

BARRIERS TO SMART PROCUREMENT IMPLEMENTATION IN THE SRI LANKAN CONSTRUCTION SECTOR: AN EMPIRICAL INVESTIGATION

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ABSTRACT

Smart procurement has the potential to improve decision-making, efficiency, and transparency in the procurement process using digital technologies like blockchain, artificial intelligence, and building information modelling. Despite the benefits of smart procurement techniques, their adoption remains low due to various barriers. This study investigates the barriers to smart procurement implementation in construction industry in Sri Lanka. A mixed-method research approach was used, beginning with a literature review to identify key barriers stated in global context, followed by a questionnaire survey of 30 industry experts with a significant procurement experience to assess their significance. The Relative Importance Index (RII) method was used to evaluate and rank the significance of identified barriers, while qualitative responses were analysed using thematic analysis to understand the perceived level of smart procurement adoption in the industry and to support the statistical findings. The results show that the most critical barrier is high implementation costs, which are followed by limited management support, data integrity concerns, legal and regulatory challenges, and cybersecurity risks. The qualitative analysis also reveals that small and medium-sized businesses in Sri Lanka still use traditional procurement methods, while smart procurement adoption is still restricted and mostly concentrated within large scale organizations. These findings provide policymakers and industry stakeholders with clear evidence on priority barriers, enabling the implementation of targeted strategies to address each barrier and promote the adoption of smart procurement in Sri Lanka's construction sector.

Keywords: Barriers; Construction Industry; Smart Procurement; Sri Lanka.

1. INTRODUCTION

In the construction industry, a project's success depends not only on meeting the time, cost, and quality but also on delivering an outcome that satisfies the client's expectation (Naoum & Egbu, 2015). Construction procurement remains largely traditional and slow to adapt to digitalization and causes inefficiencies in construction procurement and supply chains, leading to inflated project costs (Hamma-adama & Ahmad, 2021). To address

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these challenges and to improve communication, to encourage transparency, as well as to enable improved integration among key stakeholders such as clients, consultants, contractors, and suppliers, smart procurement methods can be utilized (Masoom et al., 2025). Smart procurement can be defined as implementing digital technologies like artificial intelligence (AI), blockchain, e-procurement platforms, and integrated supply chain systems in procurement process to facilitate real-time cost monitoring, automated tendering, risk prediction, and data-driven contract management and it transforms procurement from a mere transactional process into a strategic role that supports social and environmental responsibility as well as economic resilience (Akande et al., 2025). Although there are many benefits of smart procurement such as higher transparency, efficiency, increased accountability, and cost effectiveness, their adoption remains low due to various barriers (Mbao et al., 2025).

There are several existing studies that discuss digital technology adoption in Sri Lankan construction industry such as those conducted by, Fernando et al. (2025), Gamage et al. (2025), and Nitharsan and Francis (2022). However, these authors discuss the use of individual technologies such as Building Information Modelling (BIM), e-tendering, digital twin etc. and there is a lack of studies that investigate smart procurement as a whole concept. Furthermore, there is a lack of studies investigating the perceptions of construction industry practitioners regarding the current level of smart procurement adoption in the construction industry in Sri Lanka. Although several studies such as Bandara et al. (2024) and Yaparathne et al. (2025) have discussed the barriers to digitalization in the Sri Lankan construction industry in general, they have not specifically examined how these barriers relate to smart procurement. Understanding these barriers can facilitate the effective implementation of smart procurement approaches within the construction sector. Therefore, the need for a proper investigation into the barriers to smart procurement implementation in Sri Lanka is required. The aim of this study is to examine the adoption of smart procurement in Sri Lanka's construction industry while evaluating the barriers influencing its effective implementation. To achieve the aim, the following objectives were formulated.

1. To review the barriers to the adoption of smart procurement in construction industry.
2. To assess the perceived significance of the identified barriers for the Sri Lankan construction industry.
3. To assess the perceived level of smart procurement adoption in Sri Lanka's construction industry.

