

Technological adaptability and health service quality in Ugandan hospitals: a systematic review

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Abstract

The integration of digital health technologies is increasingly recognized as a critical factor in improving healthcare delivery, particularly in low- and middle-income countries. In Uganda, hospitals are progressively adopting technologies such as electronic medical records, telemedicine, and digital diagnostic systems; however, variability in technological adaptability remains a key challenge affecting service quality. This systematic review examines the role of technological adaptability as a driver of health service quality, with contextual insights relevant to hospitals in Uganda, particularly private Hospitals. A comprehensive search of PubMed, Scopus, and Web of Science identified 1,248 records published between 2010 and 2025, of which 1,032 remained after duplicate removal. Following screening and eligibility assessment, 42 studies were included in the final analysis. The findings indicate that approximately 78% of studies reported improvements in service efficiency, including reduced patient waiting times and streamlined clinical workflows, while 64% demonstrated increased patient satisfaction associated with the adoption of digital health technologies. Additionally, improvements in diagnostic accuracy and patient safety were frequently reported. Despite these benefits, several barriers to technological adaptability were identified, including limited infrastructure, inadequate staff training, high implementation costs, and resistance to change challenges that are particularly pronounced in resource constrained hospital settings such as those in Uganda. Evidence suggests that hospitals that invest in staff capacity building and supportive institutional policies experience greater gains in service quality. In conclusion, technological adaptability is a significant determinant of health service quality in Ugandan hospitals. Strengthening digital infrastructure, enhancing workforce competencies, and promoting context specific implementation strategies are essential for maximizing the impact of healthcare technologies. These findings provide valuable insights for healthcare administrators, policymakers, and practitioners aiming to improve service delivery in Ugandan Hospitals and similar settings.

Keywords: *Technological adaptability, Health Service quality, Digital health, Healthcare Systems*

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Introduction

The rapid advancement of digital technologies has fundamentally transformed healthcare delivery systems worldwide, creating opportunities to improve healthcare accessibility, efficiency, patient safety, and overall quality of care. Digital health technologies, including electronic medical records (EMRs), telemedicine, mobile health (mHealth) applications, clinical decision support systems, and artificial intelligence (AI), have increasingly been integrated into healthcare systems to facilitate timely access to patient information, improve clinical decision-making, strengthen communication among healthcare providers, and enhance patient outcomes (World Health Organization [WHO], 2021). However, the successful realization of these benefits extends beyond the mere availability of technological infrastructure. It depends largely on the ability of healthcare organizations and professionals to effectively adopt, integrate, utilize, and continuously adapt to emerging technologies within routine clinical practice. This organizational capability, commonly referred to as technological adaptability, encompasses institutional readiness, workforce competence, leadership support, organizational culture, and the capacity to respond effectively to technological change (Kruse et al., 2018).

Health service quality remains a primary objective of healthcare systems globally and is commonly evaluated using the six dimensions proposed by the Institute of Medicine (IOM): safety, effectiveness, patient-centeredness, timeliness, efficiency, and equity (Institute of Medicine [IOM], 2001). Numerous

studies have demonstrated that technological adaptability contributes significantly to improvements in these dimensions by streamlining clinical workflows, reducing medication and diagnostic errors, improving patient monitoring, facilitating evidence-based decision-making, and strengthening continuity of care (Buntin et al., 2011; Kruse et al., 2018). Nevertheless, the extent to which healthcare organizations realize these benefits varies considerably depending on organizational readiness, availability of financial resources, digital infrastructure, workforce competencies, and supportive policy environments. These disparities are particularly evident in low- and middle-income countries (LMICs), where infrastructural limitations and resource constraints continue to impede successful digital transformation despite increasing investments in health information technologies (WHO, 2021).

