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Research Article

Bridging Procurement Gaps Through Digital Tools: Evidence from Selected Philippine National Government Agencies

Mirasol O. Bacarisas[1*], Joy Maan M. Lucos[1], Shiena Marie Candelasa[1], Angelica Guzon[1], Edegar de Fátima Marcos[1], Margareth Apar-Aberia[1], Bernandino P. Malang[2*], Jocelyn DS. Malang[1]

[1]World Citi Colleges, Quezon City, Philippines
[2]Bulacan State University, Bulacan, Philippines

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**Corresponding author:*
E-mail:
bernandino.malang@bulsu.edu.ph

ABSTRACT

Public Procurement and its continuing agenda for transparency, efficiency and accountability in government. In the Philippines, government efforts towards digitalization seek to modernize the procurement process with systems that are intended to make bidding more accessible and transparent. Yet even with these reforms, many agencies remain plagued by delays and inefficiencies, indicating that the transition to digital platforms hasn't gone far enough. This paper examines how digital tools can mitigate the distance between innovation and performance in public procurement. A mixed method research was utilized, combining quantitative survey analysis and quantitative inputs from sixty (60) procurement practitioner from selected national government agencies in the National Capital Region. Analyzed that the main reasons behind procurement delays and assess the digital adoption, system compatibility, staff capacity, infrastructure preparedness as well as organizational culture. Results show that digital procurement tools significantly improved transparency and reduced reliance on manual documentation, with respondents strongly aggreging on improvements in procurement cycle time (AWM = 4.28), transparency and compliance (AWM = 4.30). Additionally, many of the issues have been addressed through the digital channels by transparency and minimisation of physical paper work, however, challenges persist, particularly on the poor system integration, limited technical skills, unstable internet connectivity and resistance to digital change. Correlation analysis revealed a strong and statistically significant relationship between the extent of digital tool adoption and operational efficiency (r = 0.606, p = < 0.001), indicating that higher levels of

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digitalization are associated with reduced procurement delays. The paper suggests building all of these into areas such as policy, interoperability between platforms and staff training can have a major impact on procurement performance. They said the transition to digital procurement in government must be the guiding philosophy to benefit from a less costly, transparent and fully integrated e-procurement system.

Keywords: *Technology Adoption, Process Improvement, Digital Governance, Procurement Delays*

Background

Public procurement is essential to the effective implementation of government programs and services, as well as in ensuring quality of service provision through transparency and economy in public expenditure. But the Philippine procurement system has long been beset with problems that stand in the way of achieving such objectives. Yet purchase systems demonstrate inefficiencies and delays that restrict development progress (Success & Maiyaki, 2025; OECD, 2025). To address these challenges, digital transformation has become a central policy response and e-procurement systems are anticipated to enhance efficiency, transparency, access to information and accountability (OECD, 2025; World Bank, 2021).

Government procurement in the Philippines is intended to raise standards, support social development and modernize the country's economic infrastructure, as required by Republic Act No. 9184 (2003), which sets out new minimum requirements for undertaking projects of all kinds on behalf of government branches at any level. These standards are to be observed in procuring goods, infrastructure projects and consulting services (GPPB 2023). For its part, the government operationalized these principles with the introduction of PhilGEPS or electronic online centralized advertising, monitoring and management of procurement opportunities (DBM 2020).

Digital procurement systems, as noted by the World Bank (2021), are efficiency drivers but also a contribution to transparency and accountability in public expenditure. Evidence from jurisdictions that have adopted e-procurement systems is such that procurement lead times are reduced by as much 30 per cent. The gains from digital procurement reforms are contingent on the strength of policy enforcement (and an ongoing investment in technical capacity) among implementing agencies. Asian Development Bank (2020) highlighted that digital transformation is more than just acquiring new tools, it also demands end-to-end process reengineering and organizational realignment. Instead, digital platforms are nothing more than the " new paint " painting over older analog problems; they are superficially faster and apparently realer, but still decay a proximal variety of the same old smells.

In the case of Philippines, Cruz and Sajo (2022) argue that despite expanding access to procurement information has become possible through PhilGEPS, delays are still experienced in posting opportunities because of poor user knowledge level and non-integration between PhilGEPS and transactional financial management systems. These holes lead to bottle neck in all stages of the supply chain, from pre-bidding to buying until pay, neutralizing the gains that digital transformation is supposed bring up. Moreover, the OECD (2021) highlights that procurement delays are not just technical but also cultural. Procurement officers' resistance to change, due to the fear of losing their job, low digital trust and attachment towards traditional habit is one of the major challenges in fully implementing e-procurement.

These issues are best understood in the context of international comparisons. According to Thai and Gupta (2019), successful e-procurement reform needs to take a "whole of Government" approach that combines the legal, institutional and technology aspects of governance. Jumbled reforms fail to bring sustained results if agencies pull systems in without

consistency or connection. Comparative studies indicate that countries with harmonized tendering systems, integrated systems and regular staff training, resultantly have higher procurement efficiency (Hochstetter & Lopez, 2023; OECD, 2025).

In the Philippines, despite the introduction of digitalized procurement via PhilGEPS, national government agencies grapple with reoccurring delays due to inadequate ICT infrastructure, little or poor interoperability as well as uneven adoptation of electronic tools (Magdaraog, 2025; Nisnisan, 2024).

These difficulties can be seen as part of a more general distance between policy intentions and practice. And as the public clamour for faster more transparent and responsive delivery of public services grow, the failure to use digital procurement is a drag on governance. Procurement delay is both a trigger for the project implementation disruption as well an indicator resulting in under-expenditure of projects, decline in public confidence and social/economic impact (OECD, 2025).

