# From Adoption to Impact: A Case Study of E-Procurement in Indian Public Sector Undertakings

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**Abstract.** The present study explores the post-adoption phase of e-procurement systems in Indian Public Sector Undertakings (PSUs) employing comparative case study methodology guided by exploratory-inductive approach of analysis, emphasizing the organizations that have successfully implemented e-procurement. The primary objective is to develop a comprehensive model of variables that include independent, dependent, mediating, moderating variables and some construct and guide practitioners in the form of what to do to enhance e-procurement performance. Information was collected from primary and secondary sources, up including internal and publicly available documents. In a world where next-generation technologies such as AI and blockchain continue to advance, the research highlights the profound impact these technologies can have in transforming procurement. Recommendations, among others, are the introduction of structured training, formulation of transparent policies and integration of systems to aid e-procurement efficiency.

**Keywords:** e-procurement, Indian PSUs, exploratory-inductive research, independent variables, dependent variable, operational efficiency, transparency, AI, block chain.

## 1 Introduction

E-procurement has emerged globally as a transformative mechanism, redefining traditional procurement by integrating advanced digital tools and platforms. It encompasses a range of activities such as vendor identification, qualification validation, specification finalization through online catalogs, and execution of tenders and bids. These systems also handle requisitions, streamline order placements, and resolve procurement queries, delivering significant improvements in operational transparency, efficiency, and cost-effectiveness. As the literature highlights, e-procurement contributes to value-driven supply chain efficiencies across various business functions (Croom & Johnston, 2003; Presutti, 2003).

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### 1.1 Global Context

E-procurement solutions globally contribute to 3 Study Rationale.
Despite development, few investigations focus on its post-adoption effects in Indian PSUs. This study aims to fill this gap by examining issues and prospects in two metal and mining companies. It will identify key drivers of e-procurement adoption and performance, enabling recommendations to improve system compatibility and align with international standards of transparency and accountability in public purchases. Advanced economies like the U.S. and EU have implemented cutting-edge platforms to tackle industry inefficiencies using technologies like AI and blockchain (Croom& Johnston, 2003). Countries such as Singapore and South Korea have created transparent, scalable, and cost-effective e-procurement models, serving as examples for emerging economies.

Conversely, countries like India face hurdles such as stakeholder readiness, inconsistent policies, and technological deficiencies. International adoption patterns offer lessons for strategy in Indian PSUs. This study examines how these corporations can address exclusions by aligning their procurement with global norms, thereby contributing to Sustainable Development Goal (OT) (United Nations, 2015), which emphasizes institutional responsibility.

### 1.2 Relevance to India

In India, e-procurement is linked to Digital India, promoting a digitally empowered society and knowledge economy. PSUs, as economic engines, must adopt e-procurement for good governance, cost savings, and transparency. Platforms like Government eMarketplace (GeM) and Central Public Procurement Portal (CPPP) have transformed procurement perceptions and enabled Indian players to support local vendors and empower technology, aiding Atmanirbhar Bharat. Policies like the National e-Governance Plan and the Public Procurement Policy for Micro and Small Enterprises (2012) emphasize inclusive and effective procurement systems. GeM data shows its growing importance in India's procurement operations, projected to exceed INR 2 lakh crore by 2023. These developments illustrate e-procurement's transformational capacity, both micro- and macro-economic.

### 1.3 Study Rationale

Research on post-adoption impacts of e-procurement in Indian PSUs is limited. This study examines challenges and opportunities in two organizations within the metal and mining sector. Analyzing e-governance-based systems identifies key factors affecting e-procurement adoption and performance, providing insights to enhance system effectiveness and align with global standards.

The study focuses on e-procurement systems in two leading PSUs. It explores the application of e-governance principles, identifying factors such as technology integration, skill development, policy frameworks, and platform efficiency that impact e-procurement effectiveness.

The second section reviews literature, highlighting gaps and insights to encourage further exploration. The third section details the qualitative research methodology; the fourth outlines PSU organizational profiles and e-procurement challenges. The fifth covers findings on platform efficiency, stakeholder coordination, and policy consistency. The final section synthesizes the discussion, limitations, and proposes a framework for future quantitative research on key variable relationships.

This research enhances the academic discourse on e-procurement and offers practical recommendations for policymakers and industry stakeholders. It aims to improve e-procurement efficiency in Indian PSUs and support national economic and governance goals.

## 2 Literature Background

### 2.1 Historical Context and Evolution of E-Procurement

E-procurement has evolved globally to address traditional system inefficiencies, providing digital solutions that enhance transparency and accountability. The transition from manual to electronic platforms has transformed procurement as organizations embrace technology in supply chains. Early adopters experienced better operational efficiency and communication, leading to widespread use.

The principles of e-procurement are based on supply chain optimization that can achieve cost reductions and shorter procurement lead times (Presutti, 2003). Regulations needed to be adopted more, particularly in the public domain. Arrowsmith (2019) and others observed that legal rules on transparency in public procurement led to the spread of e-government systems internationally as a means of reducing corruption and encouraging better practices.

In India, e-procurement started with the Central Public Procurement Portal (CPPP) in 2012, followed by the Government e-Marketplace (GeM) in 2016, transforming procurement for Public Sector Undertakings (PSUs). Sharma et al. (2023) noted that GeM enhances efficiency and standardization, but challenges like cultural resistance and inadequate IT infrastructure remain (Mishra and Singh, 2013).

The early e-procurement adopters had difficulty integrating e- procurement solutions. Aligning with current supply chain management required considerable work, in particular in terms of compatibility with legacy and new platforms (Presutti, 2003). Other concerns related to training, data security, and developing vendor confidence.

The e-procurement has evolved from being an operational tool to a strategic instrument for governance. They found improved internal customer service and decision-making. Mishra and Singh (2013) highlighted its significance in change in PSUs of India. This transition reflects how e-procurement has moved beyond a cost-saving tool to a more general instrument for transparency and innovation.

New technologies such as AI and blockchain are constantly re-shaping procurement strategies, and pushing the role of e-procurement within today's supply chain management and government.

## 2.2 Drivers and Barriers of E-Procurement

E-procurement adoption is shaped by transformative drivers and barriers, especially in the public sector.

**Drivers of E-Procurement Adoption**. Technology such as AI and blockchain contributes to e-procurement through transparency and efficiency (Gupta et al., 2022). They contain administrative costs, standardize procurement timelines and even address legacy inefficiencies (Puschmann & Alt, 2005). Initiatives such as Central Public Procurement Portal (CPPP) and Government e-Marketplace (GeM) have transformed public procurement in India, bringing in standardization and achieving savings (Kumar and Kumar, 2021).

E-governance structures ease rules, accountability and ensure adherence (Bhardwaj et al., 2021). Organizational support and IT infrastructure are also important for successful e-procurement, strengthened by stakeholder involvement and vendor training (Vaidya et al., 2006; Kumar; Mehta, 2020).

E-governance values support transparency in procurement which minimizes corrupt practices, in line with the accountability objectives (Sharma & Sahu, 2023). Investments in training and IT prepare public sector agencies to use e-procurement for improving operational efficiency (Sharma et al., 2023).

**Barriers to E-Procurement Implementation**. Barriers to E-procurement adoption Based on literature review, it could be inferred that resistance to E- procurement adoption can be classified as organizational and systemic barriers. Lack of Coordination and Communication Lack of coordination and communication leads to isolated and not cohesive procurement strategy (Rao et al., 2023). Resistance to change with bureaucratic structures hinders the digital transformation (Gunasekaran & Ngai, 2008).

Understanding the nature and extent of these deficits is of the essence, since procurement officers are frequently not trained in intricate e-procurement systems (Patel et al., 2022). Lack of vendor involvment and less training in digital procuring limits digital procurement effectiveness (Mishra & Singh, 2015).

Regulatory roadblocks stand in the way; policy ambiguities lead to ambiguity and non-compliance (Das & Roy, 2023). The cumbersome nature of the Indian public procurement laws is a disincentive for the private sector to adopt and the government must expend a great deal of resources in policy clarification and integration (Kumar & Bhanumurthy, 2008).

## 2.3 Impact Assessment of E-Procurement Systems

The advent of E-procurement has transformed public procurement by enhancing efficiency, transparency and vendor participation. Not the least of which is significantly lower costs, faster lead times and stronger stakeholder trust. But issues such as service quality and digital inclusion persist, so there's still some way to go.