2. LITERATURE REVIEW

2.1 WHAT IS SMART PROCUREMENT?

Procurement can be defined as the systematic process of identifying project needs, sourcing suppliers, evaluating bids, and acquiring goods, services, or works through tendering or competitive bidding (Bandara et al., 2024). On the other hand, smart procurement is the process of integrating new technologies like blockchain, smart contracts, and the Internet of Things (IoT) into construction supply chain procurement procedures to improve their efficacy and efficiency (Yevu et al., 2021b).

Since the traditional procurement system follows a linear and sequential process, it is considered as one of the slowest methods for project delivery (Okereke et al., 2022). Most current procurement stakeholders are aware that technology can be used to increase

performance, efficiency, and transparency of the procurement process (Uduwage et al., 2023). However, the introduction of digital procurement systems which were intended to replace traditional paper-based procurement and enhance project procurement processes, has experienced a slow rate of adoption (Yevu & Yu, 2019).

2.2 BARRIERS TO SMART PROCUREMENT

Despite that advanced digital technologies offer considerable potential to improve overall productivity of construction industry, numerous barriers continue to limit their effective adoption and widespread implementation within the industry (Perera et al., 2023a). Ojo-Fafore and Laryea (2024), defines barriers to the digitalization of procurement as the factors that hinder the smooth implementation of digital technologies in the procurement of goods and services within construction processes.

Barriers faced by developed countries and developing countries are different since the technological, infrastructural, organizational, financial, and cultural environments in which they operate affect how strongly each barrier group limits the use of digitalized systems (Yevu et al., 2022). In developed countries, the use of digital technology is rapidly expanding within industry while in developing countries, the opposite trend is observed, as various barriers continue to hinder the adoption and progress of these new technological concepts (Ojo-Fafore & Laryea, 2024). According to Yevu et al. (2022), in developed economies, the barriers to digital adoption are largely associated with technology usability, system integrations, and security issues, as compared to the developed economies where infrastructure constraints, limited finances, skill gaps and weak organizational support are more critical factors.

The barriers selected for this study were those most frequently reported across previous studies on digital procurement adoption in both developed and developing countries and they were subsequently classified according to the dimensions under which they were originally discussed in the literature, namely technological barriers, legal barriers, organizational barriers and financial barriers as presented in Table 1.

Table 1: Barriers to smart procurement implementation

Category	Code	Barrier	Source
Technological Barriers	B1	Cybersecurity concerns	[1], [2], [3], [4]
	B2	Data integrity concerns	[2], [5]
Legal Barriers	B3	Legal and regulatory challenges	[2], [4], [6]
Organizational Barriers	B4	Limited management support	[3], [4], [5], [7]
Financial Barriers	B5	High implementation costs	[2], [3], [4], [5], [6]

1 - Yevu et al. (2021b); 2 - Ibem and Laryea (2015); 3 - Precious et al. (2025); 4 - Ali et al. (2025); 5 - Bruzzi et al. (2019); 6 - Mbao et al. (2025); 7 - Lee and Shahrudin (2022)

2.2.1 Technological Barriers

Technological factors include the usability, compatibility, and interoperability of information technology systems within organizations and the quality, reliability, and ease of use of these technologies are crucial in influencing the adoption of digital procurement systems. A strong Information Communication Technology (ICT) infrastructure facilitates the adoption of ICT-driven innovations, including smart procurement technologies (Gascó et al., 2018). Furthermore, Ali et al. (2025) confirms this idea by

stating that poor internet connectivity, in developing countries, further hinders the adoption. Additionally, Yevu et al. (2021a) states barriers such as inadequate Information Technology infrastructure and technical capability, limited system integration and interoperability, and risks associated with technology immaturity and compatibility fall within this category.

2.2.2 Legal Barriers

Lack of proper legal framework can be a major barrier, that poses challenges to the adoption of digital procurement (Mbao et al., 2025). Since procurement activities are legally governed, the lack of clear laws and regulations supporting the use of smart procurement systems discourages construction stakeholders from adopting these technologies (Yevu et al., 2021a).