The studies of Seraspe et al. (2024) and Bolaños et al. (2024) provide strong conceptual support for the present research, as both demonstrate how digital systems significantly enhance operational performance, reduce inefficiencies, and strengthen decision-making processes within government-related institutions. Seraspe et al. highlight the effectiveness of a digital data-tracking platform in improving workflow accuracy and organizational responsiveness—an insight directly applicable to procurement operations where real-time monitoring can minimize delays and bottlenecks. Likewise, the work of Bolaños et al. emphasizes the challenges and opportunities of digital transition in inventory management, mirroring the obstacles national government agencies face in modernizing procurement systems and ensuring smooth, timely acquisition processes. Together, these studies affirm that digitalization is not only a technological shift but a strategic governance approach that improves efficiency, transparency, and overall operational
capacity—core objectives of the current study on mitigating procurement delays through digital tools.

In this paper, we explore the factors that contribute to procurement delays for national government agencies in the Philippines, with special attention paid to enabling Digital Tools such as PhilGEPS as well as related e-governance applications.

This study specifically sought to identify how digital solutions could mitigate the lag in procurement and enhance efficiency at the national government level of the Philippines. It seeks to: analyze the current procurement methods and digital tools being used; identify root causes of delays in procurement, and assess the existing level of use for digital tools. It also looks at the effect of these tools in KPIs such as cycle time, efficiency, cost reducer and client satisfaction. The study also discusses challenges to facilitate the deployment of e-procurement and offers specific strategic and policy recommendations aimed at improving the use of digital technologies in government procurement activity.

Conceptual Framework

This study is grounded in the theory that use of digital tools in public procurement has a strong effect on the level of operational efficiency and prevalence of procurement delays among national government institutions. Informed by the theory of digital governance and organizational performance, the framework represents the relationships between the major independent variables and dependent variables.

The independent variables used are the level of digital procurement tools adoption (in particular, e-procurement systems), system integration, technical assistance in place, and skills/education on digital for staff; and the adequacy of ICT infrastructure. These are the variables present in recognizable form in this Procurement Archetype of Digital Transformation.

The independent variables are procurement success factors, captured as cycle time of procuring, transparency and compliance in procuring, cost reduction by using resources appropriately, satisfaction of stakeholders based on project financiers preference and frequency of delays in the process of tendering respectively.

The framework posits that higher adoption of the digital tools with concomitant institutionalizing policies, training and infrastructure for their use should translate into improved procurement efficiency through reduced administrative bottlenecks and reduced technical logjams, increased transparency and consequently fewer instances of delays in procurements.

Methodology

Research Design

This study followed a quantitative descriptive research design to explore the influence of digital procurement applications on operational efficiency as well as reduction in delays among national government agencies. Such a design is suitable for describing in a systematic way the present state of affairs and connections between phenomena without intervening in or manipulating them (Creswell & Creswell, 2018).

The study aims to map typical problems related to the public procurement process and assess stakeholder opinion on how digital tools contribute. Quantitative measures were complemented with qualitative feedback that shed light on operational, technology and policies elements influencing procurement performance.

Data Collection Method

An online questionnaire designated for procurement officers, administrative personnel, technical employees, and financial personnel of certain national government agencies were tested. The survey had closed- and open-ended questions which covered perceptions of cycle time, supplier communication, system integration, and recurring obstructions in the procurement process.

Sixty responses were considered valid. Likert scale ranging from 1 to 5 (1 for strongly disagree; 2 for disagree; 3 for Moderately disagree; 4 for Agree, and 5 for Strongly Agree) was used in this survey research, a popular method of determining attitude according to Jhamtani et al (2014).

Open-ended questions of the survey were analyzed according to a codebook and from this, responses were categorized into themes that arose as system barriers, training requirements, and policy suggestions. This mix method inherent to both quantitative and qualitative richness enhanced the credibility of results.

Research Locale

The respondents were chosen among national government agencies in the National Capital Region that have utilized digital procurement systems like the Philippine Government Electronic Procurement System and other electronic administrative systems.

This site was selected to simulate the campaign environment of government procurement in the Philippines which agencies are undergoing periodical of implementing digital transformation to workaround its perennial problems and delays.

Population and Sampling Techniques

The study was conducted on 56 national government agencies attached to the Executive Department. Using Slovin's formula and with a desired population of 56, MOE approximately 0.5 and 95% confidence level a sample size of 49 respondents was estimated to be minimal.

Thus, 49 agencies were chosen to ensure adequate spread of representation by sector/area. The interviewees consisted of the following samples:.

- Heads of Procuring Entities (HOPEs);
- Members of Bids and Awards Committees (BAC);
- BAC Secretariat and Technical Working Group (TWG) members; and
- End-user representatives are directly involved in procurement operations

A purposive sampling method was used to informants who are directly involved in the procurement process, thus providing for informed and precise answers related to success factors of digital tools adoption and efficiency outcomes.

Instrument of the Study and Validation

Google Forms was used to design the structured questionnaire as the data collection tool. It comprised closed-ended (quantitative) and open-ended (qualitative) questions. The in-

strument coincided with the research objectives and was validated by 3 experts in public procurement and digital governance. The following sections were included in the questionnaire:

Section A: Profile of procurement operations

Section B: Causes of procurement delays

Section C: Extent of digital tools adoption

Section D: Impact of digital tools on procurement performance

Section E: Challenges in implementation

Section F: Suggested strategies and policy recommendations

All quantitative items were scored using a five-point Likert scale. Open questions gave participants the opportunity to flesh out particular concerns and make suggestions.

Data Collection Procedures

Prior to data collection, permission and coordination were obtained from heads of the agencies or focal persons. Respondents were informed about the aims and purpose of the study, and that participation was voluntary.

The questionnaire was delivered on the Web so that participants could fill out a survey form via Google Forms from October 6 to October 18, 2025, and they were sent an invitation by official email. This process enabled rapid dissemination and wide representation throughout the NCR.

