

ASSESSING THE BENEFITS OF E-TENDERING ADOPTION IN THE CONSTRUCTION INDUSTRY: A SYSTEMATIC LITERATURE REVIEW

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Abstract

The transition to digitalisation in the construction sector has sparked interest in e-tendering as a revolutionary method to optimise procurement processes. Nonetheless, in numerous developing countries, stakeholders persist in utilising paper-based tendering processes, frequently characterised by inefficiencies, elevated costs, and restricted transparency. In this paper, literature from the year 2016 to 2025 was systematically reviewed. The Scopus database and Google Scholar for snowballing were selected for the literature search based on the fact they are regarded as the largest databases compared to others. All articles and conference papers were screened through rigorous inclusion and exclusion criteria using PRISMA 2009 and every included paper was recorded on the Excel sheet for further review and classification. The final 25 papers were selected for this systematic literature review and all unrelated papers were excluded from the review. This systematic literature review assesses the benefits of e-tendering in the construction industry, emphasising its capacity to mitigate these challenges. The results revealed significant e-tendering benefits such as time-saving, cost reduction, process efficiency, increased transparency, and enhanced stakeholder collaboration. This study synthesised results from current research to provide insights into the critical success factors and practical implications for the efficient implementation of e-tendering. The systematic review recommends that future research should focus more on holistic methods of implementing e-tendering. Moreover, the results intended to assist policymakers, practitioners, and researchers in utilising e-tendering to improve procurement methods within the construction industry, especially in developing countries.

Keywords: Benefits, Construction Industry, E-Tendering, E-Procurement.

1. INTRODUCTION

The tendering process in the construction industry has made a splendid stride since the implementation of E-tendering. Unlike the conventional approach of tendering in developing countries, stakeholders still rely on the paper and pen tendering method (Wimalasena and Gunatilake, 2018); the transition to digitalisation in the construction sector has sparked interest in e-tendering as a revolutionary method to optimise procurement processes (Asare et al., 2024). For example, this technology is meant to significantly reduce the paper-based tendering process significantly (Santoso and Bourpanus, 2019). Specifically, e-tendering is trusted by the construction industry as the technique that helps improve efficiency and transparency (Aron et al., 2024).

Tendering in the construction industry is a procurement process where prospective bidders or contractors are required to submit a definitive proposal regarding the price and conditions for

providing designated goods, services, or works, which, upon acceptance, will form the foundation of a subsequent contract (Njiro, 2023). The framework is founded on the concepts of competitiveness, fairness, accessibility, transparency, openness, and integrity (Liu et al., 2016; Santoso and Bourpanus, 2019; Asare et al., 2024). It entails the administration of paper or electronic mail for the transmission and reception of bid notifications, associated papers, correspondence, addenda, bid submissions, and award notifications (Afolabi et al., 2019). Within the construction industry, incorrect tendering practices are believed to be a significant factor contributing to inefficiency in the construction industry (Wimalasena and Gunatilake, 2018).

Notably, the progression of digital technology has led to the emergence of the e-tender process, which is a viable method in the construction industry (Aziz, 2024). It uses the internet system for tender invitations, evaluations, and awards during the tendering stage of e-procurement (Yevu and Yu, 2020). Moreover, it has been considered a more effective method of procurement than the conventional tendering method (Tan and Suhana, 2016). Conversely, most countries still rely on a more conventional method of tendering, which remains standard procedure where contractors are expected to buy a printed tender document (Mohd Nawi et al., 2017; Bangani, 2024). For instance, in South Africa, some practitioners within the industry are still comfortable with the “paper-based tendering process and find it difficult to switch over to e-tendering” (Ibem and Laryea, 2017). This prohibits the realisation of the e-tendering method's benefits, resulting in delays and setbacks in governments to fully adopt digital technologies (Jain and Gupta, 2024). However, it should be noted that in this fourth industrial revolution (4IR) era, we have an arsenal of construction digital technologies at our disposal, like e-tendering, which construction professionals can draw from when improving the efficiency of the organisational operations. Therefore, it should be noted that without the full acceptance of digital technologies, the adoption and ultimate realisation of its benefits will remain slow (Affendy et al., 2022).

