards	Construction Industry Development Board (2022), Kementerian Kerja Raya (2022), Wimalasena & Gunatilake (2018), Tran <i>et al.</i> , (2021) Yevu <i>et al.</i> , (2021)
The disbelief in the reliability of e-tendering efficiency	Lee (2019), Wimalasena & Gunatilake (2018), Mehdipoor <i>et al.</i> , (2022), Sunmola and Shehu (2021)
High initial cost	Lee (2019), Chew (2018), Hassan (2021), Mehdipoor <i>et al.</i> , (2022), Kajendran (2022), Yevu <i>et al.</i> , (2021)
High maintenance costs	Lee (2019), Chew (2018), Tan & Suhana-Kamarudin (2016), Wimalasena & Gunatilake (2018), Mehdipoor <i>et al.</i> (2022)
Securities issue	Chew (2018), Lee, (2019), Omran (2020), Kajendran (2022), Yevu <i>et al.</i> , (2021)
Incomplete technical coverage and infrastructure	Wimalasena & Gunatilake (2018), Mehdipoor <i>et al.</i> (2022), Hassan (2021), Sunmola and Shehu (2021), Kajendran (2022) Yevu <i>et al.</i> , (2021)

STRATEGIES TO UNLOCK THE INTEGRATION OF E-TENDERING

Approaches from different aspects are required to enhance and successfully adopt the e-tendering system, spanning from people, financial, processes and procedures, and technological aspects. According to Chan & Owusu (2022), factors like project team planning, stakeholder involvement, change management, technical outsourcing, effective organisational policy and strategic plan, business process innovation and external collaboration, organisational learning, and relationship development need to be considered in formulating successful strategies for e-tendering implementation.

Among the benefits obtained when using e-tendering includes minimising the evaluation error (M. Ashaari *et al.*, 2018; Chew, 2018), enhancing the efficiency of works (M. Ashaari *et al.*, 2018), shorten the time for the tendering process (Chew, 2018; Lee, 2019) and improve communication (Chew, 2018). From the literature, 12 strategies were identified and summarised in Table 2 below.

Table 2: Summary of the Strategies

Strategies	References
Skill	<ul style="list-style-type: none"> ● Hiring experts (M. Ashaari <i>et al.</i>, 2018) ● Provide education and training (Lee, 2019; M. Ashaari <i>et al.</i>, 2018; Wimalasena & Gunatilake, 2018; Chew, 2018) ● Awareness campaign (Ibem & Laryea, 2016) ● Provide comprehensive guidelines (M. Ashaari <i>et al.</i>, 2018)