The informed consent explaining the purpose, confidentiality, and expected time of 5 to 7 minutes was present on each form. Only those who consented actually continued. All 60 responses were captured in the backend of Google Forms and securely saved/locked out for privacy.

Statistical Analysis of Data

Reported numeric data were described and tested by statistical analysis in a similar way to that given:

- Frequency and Percentage Distribution used to characterize respondents and purchasing attributes;
- Weighted average and SD for measuring perceptions of the impact of digital tools and the extent to which it has been adopted.
- Classification is used to rank what are the most and least common causes of procurement delays.
- Correlation Analysis (Pearson r) to check the correlation between adoption of digital tools and procurement efficiency.

Open-ended responses were analyzed thematically for qualitative data to identify common themes, issues and recommendations.

Ethical Considerations

This research followed the ethical guidelines in social research as advised by both Philippine Social Science Council and the American Psychological Association (2020).

- Informed Consent: All the subjects were informed about study purpose and procedure in full detailed manner before enrolling into the study voluntarily.
- Confidentiality: Confidential status is maintained on the respondent and responding agencies; no personal or identifying material was used in this report.
- Participation was completely voluntary, and the respondents had a right to refuse or choose not to participate at any time without penalty.
- Ethics Statements: All necessary permissions were taken from concerned authorities before collecting the data following local institute guidelines.

All data are kept in digital form, password encrypted and used for academic work only.

Results and Discussion

The study Bridging Procurement Gaps: Leveraging Digital Tools to Mitigate Delays and Improve Operational Efficiency in Selected National Government Agencies, the presentation of findings is discussed in this chapter. The findings are based on the responses of sixty (60) users of SNGAs in the Executive Department from selected NGAs within NCR.

Based on weighted means of all survey items, respondents' level of agreement with reasons for procurement delays and the effectiveness of digital tools to improve operational

performance were calculated. Mean scores interpretation used the following scale:

A higher average score indicates greater agreement and suggests participants think digital tools are a powerful way to cut allowance time and increase efficiency. A lower score does not necessarily imply tensor size had little impact.

Scale	Range of Mean Scores	Verbal Interpretation
5	4.21 – 5.00	Strongly Agree
4	3.41 – 4.20	Agree
3	2.61 – 3.40	Moderately Agree
2	1.81 – 2.60	Disagree
1	1.00 – 1.80	Strongly Disagree

Profile of Respondents and Agencies

In this section, the procurement profiles of participating agencies, including the type of goods and services procured, methods used for procurement implementation and their respective annual budgets as well as the adoption of digital tools are scoped. The results demonstrate the extent of operations and digital preparedness of the national government agencies included in the sample.

1.1. Types of goods and services frequently procured

Sixty (60) respondents were asked to describe the kinds of goods and services their organizations purchase. As can be seen from Table 1, the highest rank was assigned to office supplies and equipment (86.67%) which was followed by ICT equipment and software (73.33%). Consultancy services and infrastructure/civil works (both 40% and 23.33%) that demand specific knowledge are also items which are not as frequent to be accessed. Medical/specialized supplies (11.67%) and miscellaneous items (10%), including place rent and event materials, were cited by relatively small numbers of participants.

It appears that the emphasis of most organizations is on operational requirements in terms of underpinning day-to-day administrative operations and ICT. This signifies an incremental dependence on digital for routine purchas.

Table 1. Types of Goods and Services Frequently Procured

Types of goods and services frequently procured	Frequency	Percentage
Office supplies and equipment	52	86.67%
ICT equipment/software,	44	73.33%
Infrastructure and civil works	14	23.33%
Consultancy services	24	40.00%
Medical/specialized supplies	7	11.67%
Others:	6	10.00%

1.2. Procurement methods used

As shown in Table 2, Competitive/Public Bidding (81.67%) is the most common procurement method, which was closely followed by Shopping/Small Value Procurement (76.67%). Negotiated Procurement (35%) and Direct Contracting (28.33%) were less frequent and essentially employed when procurement was specialized or needed immediately. Only 1.67% stated they used Direct Acquisition, suggesting infrequent use.

Conclusion further results suggest that agencies are still pursuing the transparency and competition principles as defined in R.A. 9184. Nevertheless, the high frequency of low-value (SVP) tenders put an operational emphasis on low value and recurrent procurements indicating potentially weak procurement planning and uneven demand aggregation.

Table 2. Procurement Methods Used

Procurement methods used	Frequency	Percentage
Competitive/Public Bidding	49	81.67%
Negotiated Procurement	21	35.00%
Shopping/Small Value Procurement	46	76.67%
Direct Contracting	17	28.33%
Other: (Direct Acquisition)	1	1.67%

1.3. Annual procurement budget and transaction volume

Based on Table 3, 41.67% of the agencies had an annual procurement budget not exceeding ₱10 million, and at least 25% were within the ₱51 - ₱200 million bracket. Fifteen percent (15%) had budgets between ₱10M to ₱50M and above ₱500M, and only 3.33% reported operating within an interim budget of ₱201 - ₱500 million.

Table 3. Annual Procurement Budget

Annual procurement budget	Frequency	Percentage
Below ₱10M	25	41.67%
₱10M – ₱50M	9	15.00%
₱51M – ₱200M	15	25.00%
₱201M – ₱500M	2	3.33%
Above ₱500M	9	15.00%

As the data indicate, the majority of agencies are small-scale buyers with few high-cost projects involved. Differences in budget ability across agencies may account for variance in digital tool adoption and procurement effectiveness

1.4. Existing digital procurement tools and platforms adopted

Table 4 shows that most of the respondents (88.33%) are into PhilGEPS whereas a fewer number used e-procurement system developed by agency itself (6.67%) or contract management software (3.33%). Only 1.67% use e-bidding portals, and none mentioned using data analytics solutions.

Findings suggest that PhilGEPS as a centralized e-Procurement system is gaining popularity. Nonetheless, limited reliance on sophisticated digital tools such as analytics and contract management systems indicates an early stage yet for agencies to go fully digital.