**Efficiency and Transparency**. E-procurement platforms proved to be efficient in the running purchasing processes generating considerable savings and more transparency. "E Market place": The procedural bottlenecks involved have been eased due to platforms like Government e-Market Place (GeM), leading to time-saving and increased accountability. Despite these advancements, the quality of service is still an issue as gaps in system performance and user satisfaction have been observed (Singh et al., 2022). Further, while the lead time has been largely minimised, deeper links with department systems are important to be able to fully tap its potential (Verma et al., 2023).

**Vendor Engagement**. Digitalization of procurement processes has transformed the relationship with vendors, leading to trust and enhanced participation. By providing a standardized, transparent platform, e-procurement has increased vendor confidence and satisfaction (Patil & Verma, 2022). On the contrary, there are accessibility challenges for rural and small-scale sellers, as it has been found that they have poor digital literacy and infrastructure, which suggests the need for a targeted capacity-building program (Jain & Gupta, 2023). To address these disparities, we must achieve equal participation and a stronger vendor base.

**Technological Integration**. Technology has aided in upgrading e-procurement solutions in the new millennium to enhance their performance in security and efficiency. Predictive analysis has been advanced by artificial intelligence (Artificial Intelligence) to assist in forecasting demand and decision-making (Gupta & Das, 2023). Similarly, tracking transactions, securing information, and reducing cases of fraud have improved due to blockchain technology, which is equipped with account tracking, rewards, and transaction services (Mukherjee, 2024). These developments have increased the confidence among participants, facilitating the creation of secure and scalable procurement frameworks (Sánchez et al., 2020).

### 2.4 Technological Innovations in E-Procurement

This next-level integration of state-of-the-art technologies like AI, blockchain and machine learning has completely transformed e-procurement systems, making them more effective, transparent, and environment-friendly. These advances confront the major problems associated with public purchasing, resulting in increased dynamism and adaptability of the procurement system

**Artificial Intelligence and Machine Learning**. Procurement analytics and decision-making are being revolutionized by AI and machine learning. The predictive analytics driven by AI streamlines the forecasting of procurement and leads to more efficient demand governance and risk control (Patel & Roy, 2023). The implementation of robotic process automation (RPA) within e-procurement systems also allows for auto-

mating routine tasks, thereby decreasing manual errors and enhancing the system's efficiency (Lacity & Willcocks, 2018). It's advances like these that provide procurement teams with the data-driven insight they need to simplify complex decision-making.

**Blockchain Technology**. Elicit's global vision on Blockchain technology has become a symbol of transparency and accountability in e-procurement. Blockchain enhances accountability throughout the procurement stages by providing unchangeable records and improved traceability (Sánchez et al., 2020). Its use guarantees secure transactions and reduces the risk of fraud and data manipulation, which instills confidence in the stakeholders.

**Digital Transformation and Sustainability**. The Central Public Procurement Portal (CPPP) and the Government e-Marketplace or GeM are such online platforms for procurement, which are a few of the success stories of digital transformation in Indian PSUs (Singh & Verma, 2022). They help simplify the procurement process, decrease lead times and increase supplier involvement. In addition, the implementation of e-procurement reduces environmental pollution due to lower paper work and global initiatives for conserving environment by the procurement organization (Reddy & Iyer, 2024).

**Compliance and Governance**. The e-procurement has also enhanced the compliance and governance in public procurement system. E-procurement, through automated processes and centralized control, ensures that the regulations are followed, as well as, resulting in a lower opportunity for corruption (Baily et al., 2015). These aspects serve to build confidence in, and reliance on, the procurement process, towards honesty and transparency.

### 2.5 Theoretical Frameworks in E-Procurement

Qualitative research methodologies are popular in e-procurement studies, simplifying the explanation of complex procurement. Yin (2003) offers valuable insights on qualitative case study research for e-procurement. The HLT method characterizes practical situations and contexts with real-world cases, aiding researchers in analyzing public procurement systems and establishing a strong foundation for data collection and analysis. Similarly, Patton (2002) emphasizes exploration-induction techniques, which can support theory construction in e-procurement. These approaches enhance understanding of factors influencing adoption, allowing for the extraction of patterns and emergent theories from actual data.

### 2.6 Indian Context and E-Procurement Frameworks

Researchers in India have studied the contribution of e-governance to e-procurement. Sahu and Aggarwal (2023) summarised governance reforms improving transparency, efficiency and accountability in PSUs. Gupta and Das (2023) investigated the effect of AI on speed and decision-making in procurement. Mukherjee (2024) highlighted the ability of blockchain to enhance vendor trust and reduce fraud.

Chopra and Meindl (2019), explained relationship of e-procurement and supply chain management in terms of the objective in cost reduction and efficiency. Other studies by Dutta and Singh (2022) and Prasad and Narayan (2023) tackled interoperability issues and the positive role played by platforms such as GeM in elevating vendors' participation and reducing procurement cycles. These frameworks aid in clarifying

### 2.7 Conclusion

The theories and methodologies in the review establish a sound basis for the study of e-purchasing practices. By the inclusion of case study methods, qualitative research strategies, and the application of AI and blockchain technologies, these frameworks provide an important contribution on the transformation potentials of e-procurement. In the Indian context, with distinct challenges and progress made towards digital procurement platforms, greater appreciation of these theoretical constructs is imperative for sustained research in public procurement systems. Table; 1: Review of Literature 1.

**Table 1.** Literature Summary

| Section | Key Themes Explored | Example Literature | Indian Context | PSU Context | Technological Integration | Impact Assessment | Future Directions |
|---|---|---|---|---|---|---|---|
| Historical Context and Evolution | Evolution of global procurement practices; introduction of digital tools post-2000s; regulatory | Croom & Johnston (2003); Arrowsmith (2019). | Mention of early Indian initiatives like DGS&D manual processes transitioning to digital | Limited early involvement due to lack of digital infrastructure in PSUs. | Not applicable. | Early impacts included reducing procedural delays but lacked substantial tech integration. | Emphasis on aligning historical learnings with modern, scalable e-procurement solutions. |

| Section | Key Themes Explored | Example Literature | Indian Context | PSU Context | Technological Integration | Impact Assessment | Future Directions |
|---|---|---|---|---|---|---|---|
| | milestones. | | frameworks. | | | | |
| Drivers | Leadership commitment, IT readiness, policy mandates, cost efficiency, and global competitiveness. | Gupta et al. (2023); Mishra & Roy (2022). | Significant drivers: GeM and CPPP initiatives, Digital India program. | Example: Adoption in ONGC and BHEL for large-scale efficiency improvements. | Policy-driven integration of platforms like CPPP,GEM in PSUs. | Cost reductions, cycle time reductions, transparency improvements highlighted. | Need for stronger incentives for PSU-level adoption and further IT advancements. |
| Barriers | Resistance to change, lack of skills, infrastructure gaps, vendor hesitance, cybersecurity risks. | Banerjee (2023); Agarwal et al. (2021). | Rural connectivity and digital literacy challenges. | Skill gaps prevalent in PSU procurement staff; slow onboarding for suppliers. | Cybersecurity and interoperability concerns raised during PSU implementations. | Limitations in early-stage adoption due to barriers remained a challenge. | Addressing vendor onboarding, digital literacy, and cybersecurity concerns in a structured way. |
| Technological Advancements | Introduction of AI, blockchain, predictive analytics, | Sharma et al. (2023); Kumar et al. (2023). | India-specific platforms like GeM | GeM saw varied adoption rates across PSUs | Predictive analytics and blockchain have been piloted in advanced In PSU | Major efficiency improvements through analytics | Increased research in blockchain, AI, and IoT integration |

| Section | Key Themes Explored | Example Literature | Indian Context | PSU Context | Technological Integration | Impact Assessment | Future Directions |
|---|---|---|---|---|---|---|---|
| | GeM, CPPP, and IoT tools. | | showcasing technological potential but requiring enhanced adoption. | depending on readiness. | | for supplier evaluations. | in procurement. |
| Indian Context | GeM, CPPP, e-GP initiatives, Digital India policy impacts. | Gupta et al. (2024); Verma et al. (2022). | Comprehensive adoption across sectors but uneven readiness between central and state entities. | PSU-specific success stories like enhanced transparency at BHEL and IOCL. | CPPP provided a unified platform for some PSUs but lacked full feature adoption. | System transparency led to cost savings and reduced procurement timelines. | Full integration of AI/ML technologies for procurement optimization. |
| Context to PSUs | Focus on PSU-specific adoption rates, challenges, and outcomes. | Banerjee (2023); Verma et al. (2022). | Often aligned with broader government goals but sometimes slower due to legacy system dependencies. | Examples include NMDC and SAIL with varying levels of adoption readiness. | More PSUs are experimenting with AI-driven procurement. | Measured success stories but often marred by system interoperability challenges. | Building PSU-specific frameworks for effective and scalable e-procurement systems. |

| Section | Key Themes Explored | Example Literature | Indian Context | PSU Context | Technological Integration | Impact Assessment | Future Directions |
|---|---|---|---|---|---|---|---|
| Post-Impact Assessment | Transparency, cost-effectiveness, supplier satisfaction, and lead-time reductions. | Verma et al. (2022); Sharma et al. (2023). | Improved overall trust in public procurement processes. | Highlighted successful cost savings and accountability improvements in PSUs. | Implementation gaps in capturing end-to-end benefits. | Reports of supplier satisfaction, though vendor onboarding still faced delays. | Further reforms needed to ensure equity and robust outcome tracking mechanisms. |
| Future Directions | AI, blockchain, capacity building, sustainability, interoperability, and regional inclusion. | Sharma et al. (2023); Gupta et al. (2024). | Policy reforms aimed at bridging rural-urban gaps in e-procurement adoption. | PSUs need targeted policies for scaling e-procurement across departments. | Integration with real-time monitoring and analytics for procurement processes. | Focus on sustainable procurement aligned with ESG goals. | Advanced capacity-building programs and global benchmarking of practices for Indian PSUs. |

