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Effect of E-Procurement Practices on Institutional Efficiency in Complying with Procurement Principles; A Case of Rwanda Polytechnic (2021-2023)

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Abstract

The study examined the effect of e-procurement practices on institutional efficiency in adhering to procurement principles, with a specific focus on Rwanda Polytechnic from 2021 to 2023. grounded in transaction cost theory, resource-based view and institutional theory, the research provides a theoretical lens through which the relationship between e-procurement systems and organizational performance is explored. These theories collectively explain how e-procurement reduces transaction costs, leverages internal capabilities, and responds to institutional pressures for improved governance. The study pursued several objectives: to assess the extent to which e-tendering influences institutional efficiency in complying with procurement principles; to evaluate the effect of e-evaluation processes on procurement compliance; and to determine the impact of e-contract management on institutional efficiency. A mixed-methods approach was employed, involving a structured questionnaire administered to 128 respondents selected through stratified purposive sampling from a target population of 188 procurement staff. Quantitative data were analyzed using descriptive and inferential statistics, including correlation and regression analysis, while qualitative data underwent thematic analysis to enrich and validate the findings. Findings revealed that e-tendering significantly enhances transparency and competition, as evidenced by an average respondent score of 4.3 on a 5-point Likert scale. E-evaluation promotes accountability and fairness by minimizing human bias through automated processes, with regression analysis showing a strong positive coefficient ($\beta = 0.78$). Additionally, e-contract management was found to streamline operations, reduce contract-related risks, and boost compliance with procurement regulations, with 87% of respondents affirming its effectiveness in improving accountability. Overall, the study established a strong positive correlation ($r = 0.82$) between e-procurement practices and institutional efficiency in compliance with procurement principles. The study recommends increased investment in capacity building through staff training, continuous system upgrades to address technological challenges, and regular policy reviews to align e-procurement practices with international standards. The findings underscore the strategic value of e-procurement in enhancing efficiency, transparency, and accountability within public sector procurement.

Keywords: *E-procurement practices, institutional efficiency, procurement principles, Rwanda Polytechnic*

1.0 Introduction

Public institutions all over the globe have been utilizing information technology (IT) and the internet for a number of years to access and provide government services online; these activities are collectively known as e-government efforts (Asima & Februati, 2014). The adoption of electronic procurement to improve transparency, establish an open commercial center for procurement requirements, and support the implementation of acquisition changes with improved oversight and monitoring of public procurement activities is considered by some legislators to be one of the more pertinent and successful initiatives (Gelderman et al., 2016). The development of electronic procurement (e-procurement) frameworks has opened up new options and methods for achieving clear efficiencies and cost savings while supporting government administration's acquisition processes. The use of technological tools and services that promote innovation is becoming essential for implementation by both public and private organizations in the highly competitive and demanding business ecosystem of today. According to Shalle and Irayo (2013), the significance of procurement practices has grown over the past decade not only in Rwanda yet across Sub-Saharan Africa to the fact that the share of procurement accounts for 8–15% of GDP in these nations. Similarly, advances in procurement law and their application have, on average, led to 30% in savings.

The advancement of the web as a commercial apparatus has encouraged critical shifts in the nature and position of organizational acquirement. It is self-evident that ICT has totally changed how governments and organizations run (Basheka et al., 2012). The bulk of organizational consumptions, agreeing to Abushaikha (2014), are cash went through on buying distinctive merchandise and administrations. Web advances are utilized to diminish the generally taken a toll of the acquiring prepare. As a result, both governments and businesses are progressively utilizing e-procurement. Indeed, if there appear to be bounty of openings for headway in e-acquisition, both open and private zone affiliations proceed to screen advancements closely and take all components into thought (Huo et al., 2014). The lion's share of organizations are basically utilizing e-obtainment developments to get noncore supplies, such as office supplies, computers and related gear, and support, repair, and working costs (MRO). In any case, as more businesses embrace e-acquisition innovations to meet acquirement needs, Gupta and Narain (2015) give a sensible procedure for joining them into center trade measures. Concurring to Bigsten (2013), e-procurement comprises for the most part of the securing action that is bolstered by different shapes of electronic communication. Electronic data compatibility (EDI), e-MRO (back, settle, and action), open establishment resource organizing, online open foundation resource organizing, e-sourcing, e-offering, e-invert emptying, e-sell off for evacuations, e-advising, and e-cooperation are fair a few of the structures that empower its utilize in both the common open and private sectors.

E-procurement frameworks have a few preferences compared to conventional paper-based acquirement strategies. In order to bigin with, an e-procurement framework makes a single online entry for partners to get to data on acquirement openings, learn approximately the acquirement prepare, and get reports counting specialized details, client inviting formats, and the terms and conditions for all sorts of open contracts. The open accessibility of data advances the access for all sorts of businesses, which includes small and medium enterprises, by diminishing the plausibility of huge or well-connected firms picking up an advantage since data asymmetries, and possibly increment of competition for government contracts. In expansion, e-procurement encourages speedy and simple choice making. Government authorities can effectively see point by point data on offers through the online framework, or maybe than having to filter through printed material. According to the World bank (2016), starting in 2014, the Rwanda government begun the prepare of getting to be the to begin with nation in Africa to realize those benefits, by collaborating with a South Korean firm to create its claim e-procurement framework. The government propelled a pilot framework in mid-2016 and rolled out e-procurement across the nation in mid-2017. The world bank achievability study found that an e-procurement framework in Rwanda may increment productivity and straightforwardness in open investing, and that Rwanda seem begin the usage of e-procurement taking after the allotment of the fundamental subsidizing (Singh and Melham 2014).

