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Unifying the fragmented landscape of electronic public procurement research: A systematic review and future directions

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Abstract: Despite the considerable body of research in the arena of electronic public procurement (e-PP), most of the literature is in fragmented form due to the non-availability of a recent structured review of these studies. Therefore, the purpose of this paper was to organize, evaluate, and synthesize electronic public procurement research during the last 24 years. This paper also aims to provide some insight into the future direction of this research domain. In order to achieve this, a systematic review was conducted. A total of 37 articles were systematically identified and analyzed following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The findings revealed four main areas of investigation of e-PP research: adoption and acceptance of e-PP; implementation challenges and success factors; impacts of e-PP implementation; and evaluation of e-PP technology. Moreover, a notable variation in the usage of theories, models, and frameworks was identified across the four areas. Additionally, a conceptual framework was developed, integrating the fragmented findings presented across the four key research areas. As far as the authors are aware, this is the first systematic review with a specific focus on electronic procurement in the public sector, particularly on the state-of-the-art usage of theories in this research arena. In terms of implications for future researchers, this review highlights unexplored areas within each subdomain, along with potential theoretical advancements.

Keywords: E-procurement, E-procurement implementation, Electronic public procurement, PRISMA, Systematic literature review

1. Introduction

All over the world, governments spend a considerable portion of the national budget to acquire the necessary resources in the form of goods, services, and works in order to ensure the welfare of citizens (Ofori et al., 2023). These acquisitions are often conducted through various procurement channels of governments. Nowadays, most governments convert their manual procurement system into electronic modes, considering the numerous advantages associated with that transition (Soong et al., 2020a).

Electronic procurement employs electronic methods throughout the purchasing process, from needs identification to the management of the contract, in order to deliver the promises made in each transaction (Davila et al., 2003). Considering the benefits associated with this move, both public-sector and private-sector organizations have opted for this transition (Angeles & Nath, 2007). In this context, electronic Public Procurement (e-PP) is defined as the application of an information technology-based, high-quality, efficient management framework to procurement in the public sector (World Bank, 2004, p. 6). The terms electronic Government Procurement (e-GP) and electronic Public Procurement (e-PP) have been used interchangeably in previous studies (Alomar & De Visscher, 2019; Rotchanakitumnuai, 2013).

Previous studies relating to electronic procurement can be grouped into two main areas. First, some studies were conducted with a primary focus on the various aspects of electronic procurement applications in private-sector organizations (Angeles & Nath, 2015; Sánchez-Rodríguez et al., 2020). These organizations represent multiple sectors, including construction and manufacturing (Addy et al., 2023; Harrigan et al., 2008; Ho, 2019). Second, another cluster of studies investigated the application of electronic procurement in the public sector (Alsac, 2007; Musa et al., 2023). However, public procurement often involves acquiring resources from private-sector institutions (Soong et al., 2020a). Therefore, certain studies have investigated electronic public procurement from the suppliers' perspective (Ballerini et al., 2023; Neupane et al., 2014).

The recent literature reviews published in scholarly journals have mainly focused on electronic procurement applications in private sector organizations (Chan & Owusu, 2022; Nandankar & Sachan, 2020). Some of the studies were conducted with a specific focus on particular industries, such as construction (Chan & Owusu, 2022; Yevu & Yu, 2019), while others have synthesized electronic procurement applications in general, covering both private sector and public sector electronic procurement adaptations (Nandankar & Sachan, 2020; Schoenherr & Tummala, 2007). Furthermore, the focus of the few most recent available literature reviews on electronic public procurement is limited to the barriers to electronic procurement adoption in the public sector (Mavidis & Folinas, 2022; Mohungoo et al., 2020). Therefore, there is a dearth of reviews discussing the state of the art of electronic public procurement in recent research, with a specific focus on public sector procurement. Certainly, a synthesis of the usage of theories in public procurement research is not available in the existing literature.

Previous researchers have highlighted the fundamental differences between private and public procurement. According to Bovis (2012), public procurement emphasizes broader objectives, including social values and transparency, compared to private sector procurement, which mainly focuses

on achieving cost savings. Further, Thai (2017) explains the complex nature of public procurement due to multiple stakeholder engagement during the process. Moreover, Mohungoo et al. (2020) reveal how electronic procurement in the public sector is affected by various rigid and complex legal and policy frameworks for its design and implementation. More importantly, researchers have also emphasized the differences in the context of these two sectors. For instance, the adoption of electronic procurement in private sector organizations is a voluntary task compared to its mandatory nature in public sector institutions upon the decision of higher authorities (Gamal Aboelmaged, 2010; Vaidya et al., 2006). This might lead to variations in theoretical interpretations in the field (Stentoft Arlbjørn & Vagn Freytag, 2012). Therefore, it is argued here that the state of the art of electronic public procurement should be separately reviewed in order to properly identify the gaps in the existing literature. Such an approach will ultimately guide future research efforts more effectively.

The fragmented nature of the existing literature, therefore, leads to the aim of this systematic review: to organize, evaluate, and synthesize the electronic public procurement research during the 24 years from 2000 to 2023. In order to achieve these objectives, the paper focuses on answering the following research questions.

RQ1. What are the main areas of investigation in e-procurement research studies in the public sector?

RQ2. What theories/frameworks/models are applied in the area of e-public procurement research?

RQ3. What are the research gaps in the e-public procurement research arena?

In order to answer these research questions, a systematic review procedure has been followed by the researchers. As in similar studies in existing research, this approach has provided a structured and comprehensive approach to the synthesis (Asare et al., 2024; Mohungoo et al., 2020; Osuizugbo et al., 2024; Vejaratnam et al., 2020). Systematic reviews also aim to reduce researcher bias by following a clear and pre-defined methodology (Wang, 2014). This procedure ensures that the findings are based on a wide and accurate representation of existing research (Mishra & Mishra, 2023). The next sections of this paper outline the review methodology of this systematic review, and it is followed by the findings and discussion section, including directions for future research. Finally, limitations and conclusions are presented.

2. Review methodology

In this section, the method employed to retrieve articles relating to e-PP and the method used to conduct the systematic literature review are discussed.

2.1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)

This study used PRISMA, a guide for conducting systematic literature reviews, as the review technique. Even though it was initially popular among medical studies, it has been increasingly utilized in procurement and supply chain fields (Akbari et al., 2024; Vejaratnam et al., 2020). This guideline aims to assist in ensuring the transparency and rigor of the review process (Osuizugbo et

al., 2024; Page et al., 2021). Following the PRISMA guidelines, this study initially commenced with specific research questions, followed by the identification of specific inclusion and exclusion criteria. Subsequently, the review process was conducted according to the established criteria and is further elaborated in the following section. In order to enhance the transparency of this process, it is also recommended to do a prior registration of the methodology of the systematic reviews (Page et al., 2021). Accordingly, a detailed version of the methodology of this article was registered in the Open Science Framework (OSF); a link to the registration has been provided at the end of this paper.

