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Strategies for E-Procurement Adoption by Small and Medium-sized Enterprises: Insights from South Sudan

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Abstract

E-procurement is gaining momentum worldwide as companies realize its transformative potential to improve operational efficiency. Small and medium-sized enterprises (SMEs) strategically use advanced technologies to drive their growth and competitiveness. However, there is a significant research gap, particularly with regard to e-procurement adoption strategies in emerging markets. To address this gap, this study aims to examine the e-procurement adoption strategies used by SMEs in the Republic of South Sudan. This is intended to contribute to existing knowledge about e-procurement adoption strategies, especially in the context of emerging countries. A quantitative cross-sectional design was used for this study. Empirical data were collected through survey questionnaires distributed via email to 300 SMEs in the Republic of South Sudan using Google Forms, achieving a response rate of 71.0 percent. Data analysis involved descriptive statistics, principal component analysis (PCA), relative importance index (RII), and the analytical hierarchy process (AHP). Resultantly, the study categorizes strategies into two main factors: competitive and strategic. In the competitive factor category, allocating resources and analysing existing processes were identified as crucial for successful e-procurement implementation. Conversely, in the strategic factor category, aligning technology with strategic goals, fostering alliances, and addressing resistance were key to ensuring sustained success in e-procurement. These findings contribute to enhancing SME competitiveness and facilitating growth in the digital era by optimizing procurement processes, reducing costs, and gaining a competitive advantage. It is recommended that researchers and practitioners use the insights from this study to guide organizations in effectively allocating resources and aligning e-procurement with overall business goals. Furthermore, fostering alliances to enhance collaboration and knowledge sharing and proactively addressing resistance are crucial for realizing long-term benefits from e-procurement implementation.

Keywords: *E-procurement, Strategies, SMEs, Competitive, Strategic, Factors, South Sudan*

1. Introduction

In today's rapidly evolving digital landscape, the adoption of e-procurement is driving a step change for small and medium-sized enterprises (SMEs) worldwide (Addo 2019). Several SMEs are advocating for high-level, technology-related strategies to drive organizational business transformation (Jackson and Allen 2024). E-procurement, defined as the use of electronic methods in every aspect of the purchasing process (Azanlerigu & Akay 2015), offers a plethora of advantages including cost reduction, efficiency improvements, and enhanced market access (Nawi et al., 2016). This is particularly relevant for SMEs in emerging economies, where such technological adoption can significantly influence economic development and competitive advantage (Hooks et al., 2022; Sezgin, 2022). E-procurement platforms have opened doors for SMEs in South Sudan, giving them the opportunity to engage in emerging markets and conduct online sales and purchases of goods, works and services (United Nations Development Program or UNDP, 2022). This opportunity is in line with the broader objectives of UNDP (2022), which emphasizes how e-procurement can serve as a catalyst for entrepreneurship, promote inclusive development in the private sector and create employment opportunities.

SMEs are sometimes referred to as micro, small and medium-sized enterprises (MSMEs). These are companies with up to 249 employees, divided into 1-9 micro-enterprises, 10-49 small and 50-249 medium-sized enterprises (Organization for Economic Corporation and Development or OECD, 2017). Given the crucial role that SMEs play in economic growth and development, as highlighted by the World Trade Organization (2016), they represent two-thirds of total employment in both developing and developed countries, with significant shares of GDP at 35.0 percent and 50.0 percent respectively, integrating SMEs into e-procurement platforms could further increase their impact on economies. In South Sudan, engaging SMEs is paramount to promoting economic growth and development. According to the International Trade Centre (ITC, 2022), SMEs play a crucial role in South Sudan's economy, accounting for approximately 93.0 percent of all registered businesses. These SMEs are important drivers of job creation, economic expansion and poverty alleviation. According to the results of the ITC (2022), micro-enterprises account for 48.0 percent of MSMEs in South Sudan, small enterprises up to 38.0 percent and medium-sized enterprises 11.0 percent. Notably, most of these companies (67.0 percent) operate in the services sector, with 13.0 percent in manufacturing and 20.0 percent in the primary sector.

1.2 Problem Statement

Despite its benefits, the adoption rate of e-procurement among SMEs in South Sudan remains conspicuously low. According to ITC (2022), less than a third of companies in South Sudan, mainly in the service sector, use the Internet for business purposes. ITC (2022) highlighted that 67.0 percent of companies in South Sudan that advertise online have a high level of information about their current customers, compared to only 17.0 percent of companies that do not advertise. This disparity underscores a critical research gap in understanding the strategies for e-procurement adoption in this context is essential for harnessing its full potential. South Sudan, the world's youngest nation, presents a unique case for studying e-procurement adoption (Neupane et al., 2014). The country's economy is predominantly supported by SMEs, which encounter distinct challenges due to the nascent state of its infrastructure and regulatory environment. This study aims to bridge the existing knowledge gap by exploring the development of strategies for e-procurement adoption tailored to the South Sudanese context.

1.3 Research Objectives

The objective of this study is to examine the strategies for the adoption of e-procurement by SMEs in the Republic of South Sudan. Therefore, the research attempts to answer the following question:

RQ1: What are the strategies for the adoption of e-procurement systems by small and medium sized enterprises?