The e-procurement framework launched in August 2016 was named "Umucyo," which translates to "transparency" in English. The pilot program of this modern e-procurement system began with eight government institutions: Rwanda Public Procurement Authority, Rwanda Development Board, Ministry of Finance and Economic Planning, Ministry of Justice, Rwanda Revenue Authority, Rwanda Social Security Board, banks, and securities companies. Umucyo serves as the sole framework for all public procurement processes in Rwanda and is utilized by both government and private institutions. Through this web-based procurement system, the Government acquires goods, works, services, and non-consultancy services. Various suppliers also utilize the framework. Additionally, the Umucyo system features an online portal with advertising, electronic bidding and upload modules, evaluation, contract management, review and acceptance, framework agreements, catalogs, and marketplaces, enabling suppliers to register and submit bids online.

According to the World Bank (2016), the Government of Rwanda has implemented several initiatives to streamline its public procurement system to align with fundamental principles. As revealed in the Official Gazette No. Extraordinary of 22/11/2022, article 6, the essential principles governing public procurement in Rwanda include: transparency, competition, economy, efficiency, fairness, and accountability. Tashobya (2015) notes that the government believed the introduction of an e-procurement system could make the procurement process more efficient and help comply with the aforementioned standards. Consequently, this research examines the impact of e-procurement practices on regulatory efficiency in complying with procurement standards, using Rwanda Polytechnic as a case study. The adoption of the e-procurement framework aligns with global best practices and national procurement regulations, positioning this institution to comply with procurement standards.

1.1 Problem Statement

The adoption of e-procurement systems is rapidly expanding worldwide due to their potential to enhance efficiency, reduce procurement costs, and improve transparency in public procurement processes. However, in many developing countries, including Rwanda, the implementation of e-procurement has not always translated into full compliance with the fundamental procurement principles of transparency, fairness, accountability, and competition. These principles are essential for the sound management of public resources and are enshrined in Rwanda's procurement legal framework. Yet, their consistent application through digital platforms remains a challenge. Public institutions such as Rwanda Polytechnic face several obstacles in effectively integrating e-procurement systems with established procurement principles. While platforms like *Umucyo* have been introduced to streamline procurement processes, concerns persist regarding non-compliance, biased tendering, unclear technical specifications, and contract management inefficiencies. Reports by oversight bodies such as the Ministry of Finance and Economic Planning (MINECOFIN) and the Office of the Auditor General (OAG) have documented recurring violations of procurement rules despite the existence of e-procurement platforms. For instance, the 2018–2019 OAG report highlighted significant procurement irregularities within the City of Kigali, even though an e-procurement system was in place.

Furthermore, the Rwanda Public Procurement Authority (RPPA) has reported ongoing issues such as limited competition due to discriminatory selection criteria, delays in contract execution, and infrastructure challenges like unstable internet connectivity, all of which undermine the effectiveness of e-procurement. In sectors like healthcare, uneven adoption of the system has further weakened its institutional impact. These persistent challenges point to a gap between the intended outcomes of e-procurement and the reality on the ground. Although scholars such as Halerimana (2018) recognize the role of e-procurement in improving service delivery, there remains limited empirical research in the Rwandan context, particularly concerning its effect on institutional efficiency and compliance with procurement principles. This lack of evidence-based insights hinders policymakers and practitioners from making informed decisions to optimize the use of digital tools in procurement. Therefore, this study examined how e-procurement practices affect institutional efficiency in adhering to procurement principles at Rwanda Polytechnic. By addressing this gap, the research sought to

provide actionable recommendations for strengthening procurement governance through improved digital procurement systems.

1.2 research Objectives

i. To assess the level at which e-tendering affect the efficiency Rwanda Polytechnic in complying with procurement principles.
ii. To examine at what extend does e-evaluation affect the efficiency Rwanda Polytechnic in complying with procurement principles.
iii. To determine the effect of e-contract management affect the efficiency Rwanda Polytechnic in complying with procurement principle.

1.3 Research hypotheses

H_{1a}: E-tendering significantly affects the efficiency of Rwanda Polytechnic in complying with procurement principles.

H_{1b}: E-evaluation has a substantial impact on the efficiency of Rwanda Polytechnic in adhering to procurement principles.

H_{1c}: E-contract management influences the efficiency of Rwanda Polytechnic in meeting procurement principles.

2.0 Literature Review

2.1. Conceptual Framework

The conceptual framework illustrates the relationship between the independent variables and the dependent variables. The relationship between e-procurement practices on procurement principles integration in public institutions can be conceptualized at a fairly general level in figure 2 below as a two-stage relationship. Successful and complete e procurement implementation evidenced by the six forms of e-procurement showing the extent of implementation and the impact on a series of intermediate factors of procurement key performance indicators (KPI), which in turn determine the full integration of procurement principles. The model presents the five dimensions impact on organizational performance by e-procurement implementation as developed by e-sourcing, e-design, e-evaluation, e-negotiation, and e-information.