Several researchers in different countries have carried out systematic reviews of e-tendering and proposed future agendas as solutions for the improvement of the efficiencies of tenders (Purnomo et al., 2021; Jain and Gupta, 2024; Najafzadeh et al., 2024; Asare et al., 2024). Although research in the construction industry exists on this topic, few studies have focused on a systematic literature review, specifically on the benefits of e-tendering and providing future directions. The systematic literature review by Yevu and Yu (2020) suggested a further study focusing on e-tendering benefits in the construction industry. Therefore, this study's main objective was to assess e-tendering benefits in the construction industry through a systematic literature review in the span of 10 years from 2016 to 2025 and finally provide a future direction for the research on this topic.

2. METHODOLOGY

2.1. Research Process

Systematic literature reviews are essential for synthesising existing knowledge on diverse subjects. For this study, a literature search was done in Scopus utilising search string words to

be further discussed in detail below. This was carried out to find work done in this database on e-tendering to identify benefits in the construction industry. Scopus was found to be the most extensive database for research publication compared to other bibliographic databases such as Web of Science (Wang, et al., 2020). A broader range of journal articles is encompassed in Scopus, these were restricted to those published post-1995, whereas Web of Science offers data and citations dating back to 1900 (Mascarenhas et al., 2018; Wang et al., 2020). Thus, for this study with a focus on more recent peer-reviewed publications, Scopus was a better choice for interdisciplinary research topics such as the e-tendering method and e-procurement, considering the recognition that it is the most extensive abstract and citation database (Khudzari et al., 2018). Based on the Scopus database search outcome, an in-depth review and qualitative synthesis were carried out following the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) Statement below in Figure 1.

2.1.1 Search Strategy

A systematic literature search strategy was used to find relevant literature on e-tendering benefits in the construction industry. This study encompassed literature quality assessment, screening of data and data extraction for inclusion in the study. The deployed strategy was tailored to two databases: Scopus and Google Scholar, where the main data was extracted from Scopus, with Google Scholar used to extract data from the snowball sampling (Wohlin et al., 2022). The snowballing sampling was utilised to identify other e-tendering articles over and above those identified in Scopus (Leroy and Yannou, 2018; Ramabodu and Nena, 2024). The search string terms used in Scopus were: ("E-Tendering" OR "Electronic tendering" OR "Electronic procurement" OR "E-Procurement" OR "E-Commerce") AND ("Benefits") AND ("Construction Industry" OR "Construction sector" OR "Building construction") following Boolean operator (Aliyu, 2017; Nena et al., 2022). The search was restricted between 2016 and 2025.

2.1.2 Quality Assessment

The systematic literature review relies on articles from peer-reviewed journals. A de-duplication of findings from Scopus and Google Scholar was performed in EndNote to ensure the review's integrity (Bramer et al., 2016). Consequently, two duplicate items were eliminated throughout the screening process. A thorough analysis of abstracts and conclusions of articles was done to determine the relevance and quality of the literature enclosed in the review process; a comprehensive assessment of each research paper was performed. The subsequent step involved establishing exclusion and inclusion criteria (Bramer et al., 2017), limiting the review to papers written in English. This systematic literature search process is also explained in the PRISMA Statement below (Page et al., 2021; Sarkis-Onofre et al., 2021).

2.1.3 Articles Included in the Qualitative Synthesis

A total of 25 journal articles are chosen based on the assessment of each article following the previously stated exclusion and inclusion criteria. These papers are utilised for the final process grounded in Scopus for the descriptive analysis of literature on e-tendering in the construction sector, such as the year-wise publication, distribution of countries and document affiliation

(Robledo et al., 2022). Additionally, the included studies are imported into the VOSviewer for visualisation of the countries that contributed to e-tendering so far (McAllister et al., 2022). Finally, Microsoft Excel is used for the classification of the literature reviewed (Miñan et al., 2023).