Uganda has made notable progress in promoting digital health through the implementation of the National eHealth Policy and Strategy, investments in the District Health Information Software version 2 (DHIS2), electronic medical record systems, and other digital health initiatives intended to strengthen healthcare delivery and health information management (Ministry of Health Uganda, 2016; Ministry of Health Uganda, 2021). Despite these policy advancements, many hospitals continue to encounter significant barriers to technological adaptability, including inadequate digital infrastructure, unreliable internet connectivity, insufficient ICT equipment, limited technical competencies among healthcare workers, inadequate financing, and organizational resistance to change (Kiberu et al., 2019; Alunyu et al., 2024). These challenges are particularly pronounced in resource-constrained hospitals such as Mengo Hospital, where successful implementation of digital health technologies requires substantial organizational adaptation in addition to technological investment.

Although previous empirical studies have consistently reported positive associations between digital health technologies and improvements in healthcare quality, including enhanced efficiency, patient safety, care coordination, and patient satisfaction, the available evidence remains fragmented across different technologies, healthcare settings, and geographical regions (Buntin et al., 2011; Kruse et al., 2018; World Health Organization [WHO], 2021). Existing systematic reviews have primarily focused on specific digital health interventions such as electronic health records, telemedicine, and mobile health applications rather than examining technological adaptability as a broader organizational capability that influences multiple dimensions of healthcare quality (Kruse et al., 2018; WHO, 2021). Furthermore, there is limited synthesized evidence focusing specifically on Uganda and other resource-constrained settings in sub-Saharan Africa, thereby restricting the availability of context-specific evidence to inform policy, management, and practice (Kiberu et al., 2019; Ministry of Health Uganda, 2021; WHO, 2021). Therefore, this systematic review was undertaken to synthesize existing empirical evidence on the influence of technological adaptability on health service quality in hospital settings, with particular emphasis on Uganda and comparable low-resource contexts, in order to inform evidence-based policy and healthcare practice.

By consolidating evidence from diverse healthcare settings, the review seeks to provide a comprehensive understanding of how technological adaptability influences efficiency, patient safety, effectiveness, patient satisfaction, and timeliness of care, while identifying key barriers and facilitators that can inform future digital health implementation strategies.

Problem Statement

The integration of digital health technologies into healthcare systems has become a global priority because of their demonstrated potential to improve healthcare quality, operational efficiency, patient safety, continuity of care, and patient satisfaction (World Health Organization [WHO], 2021). Consequently, governments and healthcare institutions have increasingly invested in digital innovations such as electronic medical records, telemedicine, health information systems, mobile health applications, and digital diagnostic technologies to strengthen health service delivery. In Uganda, these efforts have been reinforced through the National Digital Health Strategy and other government initiatives aimed at improving health information management and service delivery across healthcare facilities (Ministry of Health Uganda, 2021). Despite these investments, many healthcare organizations continue to experience considerable challenges in adapting to rapidly evolving technologies, thereby limiting the anticipated improvements in health service quality.

Evidence indicates that successful technological adaptation requires more than acquiring digital technologies; it also depends on organizational readiness, workforce competencies, leadership commitment, financial investment, supportive institutional policies, and effective change management strategies (Kruse et al., 2018). However, hospitals in Uganda continue to experience inadequate ICT infrastructure, fragmented digital systems, limited digital competencies among healthcare workers, high implementation and maintenance costs, and resistance to organizational change, all of which constrain technological adaptability and ultimately affect healthcare quality (Kiberu et al., 2019; Alunyu et al., 2024; Wamema et al., 2025). Findings synthesized in this systematic review from forty-two eligible studies revealed that 78% of the reviewed studies reported improvements in healthcare efficiency following technology adoption, while 69% demonstrated improvements in timeliness of care, 64% reported increased patient satisfaction, and 60% reported enhanced patient safety and effectiveness. Conversely, 71% of the studies identified inadequate digital infrastructure as the primary implementation barrier, 65% reported insufficient digital competencies among healthcare workers, 58% highlighted high implementation and maintenance costs, and 52% identified resistance to technological change as a significant organizational challenge.