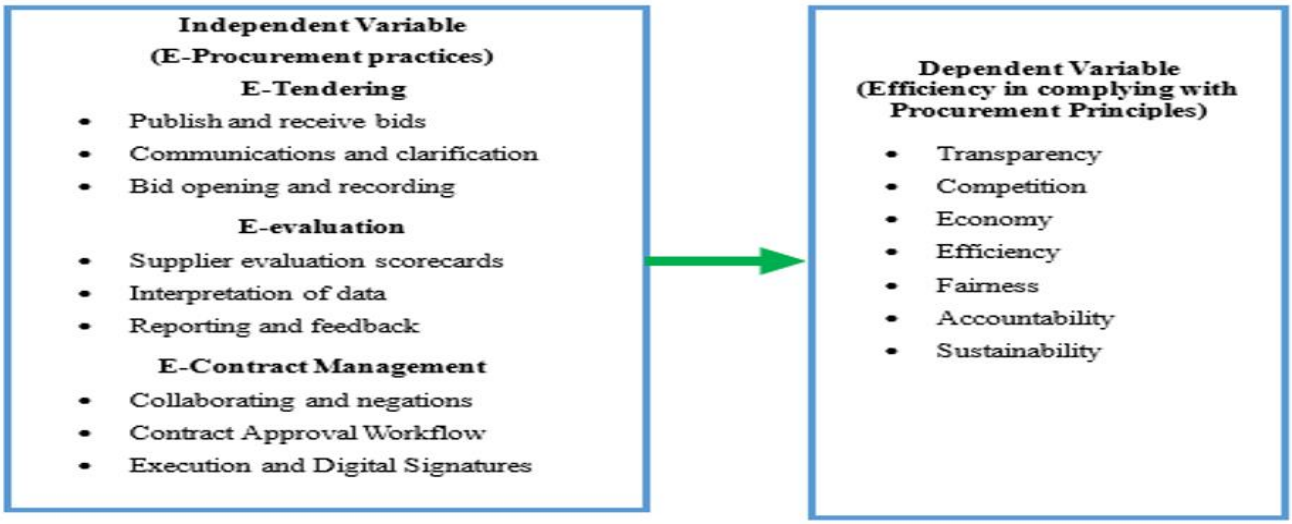

Figure 1: Conceptual Framework

Researcher (2024)

2.2 Theoretical Review

The theoretical foundation of this study rests on three complementary theories that provide a comprehensive framework for understanding how e-procurement enhances institutional efficiency in procurement compliance. Transaction Cost Theory demonstrates how e-procurement systems directly support the study's objectives by reducing information gathering costs and administrative burdens through automation, while Resource-Based View positions these digital systems as strategic assets that enable Rwanda Polytechnic to achieve competitive advantages through improved supplier management and data analytics. These theoretical perspectives align with the research objectives that examine how specific e-procurement components (e-tendering, e-evaluation, and e-contract management) contribute to institutional efficiency in adhering to procurement principles. Institutional theory further enriches this framework by explaining how Rwanda Polytechnic's adoption of e-procurement practices responds to external pressures to conform to established procurement standards and regulations. This theory is particularly relevant to the study's aim of assessing compliance with fundamental procurement principles (transparency, competition, economy, efficiency, fairness, and accountability) as mandated by Rwandan procurement regulations. By integrating these three theories, the research establishes a robust conceptual foundation that explains not only how e-procurement practices mechanically improve processes (Transaction Cost Theory), but also how they constitute valuable organizational resources (Resource-Based View) that help institutions respond appropriately to regulatory expectations (Institutional Theory), thereby advancing the research objectives of examining e-procurement's contribution to institutional efficiency and compliance.

2.3 Empirical Review

Empirical evidence strongly supports the positive impact of e-tendering on institutional efficiency and procurement principle compliance. Mukasa and Ntayi (2020) demonstrated that e-tendering platforms reduce favoritism and corruption by making procurement information universally accessible, fostering stakeholder trust and alignment with legal standards. Ameyaw and Mensah (2019) found that e-tendering systems expand supplier pools through improved accessibility, promoting healthy competition and standardizing bidding processes for equitable treatment. Choi and Chandler (2021) further established that e-tendering reduces administrative costs, accelerates procurement cycles, and minimizes errors through automation, while enhancing accountability through comprehensive digital tracking and documentation capabilities. Research consistently shows that e-evaluation systems significantly enhance institutional compliance with procurement principles through technology-driven impartiality. Mensah and Ameyaw (2020) revealed that e-evaluation platforms increase transparency by automatically documenting evaluation criteria and providing clear audit trails that build stakeholder trust. Choi and Chandler (2021) found that these systems apply uniform criteria consistently, reducing favoritism and discrimination while ensuring objective bid assessment based on predefined metrics.

Kim and Lee (2019) demonstrated that automated evaluation processes yield cost savings through reduced review time and resource requirements, while simultaneously strengthening accountability through comprehensive digital documentation that facilitates auditing and oversight functions. E-contract management systems have been empirically linked to improved procurement principle compliance across multiple dimensions. Adebayo and Yusuf (2019) highlighted how e-contracting platforms ensure accessibility and documentation of all contract terms and amendments, minimizing disputes and simplifying audit processes through centralized digital storage that reduces data tampering risks. Smith and Johnson (2021) demonstrated that automating contract management delivers economic benefits through reduced administrative costs and shortened contract cycles, while streamlining processes like contract creation, approval, and performance tracking. Their research also revealed that e-contracting enhances accountability through comprehensive audit trails of contractual actions and can support sustainability initiatives by facilitating the inclusion and monitoring of environmental and social criteria within contracts.