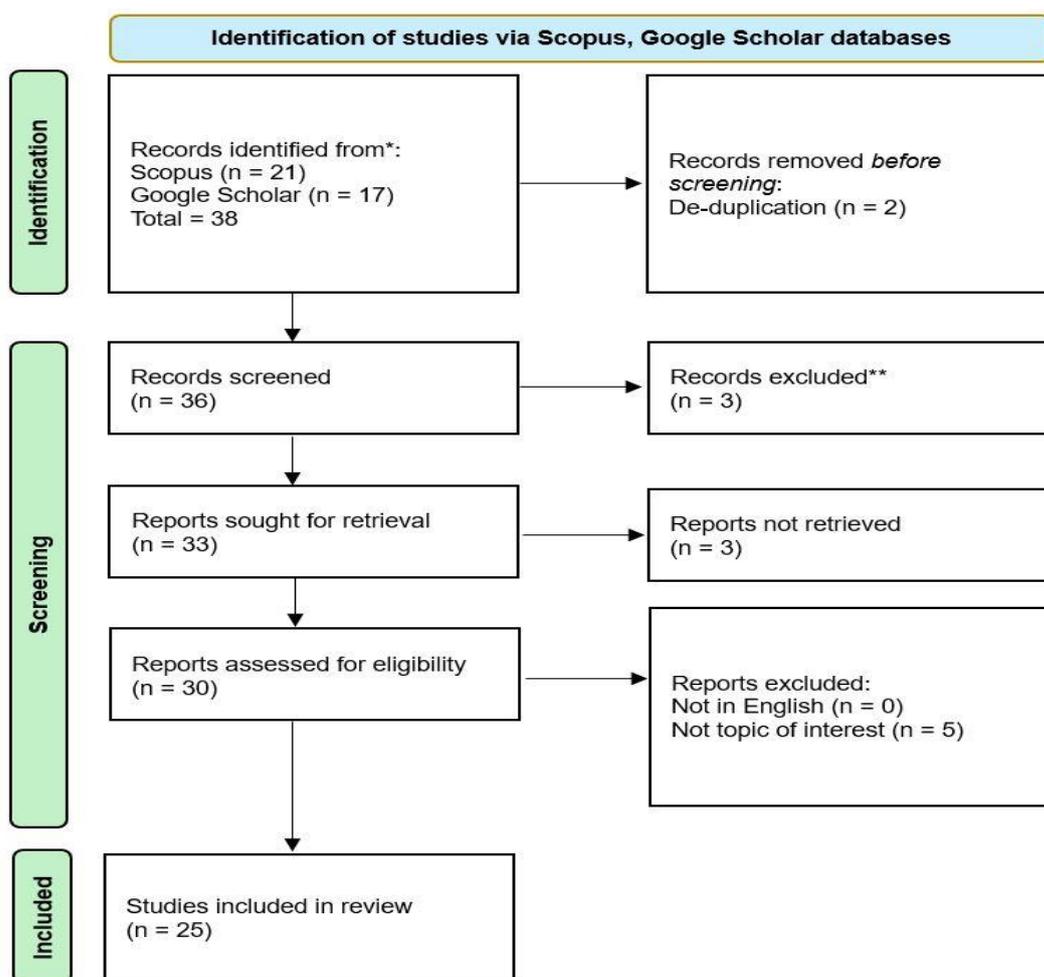


Figure 1: Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) flow chart

3. RESULTS AND DISCUSSION

3.1 Year Wise Production

Figure 2 illustrates the annual publication frequency derived from the selected literature. This reflects the annual focus on this subject (Li et al., 2019; Okoro, 2023). Published literature regarding the application of e-tendering in the construction industry has varied over the years. The number of publications peaked significantly in 2017 and 2021, with four publications each, indicating a growing interest or advancements in e-tendering. With 2025 having just began, the

low publication of 1 article is acceptable. Moreover, the potential decline in 2025 may be due to the length of time papers are reviewed for publication, as alluded to in the study by Hochstetter et al. (2023). This fluctuation could reflect various factors, including shifts in research focus, such as funding availability, or the impact of external events on academic output, like those experienced during COVID-19, as seen with one publication in 2019.