This study addresses the complexities of competitive positioning, strategic congruence, and cost efficiency. It recognizes the scarce attention afforded to e-procurement implementation strategies within the existing literature, particularly those addressing the unique circumstances of SMEs adapting to the dynamic e-procurement environment. The principal goal of this research is to delineate a clear and comprehensive analysis of the factors that facilitate the adoption of e-procurement practices. By doing so, it endeavours to craft a suite of actionable strategies that are customized to the particularities and constraints faced by SMEs in South Sudan, enhancing their procurement processes and competitive standing in the digital marketplace.

2. Literature Review

2.1 Theories for e-procurement adoption

The theoretical framework is a guide or a blueprint for research (Grant and Osanloo, 2014). According to Salawu et al. (2023), the theoretical framework is a systematically developed and interrelated set of concepts and foundations formed from one or more theories with the sole intention of supporting a study. Previous studies explored the theoretical and empirical foundation related to the adoption of e-procurement by SMEs, focusing on identifying drivers, strategies, barriers, and mitigating measures relevant to the context of South Sudan and similar emerging economies.

The adoption of e-procurement by SMEs, especially in emerging economies like South Sudan, is underpinned by several theoretical frameworks that explain the factors influencing this technological adoption. These theories not only shed light on the drivers and barriers to e-procurement adoption but also provide a basis for formulating strategies to enhance the adoption process (Chan & Owusu, 2022). At the core of e-procurement adoption is Rogers' (1962) Diffusion of Innovations Theory, which posits that the spread of new technologies within an organization or society depends on factors like relative advantage, compatibility, complexity, trialability, and observability.

This theory is instrumental in understanding why some SMEs in South Sudan are more inclined to adopt e-procurement technologies than others, highlighting the relative advantages, complexity, and compatibility with existing processes (Daoud & Ibrahim 2017). The Technology-Organization-Environment framework provides a comprehensive perspective by considering technological, organizational, and environmental contexts as determinants of technological innovation adoption (Tornatzky & Fleischer 1990). This framework is particularly relevant for examining e-procurement adoption in SMEs, where organizational readiness, technological infrastructure, and the external business environment, including regulatory policies, significantly influence adoption decisions (Hradecky et al 2022). The Technology Acceptance Model, proposed by Davis (1989), focuses on perceived usefulness and perceived ease of use as the primary predictors of technology adoption. Applied to e-procurement, the Technology Acceptance Model suggests that SMEs' willingness to adopt such systems is largely influenced by the perceived efficiency gains and the ease with which they can integrate e-procurement into their existing operations (Ramkumar et al 2019).

The Unified Theory of Acceptance and Use of Technology model then integrates elements from various theories to predict user intentions to use a new technology and subsequent usage behaviour (Ikumoro & Jawad 2019). Key constructs such as performance expectancy, effort expectancy, social influence, and facilitating conditions offer insights into the factors that might encourage or hinder e-procurement adoption among SMEs in South Sudan. These theoretical foundations underscore the multifaceted nature of e-procurement adoption among SMEs, emphasizing the interplay between technology attributes, organizational capabilities, and the broader environmental context. For SMEs in South Sudan, these theories suggest that successful adoption of e-procurement depends on recognizing the relative advantages of e-procurement systems, ensuring compatibility with existing processes, minimizing complexity and creating an enabling environment supportive policies and infrastructure development. Various theories have been put forward to explain the implementation of e-procurement, but this research is rooted in Whittington's (1993) theories of strategy. Theories of Strategy advocates for a comprehensive study of opportunities and factors, forcing us to weigh the costs and potential risks of decisions and consider their impact not only on ourselves but also on stakeholders such as opponents, partners, and others (Yarger, 2006). Whittington (1993) describes four different perspectives within theories of strategy: i) the classical viewpoint advocated by Chandler, Ansoff and Sloan in the 1960s, ii) Henderson's evolutionary perspective from 1989, iii) the processual perspective of Cyert, March and Simon in 1963 and iv) Granovetter's systemic perspective in 1985. According to Whittington (1993), the classical perspective prioritizes profitability as a business goal and advocates for rational planning to achieve this goal. Whittington (2000) states that managers have control over the allocation of internal and external resources, allowing them to optimize the organizational structure of the company to achieve these goals. In contrast, the evolutionary perspective, as explained by Whittington (2000), assumes that the economic landscape is subject to constant change and competition operates like natural selection. While evolutionary theorists do not prescribe specific planning methods, they advocate for management approaches that improve survival in dynamic environments. Whittington (1993) highlights that the processual approach views organizations and markets as often unpredictable and rigid systems from which strategies emerge in incremental steps amid confusion. For effective strategy formulation, it is paramount to consider and work within this uncertainty.

Finally, the systemic perspective, as put forward by Whittington (2000), assumes that strategies are formulated in complex networks and are strongly influenced by cultural contexts. The goals and practices of strategy are closely linked to the social systems in which strategy development takes place. These theoretical frameworks apply to the introduction of e-procurement by SMEs, where classical and evolutionary approaches address strategic facto factors such as quality improvement through benchmarking and improved communication. Meanwhile, strategies related to competitive factors such as resource allocation and analysis of the existing process influence e-procurement adoption decisions, along with strategic factors such as aligning the technology with broader business goals and dealing with alliances and resistance in the adoption process.