2.2.3 Organizational Barriers

Barriers which arise from organizational structures, cultures, and processes that create resistance or difficulties in integrating e-procurement technologies into existing workflows are called organizational barriers (Yevu et al., 2021a). Support from management is a fundamental concept in organizational leadership which reflects the collective mindset, beliefs, and strategic direction of an organization and it includes the values, assumptions, and perspectives that shape decision making at the highest level of the organization (Issah et al., 2024). Furthermore, Adebayo and David (2016) also identify management support as a crucial factor for the successful implementation of smart procurement techniques.

2.2.4 Financial Barriers

The high implementation costs of digital technologies hinder widespread adoption, causing many construction firms to hesitate to invest in new technologies due to economic uncertainty and the absence of immediate returns, despite potential long-term efficiency gains (Pittri et al., 2025). Tanoli (2025) identifies financial obstacles such as insufficient design fees to support digital initiatives, the cost of digital tools and setup, limited budgets for training or competitive salaries, and the financial burden of transitioning to new systems as challenges for the digitalization process.

2.3 CURRENT SRI LANKAN CONTEXT RELATED TO ADOPTION OF SMART PROCUREMENT

Being a developing country, the digitalization of construction industry in Sri Lanka, is limited by the unwillingness to adopt new technologies, causing the productivity to be lower than in industries where technology is adopted at a faster pace (Bandara et al., 2024). In Sri Lanka, the most common procurement delivery methods used are traditional method, design and build, Build-Own-Operate-Transfer (BOOT), Build-Own-Transfer (BOT) and Public Private Partnership (PPP) (Siriwardhana et al., 2018). Yevu et al. (2021b) identifies several digital technologies that can be implemented in the procurement delivery process such as BIM, Blockchain, and IoT. Even though several digital technologies are currently used in construction industry, survey findings show that their adoption in Sri Lanka is lower than in other countries, with BIM emerging as the most widely implemented technology (Perera et al., 2023b). Still, BIM adoption in Sri Lanka is still in its early stages and is mainly confined to large-scale infrastructure projects and foreign stakeholders (Wijesinghe et al., 2024). Although blockchain

adoption is increasing globally in the construction industry, its implementation in Sri Lanka remains limited (Bandara et al., 2025). Indunil et al. (2025) states that the adoption of Digital Twin (DT) technology in Sri Lanka remains limited compared to more technologically advanced countries.

According to Epasinghe et al. (2018) and Gamage et al. (2025), the construction sector in Sri Lanka has low levels of IT maturity, where there is heavy dependence on basic software and traditional systems, and this leads to low adoption of digital technologies. Additionally, regulatory barriers, insufficient technical capabilities, and limited government support for digital innovation further constrain the digitalization of the industry (Gamage et al., 2025). High rates of errors, regular conflicts, and low output and productivity also hinder the digitalization process and to overcome these challenges, a shift to more innovative procurement strategies is needed (Hettiaarachchige et al., 2022).

The existing studies on digital technology adoption in the Sri Lankan construction industry, such as those by Fernando et al. (2025), Gamage et al. (2025), Indunil et al. (2025), Nitharsan and Francis (2022), and Perera et al. (2023b) only focus on individual technologies such as BIM, e-tendering, and digital twins etc, and these studies do not explore the concept of smart procurement and barriers for adopting smart procurement.