Source: Author's Elaboration

Key Features of the Table:
Cross-referencing: Each row combines themes with specific literary examples, relating to relevant contexts such as PSUs, technological developments, and future trajectories

## 2.8 Key Findings from Literature Review

The literature on e-procurement systems, particularly in Indian Public Sector Undertakings (PSUs), underscores the evolving role of digital technologies in enhancing efficiency, transparency, and cost optimization. Key insights include:

**Drivers of E-Procurement Adoption**. The adoption of digital procurement platforms such as GeM and CPPP has been strongly influenced by two key factors: effective leadership and a robust technological foundation. When senior management shows a solid commitment to innovation and the digital infrastructure is both capable and adaptive, the shift to e-procurement becomes much more efficient.

Government-backed schemes, such as the Digital India programme, are also key facilitators. These policies Not Only call for a shift towards the undertaking of E-procurement, but also demonstrate the benefits of cost saving and improvement of administrative procedures, making the transition appealing to public bodies.

There is a distinct inclination among India's PSEs to benchmark their procurement with the global best practices. In this context, digitization is increasingly seen not merely as an onerous compliance task, but as a strategic lever to improve organizational performance and international positioning

**Barriers to Effective Implementation**. There are various hurdles that restrict the smooth implementation of digital procurement in Indian PSUs, even though there is a growing focus towards digital procurement. One of the main barriers is the enduring digital skills shortage in procurement. The lack of exposure and access to systematic capacity-building programs has rendered many officers under-prepared to effectively use and maneuver the advanced e-procurement systems.

In addition, regulatory hurdles and resistance from vendors serve as additional barriers the to wider uptake. Current procurement rules are often not well-suited to facilitate the digital processes, even as small suppliers, especially from rural and semi-urban areas, are still reluctant to move to the digital platforms on account of perceived complexities or lack of support infrastructure.

Another issue is cybersecurity and inter operability. Many enterprises still struggle with various weaknesses in data security and with a lack of interoperability between e-procurement solutions and internal enterprise systems that creates operational challenges. Together, these technological and structural problems impede effective implementation and long-term usage of e-procurement across the public sector.

**Technological Innovations**. Despite the enormous potential of technology in public procurement, its use in Indian PSUs is patchy and not very well-developed. Innovations like AI, blockchain, predictive analytics are revolutionizing procurement, driving more transparency, minimizing human intervention, and empowering procurement leaders to make more data-driven decisions. But these are yet in their formative stage of infancy in most of the public sector undertakings and utilities, they are not able to realise the advantage and strategic value of SCADA/HMI in them.

One reason for such underutilization can be attributed to the variability of impartation of digital adoption programs across enterprises. There is wide variation in the manner in which GeM and CPPP are implemented, in terms of both scope and depth. Even though some PSUs have made strides in deeper digital integration, a handful of them seem to be using fragmented or siloed systems, or partially digitized ones, which in turn result in differences in performance and the outcomes. This lack of consistency

creates a barrier to the kind of universal upgrade we'd like to achieve through technology advancements.

**Impacts on Procurement Outcomes**. E-procurement systems greatly enhance procurement practices, particularly in transparency and accountability. Digital spreadsheets increase transaction transparency, fostering greater integrity in public procurement systems.

These forums have reduced costs and procurement cycle times. Automation of workflow and digital documents decreased manual lag. However, poor platform operations and inconsistent service quality still limit the full potential of these benefits.

Vendors are generally more satisfied due to better access and visibility in the procurement process. However, challenges persist in bringing vendors online and involving stakeholders for qualitative improvements. These factors indicate that while procurement outcomes have progressed, further efforts are needed for equitable results.

**Post-Adoption Challenges** Post-implementation, a number of issues still impact on the proper operation of e-procurement systems. Further inefficiencies arise due to vagueness in policy interpretation and lack of coordination among stakeholders.

Quality of service on market platforms such as GeM continues to be uneven, and users experience minimal support and delayed problem resolution, which impacts long-term confidence in the system.

Another challenge is scalability – there are different levels of digital readiness across PSU departments which is impeding homogeneous adoption. Filling these gaps will require targeted and contextualized interventions

**Future Directions**. The next phase of the e-procurement project in Indian PSUs should emphasize sustainability and capacity building. Incorporating Environmental, Social, and Governance (ESG) principles in procurement would allow public sector operations to support global sustainability and promote responsible sourcing.

Any new improvements should also place a greater emphasis on technological immersion. Real-time monitoring tools and advanced analytics will facilitate more agile data-driven decision making, resulting in greater transparency and efficiency throughout the procurement cycle.

More flexible and inclusive policy formulations are also necessary. Reform of urban and rural procurement practices need to be accompanied by measures to bridge the digital gap and support outlet level adoption models that are scalable across the varied operating environments of public sector entities.

## 2.9 Constructs and Gap Assessment

### Drivers of Adoption

*Key Findings:*

. Strong leadership, a well-connected ICT base and greater transparency are some of the key enablers of e-procurement adoption among PSUs. All these factors combine to make for a more seamless rollout with higher confidence from the

*Identified Gap:*

. However, little is known about how these drivers impact long-term organizational change and how they enable adaptive power in dynamic purchasing settings.

**Barriers to Adoption**

. *Key Findings:*

. In Public Sector Organisations, such as PSUs, the adoption of E-procurement is impeded by poor digital capability of the procurers, complex regulatory demands and resistance from the supplier community, more particularly in less digital India.

*Identified Gap:*

. The literature has only a modest focus on the strategies an organization applies to circumvent these barriers during implementation and post-adoption.

**Technological Innovations**

*Key Findings:*

. The future for procurement: New sources of value and supply chain flexibility Technology applications are accelerating the pace of purchase payment by weeks. However, their application among Indian PSUs is not consistent and is piecemeal.

*Identified Gap:*

. Little work has been done gathering detailed case studies of how organizational context and internal politics shapes the adoption of these new technologies in public service provision.

**Platform Efficiency**

. *Key Findings:*

. The push for transparency and savings is evident in the development of the Government e-marketplace (GeM) and the Central Public Procurement Portal (CPPP). However, issues in onboarding vendors, service responsiveness, and turnaround time persist.

*Identified Gap:.*

Empirical research on how these operational inefficiencies affect decision-making at the organisational level, procurement performance, and longer-term sustainability for digital adoption is underdeveloped.

**Outcome Measures**

. *Key Findings:*

. E-procurement initiatives have led to measurable gains in transparency, accountability, and cost efficiency across public sector procurement processes, supporting improved governance.

*Identified Gap:*

. There remains a lack of in-depth qualitative analysis on stakeholder experiences and satisfaction. Limited attention has been given to how users perceive these changes and their broader social implications.

**Post-Adoption Challenges**

. *Key Findings:*

. Persistent coordination gaps, ambiguous policy interpretation, and inconsistent service quality on procurement platforms continue to obstruct the sustained effectiveness of e-procurement systems.

*Identified Gap:*

. Existing literature offers limited insights into the operational and strategic difficulties organizations encounter after adoption, particularly in addressing ongoing systemic and process-related inefficiencies.

**Policy Frameworks**

. *Key Findings:*

Regulatory complexity and inflexible policy structures often act as barriers to the smooth adoption and scalable implementation of e-procurement systems within Indian PSUs.

*Identified Gap:*

. There is a lack of focused research examining how policy frameworks directly impact the effectiveness and efficiency of e-procurement adoption across varied public sector contexts.