2.2 Conceptual Framework

A conceptual framework is an argument about why the topic one wants to study is important and whether the proposed means of studying it are appropriate and rigorous (Crawford 2020). Grant and Osanloo (2014) reported the benefits of a conceptual framework is to assist researchers in identifying and constructing his/her worldview on the phenomenon to be investigated. The conceptual framework for the study is shown in the figure 1 below.

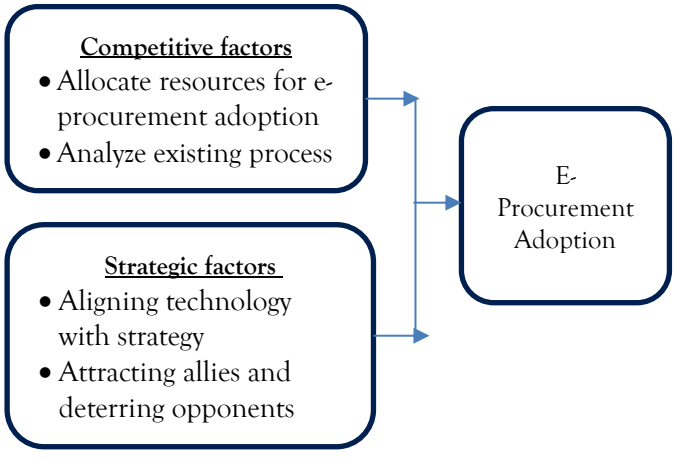

Figure 1: Strategies for E-procurement Adoption

In this framework, the competitive factors relate to the competitive advantages of the organization. Its focus is on how as resource allocation and analysis of existing process influence e-procurement adoption decisions. The strategic factors describe how organization align the technology with broader business goals and dealing with alliances and resistance in the adoption process.

2.3 Strategies to E-procurement Adoptions

The adoption of e-procurement has become a strategic imperative for organizations seeking to enhance their operational efficiency and competitive edge. This literature review synthesizes the insights and findings of various scholars and practitioners on the strategies for successful e-procurement adoption. The concept of strategy, as defined by Govender and Pretorius (2015), is a roadmap for organizations to attain specific objectives that set them apart from their competitors. Lourens and Jonkers (2013) asserted the importance of aligning technology strategies with business strategies, underscoring the role of technology as a catalyst for business success. Similarly, Nagy and Fawcett (2018) proposed a prerequisite to strategy development: evaluating the potential of strategies to significantly align with and advance the organization's mission and goals. This evaluation is crucial for identifying effective strategies for e-procurement adoption, which are predominantly categorized into competitive and strategic factors.

Competitive Factors

In the competitive factors related strategies, Shale (2015) highlights the significance of company size and culture in leveraging e-procurement for competitive advantage. Smaller enterprises often deploy e-procurement to gain a competitive edge, whereas larger corporations are reported to use it as a tool to streamline operations (Sánchez-Rodríguez, 2020). The importance of management support, resource allocation, and cross-functional coordination in the adoption of e-procurement is further supported by Pashutan et al. (2022), emphasizing the role of strategic resource utilization and technological advancement in enhancing firm strategies. Other studies (Vaidyanathan & Devaraj, 2008; Smart, 2010) further discussed how dynamic market changes and value creation are essential for maintaining competitive advantage through e-procurement.

Cost leadership strategies, as mentioned by Jelassi et al. (2020), enable firms, especially SMEs, to operate more cost-effectively than competitors. This approach is crucial for broad market reach and is further enriched by the value-added aspect of e-procurement, as observed by Simamora and Sulistianingsih (2022). The implementation of just-in-time delivery systems, as documented by Smith (2009), showcases the operational efficiencies and lead time improvements achievable through strategic e-procurement adoption.

Strategic Factors

Strategic factors revolve around aligning organizational actions with stakeholder interests, as outlined by Wu et al. (2015). Other work (Shale, 2015; Nyaga, 2019) stressed the alignment of technology with organizational strategy and the integration of e-procurement into business strategies for achieving operational efficiency, transparency, and cost reduction. Training key personnel in e-commerce and e-procurement strategies is essential for overcoming technological and security barriers, as advised by Eei et al. (2012). Chan and Owusu (2022) and subsequent studies underline the importance of adapting policies and practices to regulatory frameworks, with government incentives playing a crucial role in fostering e-procurement adoption.

3. Methodology

3.1 Study Design

This study employed a quantitative and cross-sectional research design to develop strategies for the adoption of e-procurement among SMEs in South Sudan. The advantage of the quantitative research design is that it focuses on the principles of deductive theory testing, ensures protection against bias, managing alternative explanations, and allows generalization and replication of results (Creswell & Creswell, 2018). Burrell and Gross (2019) highlighted that quantitative research is often used by researchers to observe phenomena or events that affect individuals. Additionally, Wang and Cheng (2020) pointed out that cross-section research can be carried out relatively quickly and inexpensively, which is ideal for the study due to limited timing.

3.2 Study Population and Sampling Strategy

The Taro Yamane (1977) formula of [(5/100). n=N/1+N(e)2] was used to systematically select a sample of 300 SMEs from a total of 1,215, considering a confidence level of 95% and p = 0.05. Where n denotes the sample size, N the population size and e the level of precision. The advantage of Tora Yamane formula is that it provides a simplified formula to calculate sample sizes (Israel, 1992).