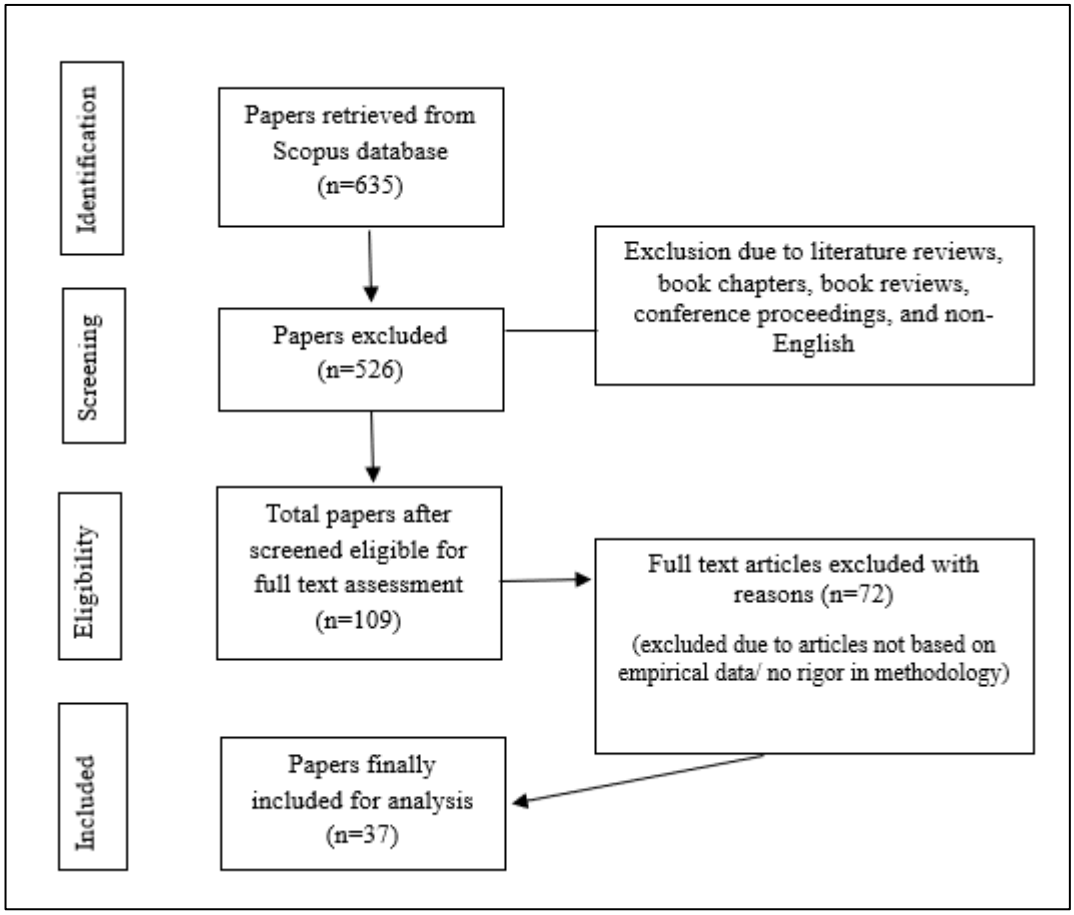
2.2. Article selection process

In conducting this structured literature review, initial articles were identified through a comprehensive search in the Scopus database. This is mainly due to its comprehensive coverage of peer-reviewed literature in the field of public procurement in order to ensure the inclusion of high-quality, relevant studies (Rejeb et al., 2024; Shivajee et al., 2023). This search considered journal publications on electronic procurement in the public sector over the past 24 years, from 2000 to 2023. This analysis includes only articles published in peer-reviewed academic journals and that were written in English. Database searches were performed using keywords such as "electronic public procurement", "electronic government procurement", "e-public procurement", "e-government procurement", "electronic public purchasing", "electronic government purchasing", and "e-government purchasing". Various combinations of keywords were employed in order to create a comprehensive list of all related papers. The prescribed search criteria were set to "paper title", "abstract", or "paper keywords" during this identification process. A total of 635 articles were identified from the initial search.

These articles were then screened based on the title and abstract. Publications such as literature reviews, book chapters, book reviews, and conference proceedings were excluded during this screening process. These sources were excluded to ensure consistency in the quality, depth, and academic rigour of the review (Tranfield et al., 2003). For instance, as argued by Snyder (2019), journal articles typically undergo more rigorous peer review and present more complete studies when compared to conference proceedings. Hence, peer-reviewed journal articles were prioritized as they typically undergo a more rigorous review process, present more complete and validated findings, and align with the structured approach required by PRISMA guidelines (Page et al., 2021). The articles written in languages other than English were also ignored at this stage. A total of 109 articles were filtered and remained for the eligibility process.

During the eligibility stage, the filtered articles were then critically studied by reviewing the full papers for appropriateness based on specific review and selection criteria. Irrelevant articles were excluded after a thorough reading based on the scholarly assessment. A similar method was suggested by PRISMA guidelines and has been adopted by previous researchers in writing structured reviews (Musa et al., 2023; Page et al., 2021; Schoenherr & Tummala, 2007; Vejaratnam et al., 2020). Finally, a total of 37 articles were carefully selected for the structured literature review of this paper. A graphical presentation of the stages involved in this process is summarized in Figure 1.

Figure 1. Flow diagram of the review methodology (adapted from Vejaratnam et al.,2020)



2.3. Data analysis technique

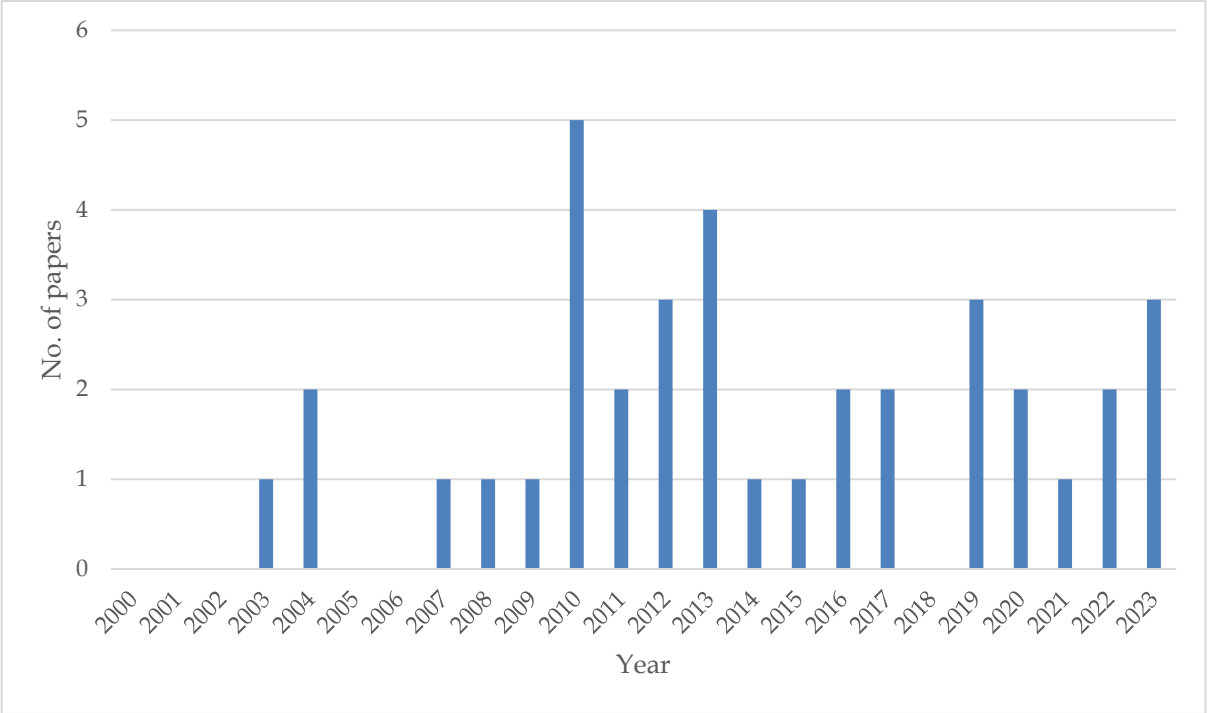
The selected papers were summarized under various categories in order to better comprehend the information. The details of each study were thoroughly studied before recording the data for each category. To make this process more systematic, Microsoft Excel has been used to prepare the data extraction table for the analysis. The categories identified for this purpose are author(s), title, source, year of publication, geographical location, main areas of the study, perspective of the e-PP usage, theories/frameworks/models used, research approach, data collection and analysis methods, the unit of analysis, key findings, and suggestions for future research. Thematic analysis was used in order to organize the areas of e-PP research systematically. This is considered an effective means for recognizing the predominant patterns in selected papers for a review (M. Zein & Twinomurinzi, 2023).