**Why Inductive Case Study is Required**

. The identified research gaps highlight the importance of exploring the post-adoption impacts, organizational factors, and stakeholder experiences with e-procurement systems. An inductive case study is ideal for this investigation due to the following reasons:

*Understanding Complexity:*

. E-procurement involves the interplay of technology, policy, and human behavior. Inductive case studies allow for an in-depth exploration of these interlinked elements within real organizational settings.

*Contextual Relevance:*

. Outcomes and challenges differ across PSUs and regulatory frameworks. A qualitative lens helps uncover context-specific insights often missed by generalized approaches.

*Addressing Research Gaps:*

. This method shifts attention from initial adoption to post-adoption realities, highlighting operational challenges and user experiences that remain underexplored.

*Theoretical Contribution:*

. The findings can be used to create locally relevant frameworks, grounded in context, for Indian public procurement.

*Practical Utility:*

. Evidence-based findings may assist officials and decision-makers to enhance e-procurement strategies, ensuring efficiency, visibility, and user satisfaction.

Following accepted procedures (Yin, 2018; Eisenhardt, 1989), our research will investigate two Indian PSUs (anonymized) to maintain confidentiality but provide rich, easily actionable findings.

Using an inductive exploratory case study, the research will analyze real-world practices to uncover the following:

- The role of technological advancements in enhancing efficiency.
- Barriers and enablers affecting e-procurement adoption.
- Stakeholder perspectives and their influence on outcomes.

This study addresses gaps and proposes a framework for e-procurement practices in Indian PSUs through interviews, focus groups, and surveys. . It seeks to offer evidence-based strategies for policymakers, procurement professionals, and technology providers.

It utilizes an inductive case theory method, seeking evidence in the literature for theory building and key constructs identification. Incorporating earlier research findings retains its theoretical basis while revealing context-specific insights. This approach enables comprehensive e-procurement analysis and offers a foundation for future studies to quantitatively verify results, improving generalization and application of the conceptual framework. This blend of inductive reasoning and guided constructs provides robust insights into e-procurement's potential for enhancing value, transparency, and innovation in the public sector.

# 3 Context of the Study: Company Profiles and Rationale for Selection

## 3.1 Context of the Study

Public procurement represents 15-20% of GDP in many nations, significantly promoting economic growth in developing countries like India. It enhances fiscal transparency, resource allocation, and infrastructure (OECD, 2022; World Bank, 2021). Government bodies and public sector undertakings (PSUs) manage substantial procurement budgets. Improved practices like e-procurement can increase efficiency, reduce corruption, and lower costs (Hussain et al 2023). This study uses an inductive case study approach to investigate e-procurement in two confidential PSUs in metals and mining. PSU1, founded in 1973, boosted procurement via the Government e-Marketplace (GeM) from ₹2.7 crore in FY 2018-19 to over ₹10,000 crore in FY 2021-22, with FY 2022-23 already exceeding the previous year. PSU2, established in 1981, specializes in the aluminum value chain, planning a capital expenditure of ₹1,997.55 crores for FY

2023-24, with 99% through GeM, showcasing its commitment to digital transformation (company website, 2023). The organization utilizes cloud-based procurement and invoice management via platforms like SAP SRM and the Central Public Procurement Portal (CPPP) for efficiency (National Aluminium Company Limited, 2023).

### 3.2 Rationale for Selection of psu1 and psu2

PSU1's procurement indicates that e-procurement enhances transparency, reduces costs, and boosts efficiency. This study examines PSU1's practices, strategies, challenges, and results. PSU2, chosen for its large-scale operations and leadership in e-procurement, uses platforms like GeM and blockchain to demonstrate innovation. PSU2's successes establish it as an ideal case for analyzing e-procurement's impact on the public sector. For confidentiality, it is called PSU2 throughout the study.

## 4 Research Methodology

### 4.1 Research Design

This study develops a comprehensive framework of variables—independent, dependent, mediating, and moderating strategies to improve e-procurement efficiency in Indian PSUs. An exploratory, inductive approach was adopted, centering on two major PSUs (PSU 1 and PSU 2) in India, where e-procurement accounts for approximately 99% of procurement processes.

A multiple case study methodology was used for theory-building through inductive reasoning. This approach enabled comparison of cases with similar characteristics, allowing deeper insights and analysis (Yin, 2003). Both PSUs were chosen from the metals and mining sector for a meaningful comparison.

Data was collected from both primary and secondary sources to ensure the validity and reliability of findings. Primary data was gathered through questionnaire-based interviews, while secondary data comprised corporate resources, including websites, reports, presentations, and related documentation (Patton, 2002).

### 4.2 Data Collection and Questionnaire Administration Phase

Primary data collection included interviews, workshops, and questionnaires (Appendix A). Workshops refined research constructs from the literature review and identified independent variables, providing insights into e-procurement practices in selected PSUs. Questionnaires were emailed to target participants, followed by in-depth interviews to clarify responses. The sample comprised 20 participants, split evenly between two PSUs, with 40% senior executives and 60% mid-level executives, all having over 15 years of experience in PSUs and involvement in e-procurement.

Interviews were recorded, transcribed, and shared with participants for validation. Most approved their transcripts, with some suggesting revisions. The questionnaire used in the study is in Appendix A, and sample characteristics are in Table 2.

**Table 2.** Sample Characteristics

| Participant No. | PSU | Role | Level | Experience (Years) |
|---|---|---|---|---|
| P1-1 | PSU 1 | Procurement Officer | Senior Executive | 20 |
| P1-2 | PSU 1 | Procurement Officer | Senior Executive | 18 |
| P1-3 | PSU 1 | Procurement Officer | Middle Executive | 16 |
| P1-4 | PSU 1 | Procurement Officer | Middle Executive | 17 |
| P1-5 | PSU 1 | Procurement Officer | Middle Executive | 15 |
| P1-6 | PSU 1 | Requisitioner | Senior Executive | 19 |
| P1-7 | PSU 1 | Requisitioner | Middle Executive | 16 |
| P1-8 | PSU 1 | Requisitioner | Middle Executive | 15 |
| P1-9 | PSU 1 | Requisitioner | Middle Executive | 18 |
| P1-10 | PSU 1 | Accounts Officer | Middle Executive | 16 |
| P2-1 | PSU 2 | Procurement Officer | Senior Executive | 21 |
| P2-2 | PSU 2 | Procurement Officer | Senior Executive | 20 |
| P2-3 | PSU 2 | Procurement Officer | Middle Executive | 17 |
| P2-4 | PSU 2 | Procurement Officer | Middle Executive | 16 |
| P2-5 | PSU 2 | Procurement Officer | Middle Executive | 15 |
| P2-6 | PSU 2 | Requisitioner | Senior Executive | 19 |
| P2-7 | PSU 2 | Requisitioner | Middle Executive | 16 |

| Participant No. | PSU | Role | Level | Experience (Years) |
|---|---|---|---|---|
| P2-8 | PSU 2 | Requisitioner | Middle Executive | 15 |
| P2-9 | PSU 2 | Requisitioner | Middle Executive | 17 |
| P2-10 | PSU 2 | Accounts Officer | Middle Executive | 16 |

Source: Authors' data

### 4.3 Data Analysis Phase

**Methodological Approach**

. The analysis employed an inductive exploratory case study methodology with semi-structured interviews of procurement officers, requisitioners, and account officers from two Indian PSUs, aligning with contemporary qualitative research methods like Grounded Theory (Charmaz, 2014) and case-based theory building (Yin, 2018).

Primary data collection utilized open-ended questions to encourage detailed responses. Data analysis was performed iteratively using three coding stages:

*Coding Stages*

. 1. Open Coding

Initial interview data was categorized into themes like "resistance to change" and "training gaps" as barriers, and "policy reforms" as drivers (Charmaz, 2014).

2. Axial Coding

Relationships between categories were identified, such as linking "technology integration" with improved "platform efficiency," and connecting "stakeholder coordination" with enhanced "transparency."(Strauss & Corbin, 2015)

3. Selective Coding

Core themes and variables were refined, eliminating irrelevant codes to focus on key constructs for the final framework (Yin, 2018). Findings from the two case studies converged, supporting the development of a preliminary framework for e-procurement practices in Indian PSUs.

**Thematic Categories and Emerging Patterns**

. Using constant comparison techniques (Glaser & Strauss, 2017), the following key findings emerged:

*1. Drivers of E-Procurement Adoption.*: Technology integration, leadership support, and policy reforms.

*2. Barriers to Implementation: Resistance to change:* lack of technical expertise, and inadequate IT infrastructure.