3.3 Data Collection

Prior to data collection, ethical clearance was granted under reference No. NASREC:2021-May-005 by the humanities and social sciences research ethics committee of University of Zambia and consent was obtained from all research participants. The confidentiality of their information was strictly maintained throughout the duration of the study.

The survey forms, consisting of Section A for personal information and Section B for strategies related to the implementation of e-procurement, were formulated based on previous research and had a high Cronbach's alpha value of 0.933. Primary data collection was carried out electronically using Google Forms as well as PDFs distributed via email. In addition, secondary data were obtained from a variety of sources, including academic articles, books, online blogs, and information from research organizations.

Survey respondents included individuals who are

systematically selected from existing sampling frame and in various roles in SMEs in South Sudan, ranging from non-managers to top managers. Participants were asked to rate the statements using a 5-point Likert scale, with options ranging from 1 for "strongly disagree" to 5 for "strongly agree." A total of 213 valid answers were received, which corresponds to a response rate of 71.0 percent of the total sample of 300. One invalid response (0.5 percent) was received and was classified as incomplete. The response rate of 71.0 percent is high when compared to Neuman's (2014) report that good response rates to questionnaires range between 10.0 percent and 50.0 percent. Conversely, Wu et al. (2022) stated that the online acceptable survey response rate is between 5.0 to 30.0 percent; anything above 30.0 percent is considered excellent.

3.4 Data Analysis

Data were analysed using IBM SPSS (Version 25) and Microsoft Excel. In the first phase of data analysis, descriptive statistics were used to examine the demographic characteristics of participants, which were then represented by frequency and percentage distributions (see Table 1). Then, the frequency and percentage distribution of 18 strategies for e-procurement adoption by SMEs in South Sudan were calculated, followed by principal component analysis (PCA), relative importance index (RII), and analytic hierarchy process (AHP) to guide decision-making across various levels and assess the key strategies for e-procurement implementations.

Principal Component Analysis

PCA is a mathematical technique used to condense the variability within a dataset into a concise set of factors (Palit et al., 2022). According to Palit et al. (2022), PCA aids in selecting pivotal data from a dataset, reducing its size by retaining essential information, simplifying dataset descriptions, and scrutinizing the structure of both observations and variables. In this study, PCA facilitates the delineation and classification of criteria and sub-criteria as well as the reduction of independent variables, thereby supporting the establishment of a hierarchical structure for the AHP. The procedural steps of PCA are as follows:

i) ***Step 1:*** Data normalisation: this includes adjusting all variables to a scale between 0 and 1, linear transformation to maintain ranking and correlation structures, and facilitating aggregation of the variables with different scales (Abdrabo et al., 2023; Tran et al., 2010). Equation (1) presents the formula for the Min-Max technique.

$$Min - Max(C_x) = \frac{C_x - C_{Min}}{C_{Max} - C_{Min}} \quad (1)$$

ii) ***Step 2***: The screen plot: The screen plot shown in figure 2 below depicts the relationship between the relative strengths of the eigenvalues and the set of components (Brown, 2009). Eigenvalues were plotted against the factor extraction sequence, with the shape of the curve guiding the identification of the cut-off point (Hair et al., 2019). As a result, two components were derived: competitive factors and strategic factors.

iii) ***Step 3:*** Varimax rotations: For ease of interpretation, varimax rotation of the retained components was performed (Abdi & Williams, 2010). The highly correlated indicators were grouped according to the correlation matrix obtained by varimax rotation (Abdrabo et al., 2023). Tightly correlated variables were examined to reduce redundancy (Field, 2018; Torok, 2018). In this study, the selection of significant dimensions of the competitive and strategic factors was determined by retaining components with eigenvalues above 1 (de Sherbinin & Bardy, 2015; Torok, 2018).

iv) ***Step 4:*** To evaluate the model's robustness and the adequacy of sampling, the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity were conducted. KMO values range from 0 to 1 (Field, 2018; Abdrabo et al., 2023). A KMO value of 0 indicates that partial correlations dominate over correlations, suggesting a scattered correlation pattern and rendering factor analysis inappropriate. Conversely, a value approaching 1 signifies a compact correlation pattern, indicative of clear and reliable factors suitable for factor analysis (Field, 2018). As outlined by Kaiser and Rice (1974), thresholds for component analysis are categorized as follows: 0.90 (marvellous), 0.80 (meritorious), 0.70 (middling), 0.60 (mediocre), 0.50 (miserable), and below 0.50 (unacceptable). Field (2018) amusingly substituted "Unacceptable" with "Merde" to maintain a pattern with words beginning with "M".

A statistically significant Bartlett test for sphericity ($p < 0.001$) indicates adequate correlations between variables to proceed with a PCA (Hair et al., 2019). In this study, the overall KMO score for sampling adequacy was 0.947, which Kaiser and Rice (1974) consider excellent, while the individual KMO scores for questions were above 0.7, which Kaiser and Rice say indicates moderate to excellent adequacy. The result of Bartlett's sphericity test was statistically significant: $\chi^2(153) = 2666.750$, $p < 0.001$.