3. Findings

3.1. Descriptive findings

In the past 24 years, the earliest publications in the dataset were in 2003, with no studies identified during the years 2000-2002. A gradual increase in publications was observed, with a notable peak in 2010, which recorded the highest number of studies (5). As depicted in Figure 2, a significant proportion of the studies included in this review (38%) were published between 2010 and 2013. The trend indicates some stagnation afterwards, with two to three publications per year in most cases.

Figure 2. Publications per year

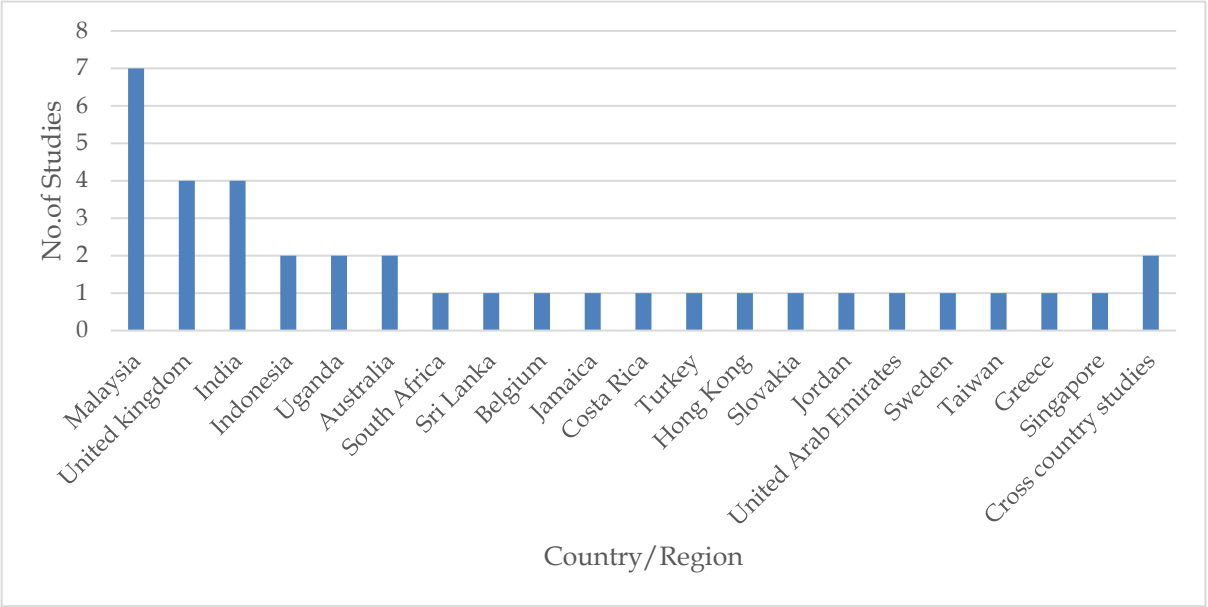


As shown in Figure 3, the 37 studies included in this systematic review cover more than 20 countries. Accordingly, it was revealed that the studies were conducted in various parts of the world, showcasing a diverse geographical distribution. The highest number of studies was conducted in Malaysia (7), followed by the United Kingdom and India (4 studies each). Two papers were published in each of the countries: Indonesia, Uganda, and Australia. There are also two studies conducted across countries. One is a comparative study between India and Indonesia, while the other covers 14 countries in Latin America and the Caribbean. Overall, this distribution highlights the global reach of the studies, with representation from countries across Asia, Europe, Africa, Oceania, and the Americas. However, certain regions appear underrepresented due to a single study, indicating potential areas for further research.

While this review identified a wide geographical distribution of studies, a more in-depth analysis revealed important differences between developed and developing country contexts. Studies from the developing countries (e.g., Uganda, India, Jamaica) frequently highlighted challenges such as

limited IT infrastructure, lack of training, and policy inconsistency (e.g., Ahmad et al., 2019; Basheka et al., 2012; Panda et al., 2019). In contrast, studies from the developed nations (e.g., the UK, Sweden, Australia) often focused on enhancing efficiency or refining existing systems (e.g., Johnson, 2011; Vaidya and Campbell, 2016). These patterns suggest that the regional context significantly influences both the adoption and implementation of e-PP systems, and future research should examine this systematically.

Figure 3. Publications per country/ region



The selected papers were published in 30 peer-reviewed scholarly journals. As indicated in Table 1, the highest number of papers was published in the International Journal of Procurement Management (04), followed by the Electronic Government Journal (03). Both the International Journal of Business Information Systems and Government Information Quarterly have published two studies each. The remaining 26 journals contributed one publication each, which indicated a broad distribution of research across various related themes. These journals span multiple related disciplines, including procurement, public sector management, and information systems. This further indicates the interdisciplinary nature of the selected studies.

Table 1. Sources of publications

Sr.no.	Journal name	No. of papers
1	International Journal of Procurement Management	4
2	Electronic Government	3
3	International Journal of Business Information Systems	2
4	Government Information Quarterly	2
5	Journal of Public Procurement	1
6	Journal of Financial Reporting and Accounting	1
7	Journal of Transport and Supply Chain Management	1
8	Innovative Marketing	1
9	International Journal on Advanced Science, Engineering and Information Technology	1
10	International Journal of Electronic Government Research	1
11	Journal of Information and Knowledge Management	1
12	International Review of Administrative Sciences	1
13	Internet Research	1
14	International Journal of Civil Engineering and Technology	1
15	American Economic Journal: Economic Policy	1
16	Information Systems Frontiers	1
17	Management Decision	1
18	International Journal of Public Sector Management	1
19	Prague Economic Papers	1
20	Information Technology Journal	1
21	International Journal of Services, Technology and Management	1
22	WSEAS Transactions on Business and Economics	1
23	European Planning Studies	1
24	International Journal of Logistics Research and Applications	1
25	Electronic Journal of Information Systems in Developing Countries	1
26	International Journal of Electronic Governance	1
27	International Journal of Knowledge Management Studies	1
28	Journal of Purchasing and Supply Management	1
29	International Journal of Production Economics	1
30	Decision Support Systems	1

3.2. The main areas of investigation in e-PP research

The analysis revealed that the selected studies cover various aspects of e-PP research. The key areas of each study and their perspectives are summarized in Table 2. A large percentage of studies (78%) have analyzed e-PP from the perspective of buyers in various government institutions. Since government institutions procure most items from various firms, a significant percentage of studies (22%) have evaluated e-PP from the perspective of those suppliers. The synthesis of the key areas of these studies resulted in four main themes, and further findings are elaborated accordingly.