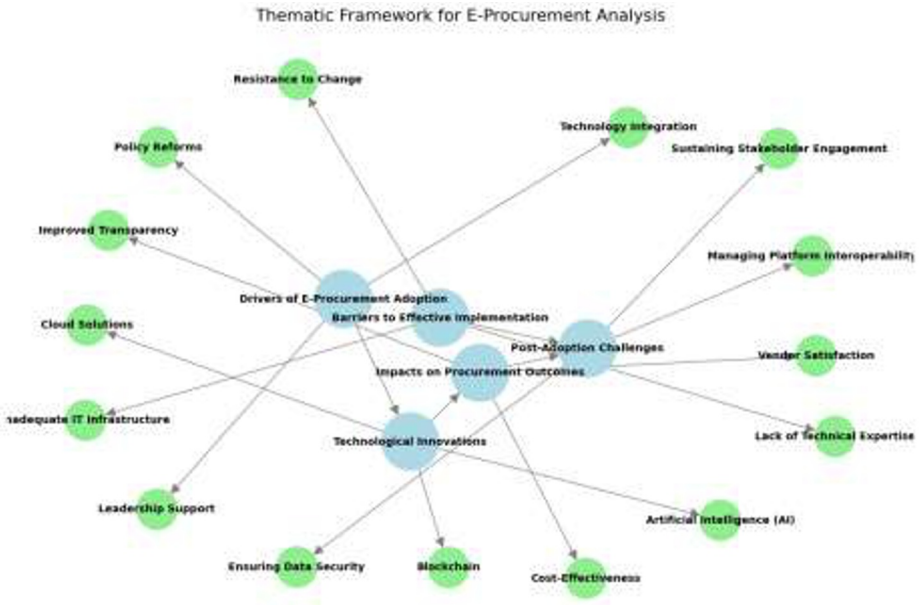
*3. Technological Innovation:* Blockchain, AI, and Cloud Solutions were critical for efficiency and transparency.

4. *Impacts on Procurement.*: Improved transparency, cost-effectiveness, and vendor satisfaction.

*5. Post-Adoption Challenges:* Sustaining stakeholder engagement, data security, and platform interoperability.

After data cleaning, we grouped the refined information into main constructs as depicted in Figure 1.

**Fig. 1.** Framework Model Elaboration




Source: Author

*Model Description*

. Nodes: Represent themes (large nodes) and their corresponding variables (smaller nodes).

Edges: Show the relationship between themes and variables or between interconnected themes.

Visualization: Colors distinguish themes from variables, and layout ensures clarity.

*Model Insights*

. Drivers and Innovations: Adoption drivers (e.g., leadership support) facilitate the introduction of disruptive technologies (e.g., blockchain).

Innovations and Outcomes: From technical interventions to concrete procurement-related outcomes such as transparency and value for money.

Barriers and Challenges: It is also likely to have barriers, including gaps in the expertise to design or use a model and to have challenges after adoption like interoperability across platforms.

# 5 Findings and Discussion of Results

## 5.1 Theme 1: Adoption of E-Procurement

**Adoption Process**

*. Platforms and Transition:*

The movement of PSU-1 from Metal Junction (MJ) to the Government e-Marketplace (GeM) demonstrates incremental adoption. While MJ addressed specific industry needs, transitioning to GeM aligns strategically with government procurement requirements for centralized buying. This shift highlights the challenges of replacing custom-built systems with a standardized, state-led platform.

Similarly, PSU-2 gradually implemented an in-house SAP SRM system to expand its reach. By allowing both vendors and internal users time to adjust, the company minimized resistance and maintained smooth operations.

*Analysis:*

These cases illustrate how public sector units manage the transition to mandated e-procurement systems through gradual adaptation strategies. Such approaches help mitigate risks typically associated with large-scale IT transformations, ensuring stability during periods of structural change. Operational disruptions linked to large IT project transformations.

*. Impact on Procurement Operations.*

The implementation of e-procurement in PSU-1 has led to notable improvements in operational efficiency. Processes have become faster, human errors have declined, and transaction accuracy has improved. Enhanced transparency has also increased vendor accountability by enforcing standardized workflows.

PSU-2's system demonstrates similar gains, particularly in cost control, policy enforcement, and supplier engagement. Built-in compliance mechanisms and automated workflows have lowered error rates while improving vendor communication. The system's alignment with e-governance principles contributes to smoother operations and reduces administrative burden.

*Analysis:*

Both instances demonstrate quantifiable improvements in efficiency, accuracy, and procedural transparency—key advantages validating the transition to e-procurement. Notably, PSU-2 underscores the comfort users feel when routine tasks are automated, indicating that system usability and user satisfaction are essential for sustained success.

**Challenges in Adoption**

Participants in PSU-1 identified major barriers including resistance to change and technical barriers of, for example, unstable network link. These issues and more highlight the necessity to be in a constant state of training and upgrading infrastructure in order for your system to be ready for adoption. And in PSU-2, there were concerns about the quality and readiness of new vendors. Respondents also indicated the importance of hiring a younger, digital-savvy procurement staff to keep pace with new technological requirements.

*Analysis:*

. These findings reinforce the crucial role of structured change management and targeted capacity-building initiatives in promoting smooth and sustainable e-procurement adoption across public sector organizations.

### 5.2 Theme 2: Technological Innovations

**Technology Integration**

. In PSU-1, the SAP Modules efficiently simplify procurement and maintain data. While AI, blockchain, and other advanced technologies remain distant dreams, they can only be realized once the SAP infrastructure is established. The current SAP setup lays a solid foundation for future integration.

PSU-2 respondents noted the growing use of AI and blockchain for real-time alerts, analytics, and supply chain visibility. The organization is integrating its ERP with GeM and adopting new technologies to enhance operational efficiency.

*Analysis:*

. These cases reflect a gradual shift, but a clear movement towards the inclusion of high technology in PSUs. Current ERP systems lay the structural foundation for the integration of AI and big data tools that facilitate the larger mission of procurement modernization.

**Influence on Transparency**

. PSU-1 and PSU-2 noted improved transparency due to reduced manual processing and increased vendor availability. Digitisation allows auditors to monitor procurement information, enhancing traceability and accountability. Hard-coded policies minimize errors and maintain vendor integrity consistency.

*Analysis:*

. These results also lend credence to the Digital India kind of initiatives of the nation that promote transparency and accountability in public procurement.

**Future Trends**

*. Predicted Developments.:*

What do respondents foresee that could enhance process efficiency and reduce fraud? AI- and ML-driven automation, along with blockchain for smart contracts, as chosen by the respondents. Big data and ML are anticipated to aid in understanding supplier behavior for smarter buying decisions through predictive analytics.

PSU-2 assumes that these tools will streamline processes even more, through task automation, real-time inventory tracking, and reduction of errors in tracking vendors and managing contracts.

*Analysis:*

This contribution discusses the main areas of e-procurement where technological developments can improve predictive abilities and automate processes.

### 5.3 Theme 3: Drivers of E-Procurement

**Influence of Government Policies**

Respondents in PSU-1 observed that national projects such as Digital India act as a major driver to eProcurement and mandate compliance at the centre.

PSU-2 emphasized the importance of service consolidation by entities like the CVC and DoE in anchoring e-procurement within regulation, thus influencing buying behavior.

*Analysis:*

. These responses underscore how policy measures drive adoption, as PSUs adapt operations to dynamic government norms.

**Leadership Role**

*Top-Driven Initiatives:*

. Leadership plays a key role in PSU-1 and PSU-2, influencing e-procurement adoption. It is organized to focus, fund, and align strategically. In PSU-2, top management integrated e-procurement goals with overall directives, encouraged a bottom-up approach, and conducted workshops to enhance transparency and compliance with guidelines.

*Analysis:*

. These results confirm earlier theories that identify executive sponsorship as being crucial for sustainable, enterprise-wide digital transformation.

**Regulatory Frameworks.**

*Supportive Adaptation:*
. It was noted by PSU-1 that continued regulatory changes have positively influenced the e-procurement, by not complicating it. PSU-2 said that while the amended procurement rules are advantageous, some of them are not clear, like those under the 'Make in India' clause in the General Financial Rules (GFR), and reduce flexibility particularly in high-value procurement.

*Analysis:*
. Regulatory flexibility can support digital uptake, but unresolved policy ambiguities may also limit the ability to respond in a nimbly fashion, required of complex procurement.

### 5.4 Theme 4: Barriers to E-Procurement

**Primary Barriers.**
Financial and Infrastructure Challenges: Financial constraints and lack of infrastructure were perceived as major barriers by both PSUs. Nevertheless, such problems were described as transitional, and PSUs were developing their response to them incrementally

*Implications:* This indicates that although constraints exist, PSUs are able to progressively lift them, indicating an evolutionary process of securing a stable procurement system.