Table 4. Existing Digital Procurement Tools and Platforms Adopted

Existing digital procurement tools and platforms are currently adopted	Frequency	Percentage
PhilGEPS (Philippine Government Electronic Procurement System)	53	88.33%
Agency-developed e-Procurement System	4	6.67%
E-bidding portals (e.g., online submission of bids)	1	1.67%
Contract management or tracking software	2	3.33%
Data analytics tools for procurement	0	0.00%
None	0	0.00%

2. Causes of Procurement Delays

The survey classified factors leading to supply delays into administrative, technical, suppliers and policy/regulatory factors. Findings indicated which areas of practice are more or less critical to procurement practice**.**

2.1 Administrative Factors

Results showed that administrative issues are strong contributors to procurement delays, with an average weighted mean of 4.11 (Strongly Agree). Respondents highlighted that multiple

layers of approval and manual document preparation significantly slow down the process. Additionally, the lack of standardized templates or forms creates confusion and inefficiency. This indicates that streamlining administrative procedures and adopting automated systems could significantly improve procurement efficiency.

Table 5. Administrative-Related Challenges in Procurement Processes

Indicators	Standard Deviation	Weighted Mean	Verbal Interpretation
Multiple layers of approval slow down the process.	0.885	4.28	Strongly Agree
Manual document preparation and routing cause delays.	0.816	4.25	Strongly Agree
Lack of standardized templates or forms creates confusion.	1.054	3.80	Agree
AVERAGE WEIGHTED MEAN		**4.11**	**Strongly Agree**

2.2 Technical Factors

There are technical issues (system failures, poor internet access and integration issues with new tools) that adversely affect the procurement processes as also confirmed by the respondents (3.99). The results highlight benefits of stable internet connection, strong IT system and enhanced system inter connectivity.

Table 6. Technical-Related Challenges in Procurement Processes

Statements	Standard Deviation	Weighted Mean	Verbal Interpretation
Frequent system downtime affects timely transactions.	0.946	4.05	Agree
Poor internet connectivity disrupts procurement activities.	1.046	4.08	Agree
Difficulty integrating new tools with existing systems.	0.847	3.83	Agree
AVERAGE WEIGHTED MEAN		**3.99**	**Agree**

2.3 Supplier-Related Factors

Supplier-related factors were a significant driver of procurement delays with average weighted mean (AWM) of 4.26 (Strongly Agree). The key challenges identified were late submissions or noncompliance by bidders and limited numbers of qualified suppliers, especially for high–tech/ high-value goods and services. Strengthening the management of suppliers, developing roles and widening the base of suppliers could cut delays and enhance competitive tendering.

Table 7. Supplier-related Challenges in Procurement Processes

Statements	Standard Deviation	Weighted Mean	Verbal Interpretation
Late submissions or non-compliance of bidders.	0.865	4.22	Strongly Agree
Limited supplier pool for specialized goods/services.	0.766	4.30	Strongly Agree
AVERAGE WEIGHTED MEAN		**4.26**	**Strongly Agree**

2.4 Policy & Regulatory Factors

Policy and regulatory do effect procurement inefficiencies to some extent, the weighted mean is 3.99 (Agree). Long and detailed policy reviews, extensive legal clearances, and repeated changes to procurement rules have been cited by respondents as a source of uncertainty and drag on decision making. It is possible to cut through procedural bottlenecks by streamlining the process steps and providing less contradictory policy advice.

Table 8. Policy and Regulatory Challenges in Procurement Processes

Statements	Standard Deviation	Weighted Mean	Verbal Interpretation
Lengthy policy reviews and legal clearances delay processes.	0.926	4.08	Agree
Frequent updates/amendments to procurement rules create uncertainty.	0.969	3.90	Agree
AVERAGE WEIGHTED MEAN		**3.99**	**Strongly Agree**

For the four main categories, respondents identified both supplier related and administrative reasons as top causes for procurement delays. Conversely, technical and policy issues were found to be of substantial but lesser importance. Results underscore the necessity to improve administrative efficiency, technological investment, supply diversification and stability of procurement rules communication so as to achieve a more timely and efficient optimum procurement.

1. Digital Tools Adoption

A survey assessed the degree of use of digital tools with the indicators: the use of e-procurement platforms for posting and bidding; integration from planning to integrated contract management at work sites; digital tracking for stakeholders; regular user training in digital uses; technical support offered.

The average weighted mean score of the respondents about having a presence of digital procurement tools in their organizations is 3.76 (Agree). The respondents clearly perceive e-Procurement platforms (4.38) as an important digital technology. There is not much that you cannot do, and the menus are well supported, however integration and training should be a little more streamlined.

Table 9. Extent of Digital Tool Adoption Across Selected NGAs

Statements	Standard Deviation	Weighted Mean	Verbal Interpretation
Use of e-procurement platforms for posting and bidding	0.940	4.38	Strongly Agree
Integration from planning to contract management	1.071	3.73	Agree

Statements	Standard Deviation	Weighted Mean	Verbal Interpretation
Availability of digital tracking to stakeholders	1.182	3.60	Agree
Regular user training on digital tools	1.156	3.45	Agree
Technical support availability	1.059	3.62	Agree
AVERAGE WEIGHTED MEAN		**3.76**	**Agree**

2. Impact of Digital Procurement Tools

The survey measured the perceived influence of technology-based procurement tools in four key areas, efficiency and timeliness; transparency and compliance; cost and resource management; and stakeholder satisfaction. The results are summarized below:

4.1. Efficiency and Timeliness

In order to determine whether digital procurement tools are influencing efficiency and timeliness, respondents were requested to agree or not with statements concerning improvements in time of the sequence of steps for a public purchase. Table 10 Respondents' perception of procurement cycle time and electronic document submission It was observed from table 10 that the respondents strongly agree that digital tools have reduced procurement cycle time (4.20) and encouraged transactions to occur electronically via document submission (4.35, Strongly Agree).