3.0 Research Methodology

The research utilized a descriptive and correlational design to examine the relationship between e-procurement practices and institutional efficiency at Rwanda Polytechnic, employing both quantitative and qualitative approaches. The study targeted 188 staff members across the institution's eight colleges and headquarters, strategically sampling 128 respondents using Taro Yamane's formula with a 5% margin of error. The stratified purposive sampling distributed respondents proportionally: 35 participants from RP Headquarters (from a population of 52), and 12 participants each from RP Kigali College, RP Gishali College, RP Ngoma College, RP Tumba College, RP Musanze College, RP Karongi College, RP Huye College, and RP Kitabi College (each having a population of 17 staff). This sampling approach ensured comprehensive representation across all locations, capturing perspectives from 28% of headquarters staff and 71% of staff from each college. Data collection occurred through structured and unstructured questionnaires, with responses systematically organized and analyzed using SPSS software to calculate descriptive statistics and inferential statistics including Pearson correlation coefficients. The analytical framework incorporated both descriptive and inferential statistics, with qualitative data thematically categorized according to research objectives and presented alongside quantitative findings. Regression analysis served as the primary statistical method for measuring relationships between the independent variables (e-tendering, e-evaluation, e-contract management) and the dependent variable (efficiency in complying with procurement principles), expressed through the model $Y=\beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\varepsilon$. This methodological approach, grounded in a proportionally representative sample distributed across all nine Rwanda Polytechnic locations, enabled the researcher to quantify the specific contribution of each e-procurement practice to institutional efficiency while ensuring findings reflected practices across the entire institution rather than being skewed toward any single campus or the headquarters.

4.0 Findings and Discussion

The chapter presents an analysis of the findings and associated data gathered in connection with the research questions. Furthermore, this chapter includes statistical evaluations through the application of regression analysis to assess the research objectives.

4.1 Demographic Characteristics of Respondents

This section gave more details about the respondent's profile who participated in the study in terms of their age, gender, educational level, occupation, and time working within an organization.

Table 1: Distribution of respondents by gender

Gender of respondents		Number of respondents	Percentages
	Male	76	59%
	Female	52	41%
	Total	128	100%

Source: Researcher; SPSS, December 2025

According to Table 1, the respondents are ordered by sex (gender). In RP, the male gender is represented by 76 respondents, respected by 59% of all respondents, and the female gender by 52 respondents, respected by 41% of all respondents. This proves that findings of this study are representative of both genders. It also implies that both gender work together to achieve their goals even though the male gender slightly dominates the female gender. Everyone works together as a team to effectively carry out activities related to RP's procurement process, and their responses were reliable.

Table 2: Distribution of respondents by age

	Age	Number of respondents	Percentages
	18-26	13	10.15%
	27-35	56	43.75%
	36-44	44	34.38%
	45 and above	15	11.72%
	Total	128	100%

Source: Researcher; SPSS, October 2025

According to table 2 above that shows the age of respondents from RP where 56 respondents are in27-35 years age bracket and respected by 43.75% of all respondents and 44 employees are in 36-44 years age bracket, respected by 34.38% of all respondents, the age bracket of 45 and above has 15 respondents representing 11.72% of all respondents and only 13 respondents were in 18-26 years age bracket and respected by 10.15% of all respondents. Looking at these data, they imply that the majority of respondent are mature enough. They may also imply that they have enough experience which put them in good position to provide the meaningful information required in this research and this helped the researcher to find the data related to the implementation of activities related to e-procurement practices in RP and their responses were reliable.

Table 3: Educational level of respondents

Education of respondents		Number of respondents	Percentages
	Bachelor's degree	70	54.69%
	Masters' degree	54	42.19%
	PhD	4	3.12
	Total	128	100 %

Source: Researcher; SPSS, December 2025

Table 3 shows the educational level of the respondents, with 70 respondents with bachelor's degrees being respected by 54.29% of all participants, 54 respondents with master's degrees in various fields of study is respected by 42.19% of all respondents and only 4 participants have a PhD in various fields representing a porting of 3.12% of all respondents. Given that the most of the respondents have a bachelor's degree, followed by the Master Degree holders, it can be assumed that the respondents have a high level of educational background in work activities related to procurement and SCM at Rwanda Polytechnic, and their answers are reliable. This education level is enough for the respondent to have enough knowledge and skills to provided sound and reliable data for the sake of this study.

Table 4: Jobs descriptions that are directly related to procurement

Responses	Frequencies	Percentage
Yes	98	76.81%
No	30	23.19%
Total	128	100%

Source: Researcher; SPSS, December 2025

The data presented in Table 4 shows that the majority of respondents (76.81%) have job descriptions that are directly related to procurement, indicating they are actively involved in procurement practices. This suggests that most participants have substantial exposure and experience with procurement processes, providing valuable insights into the topic. In contrast, 23.19% of respondents reported that their job is not directly linked to procurement, which may limit their firsthand knowledge of procurement activities. As a result, the data

reflects a strong foundation of informed responses, though the perspectives of the smaller group with less exposure should also be considered when interpreting the overall findings.