Table 2. Summary of key areas of selected studies

Author/s	Main research area of the study	Perspective
Ahmad et al. (2023)	Measuring the level of transparency of the e-PP system	Buyers'
Maepa et al. (2023)	Examining the readiness factors that affect the adoption of e-PP systems	Buyers'
Silalahi et al .(2023)	Impact of implementing e-PP on fraud prevention	Buyers'
Yusof et al. (2022)	Identifying critical quality requirements of e-PP systems to enhance user experiences	Buyers'
Koggalage et al. (2022)	Understanding the perspectives of the staff on implementing an e-PP system	Buyers'
Kit et al. (2021)	Investigating the factors affecting the acceptance of e-PP	Suppliers'
Soong et al. (2020a)	Identifying the factors affecting the adoption of e-PP	Suppliers'
Soong et al. (2020b)	Examining the factors influencing the perception and adoption of e-PP	Suppliers'
Alomar and De Visscher (2019)	Exploring the factors influencing the adoption of e-PP	Suppliers'
Panda et al. (2019)	Examining the critical success factors that influence the success of e-PP projects at various stages	Buyers'
Ahmad et al. (2019)	Exploring how e-PP can be leveraged to transform procurement operations and combat corruption	Buyers'
Zahra et al. (2017)	The role of e-PP in reducing budgetary slack	Buyers'
Pule and Bakkabulindi (2017)	Examining how e-PP affects the efficiency of public sector organizations	Buyers'
Lewis-Faupel et al. (2016)	Investigating the impacts of e-PP	Buyers'
Vaidya and Campbell (2016)	Exploring the assimilation of e-PP technologies and their impact	Buyers'
Panda and Sahu (2015)	Assessing the status and critical success factors of e-PP implementation	Buyers'
Carlos Barahona and M. Elizondo (2014)	Investigating the factors affecting the successful implementation of e-PP	Buyers'
Doherty et al. (2013)	Investigating the factors that influence the adoption of e-PP	Buyers'
Kabak and Burmaoğlu (2013)	Exploring how governments utilize e-PP to enhance efficiency, reduce costs, and improve transparency	Buyers'
Bulut and Yen (2013)	Identifying challenges and success factors of implementing e-PP	Buyers'
Pavel and Sičáková-Beblavá (2013)	Examining the role of e-PP in enhancing the efficiency	Buyers'
Concha et al. (2012)	Developing a model to assess the maturity levels of e-PP systems	Buyers'
Basheka et al. (2012)	Examining the critical success factors for the successful adoption and implementation of e-PP	Buyers'
Gupta and Narain (2012)	Investigating the barriers to the adoption of e-PP	Buyers'
Sarayrah and A. Al-Utai (2011)	Measuring the level of e-maturity to use e-PP	Suppliers'

Johnson (2011)	Examining the benefits derived from using e-PP	Buyers'
Kaliannan (2010)	Examining the factors affecting the implementation of e-PP	Suppliers'
Padhi and Mohapatra (2010)	Exploring both enabling and inhibiting factors that influence the adoption of e-PP	Buyers'
Cabras (2010)	Investigating the use of e-PP and its effects on the local supply chain	Suppliers'
Purchase and Dooley (2010)	Investigating the factors that influence an organization's acceptance and use of e-PP	Suppliers'
Al-Moalla and Li (2010)	Examining the organisational issues that influence the effectiveness of e-PP implementation	Buyers'
Kaliannan et al. (2009)	Identifying the key challenges of e-PP implementation	Buyers'
Lindskog (2008)	Explore the complexities involved with e-PP	Buyers'
Croom and Brandon-Jones (2007)	Developing a structural model to evaluate the impacts of e-PP	Buyers'
Chu et al. (2004)	Exploring the key success factors influencing the adoption and usage of e-PP	Buyers'
Panayiotou et al. (2004)	Identifying the functional specifications necessary for a successful e-PP implementation	Buyers'
Devadoss et al. (2003)	Identifying social and organizational issues of implementing e-PP	Buyers'

3.2.1. Adoption and acceptance

This theme covers the areas of investigation of the studies conducted during the initial stages (before or during adoption) of the e-PP transitions. It addresses the behavioural, organizational, and external factors that influence the willingness to adopt or accept e-PP across organizations.

The synthesis also revealed that a majority of these studies have investigated various individual-related factors (Chu et al., 2004). Accordingly, it was found that effort expectancy, performance expectancy, and social factors were positively and significantly correlated with the perception of using e-PP applications (Kit et al., 2021; Soong et al., 2020a). It was also revealed that perceived ease of use, perceived usefulness, social influence, information accuracy, and perceived non-repudiation influence the behaviour perception of individuals in terms of using e-PP (Chu et al., 2004; Kit et al., 2021; Soong et al., 2020b, 2020a). Furthermore, individuals are willing to cooperate for e-PP adoption with the expectation of improved efficiency and user-friendliness of the e-PP system compared to the manual process (Koggalage et al., 2022; Yusof et al., 2022).

Organizational aspects have also been widely examined. Studies have identified key readiness factors for successful e-PP adoption, including technological infrastructure, supportive legal frameworks, financial capacity, leadership, and effective procurement structures (Maepa et al., 2023; Padhi & Mohapatra, 2010). Institutional pressures have also been found to influence organizational behaviour (Doherty et al., 2013).

The findings of this systematic review have also revealed that previous researchers have studied this area from both the buyers' and suppliers' perspectives. For instance, suppliers are willing to adopt e-PP if they perceive that their competitors' participation in the system is high (Purchase &

Dooley, 2010). Similarly, in order to engage more suppliers with the e-PP system, the perceived quality of the e-procurement system plays a significant role (Alomar & De Visscher, 2019). Overall, studies investigating the adoption and acceptance of e-PP have examined various factors related to readiness, perceptions, and willingness during the early stages of introducing e-PP systems.

3.2.2. Implementation challenges and success factors

This theme covers the areas of investigation of the studies conducted during or after the implementation of the e-PP systems. Accordingly, those studies have identified key challenges and success factors for the proper implementation of e-PP. More importantly, the synthesis of the data revealed that all existing studies under this theme are organizational-level analyses.

Several studies have highlighted common implementation challenges. These include the high costs of adoption, limited IT infrastructure, insufficient technical skills, and weak government support (Kaliannan et al., 2009). In the Indian context, for example, Gupta and Narain (2012) grouped barriers into economic (e.g., information-sharing risks, high costs), socio-political (e.g., tax issues, legal complexity), cognitive (e.g., lack of confidence, computer illiteracy), and performance measurement challenges (e.g., weak linkage between procurement indicators and organizational goals). Other studies similarly point to the overall complexity of implementation, especially in the initial stages (Carlos Barahona & Elizondo, 2014; Devadoss et al., 2003; Panayiotou et al., 2004).

On the other hand, several critical success factors have been identified across different contexts. Strong political and institutional support, for example, was seen to be pivotal in Hong Kong's case (Bulut & Yen, 2013). Further, a broad set of success elements such as including project management skills, legal frameworks, user training, executive commitment, supplier involvement, and experienced staff, was observed in Uganda (Basheka et al., 2012). Similar factors were echoed by Kaliannan (2010), who grouped them into organizational (e.g., leadership), technological (e.g., IT skills), and environmental (e.g., policy) dimensions. Additionally, Al-Moalla and Li (2010) reported comparable findings in the UAE. Moreover, several studies have emphasized that the importance of specific factors may shift depending on the phase of implementation (Carlos Barahona & Elizondo, 2014; Panda et al., 2019; Panda & Sahu, 2015). Overall, these studies have revealed various challenges and critical success factors that can influence e-PP implementation during various stages.