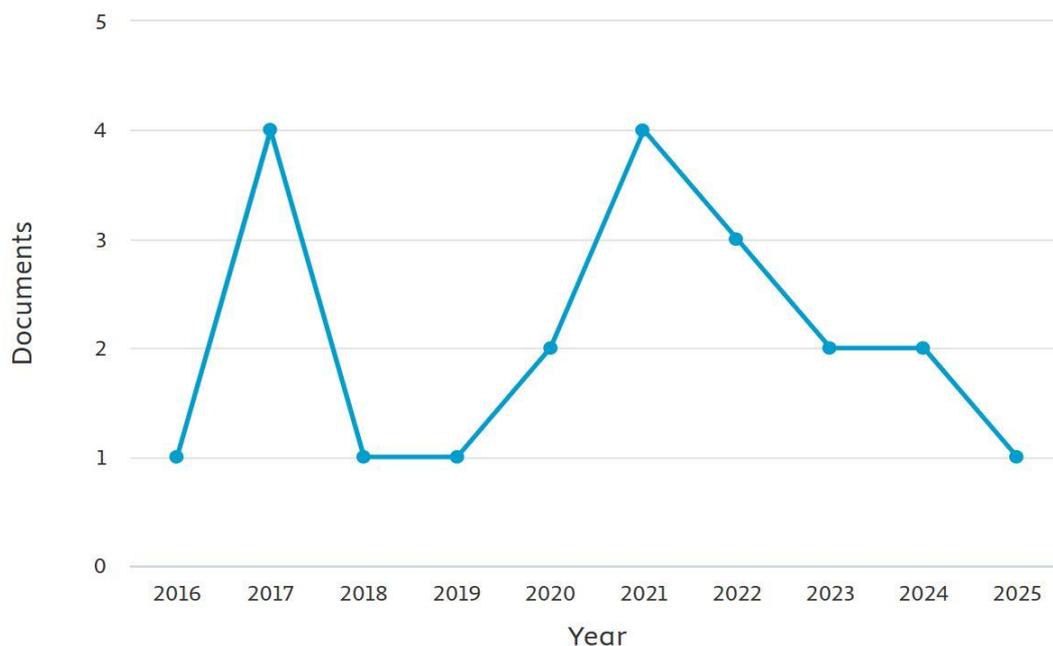


Figure 2: Publication trend over the years

3.2 Most Productive Countries in E-Tendering Publications

The country-specific publications provide an overview of global research output by regions and nations (Psomas, 2022). The understanding of country-specific e-tendering benefits is crucial in motivating other countries to implement technological interventions during the tendering process, which is in contrast with reliance on conventional tendering methods.

Moreover, it is imperative to know government efforts and funding towards advancing research as government funding centrally drives research in most countries. Therefore, maps in VOSviewer depict the countries with which authors collaborate (McAllister et al., 2022).

As a result, in this study, both developing and developed countries showed support for e-tendering topics, indicating the interest and realisation of new technology benefits for the construction sector (Purnomo et al., 2021).

A significant geographical spread was revealed with most developing countries involved, such as South Africa, during the last 10 years on publications under this topic. Figure 3 below presents the distribution of published documents among countries.