Relative Importance Index Analysis

RII refers to the relative impact a variable has on the predictor variables either independently or when considered alongside others in the regression equation (Johnson & LeBreton, 2004). Dixit et al. (2019) define RII as the aggregate of responses divided by the total responses and the maximum value on the Likert scale. In this study, the RII was used to rank criteria according to their relative importance (Akadiri et al., 2013). RII is regarded as a

dependable approach for evaluating the rankings of variables via systematic surveys (Dixit et al., 2019). Several researchers (Aduwo et al., 2020; Priyatna & Sunandar. 2021; Nitharsan & Francis, 2022) have used RII to explore critical success factors, anti-corruption capacities, and the flexibility of determinants in blockchain-based e-procurement, respectively. Following Dixit et al.'s explanation, RII is computed using the formula presented in equation (2).

$$RII = \frac{\sum w}{A\,x\,N} \quad (2)$$

Here, w indicates the weight assigned by respondents to each factor on a scale ranging from 1 (lowest) to 5 (highest). A symbolizes the maximum weight value of 5, while N represents the total number of respondents, which is 213 in this study. Akadiri (2011) categorized the RII values into five levels: High (H; 0.8 ≤ RII ≤ 1), High-Medium (H–M; 0.6 ≤ RII ≤ 0.8), Medium (M; 0.4 ≤ RII ≤ 0.6), Medium-Low (M-L; 0.2 ≤ RII ≤ 0.4), and Low (L; 0 ≤ RII ≤ 0.2). Survey questions rated with H-M levels of relative importance revealed the importance of each question as a strategies of SME e-procurement adoption in South Sudan.

Analytic Hierarchy Process Analysis

AHP represents a theory of measurement where the prioritization of pairwise comparisons is based on expert judgments to establish scales of significance (Saaty, 2008). AHP functions as an efficient method for decision-making, particularly suitable for hierarchically organizing decision criteria into sub-criteria (Agrawal et al., 2020). This methodology has been applied in various domains such as supplier selection in e-procurement (Benyoucef & Canbolat, 2007; Deepika, 2023), identification of success factors for components of mass rapid transit (MRT) in e-procurement (Hartanto et al., 2019), and assessment of the performance impact of e-procurement adoption (Masudin et al., 2021). In AHP analysis, the ranking values obtained from RII were used (Gunduz & Almuajebh, 2020). The steps involved in AHP analysis include:

i) ***Step 1.*** The process begins with describing the research problem and objectives to identify the essential information needed to understand the strategies for implementing e-procurement.

ii) ***Step 2.*** PCA was applied to identify the criteria and sub-criteria associated with the strategies that influence the adoption of e-procurement by SMEs. Decisions were hierarchically divided into three levels: Level 1 states the main objective of the study; level 2 shows the criteria (Competitive and Strategics factors); and level 3 indicates sub-criteria (the variables under each criterion). The hierarchical structure is shown in Figure 3 below.

iii) ***Step 3.*** Pairwise comparison entails using RII to assign numerical values to the relationships among different elements or criteria, based on their actual measurements and relative importance. Gunduz and Almuajebh (2020) introduced a new method for AHP analysis, which involves transferring values derived from RII. In this study, Saaty's 1-to-9-point scale was employed, where 1 denotes equal importance, 3 signifies moderate importance, 5 represents strong importance, 7 indicates very strong importance, 9 signifies extreme importance, and values 2, 4, 6, 8 denote intermediate importance levels between adjacent scale points. These values were allocated based on RII ranges as follows: High Importance (0.8 ≤ RII ≤ 1) was assigned values of 7, 8, or 9. High-Medium Importance (0.6 ≤ RII ≤ 0.8) was assigned values of 5, 6, or 7. Medium Importance (0.4 ≤ RII ≤ 0.6) was assigned values of 3 or 4. Low Importance (0 ≤ RII ≤ 0.2) was assigned a value of 1. This defined scale was used to assign pairwise comparison values to items corresponding to RII values, as shown in Table 6. A pairwise comparison matrix (A) is defined in (3).

$$A = a_{ij} = \begin{array}{c} \\ A_1 \\ A_2 \\ \dots \\ A_n \end{array} \begin{array}{c} \begin{array}{cccc} A_1 & A_2 & \dots & A_n \end{array} \\ \begin{bmatrix} 1 & a_{12} & \cdots & a_{1n} \\ 1/a_{12} & 1 & \cdots & a_{2n} \\ \dots & \dots & \dots & \dots \\ 1/a_{1n} & 1/a_{2n} & \cdots & 1 \end{bmatrix} \end{array} \quad (3)$$

where 0 ≤ a_ij ≤ 1, a_ij + a_ij = 1. The term a_ij (i, j= 1, 2, ..., n) denotes the degree of membership indicating the extent to which alternative A_i is s deemed more significant than A_j. A higher value of a_ij (i, j= 1, 2, ..., n) signifies that alternative A_iholds greater importance than A_j. If a_ij is equal to 1, it implies that alternative A_i is equally important as A_j. The results of the pairwise comparisons are presented in Table 7 and 8.