3.2.3. Impacts and benefits of e-PP

The next group of previous empirical studies has focused on studying the outcomes of e-PP initiatives. Accordingly, various impacts and benefits of implementing e-PP were revealed. According to the findings of the systematic review, all of the studies under this theme were organizational-level analyses. Moreover, those studies have attempted to uncover the impacts and benefits associated with e-PP mainly for organizations. Except for the study by Cabras (2010), all other researchers have examined this area from the buyers' perspective, aiming to reveal the associated benefits for government institutions.

One of the most widely acknowledged impacts is the prevention of procurement fraud (Silalahi et al., 2023). Studies from Slovakia, Australia, Sweden, and Uganda confirm that e-PP systems contribute to enhanced organizational efficiency, often through shortened procurement cycles and reduced information processing costs (Pavel & Sičáková-Beblavá, 2013; Vaidya & Campbell, 2016; Lindskog, 2008; Pule & Bakkabulindi, 2017). Additional effects include greater competition and improved product quality relative to cost (Lewis-Faupel et al., 2016). Johnson (2011) revealed further benefits, such as improved management information, strategic sourcing, reduced transaction errors, and increased transparency. Additionally, Zahra et al. (2017) highlighted the reduction of budgetary slack. A broader framework by Croom and Brandon-Jones (2007) categorized e-PP impacts into five areas: acquisition costs, organizational change, governance structures, system specifications, and implementation management.

In addition to the above impacts and benefits for government institutions, e-PP was also found to be beneficial for its suppliers. In a study conducted in the United Kingdom, Cabras (2010) found a significant positive impact on the supply chain in the local economy. Specifically, this impact was found to be more significant for small and medium-sized enterprises (SMEs). Accordingly, previous studies have uncovered multiple benefits and impacts of e-PP for its related parties.

3.2.4. Technological integration and evaluation

The final theme includes studies conducted on the use of various evaluation models to measure technology in e-PP implementation. When compared to the other three research areas, only a few studies have been conducted in this area. One key contribution in this area is the development of the e-Government Procurement Observatory Maturity Model (eGPO-MM) by Concha et al. (2012), which evaluates the maturity of e-PP systems across technological and institutional dimensions. This model emphasizes the importance of both technical functionalities and governance-related factors in determining overall system readiness.

Similarly, evaluations of user-facing platforms, such as those conducted by Kabak and Burmaoğlu (2013) and Ahmad et al. (2023), have focused on the accessibility and transparency of e-PP websites. These studies highlight usability challenges such as poor navigability, lack of standardization, and limited transparency as common issues requiring attention in order to improve stakeholder engagement. By incorporating the perspectives of diverse users (e.g., public officials, suppliers, and citizens), these evaluations underscore the need for inclusive and responsive system design.

Beyond buyer-focused evaluations, supplier readiness has also been examined. Sarayrah and Al-Utai (2011), for example, have proposed a multi-factor model to assess e-maturity among suppliers, integrating organizational, technological, and managerial criteria. This reflects an important shift toward assessing the capacity of all participating actors in e-PP initiatives.

Recent studies have begun to bridge the gap between technological evaluation and service quality outcomes. For example, Sambasivan et al. (2010) examined user acceptance in Malaysia's G2B e-procurement system and linked it to perceived ease of use and system quality. Nandankar et al. (2023) developed a validated e-marketplace service quality model tailored for B2G environments.

This model incorporates dimensions such as responsiveness, transparency, and system reliability. Similarly, Nandankar and Sachan (2023) investigated the adoption of G2B e-marketplaces in India, emphasizing trust, system compatibility, and perceived value.

Overall, this body of work demonstrates that effective technological integration in e-PP is multi-dimensional and that robust evaluation frameworks are essential for identifying areas of improvement. In addition to the discovery of four main areas of investigation by previous e-PP research, the synthesis also revealed numerous uses of theories, frameworks, and models in this research area. Those findings are presented in the next section of this systematic review.

3.3. The theories/frameworks/models used in e-PP research

The present systematic review revealed important insights regarding the usage of multiple theories, frameworks, and models in e-PP research. As shown in Figure 4, the majority of studies (68%) are based on explicit models or frameworks, while only 32% are based on explicit theories. In order to better interpret the findings, it is also crucial to understand certain aspects of the methodologies used in these selected articles. As depicted in Figure 5, the majority of studies employed a quantitative methodology, with 68% adopting quantitative approaches in their respective research. Another important fact about these methodologies is that 84% of the studies are organizational-level analyses. As indicated in Figure 6, only 16% of the studies are individual-level analyses.

Figure 4. Usage of theories/frameworks/ models in e-PP research

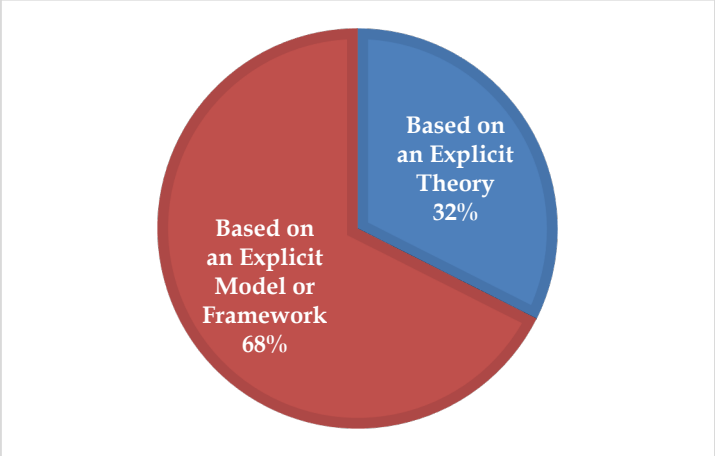


Figure 5. Research approach

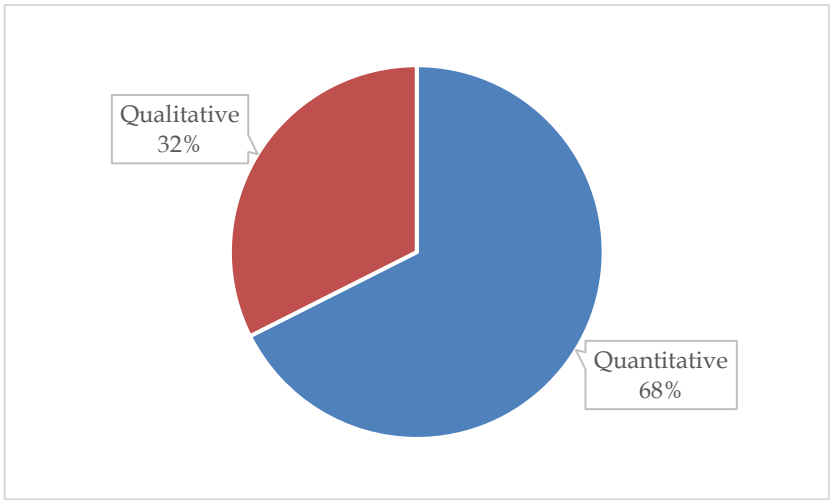
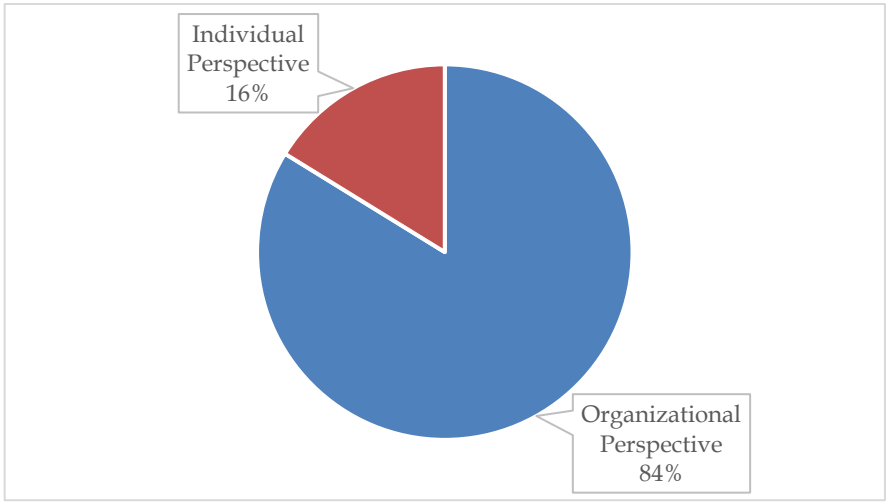