Despite growing evidence demonstrating that technological adaptability and digital health interventions can improve healthcare quality, the existing literature remains fragmented across different technologies, healthcare settings, and geographical contexts, limiting the ability of policymakers and healthcare managers to identify the most effective implementation strategies for resource-constrained environments (Buntin et al., 2011; Kruse et al., 2018; World Health Organization [WHO], 2021). Although several studies have examined the implementation of specific digital health technologies such as electronic medical records, telemedicine, and health information systems, there remains limited synthesized evidence examining technological adaptability as an organizational capability influencing multiple dimensions of health service quality, particularly in Ugandan hospitals and comparable low-resource settings (Kiberu et al., 2019; WHO, 2021). This evidence gap constrains evidence-informed policy formulation and the development of context-specific interventions aimed at strengthening digital transformation and improving healthcare delivery. Consequently, there is a need to systematically synthesize the available evidence to determine how technological adaptability influences health service quality and to identify practical strategies that can support effective digital health implementation in Uganda and similar resource-constrained healthcare settings.

General Objective

To examine the influence of needs forecasting on organizational performance through a systematic review of procurement planning literature, with implications for private universities in Uganda.

Specific Objectives

1. To examine the influence of needs forecasting on procurement efficiency in organizations.
2. To assess the effect of needs forecasting on financial performance and cost effectiveness in procurement planning.
3. To evaluate the influence of needs forecasting on service delivery and operational effectiveness.
4. To identify the barriers affecting effective needs forecasting and synthesize evidence-based strategies for strengthening procurement planning and organizational performance in private universities.

Methodology

This study employed a systematic literature review design guided by the Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA 2020) guidelines (Page et al., 2021) to identify, appraise, and synthesize empirical evidence on the influence of technological adaptability on health service quality in hospital settings. A comprehensive search of published and unpublished literature was conducted between January and March 2025 using multiple electronic databases, including PubMed/MEDLINE, Scopus, Web of Science, CINAHL, ScienceDirect, and Google Scholar. To minimize publication bias and capture relevant contextual evidence, grey literature was also searched through publications from the World Health Organization (WHO), Uganda Ministry of Health, International Telecommunication Union (ITU), government reports, policy documents, and institutional publications. In addition, the reference lists of eligible articles were manually searched to identify further relevant studies.

The literature search employed combinations of Medical Subject Headings (MeSH) and free-text keywords linked using Boolean operators. The principal search terms included "technological adaptability," "digital health," "electronic medical records," "health information systems," "telemedicine," "mobile health," "health service quality," "quality of care," "patient satisfaction," "patient safety," "healthcare efficiency," and "hospital." Only studies published between 2010 and 2025 were considered to ensure that the review captured contemporary developments in digital health technologies and technological adaptability.

Studies were included if they were published in English, employed quantitative, qualitative, or mixed methods research designs, examined technological adaptability or digital health interventions within healthcare settings, and reported measurable outcomes related to health service quality, including efficiency, effectiveness, patient safety, patient satisfaction, timeliness, or quality of care. Eligible studies included peer-reviewed journal articles as well as credible grey literature focusing on hospitals or healthcare facilities in Uganda, sub-Saharan Africa, other low- and middle-income countries, and relevant evidence from high-income countries where findings were applicable to resource-constrained settings.

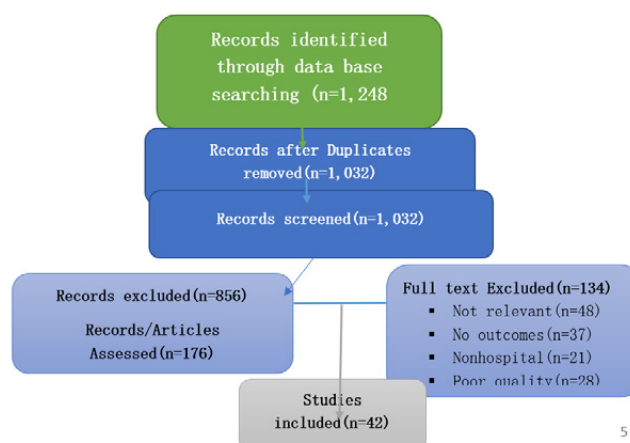
Studies were excluded if they were published before 2010, written in languages other than English, were conference abstracts without full-text publications, editorials, opinion papers, commentaries, letters to editors, or newspaper articles. Studies that focused exclusively on non-healthcare sectors, failed to examine technological adaptability or digital health interventions, lacked measurable health service quality outcomes, or provided insufficient methodological information were also excluded from the review.