iv) ***Step 4.*** The decision matrix A was normalized to generate priority vectors through the computation of eigenvalues and eigenvectors of Matrix A (Table 9 and 10). The eigenvector, denoted by X_ij corresponding to the largest eigenvalue λ_max was chosen. The eigenvector, X_ij was normalized by dividing each element in the matrix by the sum of all elements, ensuring that the vector values collectively sum up to 1 equation (4). The normalized eigenvector X_ij reflects the prioritization of sub-criteria (X1, X2, X3...Xn.). Subsequently, the priority vector X_i was computed by averaging each row of the normalized matrix X_ij in equation (5).

$$X_{ij} = \frac{a_{ij}}{\sum_{i}^{n}=1^{a_{ij}}} \quad (4)$$

$$X_i = \frac{\sum_{i}^{n}=1^{a_{ij}}}{n} \quad (5)$$

v) ***Step 5.*** The reliability of the results was evaluated by determining the consistency ratio (CR), which was computed based on the consistency index (CI; see Table 11). The CI is defined by equation (6).

$$CI = \frac{\lambda_{max} - n}{n-1} \quad (6)$$

In this scenario, λ_max signifies the largest eigenvalue of the comparison matrix, whereas n represents the number of criteria or alternatives under comparison. The CI formula entails subtracting the number of criteria from the largest eigenvalue and subsequently dividing the outcome by the difference between the number of criteria and 1.

CR is calculated by dividing the CI by the Random Index (RI), which provides a benchmark value based on the number of criteria compared and helps determine an acceptable level of consistency. The equation for CR is expressed as:

$$CR = \frac{CI}{RI} \quad (7)$$

vi) ***Step 6.*** The ranking of strategies for e-procurement implementation is based on the optimal weight calculation and was presented in tabular form (see Table 12).

4. Results and Discussion

This section offers a detailed quantitative analysis of the obtained results, providing statistical insights and interpretations.

4.1 Demographics

Table 1 presents insightful data regarding the demographics and characteristics of SME leadership in the Republic of South Sudan: The data indicates a significant gender disparity, with 85.9% of respondents being male and only 14.1% female, highlighting a predominantly male-dominated landscape within SME leadership roles. The majority of participants (54.9%) fall within the age range of 36 to 50 years old, followed by 37.6% between 26 and 35 years old, suggesting a relatively mature workforce within SMEs in South Sudan. A majority (60.1%) of respondents held a bachelor's degree, followed by 20.2% with a diploma and 14.1% with a master's degree, indicating a relatively high level of educational attainment among SME leaders. The majority (70.0%) of participants held positions as top managers, followed by 23.5% as middle managers, suggesting a hierarchical structure within SME leadership roles. The largest segment (34.7%) reported having 6 to 10 years of professional experience, followed by 30.5% with 3 to 5 years, indicating a considerable level of experience among SME leaders in the region.

Insert Table 1 Here

Table 1: Demographic Characteristics of the Respondents

4.2 Strategies to E-procurement Adoption

Table 2 shows the frequency and percentage distribution for each of the questions on the strategies of e-procurement adoption by SMEs in South Sudan. Stakeholder Engagement: The overwhelming agreement among respondents regarding the importance of involving stakeholders in the decision to adopt e-procurement indicates a strong emphasis on collaborative decision-making processes within SMEs. Strategic Alignment with Vision and Mission: The widespread consensus on aligning e-procurement initiatives with the organization's vision and mission underscores a strategic approach to technology adoption, emphasizing the integration of procurement processes with broader organizational goals.

Operational Strategies: The endorsement of operational strategies such as cost leadership, just-in-time delivery, and quality improvement suggests a proactive stance towards enhancing operational efficiency and competitiveness through e-procurement. Global Business Opportunities: The recognition of e-procurement's potential to facilitate global business opportunities reflects a forward-thinking approach to expanding market reach and tapping into international trade networks, indicating a willingness to explore new avenues for growth. Risk Management: The balanced consideration of risk appetite in e-procurement initiatives highlights a prudent approach to risk management, where SMEs weigh potential risks against the anticipated benefits of technology adoption, ensuring a cautious yet innovative approach to procurement transformation. These insights shed light on the strategic priorities and decision-making processes of SMEs in South Sudan, offering valuable perspectives on the role of e-procurement in driving growth, competitiveness, and resilience within the SME sector.

Insert Table 2 Here

Table 2: Frequency and Percentage Distribution of Strategies for E-Procurement Adoption

4.3 Principal Component Analysis Results for Strategies to E-procurement Adoption

PCA was performed on responses from 213 participants to an 18-item questionnaire aimed at identifying strategies for e-procurement adoption by SMEs in South Sudan. The KMO measure of sampling adequacy returned a high value of 0.947, signifying excellent data suitability for PCA, with individual item KMO values all exceeding 0.7, reflecting good to excellent adequacy. Bartlett's test of sphericity confirmed the variables' inter-correlations as significant ($\chi^2(153) = 2666.750$, $p < 0.001$), validating the PCA's appropriateness.

Screen Plot

The screen plot shown in the Figure 2, was used in determining the number of components for retention, identifying a notable inflection after the second component,

suggesting the retention of two components.