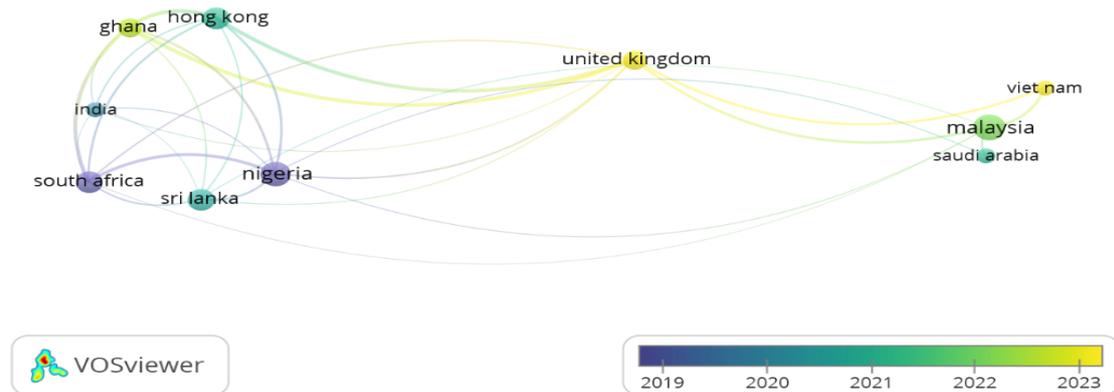


Figure 3: Country-wise publications

4. LITERATURE CLASSIFICATION

The plethora of e-tendering was classified, and the top six meaningful advantages of e-tendering were identified. E-tendering in the construction sector has various benefits, converting conventional procurement methods into more efficient, transparent, and secure solutions (Affendy et al., 2022; Aziz, 2024). This digital strategy utilises information technology to optimise processes, minimise cost, and improve collaboration among stakeholders as well as a seamless process of tendering, as seen in Figure 4 below. The following section provides an extensive discussion of the advantages of e-tendering in the construction sector.

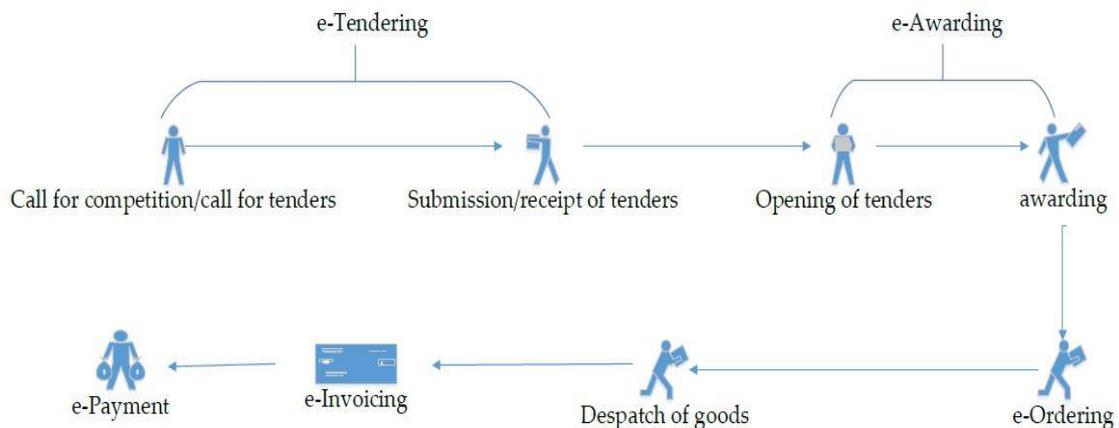


Figure 4: E-tendering process (source: He et al., 2018)