Strategies	References
Staff	<ul style="list-style-type: none"> ● Staff turnover (Yahya <i>et al.</i>, 2018) ● Attitude of staff when using e-tendering (Yahya <i>et al.</i>, 2018) ● Confidence to use new technology (Yahya <i>et al.</i>, 2018)
Leadership	<ul style="list-style-type: none"> ● Support from higher management (Yahya <i>et al.</i>, 2018; M. Ashaari <i>et al.</i>, 2018; Wimalasena & Gunatilake, 2018) ● Support from the government (Yahya <i>et al.</i>, 2018; M. Ashaari <i>et al.</i>, 2018; Wimalasena & Gunatilake, 2018) ● Organisation policy (Yahya <i>et al.</i>, 2018) ● Higher management commitment (Yahya <i>et al.</i>, 2018; M. Ashaari <i>et al.</i>, 2018; Wimalasena & Gunatilake, 2018)
Practice	<ul style="list-style-type: none"> ● Implementing Electronic Commerce Acts (Lee, 2019) ● Recognising e-signature (Wimalasena & Gunatilake, 2018)
Procedure	<ul style="list-style-type: none"> ● Prevention of tampering with documents (Yahya <i>et al.</i>, 2018) ● Improve data secrecy (Yahya <i>et al.</i>, 2018)
Structure	<ul style="list-style-type: none"> ● Cross-disciplinary communication (Yahya <i>et al.</i>, 2018) ● Standard tendering process (Yahya <i>et al.</i>, 2018) ● Create an incentive-based policy (Lee, 2019) ● Implement a compulsory staging policy depending on project size (Lee, 2019)
Awareness	<ul style="list-style-type: none"> ● Publicity about e-tendering (Yahya <i>et al.</i>, 2018) ● Awareness of best practice solutions (Yahya <i>et al.</i>, 2018)
Collaboration	<ul style="list-style-type: none"> ● Collaboration between the service provider and CIDB for system enhancement (Lee, 2019)
Technical	<ul style="list-style-type: none"> ● Simplify and organise the system (M. Ashaari <i>et al.</i>, 2018) ● Training among the tenderer (Yahya <i>et al.</i>, 2018)
Investment fee	<ul style="list-style-type: none"> ● Value management adoption (Lee, 2019) ● Gradual budget allocation for promotion (Lee, 2019) ● Reduction in purchase and installation price (Chew, 2018) ● Demand from tenderer (Yahya <i>et al.</i>, 2018)
System & Software	<ul style="list-style-type: none"> ● Incorporate security measures within the e-tendering system (Chew, 2018) ● Cooperation between CIDB and third-party tender service providers for system upgrades (Lee, 2019)
Networking	<ul style="list-style-type: none"> ● Improve the quality of internet service (Ibem & Laryea, 2016) ● Use software-as-a-service (SaaS) (Ibem & Laryea, 2016) ● Availability of high-speed internet (Wimalasena & Gunatilake, 2018; Ibem & Laryea, 2016)

To successfully adopt e-tendering, organisations must focus on several key strategies like ensuring their staff are adequately trained to use the system (Lee, 2019; M. Ashaari *et al.*, 2018). Having a strong leadership is also crucial, with leaders championing e-tendering and integrating it into the organisation. Establishing clear procedures, along with rising awareness among staff and stakeholders (Yahya *et al.*, 2018) about the benefits of e-tendering can help overcome resistance to change. Aligning the organisation's structure with e-

tendering goals, collaborating with others, and investing in the necessary resources are also vital. Additionally, considering the financial implications, cost associated with e-tendering platforms, and selecting the right system and software are key factors for successful adoption. By addressing these strategies, organisation can improve their chance of effectively adopting e-tendering.

METHODOLOGY

This study is exploratory in nature and adopts an exploratory research perspective. A series of semi-structured interviews will serve as this study's primary data collection method. Initially, a literature review was performed to provide the researchers with a better understanding of the relevant topic (Lim, Aziz, & Mohd-Rahim, 2022). The review included articles published in databases, such as Scopus, Emerald and Science Direct, conference proceedings, dissertations, books, official reports, and the Government's official websites. Findings from the literature review were used in designing the interview questions. The semi-structured interview was chosen as it provides the researcher with a deeper understanding of the issues faced in the e-tendering system in Malaysia. Furthermore, a semi-structured interview session allows the interviewee to express their viewpoint based on their experience (Pollock, 2019), thus adding to a more comprehensive list of workable solutions for successfully integrating e-tendering. There are 3 sections involved in the interview process, starting with the interviewees' background, followed by the barriers to implementing e-tendering and the suitable strategies for integrating e-tendering into the construction industry landscape.

In this study, interviewees with more than 10 years of experience in the construction industry and who have experience in using e-tendering were chosen to get meaningful data. Initially, email and phone calls were used to approach the potential interviewees. On top of that, the snowball sampling technique is adopted to find suitable interviewees. A total of 15 interviewees were involved and the overview of the respondents' profiles are tabulated in Table 3 below. The semi-structured interviews were carried out physically and via Zoom meetings, depending on the interviewee's preference. The interview session took around 50 to 80 minutes. The interview sessions were recorded with the interviewees' permission for researcher reference.