Figure 6. Unit of analysis



In the previous section of this article, four key areas of e-PP research were presented. The findings further revealed that the state-of-the-art usage of theories in e-PP research also varies significantly across those four domains.

3.3.1. Usage of theories/frameworks/models in the e-PP adoption research area

The systematic review revealed that the Technology Acceptance Model (TAM) was the most utilized theory in this area compared to other theories. The usage of theories and models is summarized in Table 3, with the respective studies mentioned for each.

Table 3. Usage of theories/frameworks/models in e-PP adoption research

Name of the theory/ framework/model	Authors
Technology Acceptance Model (TAM)	Alomar and De Visscher (2019); Chu et al. (2004); Purchase and Dooley (2010); Soong et al. (2020b), (2020a)
Unified Theory of Acceptance and Use of Technology (UTAUT)	Kit et al.(2021); Soong et al.(2020a), (2020b)
Theory of Reasoned Action (TRA)	Soong et al.(2020b)
Theory of Planned Behavior (TPB)	Chu et al. (2004)
Innovation Diffusion Theory (IDT)	Alomar and De Visscher (2019)
Institutional Theory (IT)	Doherty et al.(2013)
Tesler's Theory (TT)	Yusof et al. (2022)
Researcher's Developed Models (RDM)	Koggalage et al. (2022); Maepa et al. (2023); Padhi and Mohapatra (2010)

The Technology Acceptance Model (TAM), originally developed by Davis (1989), continues to serve as a foundational lens for understanding individual-level acceptance of e-PP systems. Core constructs of the TAM such as Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Attitude Toward Use (ATU), and Behavioural Intention (BI), are commonly used to model user behaviour, as seen in studies in Taiwan, Australia, and Belgium (Chu et al., 2004; Purchase & Dooley, 2010; Alomar & De Visscher, 2019). However, rather than applying the TAM in isolation, researchers are increasingly integrating external variables or combining them with complementary theories. For example, Purchase and Dooley (2010) introduced the notions of supplier pressure and organizational support, while Chu et al. (2004) combined the TAM with the Theory of Planned Behavior (TPB) constructs such as Subjective Norm (SN) and Perceived Behavioral Control (PBC), reflecting efforts to tailor the model to the complexities of organizational procurement.

The Unified Theory of Acceptance and Use of Technology (UTAUT), originally proposed by Venkatesh et al.(2003), has expanded upon the TAM by incorporating additional variables that enhance its explanatory power. Hence, many e-PP researchers have introduced additional variables from this model in order to enhance the validity of their models. Accordingly, Soong et al. (2020a) have introduced additional predictor variables, such as Effort Expectancy (EE), to measure the impact on the adoption of e-PP in SMEs in Malaysia. A similar model has been empirically validated by Soong et al. (2020b) with a few moderator variables, such as gender and experience. They also derived variables in order to measure Subjective Norms (SN) from the Innovation Diffusion Theory (IDT). In the context of e-PP, UTAUT has been employed in order to understand the adoption behaviour among both public procurement authorities and suppliers.

While the TAM and UTAUT dominate, alternative theoretical perspectives have received limited but promising attention. Institutional Theory, for example, has been applied by Doherty et al. (2013) to explain how coercive, mimetic, and normative pressures influence e-PP adoption in UK public sector organizations. This suggests the value of exploring e-PP not just as a technical innovation, but one shaped by broader institutional dynamics. Similarly, Yusof et al. (2022) refer to Tesler's Law in order to address interface complexity in e-PP systems. Accordingly, the study demonstrates how non-mainstream theories can offer novel insights into the user's experience and system design.

Although the TAM and the UTAUT have dominated e-PP adoption research due to their strong explanatory power for individual users' behaviour, this concentrated reliance also highlights a theoretical gap. Broader organizational, institutional, and strategic considerations in procurement processes remain underexplored. Institutional Theory, though used in limited qualitative work (e.g., Doherty et al., 2013), offers a valuable lens for understanding how coercive, normative, and mimetic pressures shape e-PP adoption, especially in public-sector settings where policy mandates, peer influence, and professional norms are significant. Expanding on this, the Technology-Organization-Environment (TOE) framework (Tornatzky & Fleischer, 1990) could enrich future research by incorporating contextual factors such as organizational readiness, competitive pressure, and technological infrastructure.

Furthermore, strategic management theories such as the Resource-Based View (RBV) (Barney, 1991), Transaction Cost Economics (TCE) (Williamson, 1981), and the Dynamic Capabilities Theory (Teece et al., 1997) provide untapped opportunities to explore how organizations leverage internal and inter-organizational resources for effective e-PP implementation. For instance, RBV emphasizes the importance of firm-specific assets such as IT competencies and leadership support, which are often overlooked in TAM/UTAUT-based models. TCE, on the other hand, can shed light on how e-PP reduces transaction costs and information asymmetries in procurement. Meanwhile, the Dynamic Capabilities approach could help explain how firms adapt procurement strategies in response to technological disruptions. These perspectives can complement behavioural models and enable a more holistic understanding of technology adoption within complex procurement ecosystems. Future e-PP research would benefit from integrating these underutilized theories, not only to enhance theoretical diversity but also to improve the contextual and strategic relevance of findings.

In addition to the above-mentioned theories and theoretically grounded models, a few researchers have employed Researcher-Developed Models (RDM) based on extensive literature reviews. Koggalage et al. (2022), Maepa et al. (2023), and Padhi and Mohapatra (2010) have employed such models in their quantitative studies. Accordingly, factors such as user-friendliness (Koggalage et al., 2022), leadership (Maepa et al., 2023), and internal resistance (Padhi & Mohapatra, 2010) have been proposed to predict the adoption of e-PP in multiple countries.

3.3.2. Usage of theories/frameworks/models in the e-PP implementation research area

In contrast to the adoption-focused stream, research on e-PP implementation has primarily aimed to uncover the critical success factors (CSFs) and barriers that influence the realization of e-PP initiatives. However, a notable trend across these studies is the limited engagement with established theoretical frameworks. The majority of studies employ Researcher Developed Models (RDMs), which are constructed through extensive literature reviews but often lack anchoring in widely recognized theories of technology implementation or organizational change (e.g., Al-Moalla and Li, 2010; Basheka et al., 2012; Kaliannan, 2010; Panda et al., 2019; Panda and Sahu, 2015). Although these models help with surface practical insights such as the roles of top management support, data security, training, and policy clarity, the absence of theoretical grounding limits their generalizability and theoretical contribution.