Table 1: Table of literature classifications on e-tendering benefits

ID	Benefits of E-Tendering	Descriptions	Sources
1.	Time-saving	<ul style="list-style-type: none"> Reduction of the required time to complete the tendering process. It reduces the time required for tender submissions and evaluations. 	Ibem and Laryea (2017); Wimalasena & Gunatilake (2018); Khahro et al. (2021); Mehdipoor et al. (2022); Tiwari et al. (2022); Affendy et al. (2022); Rathnayake et al. (2022); Cusumano et al. (2022); Saad (2024); Aziz (2024).
2.	Cost reduction	<ul style="list-style-type: none"> Reduction of administrative costs. The implementation of e-tendering reduces costs compared to the conventional paper-based method of tendering. 	Wimalasena & Gunatilake (2018); Yevu and Yu (2020); Mehdipoor et al. (2022); Affendy et al. (2022); Yevu et al. (2022); Ahmadiheykhsarmast et al. (2023); Aziz (2024).
3.	Increased transparency	<ul style="list-style-type: none"> Transparency is promoted through the procurement process which assists in building trust among stakeholders. The award of the tender is based on merit rather than favoritism or corruption. Tender information online through information technology provides transparency and fairness. 	Liu et al. (2016); Mohd Nawi et al. (2017); Santoso and Bourpanus (2019); Xu and Yang (2022); Yevu et al. (2022); Torkanfar and McCabe (2023); Hochstetter et al. (2023); Ahmadiheykhsarmast et al. (2023); Aziz (2024); Saad (2024); Budthapa et al. (2024); Najafzadeh et al. (2024); Asare et al. (2024).
4.	Improved security	<ul style="list-style-type: none"> The data security is improved. Reduced data leakage risk throughout the tendering process. 	Wimalasena & Gunatilake, (2018); Torkanfar and McCabe, (2023); Ahmadiheykhsarmast et al. (2023).
	Improved collaboration	<ul style="list-style-type: none"> Significantly improve collaboration and information sharing. This technology improves and facilitates collaboration as the platform is easy to use which accommodates and motivates construction practitioners to consider adopting. 	Yevu and Yu (2020); Najafzadeh et al. (2024); Jain and Gupta (2024)
	Information transfer efficiency	<ul style="list-style-type: none"> Reduce delays associated with manual processes, thereby enhancing efficiency. E-tendering provides considerable reductions in storage requirements, a key element influencing contractors' readiness to engage in e-tendering initiatives. This efficiency may result in diminished physical storage requirements for tender documents and associated items. It provides an optimised procurement procedure in the construction industry, hence improving efficiency. 	Tan and Suhana (2016); Mohd Nawi et al. (2017); Ibem and Laryea (2017); Santoso and Bourpanus (2019); Tiwari et al. (2022); Affendy et al. (2022); Rathnayake et al. (2022); Saad (2024); Aziz (2024).

4.1 Time-Saving

E-tendering significantly improves time efficiency by automating critical components of the tendering process, including document distribution and submission, thus obviating the necessity for in-person meetings and substantial paperwork (Wimalasena & Gunatilake, 2018; Khahro et al., 2021; Mehdipoor et al., 2022; Cusumano et al., 2022; Saad, 2024). Specifically, it decreases the time needed to complete the tendering process, reducing the likelihood of errors (Ibem and Laryea, 2017; Affendy et al., 2022; Rathnayake et al., 2022; Tiwari et al., 2022). This digital method reduces documentation and enhances prompt communication among stakeholders, resulting in faster decision-making. Moreover, the utilisation of a digital platform enhances communication and decision-making speed, significantly accelerating the procurement timeline and augmenting operational efficiency (Aziz, 2024).

4.2 Cost Reduction

E-tendering facilitates substantial cost reduction by eliminating the necessity for physical documentation and face-to-face meetings, consequently diminishing expenses associated with printing, shipping, and travel (Wimalasena & Gunatilake, 2018; Mehdipoor et al., 2022; Yevu et al., 2022). In addition, it provides more cost-effective processes than the conventional approach (Affendy et al., 2022). Similarly, the cost-saving benefit is due to paperless transactions with increased efficiency (Afolabi et al., 2019). Moreover, the streamlined and automated procedure reduces administrative costs related to tender management, hence improving the profitability of the system compared to conventional approaches (Yevu and Yu, 2020; Aziz, 2024).

4.3 Increased Transparency

E-tendering platforms improve transparency by establishing a definitive audit trail that documents all activities, ensuring responsibility and mitigating the risk of corruption (Liu et al., 2016; Yevu et al., 2022; Torkanfar and McCabe, 2023; Saad, 2024). For instance, disseminating tendering information online through information technology fosters transparency (Mohd Nawi et al., 2017; Santoso and Bourpanus, 2019; Hochstetter et al., 2023; Najafzadeh et al., 2024). In contrast, the conventional tendering method was found to have been less transparent in disseminating information (Xu and Yang, 2022). Moreover, the technologies that enable e-tendering enhance fairness by providing equal access to information, guaranteeing that all bidders obtain the same facts and opportunities, thereby cultivating a more equitable tendering process (Budthapa et al., 2024).