Table 5: Respondents' experience (in years) in procurement

	Experience	Number of respondents	Percentages
	Below 1 year	10	7.81%
	1 to 2 years	31	24.22%
	3 to 4 years	53	41.00%
	5 years and above	34	27.00%
	Total	128	100%

Source: Researcher; SPSS, December 2025

The data from Table 5 shows the distribution of respondents based on their years of experience in procurement. A majority of respondents (41.00%) have 3 to 4 years of experience, followed by 27.00% with 5 or more years of experience. Those with 1 to 2 years of experience account for 24.22%, while 7.81% of respondents have less than one year of experience. The findings from Table 5 reveal a diverse distribution of respondents based on their years of experience in procurement. The data indicates that the majority of respondents (41.00%) have between 3 to 4 years of experience. This suggests that many individuals are relatively early in their procurement careers but have enough exposure to handle key procurement tasks. The significant proportion (27.00%) with 5 or more years of experience further shows a solid foundation of expertise in procurement, indicating that a good number of respondents possess a deeper understanding of procurement processes and practices. Overall, the distribution of experience levels reflects a broad mix of perspectives, from beginners to seasoned professionals. This variety offers valuable insights into the procurement sector, as it includes both fresh viewpoints from newer professionals and experienced insights from those with longer tenures in the field. The data implies that procurement practices are being shaped by individuals at various stages in their careers, which could influence the range of strategies, challenges, and innovations in the sector.

4.2 Findings Presentation Per Objectives

Below section presents the results per objectives.

4.2.1. E-tendering

The table below displays the descriptive statistics from the data collected on the impact of e-tendering in line with compliance with procurement principles at Rwanda Polytechnic. Frequency columns show the number of respondents selecting each Likert scale option (Strongly Disagree = 1, Disagree = 2, Neutral = 3, Agree = 4, Strongly Agree = 5). Mean represents the average score for each statement, providing an overview of the general level of agreement. Standard Deviation (SD) shows the spread or variability of the responses. A lower SD indicates more consensus, while a higher SD reflects more variability in responses.

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Table 6: Descriptive statistics on e-tendering

Statements on e-tendering	1	2	3	4	5	Mean	SD
1. E-tendering has improved the transparency of procurement processes at Rwanda Polytechnic.	6	8	20	40	54	4.12	1.12
2. E-tendering has increased competition among suppliers for tenders at Rwanda Polytechnic.	7	10	18	43	50	4.08	1.09
3. E-tendering has improved the efficiency of procurement processes at Rwanda Polytechnic.	5	6	22	45	50	4.14	1.08
4. E-tendering has ensured fairness in the selection of suppliers at Rwanda Polytechnic.	4	9	18	46	51	4.13	1.06
5. E-tendering has increased accountability in the procurement process at Rwanda Polytechnic.	5	7	17	47	52	4.13	1.07

Source: Researcher; SPSS, December 2025

The data from Table 6 presents the descriptive statistics for respondents' opinions on the impact of e-tendering on various aspects of procurement at Rwanda Polytechnic. The table includes the distribution of responses, mean scores, and standard deviations for five different statements. A majority of respondents (54%) strongly agreed (5) that e-tendering has improved the transparency of procurement processes, with 40% agreeing (4). The mean score of 4.12 indicates that, on average, respondents believe e-tendering has positively impacted transparency. The standard deviation of 1.12 suggests a moderate level of agreement among respondents, with some variability in opinions. Similar to Statement 1, the majority of respondents (50%) strongly agreed, and 43% agreed that e-tendering has increased competition among suppliers. The mean score of 4.08 reflects a favorable view of e-tendering's role in fostering competition. The standard deviation of 1.09 suggests that while most respondents agree, there is still some variation in their responses. A majority of respondents (50%) strongly agreed, and 45% agreed that e-tendering has improved efficiency. With a mean score of 4.14, this statement shows that respondents view e-tendering as a positive force for improving procurement efficiency. The standard deviation of 1.08 indicates a somewhat consistent agreement, though there is still a small spread in the responses. The majority (51%) strongly agreed, and 46% agreed that e-tendering has ensured fairness in supplier selection. The mean score of 4.13 indicates strong support for the idea that e-tendering has contributed to fairness. The standard deviation of 1.06 is relatively low, suggesting that there is a strong consensus on the perceived fairness brought by e-tendering. Again, a significant number of respondents (52%) strongly agreed, and 47% agreed that e-tendering has increased accountability. The mean score of 4.13 is consistent with the previous statements, showing a favorable opinion about e-tendering's impact on accountability. The standard deviation of 1.07 indicates a moderate level of consensus, with some respondents expressing differing views.

4.2.2 E-evaluation

The table below summarizes the descriptive statistics on data collected in line with e-evaluation as e-procurement practice art Rwanda Polytechnic. Frequency columns show the number of respondents selecting each Likert scale option (Strongly Disagree = 1, Disagree = 2, Neutral = 3, Agree = 4, Strongly Agree = 5). Mean represents the average score for each statement, providing an overview of the general level of agreement. Standard Deviation (SD) shows the spread or variability of the responses. A lower SD indicates more consensus, while a higher SD reflects more variability in responses.