Electronic document submission was followed closely (4.35) by improvements in their impact on facilitating transactions. These results confirm the value of digitized systems in mitigating delay and improving turnaround time in government procurement.

Table 10. Contributions of Digital Procurement Tools on Efficiency and Timeliness

Statements	Standard Deviation	Mean Score	Verbal Interpretation
Procurement cycle time has significantly improved with the use of digital tools.	0.755	4.20	Strongly Agree
Electronic document submission speeds up transactions.	0.732	4.35	Strongly Agree
AVERAGE WEIGHTED MEAN		**4.28**	**Strongly Agree**

4.2. Transparency and Compliance

In a similar way, these respondents were also asked to gauge e-document submissions (as an attribute of digital procurement) bearing on procurement transaction cost in relation to evaluating the extent to which these Digital Procurement Solutions tools enhance transparency and compliance. Table 11 indicates that respondents very strongly agreed on procurement policies (4.37) and stakeholder access to information (4.23). The findings validate the extent of which e-Procurement tools enhance transparency and accountability as have been observed internationally (OECD, 2025; World Bank, 2021).

Table 11. Contributions of e-Procurement on Promoting Transparency and Compliance

Statements	Standard Deviation	Mean Score	Verbal Interpretation
Digital systems promote compliance with procurement policies.	0.663	4.37	Strongly Agree
Stakeholders have better access to procurement information.	0.831	4.23	Strongly Agree
AVERAGE WEIGHTED MEAN		**4.30**	**Strongly Agree**

4.3. Cost and Resource Utilization

Respondents were intended to express their degree of agreement that digital procurement tools contribute to saving on administrative costs and avoiding errors depicted as their influence on cost efficiency and the use of resources. As the Table 12 results indicate, respondents strongly agreed (4.28) that digital procurement tools cut down on administrative costs and errors. This reflects a strong notion that these applications support budget effectiveness and more efficient use of resources by automating and limiting the scope for error in manual processes. These highlight the increased efficiencies brought about through automation, particularly in respect of document processing and records management.

Table 12. Contributions of Digital Procurement Tools on Resource Utilization

Statement	Standard Deviation	Mean Score	Verbal Interpretation
Digital procurement tools reduce administrative costs and errors.	0.739	4.28	Strongly Agree

4.4 Stakeholder Satisfaction

Respondents were also required to express their agreement with a sentence stating digital systems secure communication to suppliers and end users (related to the perceptions of cost and resource efficiency). As seen in Table 13, respondents agreed (4.43) that digital has improved communication with suppliers and final customers significantly. This is indicative of the trust in which digital technology is perceived to play among stakeholders, in promoting better interaction and collaboration. This discovery indicates that increased stakeholder engagement is indicative to user focused importance/ value of digital procurement, this then condoning and facilitating more participation and trust.

Table 13. Contributions of Digital Procurement to Stakeholder Communication

Statement	Standard Deviation	Mean Score	Verbal Interpretation
Digital systems improve communication with suppliers and end-users.	0.647	4.43	Strongly Agree

3. Challenges in Implementing and Sustaining Digital Procurement Tools

This section also describes some of the major operational challenges that government entities encounter when they adopt, implement, and maintain digital procurement systems. The learnings came from those who have cited obstacles to moving seamlessly between paper-based, traditional procurement and fully digitalized. The challenges were categorized in three major classes: (A) Operational, (B) Technical; and C) Administrative and Policy. The frequencies reported are the number of respondents who mentioned each issue

5.1. Operational challenges

Operational challenges mainly concern behind-the-scenes human resources and structural capacity, while in turn affecting the efficiency of digital procurement adoption. The predominant issue identified was a lack of staff training (48), which suggests procurement personnel require more continuing professional education and skill development programming. Without the correct guidance and training staff could struggle to make full use of digital procurement tools.

Low staff numbers for e-procurement management and oversight (31) are a further important issue as workloads increase during the implementation phase (27). These results indicate that previously present staff tend to take on new roles without commensurate changes in organization and/or resources.

Further, resistance to change (16) and low levels of digital literacy (21) continue to be

enduring obstacles which underline the importance of stronger internal communication and leadership support as well as better change management efforts. The unequal use of digital systems between departments (25) and the lack of motivation for employees (19) also undermine coherence and drive in implementing new technologies, by organizations.

The conclusions indicate that operational shortfalls are principally associated with personnel shortcomings, including readiness state. Dealing with these challenges by investing in education, change management and incentivization programs is the only way to ensure successful digital procurement implementation in the long run.