3. RESEARCH METHODOLOGY

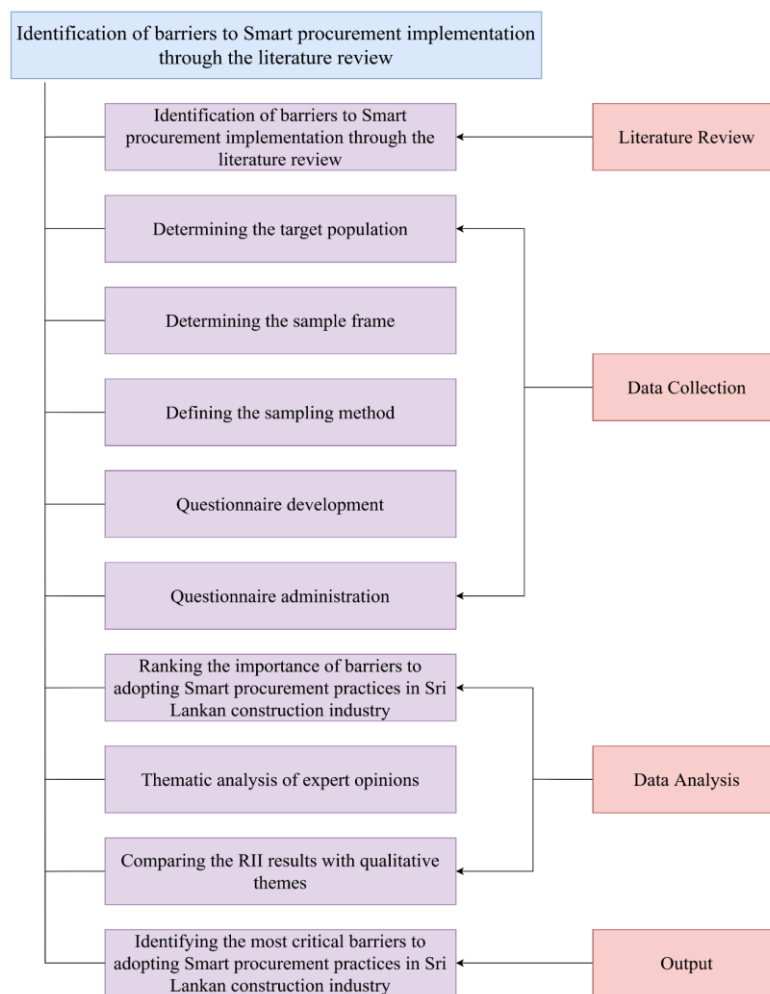


Figure 1: Research design

Figure 1 shows the research design of this study. Initially a literature review was conducted to identify the barriers to adopting smart procurement. Then a questionnaire survey was developed to collect both quantitative and qualitative data from respondents. The quantitative data were obtained using questions measured on a five-point Likert scale. Respondents were asked to evaluate the significance of identified barriers to smart procurement adoption in Sri Lanka. The qualitative data were collected through open-ended questions included in the questionnaire. Respondents were invited to assess the current level of smart procurement adoption in Sri Lanka and provide explanations for their assessment.

Objective 1 of the study was achieved through a comprehensive literature review. Objective 2 was addressed using a quantitative ranking method to evaluate and rank the perceived significance of barriers to adopting smart procurement. Objective 3 was addressed through qualitative thematic analysis, which was used to analyse respondents' opinions regarding the current level of smart procurement adoption in the construction industry in Sri Lanka. Accordingly, the overall research approach adopted in this study is a mixed approach.

The target population of this study includes personnel in the construction industry in Sri Lanka who are directly engaged in the procurement related operations and have satisfactory knowledge regarding the digital and smart procurement practices. Aforementioned target population includes quantity surveyors, architects and engineers.

The sampling frame is defined as professionals who has a minimum of 10 years of industry experience and have been directly exposed to procurement decision-making process. Purposive sampling was used to intentionally select professionals with significant industry experience and direct exposure to procurement decision-making processes. Purposive sampling was used because it allows the researcher to deliberately select participants who possess specific experience relevant to the research topic (Creswell, 2014). Data was collected from 60 respondents using a structured questionnaire shared online via Google Forms. The questionnaire consisted of three sections as follows:

- Demographic information
- Respondents' perceptions of the current level of smart procurement adoption in the construction industry in Sri Lanka, collected through open-ended responses.
- Assessment of the significance of identified barriers, measured using a 5-point Likert scale (1 = Very low significance, 5 = Very high significance).

3.1 DATA ANALYSIS

The objective 2 of this study is to assess the perceived significance of the barriers identified through the literature review for the Sri Lankan construction industry. To achieve this objective quantitative data was analysed using descriptive statistical methods. The Relative Importance Index (RII) can be used to quantify the relative importance of factors (Thiruchelvam & Uduwage, 2025). Therefore, RII is used to determine the relative significance of each barrier and to establish their ranking. The RII was calculated using the following formula:

$$RII = \frac{\sum W}{A \times N}$$

W = Weight assigned by respondents

A = Highest weight on the scale

N = Total number of respondents.