**Resistance to Change**
. *Cultural Challenges:* Both PSUs faced resistance to change, hindering rapid implementation but enabling sustainable adaptations. This highlights a preference for gradual changes that minimize disruption during the transition.

*Analysis* This resistance highlights a preference for incremental changes, which enable better adaptation and minimize disruption during the transition.

**Skilled Personnel Shortages**
*Training Initiatives:* Both PSUs face skill gaps, which they address by investing in multi-skill training programs and utilizing external resources to enhance their internal capabilities.

*Analysis.*: Investing in skill development is crucial for maintaining the efficiency of e-procurement systems and leveraging advanced technologies effectively.

### 5.5 Impacts on Procurement Outcomes

*Efficiency and Cost-Effectiveness:* Both PSUs reported measurable improvements in procurement lead times, transparency, and cost-effectiveness. The reduced manpower requirements indicate that resources have been reallocated more efficiently.

*Analysis:* These findings align with the primary objectives of e-procurement systems, indicating that adoption leads to enhanced operational efficiency.

### 5.6 Post-Adoption Challenges

*Service Quality Concerns:* Respondents from PSUs reported limitations in platform service quality, particularly on GeM, which have impacted procurement timelines and vendor interaction. Concerns about data security were also highlighted.

*Policy Ambiguities and Oversight:* PSU-2 noted conflicts arising from varied interpretations of procurement regulations and recommended the creation of an independent oversight body to address such inconsistencies.

**Summary:**

. Persistent issues with service quality, data protection, and regulatory clarity remain significant. Establishing an autonomous oversight mechanism may help resolve disputes and reinforce procurement transparency. A summary of these findings is presented in Table 3.

**Table 3.** Summary of the Result discussions

| Theme | PSU-1 | PSU-2 |
|---|---|---|
| 1. Drivers of E-Procurement Adoption | Technology Integration: Adoption of GeM for compliance, transitioning from specialized systems (Metal Junction) to a broader government system. Leadership Support: Top-down adoption strategy ensuring compliance with government mandates. Policy Reforms: Digital India policies played a key role in shaping e-procurement. | Technology Integration: Integration of ERP systems with GeM to leverage emerging technologies like AI and blockchain. Leadership Support: Senior management prioritized e-procurement and conducted workshops for adoption. Policy Reforms: Digital India and CVC guidelines embedded in procurement strategies. |
| 2. Barriers to Effective Implementation | Resistance to Change: Initial resistance to the transition, technical issues, and infrastructure upgrades. Lack of Technical Expertise: Training initiatives required to overcome gaps. Inadequate IT Infrastructure: Challenges with system stability due to network and infrastructure issues. | Resistance to Change: Similar resistance faced during the adoption phase. Lack of Technical Expertise: Skill gaps addressed through training programs. Inadequate IT Infrastructure: Infrastructure issues were prevalent but seen as temporary. |

| Theme | PSU-1 | PSU-2 |
|---|---|---|
| 3. Technological Innovations | Blockchain and AI: Not extensively integrated yet but identified as potential future enablers. Cloud Solutions: SAP system integration for data management and procurement automation. Future Innovations: Advanced technologies (AI, blockchain) expected to improve procurement. | Blockchain and AI: Actively integrating AI and blockchain for predictive analytics and process automation. Cloud Solutions: ERP system integration with GeM, enhancing transparency and efficiency. Future Innovations: ML and Big Data for supply chain insights, predictive analytics, and contract management. |
| 4. Impacts on Procurement Outcomes | Transparency: Enhanced transparency through reduced procurement lead times and minimized human errors. Cost-effectiveness: System enabled better resource allocation and efficiency. Vendor Satisfaction: Increased vendor accountability through standardized workflows. | Transparency: Streamlined procurement process, more transparency, reduced errors, and improved vendor communication. Cost-effectiveness: Simplified procedures and lower costs due to automation. Vendor Satisfaction: Improved vendor relations through system-driven policies. |
| 5. Post-Adoption Challenges | Sustaining Stakeholder Engagement: Concern about vendor engagement with the platform's quality, leading to delays. Data Security: Emphasized the importance of ensuring secure data exchange. Platform Interoperability: Issues with integration and service quality affecting operations. | Sustaining Stakeholder Engagement: Ongoing challenges with vendor engagement and platform service quality. Data Security: Maintaining data security and ensuring privacy remained crucial. Platform Interoperability: Ambiguities in policy affecting flexibility, particularly with high-value procurements. |

Source, Investigated from Authors' discussion.

### 5.7 Analysis:

**Drivers of E-Procurement Adoption:**

. Both PSUs highlighted leadership commitment and supportive policies—like Digital India and CVC directives—as key enablers. PSU-1 is exploring emerging technologies, while PSU-2 is integrating AI and blockchain into its procurement systems.

**Barriers to Effective Implementation:**
. Resistance to change, skill deficits, and infrastructure limitations were common to both PSUs, though perceived as transitional. To overcome these issues, each organization prioritized ongoing training and incremental infrastructure improvements.

**Technological Innovations:**
. PSU-2 has progressed further in aligning AI, blockchain, and ERP systems with platforms like GeM. PSU-1, meanwhile, is still focused on building foundational capabilities through its SAP-based framework and has not yet adopted advanced technologies.

**Impacts on Procurement Outcomes:**
. Improved transparency and cost efficiency were reported by both PSUs. PSU-2 also noted strengthened vendor engagement, while PSU-1 emphasized increased accountability through standardized workflows.

**Post-Adoption Challenges:**
. Ongoing concerns include maintaining stakeholder involvement and resolving platform integration issues. PSU-2 specifically highlighted policy ambiguities—such as interpretations under the "Make in India" initiative within the GFR—that hinder flexibility in high-value procurement scenarios.

E-procurement in Indian PSUs, through platforms like CPPP and GeM, enhances transparency, cost efficiency, and vendor engagement. Nonetheless, gaps in coordination, policy ambiguities, and platform inefficiencies remain. Technological advancements such as AI and blockchain, alongside strong policy initiatives, drive adoption, but skill gaps and systemic issues pose barriers. While accountability has improved, procurement delays highlight the need for better coordination and infrastructure. Transparent policies and targeted interventions are essential for unlocking e-procurement's full potential.

# 6 Framework

Following comprehensive investigation and analysis, essential variables and constructs have been outlined, presenting a proposed framework to guide future studies on e-procurement adoption and its impact.

## 6.1 Key Variables

1. **Independent Variables (IV):**
   a. Technological advancements (e.g., Blockchain, AI, Cloud Technology).

b. Training programs and skill enhancement.
c. Policy clarity and regulatory framework.

**2. Dependent Variables (DV):**
a. Procurement efficiency (lead time, cost reduction).
b. Transparency and accountability.
c. Vendor satisfaction and engagement.

**3. Mediator Variables (MV):**
a. Platform service quality (e.g., GeM usability, system responsiveness).
b. Coordination among stakeholders (PSUs, vendors, policymakers).

**4. Moderator Variables:**
a. Organizational readiness (e.g., digital infrastructure, employee adaptability).
b. External regulations and market dynamics.

### 6.2 Key Constructs:

**1. Technology Integration**
a. Blockchain → Data transparency.
b. AI → Predictive analytics and decision-making.
c. Cloud → Scalability and inter-system coordination.

**2. Skill Development**
a. Training programs → Improved confidence and efficiency in procurement processes.

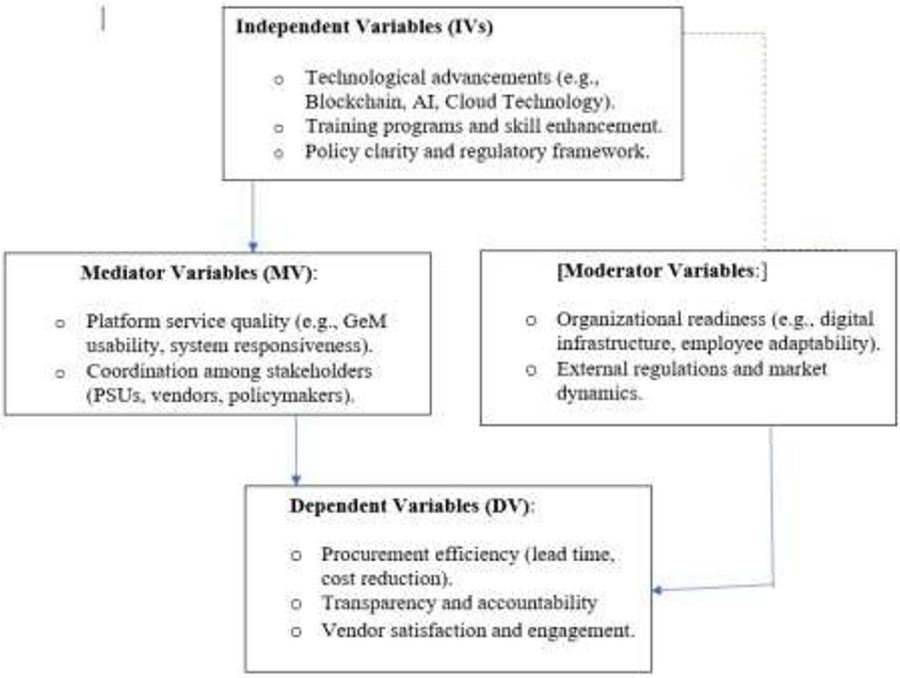
**3. Policy and Governance.**
a. Simplified guidelines → Consistency in decision-making.
b. independent oversight bodies → Conflict resolution and trust enhancement.