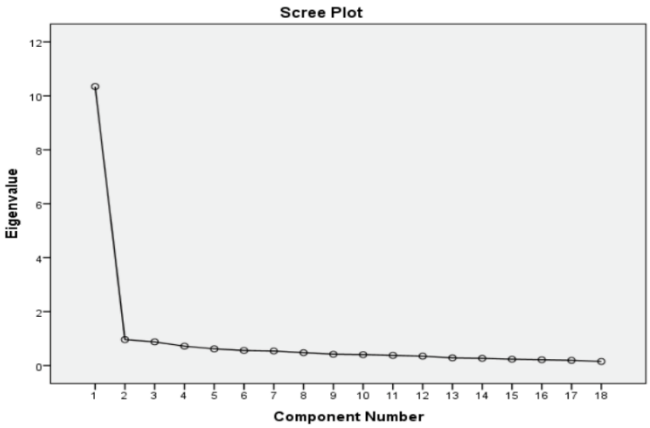

Figure 2: Screen plot for SMEs E-procurement Adoption Strategies in the Republic of South Sudan

PCA Extraction Method

Table 3 shows the PCA extraction outcomes, with two components explaining a cumulative variance of 62.8%. The first component accounted for 57.5% of variance, indicating a strong singular dimension within the dataset.

Insert Table 3 Here

Table 3. Component Transformation Matrix for the Strategies to E-procurement Adoption

Varimax Rotation Method

Table 4 presents the Varimax-rotated component matrix, delineating the strategies into two distinct categories: competitive and strategic factors. Analysis effectively grouped the 18 strategies into these categories, offering a nuanced understanding of their contribution to e-procurement adoption. The first component, focusing on competitive factors, encompassed 11 strategies such as resource allocation, process analysis, and stakeholder involvement, explaining a significant portion of variance. The second component, emphasizing strategic factors, included seven strategies, such as risk-taking and aligning technology with strategy, highlighting different aspects of strategic consideration in e-procurement adoption.

Insert Table 4 Here

Table 4. Strategies of E-procurement Adoption by SMEs in the Republic of South Sudan

This division into competitive and strategic factors through PCA provides a clear framework for SMEs to strategize their e-procurement adoption processes. By categorizing strategies into distinct components, the analysis underscores the multifaceted approach needed for effective e-procurement implementation, combining both competitive enhancements and strategic alignment.

4.4 Assessment of E-procurement Adoption Strategies Using the Relative Importance Index

To prioritize the strategies for adopting e-procurement among SMEs in South Sudan, RII was employed. This method facilitated the ranking of survey questions based on their significance in relation to e-procurement adoption strategies, setting the stage for the subsequent AHP. Table 5 outlines the RII for various e-procurement adoption strategies.

Insert Table 5 Here

Table 5. Relative Importance Index for E-procurement Adoption Strategies Among SMEs in the Republic of South Sudan

Training staff in the use of e-procurement software emerged as the most critical strategy with an RII of 0.8531, underscoring the value of skill development in e-procurement systems. Following closely were strategies related to exploring global business opportunities (RII = 0.8453) and defining the organization's vision and mission for procurement automation (RII = 0.8417). Other highly rated strategies include quality improvement (RII = 0.8396), establishing a procurement regulatory framework (RII = 0.8392), and market research planning (RII = 0.8292). Conversely, the strategies perceived as less critical included risk-taking (RII = 0.7764), adjusting organization size and type (RII = 0.7717), and fostering alliances while countering opponents (RII = 0.6660), which were ranked lowest. The assessment revealed that 13 strategies were deemed of high importance, whereas 5 strategies fell into the high-medium importance category. This detailed ranking not only highlights the pivotal role of each strategy in facilitating e-procurement adoption among SMEs in South Sudan but also assists in guiding where efforts and resources might be best allocated for effective e-procurement implementation.

4.5 Application of the Analytic Hierarchy Process to E-procurement Adoption Strategies

The AHP, a comprehensive decision-making framework, created by Thomas Saaty in the 1970s, was used to evaluate strategies for e-procurement adoption among SMEs in South Sudan. The core issue addressed was identifying effective strategies for SMEs in South Sudan to adopt e-procurement systems.

AHP Hierarchical Structure Derived from PCA

The hierarchical organization of criteria, as illustrated in Figure 3, showcases the relationships and relative importance among the strategies.

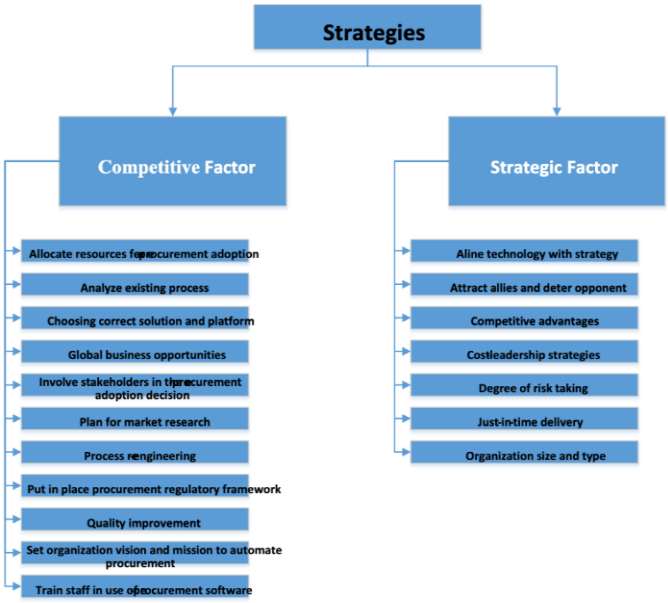

Figure 3: Hierarchical Structure of Strategies to E-procurement

Adoption.