The barrier with the highest relative index was ranked first, while the barrier with the lowest relative index was ranked last.

Objective 3 of the study is to assess the perceived level of smart procurement adoption in Sri Lanka's construction industry. To achieve this, qualitative data collected were analysed using manual thematic analysis. To begin the analysis, all responses were carefully read multiple times to become familiar with the data. Key phrases and recurring ideas were highlighted and then directly grouped into themes.

4. RESULTS AND DISCUSSION

4.1 DEMOGRAPHIC INFORMATION

For this study, 60 questionnaires were distributed among the respondents who have at least minimum 10 years of experience in construction industry and among them 30 were returned with valid responses resulting the response rate of 50%. According to Malterud et al. (2015), studies involving participants with relevant expertise and focused research aims require fewer participants to generate sufficiently rich data. Therefore, the sample size of 30 for this analysis is considered sufficient.

The study collected responses from a total of 30 participants, representing professionals in the Sri Lankan construction industry. Among them, Quantity Surveyors (QS) constituted the largest group with 22 respondents (73%), followed by Engineers with 7 respondents (23%), and Architects with 1 respondent (4%).

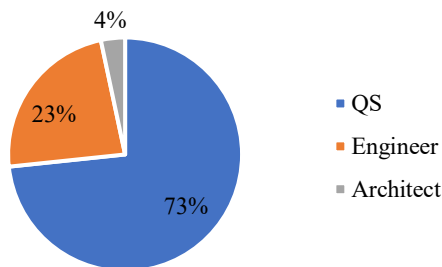


Figure 2: Respondents' profession

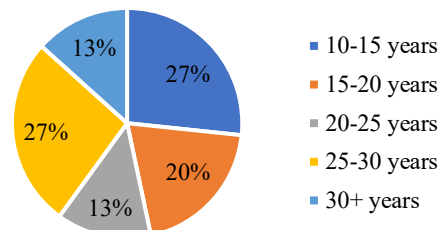


Figure 3: Respondents' experience

In terms of professional experience, 8 (27%) respondents had professional experience of 10-15 years, 6 (20%) respondents had experience of 15-20 years, 4 (13%) respondents had 20-25 years, another 8 (27%) respondents had 25-30 years and 4 (13%) respondents had over 30 years of experience. The respondents had an average working experience of about 21 years implying that the sample size has been made up of experienced industry professionals who have worked in the industry over a considerable period.

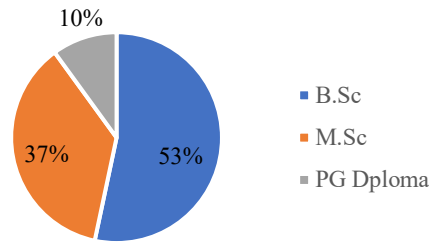


Figure 2: Respondents' academic qualifications

In terms of academic qualifications, 16 respondents (53%), 11 respondents (37%), and 3 respondents (10%), had achieved a bachelor, master, and postgraduate diploma respectively. This indicates that the respondents possess a satisfactory educational background relevant to their professional roles.

Overall, the demographic profile demonstrates that the study has reached well experienced and sufficiently qualified individuals in the construction professionals, which gives credible bases to the research findings.

4.2 RELATIVE IMPORTANCE OF BARRIERS TO SMART PROCUREMENT ADOPTION

While there are many barriers to the adoption of digital technologies reported in the literature, based on the applicability to developing-country like Sri Lanka, five key barriers were identified. The Relative Importance Index (RII) was used to evaluate and rank the perceived significance of barriers to adopting smart procurement in Sri Lanka's construction industry. Table presents the calculated RII values and corresponding rankings.