Table 3: Interviewees' Profile

Interviewee	Position	Type of Organisation	Highest Level of Education	Working experience
01	Director	Private sector QS Consultant	Bachelor Degree	30
02	Project manager	Contractor	Bachelor Degree	11
03	Quantity surveyor	Government sector	Master	24
04	Quantity Surveyor	Private sector QS Consultant	PHD	25
05	Quantity Surveyor	Private sector QS Consultant	PHD	20
06	Associate Director	Private sector QS Consultant	Bachelor Degree	29
07	Contractor	Contractor	Bachelor Degree	14
08	Quantity Surveyor	Private sector QS Consultant	Bachelor Degree	15
09	Director	Private sector QS Consultant	Bachelor Degree	40
10	Quantity surveyor	Government sector	PHD	18
11	Project manager	Contractor	Bachelor Degree	18
12	Director	Private sector QS Consultant	Bachelor Degree	29
13	Contractor	Contractor	Bachelor Degree	28
14	Project manager	Contractor	Master	11
15	Contractor	Contractor	Bachelor Degree	20

Collected data was analysed using the thematic analysis, which involved six steps: (i) familiarisation, (ii) coding, (iii) themes generations, (iv) reviewing the themes, (v) defining the themes and (vi) writing up. Before the thematic analysis was performed, data from the semi-structured interview were transcribed. After that, the information and keywords are highlighted and assigned with relevant codes. These codes will assist the researcher in forming a thorough understanding of the study. To produce pertinent themes, some codes are combined. The themes are then checked to make sure they are accurate.

RESULTS AND DISCUSSION

Barriers to Implement e-Tendering

From the thematic analysis, 8 codes emerged, which are further grouped into four main themes. The themes are people, process and procedure, financial and technology. Figure 2 summarises the process of the thematic analysis.

The first barrier identified is people. These include the lack of awareness about the benefits of e-tendering and the availability of the current technology, shortage of trained technical personnel, reluctance to shift to e-tendering, perception about the e-tendering method and disbelief in its efficiency. Interviewees 02, 03, 08, 11 and 13 experienced a lack of awareness of the benefits of e-tendering. Interviewee 11 mentioned "... there was lack of promotion and awareness among the construction industry players...". According to interviewees 02 and 08, this issue arises because they are unfamiliar with the IT system. On the other hand, interviewees 02, 05, 09, 14 and 15 experienced resistance to change. Lack of exposure was the main reason for not adopting e-tendering, according to interviewees 03 and 12. Accordingly, interviewees 05 and 15 resisted to adopt the system since they were already packed with the workload in the firm. Perception as a waste of time was the reason interviewees 09, 13 and 10 still opted for conventional tendering.

The second barrier is the process and procedure. Issues with digital contract enforcement, insufficient law for e-tendering, disputes, lack of standardisation on e-tendering procedures and lack of policies about electronic contracts and e-commerce. Interviewees 03, 06, 09, and 10 highlighted the barrier of legal issues. Although the acts had been enacted, interviewees were still unfamiliar with the latest legal act regarding online transactions, which made the tendering process more complex. The reason might be the acts were not widely introduced to all construction industry players. Furthermore, most interviewees (01, 02, 04, 05, 07, 08, 11, 13, 14) encountered a lack of government policies and standards. According to interviewees 01, 12, and 14, "...government should develop a standard procedure for all types of construction projects...". According to interviewees 02, 08, 11, 13 and 14, there is currently no standardisation on the e-tendering procedures to which the tenderer could refer. Interviewees 05 and 12 stated the lack of government policy on the enforcement to adopt the e-tendering system. Accordingly, interviewees 05, 08 and 14 did not believe in the efficiency of e-tendering. The interviewees were sceptical about reliability and efficiency since the system is not widely used in the Malaysian construction industry.

The third barrier is financial. This includes the high initial cost, high maintenance cost and the cost of purchasing compatible software and hardware. Interviewees 01, 03, 10, 12 and 13 encountered the barrier of high initial and maintenance costs. According to them, they experienced a lack of funding to purchase the software and hardware as well as to train their staff to ensure the companies are ready to adopt e-tendering.