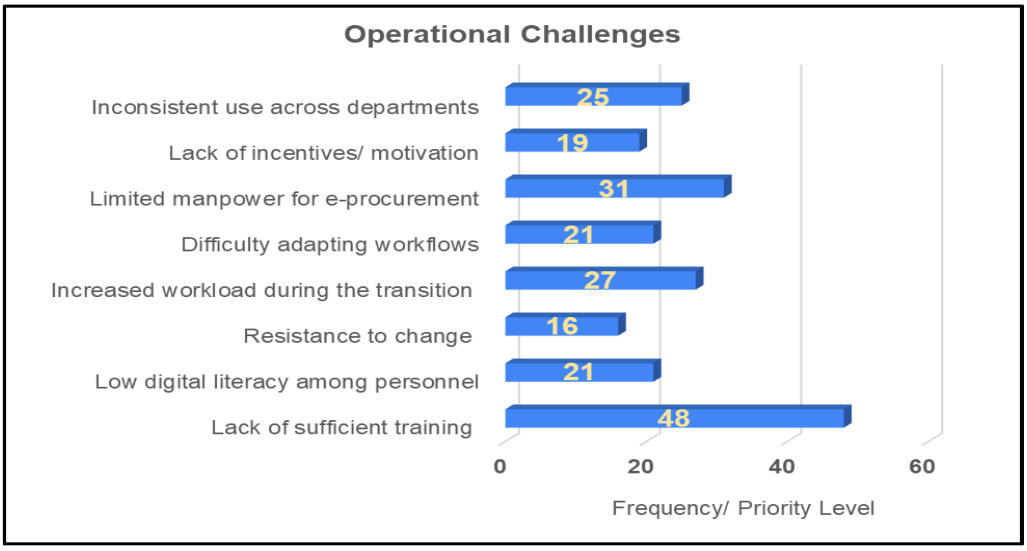

Figure 1. Identified Operational Challenges in Digital Procurement

5.2 Technical challenges

Many technical challenges still act as a major obstacle for efficiency, dependability and sustainability of electronic procurement systems. The most common problem mentioned was slow and unstable internet connection in 41 recounts, highlighting how essential it is to have reliable IT infrastructure that can handle real time transactions and swift functioning of the system. Regular system breakdown and unreliability of the platform (35) were identified as obstacles, which disrupts workflow continuity and undermines users' confidence in digital systems.

Respondents also underscored limited IT infrastructure (25) and the cost of system upgrades and software licenses (27) as most important barriers to scaling and modernizing systems. Resource limitations prevent agencies from implementing the newest cutting-edge available technology and maintaining an updated, secure set of systems.

Cybersecurity threats (21) and data privacy compliance challenges (21) are also a continuing problem, showing long-term weaknesses around hacking protection and unauthorized access to procurement data. Other challenges include the problems of integrating new digital technology with existing legacy systems (15), lack of available local technical support for initial trouble-shooting (19) and there not being real-time data analysis and reporting tools (20) that would limit evidence-based decision making and performance monitoring.

These technical challenges underscore the critical importance of greater investment in IT infrastructure, stronger cyber security support and better system interoperability. It is crucial to address these concerns to enable government procurement systems to function efficiently, transparently and sustainably over the longer term.

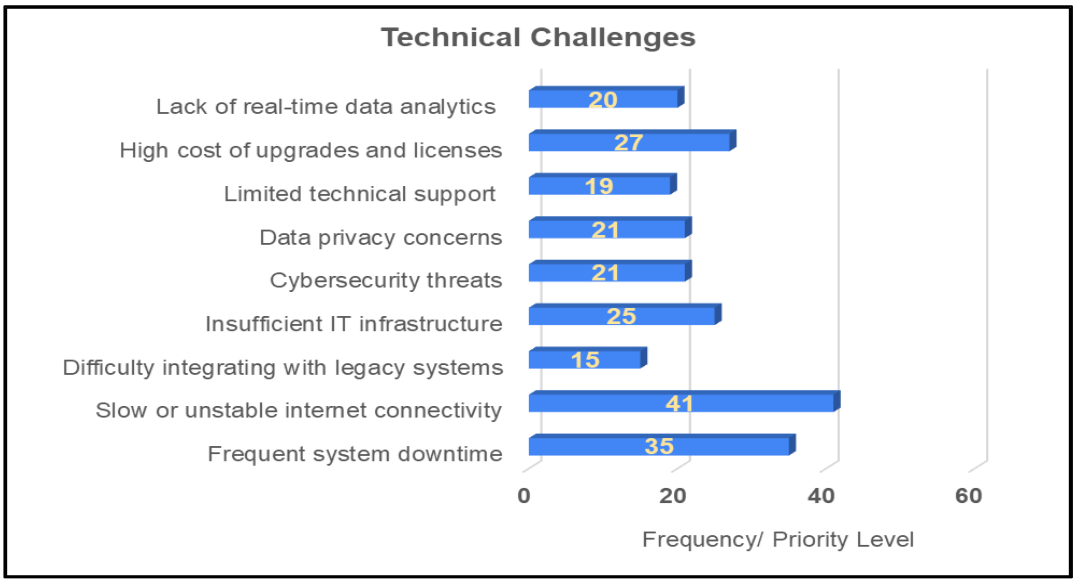

Figure 2. Identified Technical Challenges in Digital Procurement

5.3. Administrative and policy challenges

Administrative and policy constraints are mostly about leadership, governance, and institutional architectures that form the general context for eProcurement. The most commonly cited problem was a lack of or poor quality budgeting for maintenance and evolution of the system (37). Agencies' struggle to get consistent funding also hampers their ability to maintain and enhance their digital procurement services in the long term. Financial instability or inadequate financial support frequently leads to old equipment and deferred upgrades, and decreases in technical help both of which contribute to reduced system dependability and user confidence.

Bureaucratic/inefficient procedures combined with long approval processes (31) also restrict the innovation. Underdeveloped leadership support (24) and absence of internal policies and implementation guidance (28) were the other two major barriers for a uniform roll-out across government departments. This may contribute to inconsistent decision making and/or varying levels of digital maturity.

Additional concerns raised on more than one occasion were changes or vagueness in procurement policies (24), poor monitoring and evaluation (19) and mismatch between national policy making and agency-level operations (12). On the whole, these discrepancies suggest systematic governance deficits that need to be remedied through extensive institutional reforms and coherent policy direction.

Results indicate that the leadership, a stable policy environment and sound financial base are highly significant in place with successful and sustainable digital procurement. Clear rules, defined procedures and effective administrative tools are necessary for long-term digital transformation. Finally, government agencies can take full advantage of the e-procurement by embedding accountability, permanence and flexibility in administrative practices are necessary to sustain long-term digital transformation. The opportunities of e-Procurement can be reaped by government institutions only if the enabling environment of accountability, stability and adaptability are prevalent.