Only a few studies venture beyond descriptive or empirical generalization. Notably, Christensen's Theory of Disruptive Innovation was applied by Barahona and Elizondo (2014) to conceptualize how e-PP systems in Costa Rica can act as disruptive technologies within bureaucratic structures. This is a rare and valuable example of theory being used to interpret broader shifts in procurement logic and institutional capacity. In contrast, most qualitative studies in this area (e.g., Bulut and Yen, 2013; Kaliannan et al., 2009; Panayiotou et al., 2004; Devadoss et al., 2003) have adopted case study approaches that often lack a strong theoretical lens. Even studies such as that of Gupta and Narain (2012), which use structured models, do not go beyond identifying categories of barriers such as cognitive, socio-political, and cultural obstacles.

In order to advance this stream of literature, future research could benefit significantly from the application of more robust and explanatory theoretical frameworks. For example, the Technology-Organization-Environment (TOE) framework (Tornatzky & Fleischer, 1990) offers a comprehensive lens to analyze how contextual factors shape e-PP implementation outcomes. Similarly, the Resource-Based View (RBV) (Barney, 1991) could be employed in order to understand how organizational capabilities, such as IT infrastructure or procurement expertise, contribute to implementation success. Additionally, Dynamic Capabilities Theory (Teece et al., 1997) may help to explain how organizations adapt to rapidly evolving procurement technologies. Applying such theories would allow researchers to move beyond isolated factor analysis and toward a more integrated understanding of implementation processes.

3.3.3. Usage of theories/frameworks/models in the impacts of e-PP research area

Compared to the adoption and implementation domains, research investigating the impacts of e-PP has demonstrated a limited use of well-established theoretical foundations. A small number of studies have employed theories to explain or assess the broader consequences of e-PP systems. For example, Adaptive Culture Theory has been applied to understand how organizational flexibility and cultural alignment can condition the outcomes of e-PP systems on budgetary governance (Zahra et al., 2017), while Stewardship Theory has been used to frame public officials as stewards whose accountability and commitment to public service can help to mitigate procurement fraud and corruption (Silalahi et al., 2023). These contributions reflect early attempts to move beyond functionalist perspectives, incorporating behavioral and cultural dimensions into impact analysis.

Despite these efforts, the field remains largely under-theorized, with a considerable proportion of studies relying on Researcher-Developed Models (RDMs) informed by literature syntheses rather than theory-driven constructs. Many of these models include outcome variables such as cost efficiency, procurement cycle time, and transparency, but often lack grounding in organizational or institutional theory. This gap presents an opportunity for researchers to enhance the explanatory depth and generalizability of findings by integrating underutilized theoretical lenses.

Future research could benefit from engaging with broader organizational and institutional theories in order to analyze the impacts of e-PP. For example, the Resource-Based View (RBV) could be employed to assess how internal capabilities such as IT infrastructure or procurement expertise shape the realization of efficiency or innovation benefits from e-PP. Similarly, Institutional Theory can offer valuable insights into how coercive, normative, and mimetic pressures affect the long-term

impact of e-PP systems on procurement practices. Moreover, Dynamic Capabilities Theory could help to explore how organizations adapt their procurement strategies in response to evolving digital tools. Further, the Technology-Organization-Environment (TOE) framework could also support a holistic assessment by examining how technological readiness, organizational context, and external environment interact to influence the success and sustainability of e-PP impacts. By shifting toward these richer theoretical perspectives, future studies can move beyond descriptive analyses and contribute to a more explanatory and critical understanding of how e-PP transforms public procurement systems.

3.3.4. Usage of theories/frameworks/models in the evaluation of technology in the e-PP research area

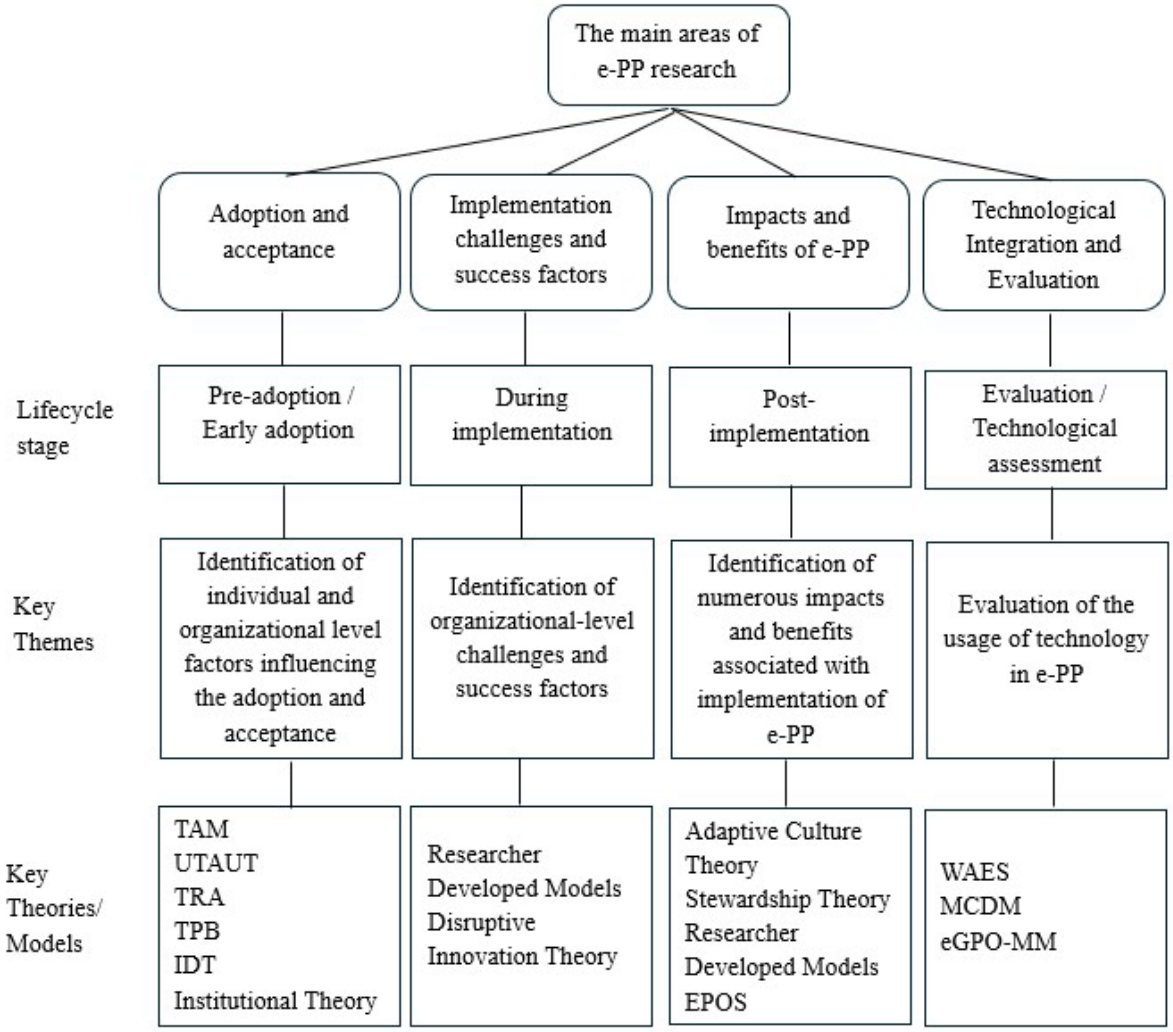
The evaluation of technology in the e-PP domain has largely been driven by pragmatic frameworks and assessment models rather than grounded theoretical foundations. Scholars in this area have focused on assessing system effectiveness, technological maturity, and stakeholder usability, often with reference to structured evaluation models.