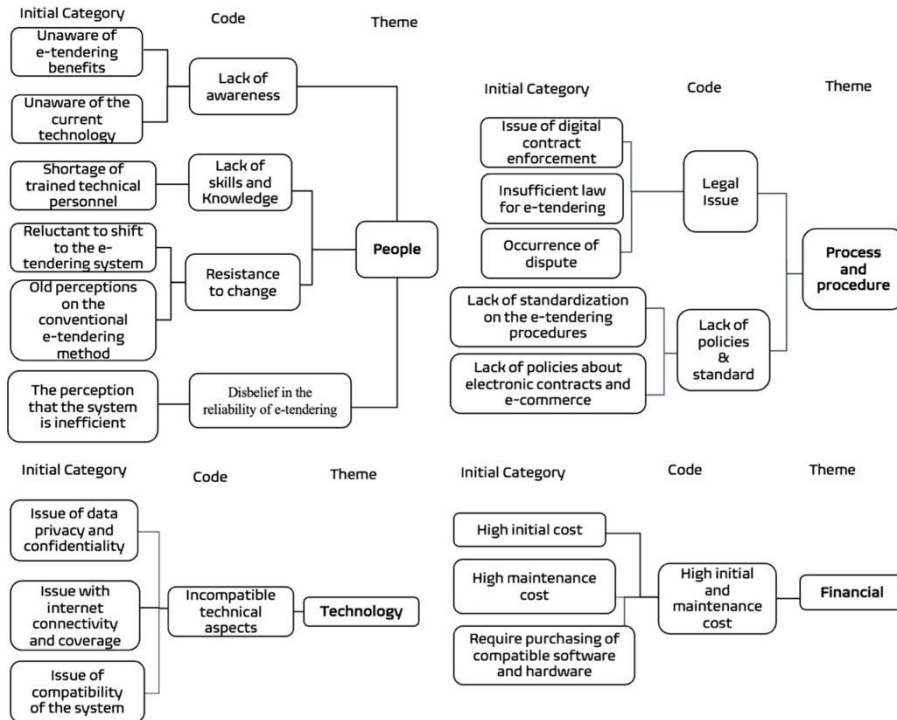


Figure 2: Summary of the Barriers

The final barrier is in terms of technology. These include data privacy and confidentiality issues, internet connectivity and coverage and the compatibility of the system. The issue of limited technical coverage of the e-tendering process is faced by interviewees 03, 04, 06, 07, 11 and 15. Interviewee 04 faced an issue with the low bandwidth coverage of the internet connection since the e-tendering transaction was online. The comprehensiveness of the e-tendering to be compatible with various electronic devices was the issue faced by interviewees 06, 07 and 15. This is because the software and hardware used might not be up to date for a small company.

Strategies to Unlock the Integration of e-Tendering

Interviewees were asked about the possible strategies to improve the implementation of e-tendering in Malaysia. Based on the findings, the proposed strategies to unlock the integration of e-tendering were categorised into 4 themes: people, process and procedures, financial and technology. There are 5 proposed strategies for the people theme: hiring experts, education and training, an awareness campaign and providing comprehensive guidelines. M. Ashaari *et al.*, (2018), have emphasised the need to hire experts or skilled personnel in assisting the organisation during its transition to the new system. With this, issues relating

to the lack of technical knowledge can be avoided, thus increasing the organisations' likelihood of using e-tendering. Education, training and awareness campaigns are among other efforts the organisation should make to encourage the elderly staff who are reluctant to use e-tendering (M. Ashaari *et al.*, 2018; Hassan, M., 2021). As highlighted by interviewee 05 "...provide training to employees internally...". These efforts can potentially alter their negative perceptions towards e-tendering.