Table 2: Relative Importance Index (RII) for barriers

Code	Factor	RII	Rank
B5	High implementation costs	0.827	1
B4	Limited management support	0.760	2
B2	Data integrity concerns	0.733	3
B3	Legal & regulatory challenges	0.713	4
B1	Cybersecurity concerns	0.660	5

The findings of this study are largely related to previous research on electronic procurement adoption in construction. For example, Yevu et al. (2021a) also cited the high technology cost, absence of legal regulations, lack of management support, and inadequate technical capability as barriers to adoption of e-procurement. In their study, resistance to change and lack of trust were highlighted as the most relevant barriers. Similar findings related to Nigerian construction industry, were reported by Precious et al. (2025), identifying high implementation cost, security concerns, and lack of expertise as key barriers to electronic procurement adoption, while security concern is emphasized as the most critical barrier affecting smart procurement adoption. Study by Inwere et al. (2025) on e-procurement adoption in Nigeria, identified lack of top management or government support, high implementation costs, limited technical expertise, and transaction security concerns as the main barriers to e-procurement implementation. Inwere et al. (2025) ranked lack of management or government support as the most

critical barrier. Comparable barriers have also been observed in other studies conducted in South Africa by Ibem and Laryea (2015) which highlighted unreliable IT infrastructure, cultural barriers, and limited technological access, while research by Tanoli (2025) in Pakistan noted resistance to change, lack of skilled workforce, and absence of policy guidelines as major barriers.

4.3 THEMATIC ANALYSIS

The thematic analysis of responses revealed that Smart procurement adoption in Sri Lanka's construction industry is currently partial and concentrated only within large-scale organization. Many respondents stated that they had "not come across such systems" or had observed them only in "very limited offices," while several explicitly stated that smart procurement is "not commonly seen in the industry" and that "proper procurement systems are not practicing in Sri Lanka in most organisations." All these responses suggest a low level of adoption.

Table 3: Thematic findings

Theme	Summary of Findings	Evidence from Respondents
Theme 1: Adoption inequality between larger and smaller organizations	Smart procurement adoption is mainly concentrated in large organizations, while many small and medium contractors still rely on traditional procurement practices.	Respondents noted that "large and Tier-1 organizations use digital tools," but adoption "has not spread into the entire ecosystem." One respondent stated that "many Sri Lankan contractors still rely mainly on traditional methods, so large platforms like Oracle and Aconex are not yet widely used across the whole industry".
Theme 2: Predominance of basic digitalization	Most procurement procedures are still done manually, and digital tools are mostly utilized for simple communication rather than integrated smart systems.	According to respondents, procurement is still "manual" and "paper-based," where organizations often "just call and get the prices through e-mail," indicating limited use of advanced digital procurement systems.
Theme 3: Barriers to adoption of smart technologies	Adoption is hindered by technological, financial, and regulatory barriers, including inadequate infrastructure, lack of skills, and high investment costs.	Respondents mentioned that "the IT system is not being developed island wide" and "relevant software is not available with everyone." Additionally, they also highlighted "lack of knowledge," "moderate IT" literacy," "no capable staff to handle procurement systems," and that many organizations "do not have funds to start smart procurement systems." They also noted that government procurement process must follow "NPA Guidelines" and emphasized that "government support and standardized processes are key to successful implementation."
Theme 4: Inadequate	Due to their lack of readiness and resistance	Respondents stated a "significant gap between the desire for these technologies

Theme	Summary of Findings	Evidence from Respondents
organizational readiness	to change, many organizations are inadequately prepared for smart procurement.	and actual organizational readiness,” noting that “it will take some time to change mind set of stakeholders,” and that many organizations perceive the “initial investment to digitalization of the procurement is very costly.”

The findings from thematic analysis can relate to the existing literature. According to Chan and Owusu (2022), in new firms, the adoption of e-procurement is often constrained by inadequate standardization and lack of confidence related to legal concerns. Respondents also supported this perspective by mentioning that smart procurement has not yet diffused throughout the wider industry. The predominance of manual procurement is highlighted in the study by Gurgun et al. (2024) where it was revealed that construction companies are reluctant to adopt new technologies and procurement operations are often conducted using traditional procurement methods. The construction industry in Sri Lanka face high error rates, frequent disputes, and low productivity, mainly due to its reliance on traditional procurement systems (Hettiaarachchige et al., 2022). Epasinghe et al. (2018) found that most construction organizations in Sri Lanka primarily use basic software such as Microsoft Office, AutoCAD, and Microsoft Project, while the adoption of advanced software remains minimal suggesting that the industry's IT system is not developed adequately for implementation of smart procurement. Considering the theme Inadequate organizational readiness, the findings by Mohungoo et al. (2020) support the findings by emphasizing that insufficient stakeholder involvement and resistance to change significantly hinder adoption of smart procurement. Overall, the qualitative findings align closely with existing literature, confirming that the level of smart procurement adoption is low in Sri Lanka.