One notable approach is the Website Attribute Evaluation System (WAES) framework, used by Ahmad et al. (2023), to assess transparency in Malaysia's e-PP systems. This framework, comprising 23 checklist items including "freshness" and "citizen consequences," enabled a binary evaluation of platform efficiency. Similarly, Multi-Criteria Decision Making (MCDM) techniques have been used to evaluate stakeholder-centric dimensions of e-PP systems. Kabak and Burmaoğlu (2013) applied MCDM in Turkey by integrating the DEMATEL and Analytic Network Process (ANP) methods to analyze stakeholders' needs from public authorities, suppliers, and citizens. These models offer a structured yet flexible way to assess the technological and functional aspects of e-PP platforms.

In efforts to evaluate technological maturity, e-maturity models have emerged as practical tools. Concha et al. (2012), for example, proposed the e-Government Procurement Observatory Maturity Model (eGPO-MM), which assesses both institutional-legal arrangements and the technical sophistication of public procurement systems. Complementing this, Sarayrah and Al-Utai (2011) applied a four-level e-maturity model to gauge supplier readiness for e-PP in Jordan, using criteria such as technological infrastructure, organizational preparedness, and managerial capacity.

Finally, a conceptual framework has been developed by this study to synthesize the fragmented findings presented across the four key research areas. The conceptual framework integrates these themes along the lifecycle of electronic public procurement (e-PP). The framework also maps the relevant theories and models associated with each domain. This serves as a visual summary of current research directions and provides a structured foundation for future inquiry. The conceptual framework is presented in Figure 7.

Figure 7. Integrated conceptual framework of e-PP research domains



4. Discussion and unexplored areas in the e-PP research arena

The systematic review of the selected 37 studies of e-PP research revealed four main areas of investigation in this research area, as indicated above. These areas were not identified in previous systematic reviews, which covered electronic procurement initiatives in private sector organizations (Chan & Owusu, 2022; Yevu & Yu, 2019). The systematic review of both private and public sector electronic procurement research by Nandankar and Sachan (2020) identified three research areas: adoption, usage, and performance. The present study contributes to further elaboration of similar areas and investigates the usage of theories in each area while broadening the classification of the research area. Furthermore, the challenges identified during the e-PP implementation in this study cover technological, organizational, and environmental aspects, confirming the findings of the e-PP implementation challenges reviewed by Mohungoo et al. (2020).

This present study also found that the use of theories, models, and frameworks varied across the four e-PP research areas identified. Moreover, only 32% of the selected studies for the systematic review were based on explicit theories, while others were based on various models and frameworks.

A similar conclusion about the underutilization of theories in the field was made by Schoenherr and Tummala (2007). Although their review encompassed both private and public sector organizations, this highlights the validity of a similar observation in e-PP research, even more than a decade later.

Among the selected articles for the review, most of the studies followed the cross-sectional research design, where all questionnaire items were collected simultaneously. As suggested by Koggalage et al. (2022) and Panda et al. (2019), this approach may not provide an accurate picture of the changes in challenges and critical success factors over time. Therefore, future research should adopt a longitudinal design to assess the long-term impact of e-PP adoption.

In the area of e-PP adoption and acceptance research, individual-level analyses conducted using the TAM and UTAUT were focused on the suppliers' perspective. Similar studies in government institutions were conducted at the organizational level. Therefore, future research should explore the relationships from the individual perspective.

This systematic review also revealed that most of the studies in the areas of e-PP implementation, impacts, and evaluation of e-PP technology research were explicitly grounded on researcher-developed models and related frameworks. Hence, future studies should explore the possibilities of grounding the studies on theoretical foundations in order to better validate the findings.

Moreover, the study revealed that the TAM and UTAUT are the most utilized theoretical frameworks in e-PP research. Only a few studies attempted to combine other theories with these frameworks. Therefore, as suggested by Alomar and De Visscher (2019), future research should investigate other potential factors from different theoretical grounds that could influence the adoption of e-PP. Understanding these factors could provide a more comprehensive view of what drives e-PP adoption.

This study also revealed that the majority of previous e-PP research has been conducted using quantitative methods, and this resulted in the identification of various environmental factors that influence e-PP adoption in organizations. However, how institutional pressures shape organizational behavior in the public sector remains unexplored in the existing research (Doherty et al., 2013). Therefore, future research should adopt qualitative approaches to the investigation of this unexplored area in e-PP research.

The findings of this systematic review hold several important implications for government institutions and public agencies seeking to implement or improve e-PP systems. First, during the pre-adoption stage, agencies should focus on enhancing organizational readiness through structured training programs, stakeholder engagement, and ensuring that legal and financial frameworks are in place. Second, implementation success depends heavily on political commitment, IT infrastructure, leadership, and continuous supplier involvement. Therefore, those factors highlight the need for coordinated inter-agency strategies. Third, in order to realize the full benefits of e-PP, including efficiency and fraud reduction, public agencies should integrate performance metrics into procurement systems and ensure that ongoing monitoring and evaluation take place. Lastly, technological evaluation models such as eGPO-MM or WAES can be institutionalized as part of periodic audits to

assess transparency, usability, and system maturity. Together, these steps can provide a roadmap for governments aiming to build effective, efficient, and accountable procurement systems.

5. Conclusion and limitations of the study

A systematic review of e-PP research published between 2000 and 2023 was conducted in the present work in order to unify the fragmented nature of research in this field. This was achieved by organizing, evaluating, and synthesizing 37 selected papers through a rigorous and transparent selection process. To address the first research question, we identified four main areas of e-PP research: adoption and acceptance of e-PP, implementation challenges and success factors, impacts of e-PP implementation, and evaluation of e-PP technology. Moreover, dependence on several key theoretical frameworks, such as the TAM and UTAUT, along with a notable variation of usage in theories, models, and frameworks, was revealed in order to respond to the second research question of the study. Additionally, in our quest to answer the third research question, several unexplored areas were presented to suggest future research directions.

We would also like to highlight several limitations of the study. First, the initial search was conducted in early 2023 for this study. Hence, studies before 2000 and after 2023 are not reflected in the findings. Second, due to the practical limitations of time and resources required to manage over 635 articles, the database search was limited to Scopus. While Scopus provides extensive coverage of peer-reviewed literature, relying exclusively on a single database may introduce selection bias and potentially exclude relevant studies indexed in other sources such as Web of Science, IEEE Xplore, or Google Scholar. In order to address this limitation, future systematic reviews of this area could incorporate multiple databases to enhance the comprehensiveness of article selection and to reduce the risk of publication bias. Third, we also noted differences in the methodological rigour of the articles over time. Particularly, we noticed an advancement of methodology over time within the same journal. However, in order to ensure appropriate rigour in selecting papers for the review, we followed the PRISMA guidelines and prior registration procedures in order to mitigate this limitation.

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