There are 5 strategies for the process and procedure theme that have been highlighted by the interviewees: the enforcement of the Electronic Commerce Acts, recognition of e-signature, having a standard e-tendering process, implementing compulsory staging policy depending on project size and cooperation to upgrade the system upgrade. Legislation has been established in Malaysia to support the e-tendering application. Nevertheless, several issues occur during its enforcement (Mehdipoor *et al.*, 2022; Chan, & Owusu, 2022). The enactment of the 1997 Computer Crime Act has restricted unauthorised personnel access to the e-tendering system, thereby decreasing legal concerns. In 2012, the act was incorporated into the E-Commerce Law and Copyright Law to establish a comprehensive framework for cybercrime legislation in Malaysia (Mehdipoor *et al.*, 2022; Lee, 2019). On top of that, the Electronic Commerce Act 2006 has acknowledged the importance of digital messages in online transactions. In 1998, the Digital Signature Act 1997 (DSA 1997) was enacted to validate digital signatures in Malaysia's electronic transactions (Wimalasena & Gunatilake, 2018). On top of that, all construction projects in every organisation should use e-tendering to increase the trust level in the system among the staff (Yahya *et al.*, 2018; M. Ashaari *et al.*, 2018; Wimalasena & Gunatilake, 2018). On the other hand, the local government may support e-tendering by establishing an incentive-based policy and staging compulsory policy. Staging compulsory policy will enhance the users' confidence in the system, especially for small-sized contractors. It is due to the involvement of the higher-grade contractor and then followed by the lower-grade contractor after a certain period. The staging policy is expected to help build confidence among small-sized contractors and give them ample time to prepare their staff's infrastructure, hardware, software and training before embarking on the e-tendering (Lee, 2019).

In terms of financial aspects, there are 3 proposed strategies: the adoption of value management, support from the government in terms of finances and reasonable purchase of software and hardware infrastructure. A value management method should be used to balance the financial resources available and the need to upgrade the e-tendering system to the tender review stage. Due to the potential financial challenges faced by small-size contractors, the government should offer incentives such as subsidies for facility acquisition and software installation costs (Lee, 2019). Interviewee 01 has mentioned that

“currently, there is no financial support from government...”. The government can do this by regulating the sale of e-tendering software and hardware infrastructure to maintain control over purchase prices. The availability of standardised and reasonable facilities and software prices will motivate more organisations to adopt the system (Chew, 2018).

The 5 proposed strategies for the technological aspect are hiring experts and professionals for system upgrades, cooperating between the service provider and CIDB for system enhancement, improving the quality of internet service, utilisation of SaaS and the availability of high-speed internet. A stable and fast connection to the internet is crucial for e-tendering, particularly for information sharing and submitting the online bid. The internet service provider should elevate their services to tackle the bandwidth issue and provide a robust internet connection with at least 100 megabytes per second (Wimalasena & Gunatilake, 2018). On top of that, in handling the issue with technological aspects, hiring a professional and an experienced e-tendering service provider is necessary to ensure the establishment of the system in the organisation. Accordingly, Ibem & Laryea (2016), encourage the use of tailored made internet-based software, as this allows clients to access the system by rental, eliminating the concerns on the infrastructure ownership and maintenance cost that require high initial expenses. Table 4 summarises the strategies to unlock the integration of e-tendering into the construction landscape.

Table 4: Summary of Strategies to Integrate e-Tendering

Strategies	Code	Theme
Employ skilled and experienced staff	Hiring experts	People
Hired personnel with an e-tendering background		
Provide education and training to tenderers to use the system	Education and training	
Understand the advantages and significance of using e-tendering	Awareness campaign	
Promotional talk on the benefits of e-tendering		
Provide a comprehensive guideline	Comprehensive guideline	
Invest in a reliable e-tendering system to increase staff's confidence level in using e-tendering	Improve staff's confidence	
Implementing Electronic Commerce Act	Enforce Electronic Commerce Acts	Process & Procedures
Recognising the e-signature	Recognition of e-signature	
Standardise the e-tendering process	Standard e-tendering process	