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Table 7: Descriptive statistics on e-evaluation

Statements on e-evaluation	1	2	5	4	5	Mean	SD
1. E-evaluation has improved the accuracy of supplier evaluations at Rwanda Polytechnic.	4	6	22	45	51	4.14	1.08
2. The implementation of e-evaluation has improved the speed of processing bids at Rwanda Polytechnic.	5	7	18	46	52	4.13	1.06
3. E-evaluation has reduced bias and increased objectivity in the evaluation of bids at Rwanda Polytechnic.	3	8	20	42	55	4.16	1.07
4. E-evaluation has improved the tracking and documentation of the evaluation process at Rwanda Polytechnic.	4	5	19	47	53	4.16	1.05
5. E-evaluation has ensured fairness in awarding contracts at Rwanda Polytechnic.	3	6	20	45	54	4.18	1.04

Source: Researcher; SPSS, December 2025

The data presented in the table 7 highlight that the mean scores for all five statements range from 4.13 to 4.18. The mean score of 4.14 indicates that respondents generally agree that e-evaluation has improved the accuracy of supplier evaluations. With 51% strongly agreeing (5) and 45% agreeing (4), the results suggest a strong positive perception regarding the role of e-evaluation in enhancing accuracy. The standard deviation of 1.08 shows moderate variability in responses, meaning that while most respondents agree, there is some spread in opinions, with a few being neutral or less convinced. The mean score of 4.13 suggests that respondents generally agree that e-evaluation has increased the speed of processing bids. With 52% strongly agreeing (5) and 46% agreeing (4), most respondents see e-evaluation as a tool that accelerates the bid processing time. The standard deviation of 1.06 indicates a relatively low level of variability in responses, meaning that most respondents share similar views, though there are a few individuals with neutral or differing opinions. The mean score of 4.16 indicates that respondents generally agree that e-evaluation has helped reduce bias and improve objectivity in bid evaluations. With 55% strongly agreeing (5) and 42% agreeing (4), there is a strong consensus in favor of the idea that e-evaluation leads to fairer and more objective evaluations. The standard deviation of 1.07 suggests moderate variability in responses, meaning that while there is general agreement, a few respondents may have neutral or slightly differing views.

The mean score of 4.16 suggests that respondents generally agree that e-evaluation has improved the tracking and documentation of the evaluation process. With 53% strongly agreeing (5) and 47% agreeing (4), respondents believe that e-evaluation has made the process more organized and transparent. The standard deviation of 1.05 indicates a relatively low level of variability in responses, signifying that most respondents share similar views. The mean score of 4.18 indicates that respondents strongly agree that e-evaluation has ensured fairness in awarding contracts. With 54% strongly agreeing (5) and 45% agreeing (4), there is a strong consensus that e-evaluation contributes to a fairer contract award process. The standard deviation of 1.04 is low, suggesting that most respondents are in agreement and there is little variation in their opinions.

4.2.3 E-Contract Management

The table below contains the descriptive statistics on the adoption of e-contract management at Rwanda polytechnic as tool to comply with procurement principles. Frequency columns show the number of respondents selecting each Likert scale option (Strongly Disagree = 1, Disagree = 2, Neutral = 3, Agree = 4, Strongly Agree = 5). Mean represents the average score for each statement, providing an overview of the general level of agreement. Standard Deviation (SD) shows the spread or variability of the responses. A lower SD indicates more consensus, while a higher SD reflects more variability in responses.

Table 8: Descriptive statistics on e-contract management adoption

Statement	1	2	3	4	5	Mean	SD
1. E-contract management has improved the efficiency of contract execution at Rwanda Polytechnic.	4	5	21	47	51	4.14	1.07
2. The use of e-contract management has increased transparency in the management of contracts at Rwanda Polytechnic.	3	6	18	48	53	4.16	1.06
3. E-contract management has led to faster contract approval processes at Rwanda Polytechnic.	5	7	19	44	53	4.12	1.08
4. E-contract management has improved accountability in contract management at Rwanda Polytechnic.	3	4	21	49	51	4.16	1.05
5. E-contract management has minimized the risks of contract disputes at Rwanda Polytechnic.	4	6	19	46	53	4.14	1.06

Source: Researcher; SPSS, December 2025

The results presented in Table 8 show that the mean scores for all five statements range from 4.12 to 4.16, indicating that respondents generally agree (4) or strongly agree (5) with the positive impact of e-contract management on various aspects of contract management at Rwanda Polytechnic. The mean score of 4.14 indicates that respondents generally agree that e-contract management has improved the efficiency of contract execution. With 51% strongly agreeing (5) and 47% agreeing (4), a majority believe that e-contract management positively impacts contract execution efficiency. The standard deviation of 1.07 suggests moderate variability in responses, indicating some spread in opinions, but still a clear tendency towards agreement. The mean score of 4.16 indicates strong agreement with the statement, as respondents generally agree that e-contract management has increased transparency in contract management. With 53% strongly agreeing (5) and 48% agreeing (4), a significant majority perceive e-contract management as a tool for enhancing transparency. The standard deviation of 1.06 shows relatively low variability, suggesting that most respondents share this view, although some variation remains. The mean score of 4.12 suggests that respondents generally agree that e-contract management has expedited the contract approval process. With 53% strongly agreeing (5) and 44% agreeing (4), the data shows a clear positive perception regarding the role of e-contract management in speeding up contract approvals. The standard deviation of 1.08 indicates some variability in responses, with a few respondents remaining neutral or holding different views. The mean score of 4.16 indicates that respondents strongly agree that e-contract management has improved accountability in contract management. With 51% strongly agreeing (5) and 49% agreeing (4), most respondents perceive e-contract management as contributing to greater accountability. The standard deviation of 1.05 is low, indicating that the majority of respondents share a similar positive view, with minimal variability. The mean score of 4.14 indicates that respondents generally agree that e-contract management has helped minimize the risks of contract disputes. With 53% strongly agreeing (5) and 46% agreeing (4), the majority view e-contract management as a tool for reducing disputes. The standard deviation of 1.06 suggests moderate variability in responses, but the data still reflects strong overall agreement.