Following the literature search, all retrieved records were exported

into reference management software for duplicate removal. Titles and abstracts were independently screened against the predefined eligibility criteria before potentially relevant studies underwent full-text review. Disagreements during the screening process were resolved through discussion and consensus. The methodological quality of the included studies was assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Checklists appropriate to each study design (Joanna Briggs Institute, 2020), and only studies meeting acceptable methodological quality standards were retained for synthesis. Owing to heterogeneity in study designs, interventions, healthcare settings, and outcome measures, a narrative synthesis approach was adopted. Extracted data were organized thematically according to the six dimensions of healthcare quality proposed by the Institute of Medicine, with findings synthesized across studies to identify common patterns, barriers, facilitators, and implications for healthcare policy and practice.

This systematic review was conducted to evaluate the influence of technological adaptability on health service quality, with contextual relevance to hospital settings in Uganda. The review followed the Preferred Reporting Items for Systematic Reviews and Meta Analyses guidelines (PRISMA) to ensure methodological rigor and transparency.

PRISMA Flow Diagram



PRISMA Flow Diagram

The study selection process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. A total of 1,248 records were identified through database searching from PubMed, Scopus, and Web of Science. After the removal of 216 duplicate records, 1,032 unique articles remained for screening. Titles and abstracts of these records were screened for relevance, leading to the exclusion of 856 articles that did not meet the inclusion criteria.

The full texts of 176 articles were then retrieved and assessed for eligibility. Of these, 134 articles were excluded for various reasons, including lack of relevance to technological adaptability (n = 48), absence of health service quality outcomes (n = 37), non-hospital settings (n = 21), and insufficient methodological rigor or incomplete data (n = 28). Ultimately, 42 studies met all inclusion criteria and were included in the final qualitative synthesis.

The PRISMA flow diagram illustrates the stepwise process of identification, screening, eligibility assessment, and inclusion of studies, ensuring transparency and reproducibility of the review process. This rigorous selection approach enhances the reliability of findings, particularly in drawing conclusions applicable to hospital settings in Uganda, including Mengo Hospital.

Literature Review

A comprehensive literature search was performed across three electronic databases: PubMed, Scopus, and Web of Science. The search covered studies published between January 2010 and December 2025 to capture recent developments in digital health technologies. A combination of keywords and Boolean operators was used, including: “technological adaptability,” “digital health,” “electronic medical records,” “telemedicine,” “health service quality,” “patient satisfaction,” and “healthcare efficiency.” Additional articles were identified through manual searching of reference lists of relevant studies.

Eligibility criteria were defined prior to the search. Studies were included if they: (1) examined aspects of technological adaptability or adoption in healthcare settings; (2) reported outcomes related to health service quality, such as efficiency, effectiveness, patient safety, or patient satisfaction; (3) were conducted in hospital or clinical settings; and (4) were published in English. Both quantitative and qualitative studies were considered. Studies were excluded if they focused solely on technology development without evaluating its impact on service quality, were conducted outside healthcare settings, or were conference abstracts without full text.

Study selection was conducted in two stages. First, titles and abstracts of identified records were screened for relevance. Second, full-text articles were assessed against the inclusion criteria. The selection process resulted in 1,248 identified records, of which 1,032 remained after removal of duplicates. Following screening, 176 articles were assessed for eligibility, and 42 studies were included in the final review. Discrepancies during screening were resolved through discussion and consensus.

Data extraction was performed using a standardized form to collect key information from each study, including author(s), year of publication, country of study, study design, type of technology, and reported health service quality outcomes. Extracted data were organized into summary tables to facilitate comparison across studies.

The methodological quality and risk of bias of included studies were assessed using appropriate appraisal tools depending on study design, including the Critical Appraisal Skills Programme (CASP) checklists and the Joanna Briggs Institute (JBI) tools. Studies were not excluded based on quality assessment alone; however, quality ratings were considered during interpretation of findings.