Strategies	Code	Theme
Divide the e-tendering implementation into a few phases according to the project size	Implement compulsory staging policy depending on project size	
Collaboration between a service provider and CIDB for system upgrade	Cooperation for system upgrade	
Implement value management in reducing the cost required	Value management adoption	Financial
Government's financial assistance	Support from government	
Reduction of the installation cost	Reasonable price	
Reasonable installation cost		
Hiring experts for system upgrades and maintenance	Hiring experts	
Collaboration between the service provider and CIDB for system enhancement	Collaboration between the service provider and CIDB for system enhancement	
Using user-friendly system		
Improve the quality of the internet service	Improve the quality of internet service	
Use SaaS to improve the procurement process	Use SaaS	
Install a high-speed internet connection in the company	Availability of high-speed internet	

PROPOSED STRATEGIES

To successfully integrating e-tendering into the construction landscape requires a comprehensive and holistic approach encompassing people, process and procedure, and financial and technological aspects. Neglecting any of the aspects may compromise the successful application of the e-tendering system. Investing in the people aspect is crucial in integrating e-tendering into the construction landscape. This involves providing comprehensive training and education to the personnel involved, which will empower individuals with the necessary skills to navigate the system effectively. This will further reduce the issue of resistance to change and, eventually, boost the confidence level. Streamlining the e-tendering process is another critical component in the enhancement effort. Standardising the tendering process, enforcing the Electronic Commerce Act and implementing the policies will ease the process of e-tendering integration.

Understanding the financial aspects to successfully integrating e-tendering into the construction is essential. Reduction in the purchasing and maintenance cost can become an initial step for the organisation to embark on a new system that is more efficient and undoubtedly enhances the overall performance of the tendering process. The technological aspect, which involves

optimising the digital infrastructure and cooperation with CIDB and professionals, will reduce the learning curve associated with adopting the e-tendering system. Table 5 shows the strategies to integrate the e-tendering system into the construction landscape.

Table 5: Successful e-Tendering Strategies

Theme	Barriers	Strategies
People	Lack of Awareness	<ul style="list-style-type: none"> ● Hiring experts ● Provide education and training ● Awareness campaign ● Provide comprehensive guidelines Development of confidence to use new technology
	Lack of Skills and Knowledge	
	Resistance to Change	
	Disbelief in the Reliability of e-tendering	
Process and Procedure	Legal Issue	<ul style="list-style-type: none"> ● Enforce Electronic Commerce Acts ● Recognition of e-signature ● Standard e-tendering process ● Implement compulsory staging policy depending on project size
	Lack of Policies and Standards	
Financial	High Initial and Maintenance Cost	<ul style="list-style-type: none"> ● Value management adoption ● Support from government ● Reasonable price
Technology	Incompatible Technical Aspects	<ul style="list-style-type: none"> ● Hire experts ● Collaboration between the service provider and CIDB for system enhancement ● Improve the quality of internet service ● Use SaaS ● Availability of high-speed internet

CONCLUSION

This study revealed the issue behind the lack of e-tendering adoption among the industry players, specifically in the Malaysian context. The study identified barriers, which is an essential first step in moving towards the digital future. The fundamental discoveries of this research proposed 4 strategic categories that the construction industry players and policymakers can focus on to implement e-tendering in the construction process. The proposed strategy is an initial step for the construction industry to prioritise their strategies in developing a robust strategic plan. The industry needs to adapt to the e-tendering strategies accordingly to avoid becoming stagnant and maintain competitiveness. Furthermore, this research has extended the knowledge regarding the existing barriers during the implementation of e-tendering in Malaysia. The list of the

barriers can be used as a foundation for other researchers to further understand the root cause of this issue.

Future research could focus on assessing the effectiveness of the proposed strategies in real world implementation. This could involve case studies to understand how these strategies are adopted and their impact which will provide valuable insight to policy makers and construction industry players.

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