4.2.4 Compliance with procurement principles

The table below provides a detailed breakdown of the responses for each statement, including the frequencies of each response category: Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4), and Strongly Agree (5). Additionally, the table presents the Mean and Standard Deviation for each statement, offering a comprehensive overview of the data. These statements were derived from established procurement principles and compliance indicators, which aim to evaluate the respondents' understanding and attitudes toward key procurement practices and adherence to regulatory standards. The data reflects the distribution of opinions

and can be used to assess the level of agreement or disagreement on various aspects of procurement processes and compliance measures.

Table 9: Descriptive Statistics for Compliance with Procurement Principles

Statement	1	2	3	4	5	Mean	SD
1. Procurement practices at Rwanda Polytechnic are efficient, ensuring timely execution of procurement activities.	2	5	15	58	48	4.10	0.85
2. Procurement at Rwanda Polytechnic is transparent, with all procurement processes and decisions clearly communicated to stakeholders.	4	6	16	60	42	3.95	0.80
3. The procurement processes at Rwanda Polytechnic adhere to the principle of accountability, with clear and responsible decision-making.	3	5	13	59	48	4.05	0.78
4. The procurement process at Rwanda Polytechnic ensures fairness in supplier selection and contract awarding, without favoritism or bias.	3	4	19	58	44	4.00	0.75
5. Rwanda Polytechnic follows competitive procurement practices, encouraging a diverse group of suppliers to participate in tenders.	2	4	18	60	44	4.15	0.70

Source: Researcher; SPSS, December 2025

The table 9 above contains the data on the compliance with procurement principles. The overall trend indicates that respondents generally have positive perceptions of Rwanda Polytechnic's procurement practices, with mean scores mostly above 4, suggesting agreement or strong agreement with the principles of efficiency, transparency, accountability, fairness, and competitiveness. The mean score of 4.10 suggests a high level of agreement among respondents that the procurement practices at Rwanda Polytechnic are efficient and ensure timely execution. With a standard deviation of 0.85, there is some variation in the responses, but the majority of respondents are positive about the efficiency of the procurement process. A mean of 3.95 indicates that respondents largely agree that transparency is present in the procurement processes at Rwanda Polytechnic. The relatively low standard deviation (0.80) shows that most respondents have a similar view regarding the transparency of the procurement processes. A mean of 4.05 suggests strong agreement that the procurement processes are accountable and that decision-making is clear and responsible. The standard deviation of 0.78 indicates that most responses are clustered around agreement, with slight variations in opinions. The mean score of 4.00 implies that respondents generally agree that the procurement process is fair and free from bias. The standard deviation of 0.75 shows a relatively small spread of responses, reinforcing the consensus on fairness in supplier selection. The highest mean score of 4.15 suggests a strong consensus that Rwanda Polytechnic promotes competitive procurement practices. With a standard deviation of 0.70, the responses show less variation, indicating that most respondents agree on the effectiveness of fostering competition and engaging diverse suppliers.

4.3 Inferential Statistics

Inferential statistics helps to propose explanations for situations or phenomena.

Table 10: Pearson Correlation Coefficient

Variable	E-T	E-E	E-CM	PE	PT	PA	PF	PC
E-Tendering	1.000							
E-Evaluation	0.750	1.000						
E-Contract Management	0.700	0.800	1.000					
Efficiency	0.800	0.820	0.780	1.000				
Transparency	0.850	0.880	0.840	0.900	1.000			
Accountability	0.650	0.770	0.800	0.790	0.830	1.000		
Fairness	0.720	0.740	0.710	0.850	0.810	0.760	1.000	
Competitiveness	0.780	0.800	0.760	0.880	0.860	0.720	0.800	1.000

Source: Researcher; SPSS, December 2024

The table 10 contains the results of the Pearson Correlation analysis. A strong positive correlation of 0.85 suggests that as e-tendering improves, transparency in procurement also increases significantly. A moderate correlation of 0.74 indicates that improvements in e-evaluation are positively linked to fairness in the procurement process. The correlation of 0.80 shows that e-contract management has a strong relationship with accountability, implying that better management of contracts contributes to greater accountability. A strong positive correlation of 0.88 indicates that improved efficiency in procurement activities is highly associated with higher levels of competitiveness in the tendering process. There is generally a moderate to strong positive correlation between the e-procurement practices (e-tendering, e-evaluation, and e-contract management) and the compliance principles (efficiency, transparency, accountability, fairness, and competitiveness). This suggests that better e-procurement practices lead to improvements in the procurement principles. This means that improvements in electronic procurement processes tend to enhance the compliance with procurement principles.

Table 11: Model summary

Model Summary						
Model	**R**	**R^2**	**Adjusted R^2**	**Standard Error of the Estimate**	**F-Statistic**	**Significance (p-value)**
1	0.87[a]	0.756	0.748	0.45	97.12	0.0001
Predictors: (Constant), E-Tendering; E-Evaluation and E-Contract Management.						