4.4 Improved Security

E-tendering systems utilise advanced security protocols, including encryption and blockchain technology, to protect sensitive information and maintain integrity as well as confidentiality during the tendering process (Tan & Suhana, 2016; Wimalasena & Gunatilake, 2018; Torkanfar and McCabe, 2023; Saad, 2024). The United Kingdom and other developed nations, are leading with the adoption of electronic exchange of sensitive data, leveraging the enhanced security offered by advanced e-tendering systems (Wimalasena & Gunatilake, 2018). Similarly,

Torkanfar and McCabe (2023) established a decentralised system that illustrated blockchain's capability to alleviate security concerns. These technological solutions effectively mitigate challenges regarding data breaches and unauthorised access, enhancing trust and trustworthiness in the e-tendering process (Tan & Suhana, 2015).

4.5 Improved Collaboration

E-tendering improves collaboration and facilitates information sharing among construction stakeholders by providing a centralised platform for efficient communication and document sharing, allowing all parties to access and exchange essential information effectively (Najafzadeh et al., 2024). Moreover, it's an easy-to-use platform that accommodates and motivates construction practitioners to consider adopting it (Yevu and Yu, 2020). This integrated approach promotes a more unified working atmosphere, facilitating collaboration and enhancing project delivery through better coordination and alignment efforts (Jain and Gupta, 2024).

4.6 Information Transfer Efficiency

E-tendering systems are essential for improving information transfer efficiency by facilitating swift and accurate data transfers, thus reducing errors and miscommunications typically linked to conventional tendering processes (Santoso and Bourpanus, 2019; Aziz, 2024). For example, it speeds up the preparation of the tendering procedure, which would take a long time during the conventional approach (Mohd Nawawi et al., 2017; Ibem and Laryea, 2017; Tiwari et al., 2022; Affendy et al., 2022; Rathnayake et al., 2022). Furthermore, the implementation of standardised formats and automated workflows significantly enhances data accuracy and consistency, facilitating a smooth information flow during the tendering process (Schoenherr, 2019).

In a nutshell, despite all discussed various benefits of e-tendering, challenges including reluctance to change, adoption costs, and security concerns persist (Tan and Suhana, 2016; Mohd Nawawi et al., 2017; Wimalasena and Gunatilake, 2018). Therefore, it might be wise for construction organisations to assess the adoption level of e-tendering following the frameworks such as that of Rogers (2003) for the technology adoption process. This way they may realise the benefits of implementing new technologies for efficient and effective improvement in their organisations like others reported in this study.

Resolving these challenges is essential for optimising the advantages of e-tendering in the construction sector (Tan and Suhana, 2016). Hence, sometimes compromising can be the only way to move forward. Thus, e-tendering should be considered more to ensure an efficient and effective procurement process to realise more benefits, including more transparency and time-savings, as discussed above.

5. CONCLUSION

This study provided an extensive overview of current literature on e-tendering benefits and helped guide future research directions. It concludes that, for the construction industry,

particularly in developing countries, to thrive in the 4IR, they should digitalise tendering processes instead of relying on more conventional processes that are more time-consuming and less transparent.

This study synthesised results from current research to provide insights into the benefits of e-tendering towards practical adoption encouragement in the construction industry. The systematic review recommends that holistic methods of implementing e-tendering should be the focus of the future. Moreover, the results are intended to assist policymakers, practitioners, and researchers in implementing e-tendering to improve procurement methods within the construction industry, especially in developing countries, and to realise the benefits experienced by others.

Despite the plethora of e-tendering benefits in recent studies, further research is required to investigate the challenges that might deter the adoption and integration of e-tendering inside conventional tendering processes. This may enhance the efficacy of e-tendering deployment after the challenges related to benefits are addressed. The comprehensive benefits of e-tendering will become increasingly evident. Furthermore, future research should examine best practices and compliance in procurement utilising digital technologies within the construction industry, which is essential for successful project execution. Consequently, the construction industry needs to use e-tendering.

Data availability statement

All data that support the findings from this systematic literature review are available upon request.

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