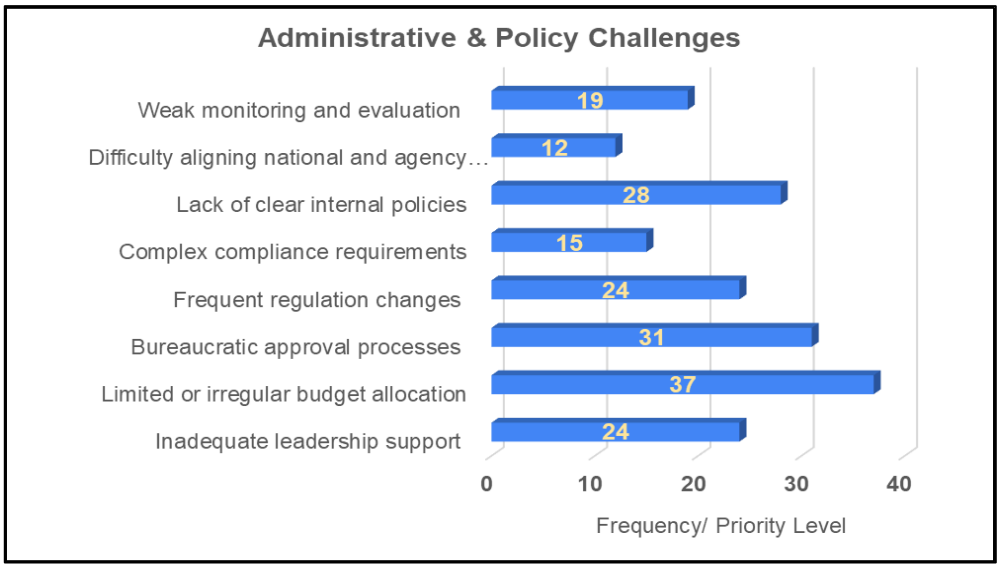

Figure 3. Identified Administrative and Policy Challenges in Digital Procurement

4. Extent of Digital Procurement Tool Adoption and Level of Operational Efficiency

Correlation analysis Results of the correlation between 'depth' in digital procurement tool adoption and procurement operational efficiency. The results of the Table 14 show that depth in digital procurement tool adoption is positively correlated to operational efficiency across NGAs. A strong positive interdependence is shown by the computed value of Pearson correlation coefficient (r=0.606). This result indicates that the higher adoption of digital tools, the higher the operational efficiency in purchase activities.

The associated p-value (< 0.001) indicates that this association is statistically significant at 0.05 level. Accordingly, the null hypothesis is rejected asserting that there is a significant relationship between digital procurement adoption and operational efficiency. The findings support H2, which states that e-procurement tools significantly increase effectiveness and make processes more efficient, as well as reducing delays in government procurement activities.

Table 14. Correlation Between the Extent of Digital Procurement Tool Adoption and Level of Operational Efficiency

Variables	Pearson r	p-value	Decision	Interpretation
Extent of Digital Procurement Tool Adoption and Level of Operational Efficiency	0.606	< 0.001	Reject the null hypothesis	Significant / Strong Positive Correlation

5. Proposed strategies and policy recommendations

This chapter provides an outline of the main aspects and policy prerequisites required to support successful deployment of digital procurement at a national level in government institutions. The findings are used as the basis for deriving recommended strategies, which were arranged in four main dimensions:

a) Training and HRD,
b) Innovative Modification and Integration of Technologies,
c) Improvements in Policy and Governance, and
d) Stakeholder Engagement and Transparency.

a. Development of Capacities and Human Resources

This dimension highlights the importance of human capital to successful digital transformation. Respondents repeatedly stressed that the skills and preparedness of personnel are crucial to a successful implementation of digital procurement.

Digital transformation's cornerstone is building capability. Ongoing training, digital competencies and incentive elements in the organization are indispensable to equip staff with the skills and context for complete implementation or use of e-procurement systems.

Key Priorities:

- Deliver regular workforce training on digital procurement systems (and data analytics) – ranked highest by 56 respondents and reflective of the immediate need to re-skill and upskill capability amongst the procurement cohort.
- Offer technical certification and professional development options that would be available to staff to ensure currencies of procurement officers with regard to necessary technical experience in managing complex digital systems (cited by 45 passengers).
- Promote digital literacy among all staff (identified by 39 responses) to foster inclusiveness and agility in the digital workplace.
- Create mechanisms of incentive and reward for staff that has had a proper use, improvement of digital processes, key motivating measure highlighted by 31 respondents to keep the innovative engagement.
- Roll out change management initiatives (sponsored by 30 respondents) to tackle resistance and promote acceptance of digital changes across the organization.

b. Technology upgrade and system integration

This dimension is concerned with enhancing technology investments and enabling smooth operation of e-procurement platforms. Respondents understood that effective system performance, strong security, and data-based processes are key for the modernization of public procurement.

Improving digital infrastructure and incorporating analytics-based decision making tools not only increase efficiency but also transparency, reliability in the procurement cycle.

Key Recommendations:

Public procurement priorities to enjoy the latest AI and cloud-based applications public procurement organizations have several urgent requirements, with faster network traffic such as those for real-time procurement transactions ebusiness being one of them: Upgrade IT infrastructure- specifically a ditto from 52 respondents who want to see faster, more stable and reliable Internet connections that are secure enough to connect seamlessly in seconds.

- (44 respondents) Deploy fully integrated, end-to-end epurchasing systems to simplify processes from procurement planning through the completion of a contract and harmonize government platforms with those provided by e-procurement vendors.
- Improve cybersecurity and data privacy protection – 33 respondents emphasized the need to protect sensitive procurement data from cyber security threats and comply with regulations relating to data protection.
- Employ data analytics and dashboards for real-time tracking backed by 30 respondents for the purpose of evidence-based management and better performance measurement.
- Embrace cloud technologies, suggested by 26 responders to bring the same level of accessibility, scalability and redundancy to agencies.

c. Policy & Governance Improvements

To ensure that strategies corresponding to digital procurement efforts are feasible and effective, the chapter underscores the importance of retaining change within an institution, engaging in leadership which is prepared for work and methodically mixing policy fields. A reasonable management approach should be established to ensure that the application, monitoring and repeated upgrading of e-procurement by government organizations can be normalized. Respondents listed the number of

key actions in creating governance programmes and adapting institutional activity for their digital transformations.