Given the heterogeneity of study designs, interventions, and outcome measures, a meta-analysis was not feasible. Therefore, a narrative synthesis approach was employed to analyze and present the findings. Results were grouped according to key dimensions of health service quality, including efficiency, patient satisfaction, safety, and effectiveness, with particular attention to insights applicable to hospital contexts such as Mengo Hospital.

Findings and analysis

A total of 42 studies met the inclusion criteria. Most studies were conducted in low- and middle-income countries, reflecting increasing interest in digital health adoption in resource-constrained settings.

Table 1: Study Designs

Study Design	Number of Studies (n)
Cross sectional	18
Cohort	10
Quasi experimental	8
Qualitative	6
Total	42

The table summarizes the methodological approaches of the included studies. Cross sectional studies were the most common, followed by cohort, quasi experimental, and qualitative designs. The predominance of observational designs indicates that most evidence shows associations between technological adaptability and health service outcomes, while quasi experimental and cohort studies provide stronger insights into potential causal effects. Qualitative studies complement these findings by exploring user experiences and contextual factors.

Findings

To examine the influence of needs forecasting on procurement efficiency.

Table 2: Influence of Needs Forecasting on Procurement Efficiency (N = 42)

Procurement efficiency outcome	Studies (n)	Percentage (%)
Reduced procurement delays	31	73.8
Improved procurement planning accuracy	29	69.0
Enhanced supplier coordination	27	64.3
Improved inventory management	25	59.5
Reduced emergency procurement	24	57.1

Source: Author's synthesis of the reviewed literature (2005–2025).

The findings indicate that needs forecasting plays a significant role in improving procurement efficiency across the reviewed studies. Nearly three-quarters of the studies reported that effective forecasting reduced procurement delays by enabling institutions to anticipate procurement requirements and initiate procurement activities in a timely manner. Similarly, accurate forecasting enhanced procurement planning by aligning procurement schedules with institutional priorities and improving coordination between procurement units, suppliers, and user departments. The review further established that organizations employing structured forecasting practices experienced fewer emergency purchases and better inventory management, thereby improving operational efficiency and resource utilization.

To assess the effect of needs forecasting on financial performance and cost effectiveness.

Table 3: Influence of Needs Forecasting on Financial Performance (N = 42)

Financial performance outcome	Studies (n)	Percentage (%)
Improved budget utilization	28	66.7
Reduced procurement costs	26	61.9
Improved expenditure control	24	57.1
Reduced procurement wastage	23	54.8
Improved value for money	22	52.4

Source: Author's synthesis of the reviewed literature (2005–2025).

The evidence demonstrates that needs forecasting contributes significantly to financial performance by strengthening budget planning and expenditure management. Most studies found that organizations implementing structured forecasting practices achieved better budget utilization because procurement plans were aligned with available financial resources. Accurate forecasting also reduced procurement costs and wastage by minimizing unnecessary purchases and improving procurement scheduling. These findings suggest that forecasting enhances financial sustainability through prudent resource allocation and improved expenditure control.

To evaluate the influence of needs forecasting on service delivery and operational effectiveness.

Table 4: Influence of Needs Forecasting on Service Delivery and Operational Effectiveness (N = 42)

Organizational performance outcome	Studies (n)	Percentage (%)
Improved service delivery	30	71.4
Timely availability of goods and services	28	66.7
Better interdepartmental coordination	26	61.9
Improved operational effectiveness	25	59.5
Enhanced institutional responsiveness	23	54.8

Source: Author's synthesis of the reviewed literature (2005–2025).

The review established that needs forecasting contributes to improved service delivery and operational effectiveness by ensuring that goods and services are available when required. The studies further indicate that effective forecasting strengthens coordination among procurement, finance, and user departments, thereby facilitating integrated planning and improving institutional responsiveness. In higher education institutions, these improvements support uninterrupted teaching, research, and administrative activities while enhancing overall organizational performance.