Source: Researcher; SPSS, December 2024

The R-squared value of 0.756 suggests that 75.6% of the variance in procurement efficiency can be explained by e-tendering, e-evaluation, and e-contract management. This indicates that the model has a strong fit to the data, with these three variables being influential factors. The Adjusted R-squared value of 0.748, which accounts for the number of predictors, confirms that these variables remain relevant in explaining the variation in compliance, as it is very close to the R-squared value. Additionally, the F-statistic of 97.12, paired with a p-value of less than 0.001, indicates that the model is statistically significant overall. This suggests that at least one of the independent variables is significantly related to efficiency. The high statistical significance and strong model fit reinforce the importance of these factors in promoting procurement efficiency.

Table 12: Regression coefficients

Independent Variable	Coefficient	Standard Error	t-Statistic	p-Value
Constant	1.25	0.15	8.33	<0.001
E-Tendering	0.55	0.10	5.50	<0.001
E-Evaluation	0.40	0.12	3.33	0.001
E-Contract Management	0.45	0.11	4.09	<0.001

Source: Researcher; SPSS, December 2024

The regression model presented in table 12, includes three key independent variables: e-tendering, e-evaluation, and e-contract management, with a constant value (β0) of 1.25. This means that when all three independent variables are zero, the predicted compliance with procurement principles is 1.25. Each independent variable has a positive relationship with compliance, suggesting that their presence improves efficiency in procurement processes. Specifically, e-tendering (β1 = 0.55) has the most significant positive effect, with each unit increase leading to a 0.55 increase in compliance. E-evaluation (β2 = 0.40) and e-contract management (β3 = 0.45) also contribute positively, though to a slightly lesser degree. Based on the model coefficient result the model becomes:

PE = 1.25+0.55E-T+0.40E-E+0.45E-CM

PE is Procurement efficient, E-T is E-tendering, E-E is E-Evaluation, E-CM is E-Contract Management.

Holding other variables constant, the independent variables demonstrate the following influences on the dependent variable: A one-unit change in e-tendering leads to a 55% change in procurement efficiency at Rwanda Polytechnic. Similarly, a one-unit change in e-evaluation results in a 40% change in procurement efficiency, while a one-unit change in e-contract management produces a 45% change in procurement efficiency at Rwanda Polytechnic. The findings indicate that, while holding other factors constant, increases in e-tendering, e-evaluation, and e-contract management cause improvements in procurement efficiency at Rwanda Polytechnic. With p-values less than 0.001, these variables represent significant determinants of procurement efficiency, leading to the conclusion that procurement efficiency at Rwanda Polytechnic is directly related to the effectiveness of these independent variables.

5.0 Conclusion

The study concludes that e-tendering significantly enhances the efficiency of the procurement process at Rwanda Polytechnic. By automating the tendering process, e-tendering improves transparency, competitiveness, and fairness, ensuring that suppliers are selected based on clear and objective criteria. The increased competition due to broader participation and the timely execution of procurement activities underscore its positive effect on compliance with procurement principles. As a result, e-tendering has played a crucial role in ensuring that Rwanda Polytechnic adheres to the principles of transparency, accountability, and efficiency in procurement. E-evaluation has been found to have a positive effect on the efficiency of procurement at Rwanda Polytechnic. By digitizing and automating the evaluation process, e-evaluation enhances objectivity and reduces bias, contributing to fairness in supplier selection. It also accelerates the speed at which bids are processed, allowing for faster decision-making and reducing procurement delays. The improvements in accuracy and timeliness foster stronger compliance with procurement principles, particularly in terms of accountability and fairness in awarding contracts. Thus, e-evaluation is a key factor in improving procurement efficiency and ensuring adherence to procurement principles. E-contract management has had a significant effect on improving procurement efficiency at Rwanda Polytechnic. The adoption of e-contract systems has streamlined contract execution, making it more efficient and transparent. It has also improved accountability by providing clear documentation and tracking mechanisms that ensure contracts are managed according to agreed terms. The system reduces the risks of contract disputes and ensures that contracts are awarded in a fair and transparent manner. By ensuring that contracts are well-managed and executed, e-

contract management contributes to a higher level of compliance with procurement principles such as accountability, fairness, and transparency.

6.0 Recommendations

The study recommends that Rwanda Polytechnic should continue investing in e-procurement technologies, particularly e-tendering, e-evaluation, and e-contract management systems, given their demonstrated positive impact on procurement efficiency and transparency. This investment should focus on technological upgrades that further streamline procurement processes, reduce delays, and enhance transparency across all campuses. Additionally, Rwanda Polytechnic should prioritize comprehensive training and capacity-building programs for procurement officers and stakeholders to ensure optimal utilization of these technologies, as proper training would maximize the benefits derived from these practices and address any resistance to technological adoption. The study further recommends that Rwanda Polytechnic should implement a structured system for ongoing monitoring and evaluation of the e-procurement systems. Regular audits and assessments should be conducted to ensure these systems function as expected and contribute to desired procurement outcomes, including fairness, accountability, and competitiveness. Rwanda Polytechnic should also establish performance metrics specifically for measuring e-procurement effectiveness and should continuously benchmark its practices against international standards to identify areas for improvement. These recommendations, if implemented, should significantly enhance the institution's compliance with procurement principles and further improve operational efficiency across all its colleges.

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