If the shift to digital procurement is to be sustained, policy and leadership will need a realignment. And I think, by streamlining along the regulatory pathway that's going to be achieved also with institutionalizing normal and clear processes. Whether or not there will be continuity in leadership and financial support. Such a system will not only increase operational efficiency, but also ensure greater accountability and bring about good governance and an innovative culture within the government.

Key Actions:

- Simplify procurement rules. Consolidated and aligned guidance to support ease of compliance, minimize administrative load and promote efficiency among implementing offices.
- Establish clear internal policies and SOPs for e-procurement use. Highlight of 45 respondents described the SOP-type structure in terms of preserving commonality, credibility, responsibility and coherence among all departments/organizations. Strong policies are at the heart of how we work and operate digital systems effectively.
- Budget and fund a good digital tool for 28 respondents. Maintenance and upgrading of e-procurement was suggested by 32. They also need to prospect what is essential with regard to e-procurement. Predictable funding maintains the operational, safe and adaptable systems.
- Formalize the practice of establishing benchmarks and policy review This was noted as a best practice by 31 survey respondents for continual improvement.

d. Stakeholder Engagement and Transparency

Trust and accountability can only be embedded if strong rapport is built, transparency in communication is fostered as well as being consistently kept informed at every stage of the procurement process. Effective governance is supported by active stakeholder participation, which in turn stimulates the further growth and responsiveness of e-procurement. With the involvement of suppliers, government departments and the public, digital procurement is much more inclusive, efficient and user needs-led.

Key Recommendations:

Enhance the communication with suppliers regarding questions / future plans for procurement from 49 respondents noted amongst their top three issues to make access better and this can be done via additional web information availability, helpdesks, a contact for procurement related queries etc. Better communication leads to more efficient deals and happier vendors.

- Increase supplier base and encourage greater participation, using the digital markets enabled by 48 respondents to make their procurement accessible for a wider spectrum of suppliers including MSMEs. This provision encourages fair competition and enhances the integrity of the competitive bid process.
- Increase transparency by posting procurement data and process online – a suggestion from 37 respondents to help hold authorities accountable and to head off irregularities.
- According to 30 respondents, refer to feedback and user experience reporting in order to help enhance digital systems (to inform views on the experiences of users of a system and/or the staff, suppliers or general public may have expressed opinions about it). And by collecting and analyzing feedback in an ongoing way, other agencies can learn from where there are any roadblocks causing kinks in their digital services or usability issues or areas for improvement by continuing to remain agile and user-centered with their technology

Conclusion

This research concludes that public procurement systems should be framed in terms of a four-dimensional strategy in an effort to leverage digital tools for their optimization: (a) Capacity Building and Human Resource Development, (b) Technology Improvement and System Integration, (c) Policy Adjustment and

Governance Reform, (d) Stakeholder Commitment and Transparency. Combined, these interconnected elements reinforce the digital procurement ecosystem and drive sustainable efficiency at scale in national governments.

Of the four, capacity and human resource were the top priority. Respondents emphasized that on-going training in digital procurement systems and data analytics are essential in providing staff with technical as well as analytical skills. Furthermore, targeted training programs, the introduction of Change Management Programs are also suggested to overcome organizational resistance, facilitating an easier transition into digital systems and emphasizing that people problems are paramount in implementing a digitally enabled procurement process.

With regard to technology development and system integration, respondents emphasized the need for IT infrastructure that can be updated to create a fast, stable platform capable of supporting large-scale procurement operations in a secure manner. End-to-end e-procurement systems, secure

Respondents also emphasized the need for strong technology and systems integration, as well as scalable IT infrastructure, to enable secure large-scale procurements. End-to-end e-procurement arrangements that were underpinned with strong features and applications including cloud-based solutions, real-time data analytics, and robust cyber security were highlighted as tools to help increase efficiencies, facilitate evidence-based decision-making, and ensure secure connections between users of the system and information available in relation to procurement.

On the policy and governance side, firm political leadership and institutional reforms are a must. Standardized processes, well defined corporate policy, rigid budgeting method and supportive top-level managers are necessary to assure the homogeneity, accountability of digital initiatives with business goals. I believe transparent and efficient governance underpins the agile procurement.

The need for stakeholder engagement and transparency was also emphasized. Key recommendations to drive trust, inclusiveness and innovation in the system also included opening digital marketplaces; better communicating with suppliers; ensuring members of the public can access data on procurement activity; and working more closely with other departments, as well as within the private sector.

To ensure the efficiency of government procurement using digital platforms it's essential to employ a coordinated and collaborative approach that binds human skills, technology, and good governance. To maintain these interventions, the research suggests:

1. Regular sessions with digital tools, data analytics and cybersecurity training.
2. The investment in resilient and interconnected IT.
3. Strengthen policy environment and governance structures, streamline procurement guidelines, establish standardized internal procedures, regulated or periodic review processes to ensure uniformity and accountability.
4. Obtain the ongoing funding and commitment of leadership. Establish 'ringfenced' budgets to maintain, upgrade,develop skills within staff and have active executive support for digitization goals.
5. Enhancing cybersecurity and data protection.
6. Promoting stakeholder participation and transparency.
7. Promoting innovation and collaboration across agencies and sectors

Adopting these approaches will be delivered the procurement environment to a more open, adaptive and technology-led model that can deliver services more quickly, delivers better accountability, increases confidence in the way government operates.

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