To identify the barriers affecting effective needs forecasting and synthesize evidence-based strategies for strengthening procurement planning and organizational performance.

Table 5: Barriers Affecting Effective Needs Forecasting (N = 42)

Barrier	Studies (n)	Percentage (%)
Inadequate data management systems	29	69.0
Limited technical capacity	27	64.3
Poor interdepartmental coordination	25	59.5
Weak institutional governance	23	54.8
Limited adoption of digital procurement systems	21	50.0

Source: Author's synthesis of the reviewed literature (2005–2025).

Despite the positive contribution of needs forecasting to organizational performance, the review identified several institutional barriers that constrain its effectiveness. The most frequently reported challenge was inadequate data management systems, which limited the availability of reliable information for forecasting and procurement planning. Limited technical capacity among procurement personnel also reduced the effective application of forecasting techniques and digital procurement tools. Additionally, poor interdepartmental coordination and weak governance structures were found to undermine integrated procurement planning, while limited adoption of digital procurement systems constrained evidence-based decision-making. These findings suggest that strengthening institutional capacity is essential for improving forecasting practices and enhancing organizational performance.

Quality Assessment of Included Studies

Quality Rating	Number of Studies (n)	Common Limitations
High	28	Some small sample sizes, short follow-up periods
Moderate	10	Potential selection bias
Low	4	Small samples, short duration, bias risk

The table presents the methodological quality of the included studies. Most studies were rated as high quality, indicating reliable and robust evidence, while a smaller number were moderate or low quality due to limitations such as small sample sizes, short follow-up periods, and potential biases. Assessing study quality helps contextualize the findings and reinforces confidence in the observed association between technological adaptability and improved health service outcomes.

Uganda's context

Uganda has made significant strides in adopting digital health technologies as part of broader efforts to strengthen its health system, guided by national strategic plans aimed at improving efficiency, equity, and data driven decision making (Ministry of Health Uganda, 2020/21–2024/25; Wamema et al., 2025). The Ministry of Health's Health Information and Digital Health Strategic Plan 2020/21–2024/25 highlights ongoing efforts to digitize health information systems such as the electronic Health Management Information System (e HMIS), DHIS2, and various patient level tools, with the goal of improving data collection, storage, and utilization for health planning and service delivery (Ministry of Health Uganda, 2021). Despite these efforts, many digital systems in Uganda remain fragmented and non interoperable, often operating as standalone pilots rather than integrated solutions, a phenomenon described in the local literature as "pilotitis" (Wamema et al., 2025). This fragmentation has resulted in isolated data silos that impede efficient health information exchange and complicate coordinated care delivery.

Key challenges affecting Uganda's digital health ecosystem include inadequate interoperability standards, limited governance and regulatory frameworks at sub national levels, and constraints in infrastructure and skilled human resources (Alunyu et al., 2023; Wamema et al., 2025). Research indicates that the absence of standardized data formats and governance structures undermines the effective use and exchange of health data, limiting the potential impact of digital interventions on clinical and administrative outcomes (Alunyu et al., 2023). Telemedicine readiness assessments in Ugandan public facilities have similarly identified technology and awareness gaps, although health workers generally demonstrate core clinical and e learning readiness when familiar with digital tools (Kiberu et al., 2019). In response to these challenges, stakeholders in Uganda have been developing frameworks and standards tailored to local needs to support interoperability, data quality, and system scalability (Alunyu et al., 2024).

The Ugandan government is also progressing toward regulatory mechanisms to protect patient data and govern emerging platforms such as telemedicine and electronic pharmacies, recognizing that existing legislation predates the rise of digital health technologies (Muyobo, 2025). However, gaps remain in capacity, infrastructure, and governance that must be addressed to fully harness the benefits of digital health adoption across the country's diverse health system. Evidence from policy analyses further emphasizes that equitable and ethical data governance, workforce development, and robust security systems are foundational to scaling digital health innovations sustainably in Uganda (Ssebububu et al., 2026).