4.4 INTEGRATING QUANTITATIVE AND QUALITATIVE FINDINGS

When qualitative and quantitative insights were analysed together, a strong convergence of evidence regarding the barriers to Smart Procurement adoption was identified.

The highest ranked barrier in the RII analysis, high implementation costs was emphasized in responses, where financial limitations were described as a key reason why many organizations, especially small and medium scale organizations, are unable to invest in digital procurement systems. This alignment confirms that financial barriers are significant statistically and practically experienced within the industry.

Similarly, limited management support, which was ranked second in the RII results, is reflected in qualitative insights relating with inadequate organizational readiness. The gap between the desire for these technologies and actual organizational readiness and the need for stakeholder mindset shift were noted by the respondents in qualitative insights.

Furthermore, technical barriers identified in the RII analysis, such as data integrity and cybersecurity concerns, were also indirectly supported by respondents' comments regarding limited trust in digital systems and continued preference for manual processes. This indicates that organizations may be hesitant to transition fully to digital platforms due to perceived technological risks.

Finally, legal and regulatory challenges can be related to the qualitative comments highlighting the limitations in government procurement and the absence of standardized

digital practices across the sector. This shows that institutional frameworks are not yet fully aligned with the requirements of smart procurement systems.

5. CONCLUSIONS

Smart procurement refers to the use of digital technologies such as AI, BIM and blockchain into the procurement process. The existing studies have mainly focused on individual technologies rather than the broader concept of smart procurement and they have only examined barriers to the general digitalisation of construction industry rather than specifically exploring how these barriers relate to smart procurement within the sector. Therefore, this study examines the level of smart procurement adoption in Sri Lanka's construction sector while identifying and evaluating the key barriers affecting its effective implementation. After identifying barriers through the initial literature review, a mixed-method approach was used, where quantitative analysis using the RII was used to rank the significance of the identified barriers, while qualitative thematic analysis was employed to explore respondents' perceptions regarding the current level of adoption of smart procurement in Sri Lankan construction industry. The RII analysis revealed that high implementation costs (B5) and limited management support (B4) were the most critical barriers, ranking first and second, respectively. These findings suggest that the limited adoption is caused mainly due to organizational and financial factors rather than due to purely technical factors. The qualitative findings confirmed that smart procurement adoption in Sri Lanka remains low, with only large organizations being able to implement it meaningfully. due to limited digital infrastructure, lack of technical expertise, resistance to change, and financial limitations. This study, however, is restricted to the construction sector in Sri Lanka. Since Sri Lanka represents a developing economy, the findings may not be directly generalizable to other countries, particularly developed economies. Nevertheless, they may still offer useful insights for other developing countries facing similar barriers in adopting smart procurement practices to better understand the barriers and to guide the gradual transition toward smart procurement practices. Also, future studies could conduct comparative analyses between Sri Lanka and other developed and developing countries to examine how differences in technological maturity, organizational readiness, regulatory frameworks, and procurement practices influence smart procurement adoption. Furthermore, as the organizational classification of respondents (i.e., client, consultant, and contractor) was not captured in this study, future studies may consider incorporating this aspect to provide deeper insights into role-based differences in perceptions. Industry practitioners, organizational top management and policymakers can use the findings of this study to address adoption barriers by promoting digital solutions, strengthening management support, improving technological capabilities and regulatory support. This offers a path for future research for identifying practical strategies to mitigate these barriers and for further exploring how smart procurement can improve efficiency, transparency, and decision-making in construction procurement processes.

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