**4. Platform Efficiency**
a. GeM service quality → Reduction in lead times and user satisfaction.

**5. Outcome Measures.**
a. Transparency.
b. Efficiency (cost-effectiveness and speed).
c. Vendor engagement and satisfaction.

The core variables and their interrelationships have been analyzed and depicted visually in Figure-2.

**Fig. 2.** Block Model of Variable Relationships (IV, DV, Moderator, Mediator)




Source: Authors' Investigation

1. Independent Variables (IVs) → Mediator Variables (MVs) → Dependent Variables (DVs)
2. Moderating variables influence the relationship between IVs and DVs

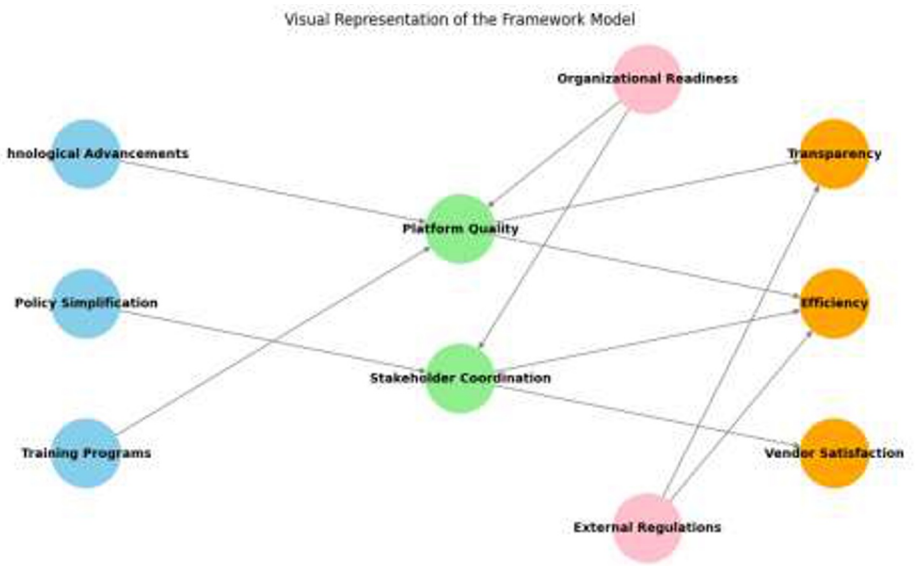
### 6.3 A Qualitative Model Proposed for Testing E-Procurement Variables

The model in Figure 3 outlines key variables influencing e-procurement in Indian PSUs. It is based on a qualitative study that includes a literature review, stakeholder discussions, and case analyses. It identifies crucial variables like "technological infrastructure," "organizational readiness," and "policy support" as vital for effective e-procurement. The relationships among these variables enhance transparency, operational efficiency, and cost management in procurement. This model serves as a basis for validation through quantitative methods, like surveys and statistical techniques, to evaluate the proposed relationships. Ultimately, it provides a path for improving practical, evidence-based strategies to optimize e-procurement systems in the public sector.

**Visualization Approach:**

The directed graph uses nodes to represent each variable, employing a color scheme that distinguishes between IVs (sky blue), MVs (light green), DVs (orange), and moderators (pink). The layout organizes the nodes logically to visually illustrate their roles in the framework, with edges denoting causal relationships. Furthermore, the graph features dashed edges for moderating variables, indicating their potential influence on the relationships among other variables. These moderating factors highlight the complexity of the e-procurement implementation process, where external conditions and internal organizational factors can significantly affect outcomes. This model serves as a tool for understanding the intricate relationships within e-procurement frameworks in PSUs, providing valuable insights for stakeholders seeking to enhance procurement practices through technological, organizational, and regulatory reforms.

**Fig. 3.** Frame work Model




Source: Author's Investigation

(The Framework Model integrates independent variables (e.g., technological advancements, policy clarity, and training programs), dependent variables (e.g., procurement efficiency and transparency), mediators (e.g., platform service quality), and moderators (e.g., organizational readiness). This design facilitates a systematic evaluation of e-procurement's effectiveness).

## 7 Conclusion

E-procurement has made its presence felt in India's public sector undertakings (PSUs) especially with tools like the Central Public Procurement Portal (CPPP) and the Government e-Marketplace (GeM). Those channels have led to more transparency, reduced expense, and improved service provider interaction. But it also underscores ongoing challenges, including weak coordination, murky policy interpretations and weaknesses in existing platforms.

Key catalysts for the adoption of e-procurement are technology solutions such as blockchain, artificial intelligence (AI) and cloud computing. However, shortages of skills among procurement professionals, systemic inefficiencies, and lax legislative frameworks are still hindrances. The sign of a move in the right direction is a better accountability and process transparency but little change in reducing procurement lead times reflects the necessity of more substantial infrastructure and policy interventions at the systemic level. Moreover, because of the complexity of policies such as Make in India and local content, it becomes difficult for procurement officers, mandating for the simplification of regulations because of the complexity of policies such as Make in India and local content, it becomes difficult for procurement officers, mandating for the simplification of regulations.

## 8 Recommendation and Next Steps

**Structured Training Program.**

Develop and conduct specialised training courses for the technical and procedural qualifications of procurement officials. These initiatives will help address the current skills deficit and increase confidence in effectively managing complex procurement processes.

**Policy Simplification and Standardization.**

.Rationalize procurement norms and formulate a standard policy across ministries. An integrated rulebook will reduce the confusion, drive more consistent decisions, and allow stakeholders to find procurement rules with less difficulty.

**Establishment of an Independent Oversight Body.**

Establish an independent regulator to monitor procurement, resolve disputes and mediate conflicts. This will serve as a kind of guarantor of the openness, accountability, and trust of parties involved.

**Technological Integration.**

- *.Blockchain:* Enhance data integrity and ensure secure, transparent transactions by implementing blockchain technology.
- *.Artificial Intelligence (AI.*): Automate workflows, forecast procurement needs, and provide actionable insights through AI-driven analytics.
- *Cloud Technology:* Enable seamless integration between PSU systems (such as SAP) and external platforms using cloud-based solutions, thereby improving scalability and interconnectivity.

**Platform Enhancements**
Upgrade platforms like the Government e-Marketplace (GeM) to enhance user experience, improve operational efficiency, and ensure faster response times. Investments in scalable and robust infrastructure will help address existing delays and operational inefficiencies.

## 9 Study Limitations

*1. Sectoral Focus:*
. This research is limited to two public sector undertakings (PSUs) within the metal and mining sectors. Consequently, the findings may not fully represent other industries. Future studies should consider broader sectors, such as healthcare, energy, and education, to generalize insights effectively.
*2. Stakeholder Representation:*
. The study's focus on PSU employees excludes critical stakeholders such as vendors, administrators, and platform managers (e.g., GeM). Their perspectives are vital to obtaining a more comprehensive understanding of e-procurement practices.
*3. Methodological Constraints:*
. The research employs an exploratory qualitative analysis, and the proposed framework remains untested using quantitative methods. Future studies should employ statistical tools such as regression analysis or structural equation modeling (SEM) to validate the framework and relationships among variables.

## 10 Future Research Directions

This framework provides a foundation for quantitative research, allowing statistical validation of the identified relationships. Including perspectives from a wider range of stakeholders and sectors will enhance the applicability of findings. Broadening the study to incorporate diverse industries and utilizing advanced analytical methods will yield deeper insights and promote the continuous improvement of e-procurement systems in India.