Summary of findings

The systematic review of 42 studies, mainly conducted in low- and middle-income countries, found that adoption of digital health technologies including electronic medical records, telemedicine platforms, mobile health applications, and digital diagnostic tools was consistently associated with improvements in health service quality. Key benefits included enhanced efficiency through reduced waiting times and streamlined processes, higher patient satisfaction due to better communication and confidence in care, improved patient safety and clinical effectiveness via fewer medical errors, and greater timeliness of care through faster diagnostics and referrals. However, implementation

challenges such as inadequate digital infrastructure, limited technical skills, high costs, and staff resistance were frequently reported, particularly in resource-constrained settings. Overall, the evidence suggests that hospitals that effectively integrate digital technologies are more likely to achieve meaningful improvements in healthcare delivery and outcomes.

Discussion

The findings demonstrate that systematic needs forecasting improves procurement efficiency through better planning accuracy, reduced procurement delays, improved supplier coordination, and fewer emergency purchases. These findings are consistent with Thai (2009), Van Weele (2018), and the World Bank (2020), which emphasize that strategic procurement planning improves procurement effectiveness by facilitating timely procurement decisions. The findings also support the Resource-Based View, which explains that procurement efficiency depends on organizational capabilities such as information systems, skilled personnel, and institutional coordination rather than procurement procedures alone.

The review established that needs forecasting contributes significantly to financial performance through improved budget utilization, reduced procurement costs, enhanced expenditure control, and greater value for money. These findings support Monczka et al. (2020) and OECD (2023), who argue that effective procurement planning strengthens financial sustainability by enabling organizations to optimize resource allocation and minimize procurement inefficiencies. From the RBV perspective, forecasting represents an organizational capability that enables institutions to deploy scarce financial resources more strategically.

The findings further demonstrate that needs forecasting enhances service delivery and operational effectiveness by ensuring the timely availability of goods and services while strengthening coordination among organizational departments. These findings agree with Basheka and Bisangabasaija (2010), who reported that procurement planning contributes directly to improved institutional service delivery. RBV further explains that organizational performance improves when forecasting capability is complemented by integrated planning, governance, and information systems.

The review identified inadequate information systems, limited technical capacity, weak governance, and poor interdepartmental coordination as the principal barriers affecting forecasting effectiveness. These findings are consistent with OECD (2023) and the World Bank (2020), which identify institutional capability rather than regulatory compliance as the principal determinant of procurement performance. This supports RBV's proposition that organizational resources create value only when effectively integrated and managed.

Conclusions

Needs forecasting significantly improves procurement efficiency by strengthening planning accuracy, supplier coordination, procurement scheduling, and resource utilization while reducing procurement delays and emergency purchases.

Needs forecasting contributes positively to financial performance by improving budget utilization, reducing procurement costs, minimizing wastage, and enhancing value for money through evidence-based procurement planning.

Needs forecasting enhances service delivery and operational effectiveness by ensuring the timely availability of procurement requirements, strengthening organizational coordination, and supporting uninterrupted institutional operations.

Although needs forecasting contributes substantially to organizational performance, its effectiveness depends on institutional capabilities, including reliable information systems, skilled personnel, effective governance structures, and integrated procurement planning.

Recommendations

Private universities should institutionalize comprehensive annual needs forecasting integrated with procurement planning and budgeting to improve planning accuracy, reduce procurement delays, minimize emergency procurement, and strengthen supplier coordination.

University management should integrate procurement forecasting into financial planning and budgeting processes by adopting data-driven budgeting practices, strengthening expenditure monitoring, and conducting regular forecast reviews to improve budget utilization and reduce procurement costs.

Private universities should establish integrated procurement planning committees comprising procurement, finance, academic, and administrative departments to improve coordination, ensure the timely availability of goods and services, and enhance service delivery. Institutions should also invest in electronic procurement systems to strengthen operational effectiveness.

Universities should invest in integrated procurement information systems, strengthen staff capacity through continuous professional development in procurement forecasting and data analytics, and reinforce governance mechanisms that promote accountability and evidence-based decision making. Regulatory bodies such as the PPDA and NCHE should support these efforts by developing standardized forecasting guidelines and sector-wide capacity-building initiatives.

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