**Appendix –A Questionnaire**

*. Qualitative Analysis: Open-Ended Interview Guide (Long Text Responses).*

This section aims to gather in-depth insights into e-procurement practices within Public Sector Undertakings (PSUs) in India, focusing on understanding the adoption, challenges, drivers, and impact of technological innovations. Please provide detailed responses based on your experiences, supported by specific examples where applicable.

*Theme 1: Adoption of E-Procurement*
1. How has your organization adopted e-procurement platforms?
2. Can you describe the impact of e-procurement on daily procurement operations?
3. What challenges did your organization face during the adoption phase?

*Theme 2: Technological Innovations*

4. To what extent has your organization integrated technologies such as AI,
5. In your opinion, how has technology influenced transparency in procurement?
6. What technological innovations do you believe will play a key role in the future of e-procurement?

*Theme 3: Drivers of E-Procurement*

7. How have government policies shaped your organization's approach to e-procurement?
8. What role has leadership played in promoting e-procurement within your PSU?
9. Are there any specific regulatory frameworks that have either supported or hindered the adoption of e-procurement?

*Theme 4: Barriers to E-Procurement*

10. What are the primary barriers your organization faces in adopting e-procurement systems?
11. How do resistance to change and outdated infrastructure affect the implementation process?
12. How does your organization address the shortage of skilled personnel in the e-procurement environment?

*Theme 5: Organizational Performance (outcomse)*

13. How has e-procurement impacted your organization's efficiency, transparency, and cost-effectiveness?
14. Can you describe a specific instance where e-procurement led to improved procurement performance?

*Theme 6: Post Impact Challenges*

15. How do you measure the success of e-procurement in your organization?

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## References

1. Arrowsmith, Sue. The Law of Public and Utilities Procurement. 3rd ed. London: Sweet & Maxwell, 2019.
2. Baily, Peter, David Farmer, Barry Crocker, David Jessop, and David Jones. Procurement Principles and Management. 11th ed. Harlow: Pearson Education, 2015.
3. Banerjee, Ranjan. "Digital Procurement Adoption: Challenges and Opportunities in Indian PSUs." Journal of Public Procurement, vol. 23, no. 1 (2023): 45-67.

4. Bhardwaj, Anil, Sunil Gupta, and Ritu Sharma. "E-Governance and Public Procurement: Transforming India's Public Sector." Government Information Quarterly, vol. 38, no. 2 (2021): 231-248.
5. Chopra, Sunil, and Peter Meindl. Supply Chain Management: Strategy, Planning, and Operation. 7th ed. New York: Pearson, 2019.
6. Croom, Simon, and Robert Johnston. "E-Procurement: Key Issues in Adoption and Impact." Journal of Supply Chain Management, vol. 39, no. 1 (2003): 27-37.
7. Das, Sandeep, and Arvind Roy. "Regulatory Challenges in E-Procurement Implementation: An Indian Perspective." Procedia CIRP, vol. 102 (2023): 298-309.
8. Dutta, Anirban, and Prakash Singh. "Interoperability Challenges in Indian Public Sector Procurement Platforms." International Journal of Procurement Management, vol. 15, no. 3 (2022): 189-206.
9. Eisenhardt, Kathleen M. "Building Theories from Case Study Research." Academy of Management Review, vol. 14, no. 4 (1989): 532-550.
10. Glaser, Barney, and Anselm Strauss. The Discovery of Grounded Theory: Strategies for Qualitative Research. New York: Routledge, 2017.
11. Gupta, Rajesh, and Sanjay Das. "AI-Driven Procurement: Enhancing Public Procurement Efficiency in India." Journal of Business & Industrial Marketing, vol. 38, no. 4 (2023): 512-530.
12. Gunasekaran, A., and E.W.T. Ngai. "Adoption of E-Procurement in Public Sector Organizations: An Empirical Analysis." Journal of Strategic Information Systems, vol. 17, no. 2 (2008): 247-266.
13. Hussain, Zafar, Rajesh Kumar, and Vivek Sharma. "Impact of Digital Procurement on Fiscal Transparency in Public Sector Undertakings." World Bank Economic Review, vol. 37, no. 2 (2023): 115-132.
14. Jain, Meera, and Rohan Gupta. "Digital Inclusion of Small-Scale Vendors in Indian E-Procurement." Government Information Quarterly, vol. 40, no. 1 (2023): 77-95.
15. Kumar, Amit, and Suresh Bhanumurthy. "Public Procurement in India: Challenges and Reforms." Asian Journal of Public Administration, vol. 30, no. 2 (2008): 115-130.
16. Kumar, Ramesh, and Meenal Kumar. "The Role of Central Public Procurement Portal in Enhancing Efficiency." Indian Journal of Management Studies, vol. 15, no. 3 (2021): 243-260.
17. Lacity, Mary C., and Leslie P. Willcocks. Robotic Process Automation and Risk Mitigation: The Next Frontier in Digital Transformation. London: Palgrave Macmillan, 2018.
18. Ministry of Electronics and Information Technology. "Annual Report on Government E-Marketplace (GeM)." New Delhi: Government of India, 2020.
19. Mukherjee, Subodh. "Blockchain in Public Procurement: A Case Study of Indian PSUs." International Journal of Digital Economy, vol. 15, no. 2 (2024): 188-204.
20. Patel, Ananya, and Vijay Roy. "Predictive Analytics in Public Sector Procurement: The Role of AI and Machine Learning." Journal of Public Administration Research, vol. 25, no. 3 (2023): 421-438.
21. Patton, Michael Q. Qualitative Research and Evaluation Methods. 4th ed. Thousand Oaks, CA: Sage Publications, 2015.
22. Presutti, William D. "Supply Management and E-Procurement: Creating Value Added in the Supply Chain." Industrial Marketing Management, vol. 32, no. 3 (2003): 219-226.
23. Puschmann, Thomas, and Rainer Alt. "Successful Use of E-Procurement in Supply Chains." Supply Chain Management: An International Journal, vol. 10, no. 2 (2005): 122-133.

24. Rao, Srinivasan, Meera Banerjee, and Vikram Sharma. "Coordination Gaps in E-Procurement Adoption: An Empirical Investigation in Indian PSUs." Journal of Supply Chain Management, vol. 28, no. 1 (2023): 98-120.
25. Reddy, Subramanian, and Prakash Iyer. "Sustainability in Public Procurement: How Digital Platforms Reduce Environmental Impact." Journal of Sustainable Business Practices, vol. 19, no. 2 (2024): 155-173.
26. Sánchez, Diego, Aniket Pradhan, and Jitendra Verma. "Blockchain and E-Procurement: A Path Toward Transparency in Public Sector Purchasing." International Journal of Procurement Management, vol. 20, no. 4 (2020): 385-402.
27. Sharma, Ankit, and Rajeev Sahu. "E-Governance and the Future of Public Procurement in India." Journal of Public Procurement, vol. 25, no. 2 (2023): 177-195.
28. Sharma, Manish, Rakesh Kumar, and Priya Verma. "Digital Procurement in India: Challenges and the Role of Emerging Technologies." Procedia CIRP, vol. 108 (2023): 356-372.
29. Singh, Harish, and Ajay Verma. "Public Procurement Reform in India: Evaluating GeM's Impact on Transparency." Government Information Quarterly, vol. 39, no. 2 (2022): 215-234.
30. Singh, Pavan, Ravi Patel, and Sanjay Gupta. "Assessing Service Quality in Indian Public Procurement Platforms." International Journal of Public Sector Management, vol. 35, no. 1 (2022): 88-105.
31. Strauss, Anselm, and Juliet Corbin. Basics of Qualitative Research Techniques and Procedures for Developing Grounded Theory. 4th ed. Thousand Oaks, CA: Sage Publications, 2015.
32. The Financial Express. "Government e-Marketplace Achieves Record Procurement in FY 2021-22." The Financial Express, May 15, 2022. https://www.financialexpress.com.
33. United Nations. Transforming Our World: The 2030 Agenda for Sustainable Development. New York: United Nations, 2015.
34. Vaidya, Kishore, Andrew Campbell, and Henry Macris. "Critical Success Factors for E-Procurement Implementation in Public Sector Organizations." Journal of Public Procurement, vol. 6, no. 1 (2006): 70-99.
35. Verma, Suraj, Ritu Sharma, and Sandeep Gupta. "Enhancing Vendor Participation in Digital Procurement Systems." Journal of Public Procurement Research, vol. 29, no. 3 (2023): 145-168.
36. Yin, Robert K. Case Study Research and Applications: Design and Methods. 6th ed. Thousand Oaks, CA: Sage Publications, 2018.
37. Glaser, Barney G., and Anselm L. Strauss. 2017. The Discovery of Grounded Theory: Strategies for Qualitative Research. New York: Routledge.

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