This structure, informed by PCA findings, is segmented into three tiers. Level 1 focuses on the overall objective, which is the adoption of e-procurement strategies. Level 2 delineates two main criteria - competitive factors (F1) and strategic factors (F2). And level 3 details 18 specific strategies (sub-criteria) that play a pivotal role in e-procurement adoption. Figure 2 visualises this hierarchical arrangement, emphasizing the interplay between various e-procurement adoption strategies.

Pairwise Comparison Using the Relative Importance Index

RII facilitated numerical comparisons among the strategies, converting subjective assessments into quantifiable metrics. Table 6 establishes a correlation between RII scores and specific value assignments across a range of importance levels, aiding in the precise prioritization of strategies.

Table 6. Assign Pairwise Comparison Values to RII Values.

Scale	Range	Assigned Value
High Importance	0.8-1.0	7,8,9
High Medium	0.6-0.8	5,6,7
Medium	0.4-0.6	3,4
Medium Low	0.2-0.4	2
Low	0.0-0.2	1

Tables 7 and 8 present a matrix that documents the pairwise comparisons among each element and criterion. The matrix's diagonal values are set to 1, signifying that each element holds equal importance to itself. The upper triangular section of the matrix includes values assigned according to the RII, which denote the level of preference or importance of one element compared to another. Conversely, the lower triangular section consists of values that are the inverses of the corresponding upper triangular values.

Insert Table 7 Here

Table 7. Pairwise Comparison Matrix of Competitive Factors

Insert Table 8 Here

Table 8: Pairwise Comparison Matrix of Strategic Factors

Normalization of Decision Matrix

To refine the decision-making process, the decision matrix underwent normalization to derive priority vectors, effectively ranking the sub-criteria based on their importance for e-procurement adoption. The normalization process involved calculating and normalizing the eigenvectors corresponding to the matrix's largest eigenvalue, λmax.

Tables 9 and 10 display the eigenvector associated with the highest eigenvalue, identified as λmax. This eigenvector has been normalized through division of each of its elements by the total sum of the elements, guaranteeing that the sum of the vector's values equals 1. The resulting normalized eigenvector illustrates the priority ranking of the sub-criteria.

Insert Table 9 Here

Table 9. Normalized Matrix of Competitive Factors

Insert Table 10 Here

Table 10. Normalized Matrix of Strategic Factors

Consistency Ratio

The consistency of pairwise comparisons was verified using the CR, derived by dividing the CI by the RI. A low CR indicates a high level of consistency in the pairwise assessments, enhancing the reliability of the decision-making process. Table 11 confirms the adequacy of the consistency levels across the evaluated strategies.

Table 11. Consistence Ratio for Strategies to e-procurement adoption

Strategies	Competitive Factor	Strategic Factor
Lambda Max	14.7251	9.2975
Consistency Index	0.0373	0.0638
Random Consistency Index	1.5300	1.3500
Consistency Ratio	0.0243	0.0473

Ranking of Key Strategies Based on Optimal Weight Calculation

The AHP analysis culminated in identifying and ranking the key strategies for e-procurement adoption. Table 12 highlights the top strategies within the competitive and

strategic factors categories, pinpointing "Allocation of resources for e-procurement adoption" and "Aligning technology with strategy" as the foremost priorities.

Insert Table 12 Here

Table 12. AHP Weightages and Ranking of Strategies for E-Procurement Adoption

The results outlined in Table 12 highlight "resource allocation and analysing existing process for E-Procurement Adoption" as the primary strategy within the competitive factor category. This echoes Kumar et al. (2019) and Masudin et al. (2021), stressing the critical need for organizations to allocate diverse and sufficient resources to ensure the successful integration of e-procurement. In an era driven by technology, proper resource allocation emerges as a fundamental element for organizations striving to maintain competitiveness and foster innovation.

Following closely in significance is the strategy of "Evaluation of Current Processes," in line with Aziz (2019). This underscores the importance of thoroughly examining existing processes and considering business process reengineering as an effective approach to e-procurement adoption. A deep understanding and optimization of current processes lay the foundation for a smooth integration of e-procurement, minimizing disruptions and enhancing efficiency.

Additionally, "Selection of Appropriate Solution and Platform" stands out prominently among the identified strategies. This correlates with Ramanujam (2012), stressing the need for a thorough cost-benefit and risk analysis when choosing the right solution and platform for standardizing infrastructure in e-procurement. The strategic decision regarding platform selection plays a crucial role in ensuring the successful implementation and sustainability of e-procurement practices. Contrary to these findings, De Sousa et al. (2014) argue that just-in-time delivery emerged as a significant strategy among competitive factors for e-procurement adoption, leading to notable improvements in lead time for multinational companies and streamlining the returns process for the proposed routing company.

In the realm of strategic factors, key strategies for successful e-procurement adoption were identified as "Alignment of Technology with Strategy" and "Building Alliances while Dissuading Opposition." These findings align with Mutua et al. (2013) and Nagy and Fawcett's (2018) work, stressing the importance of aligning technology with an organization's overarching strategy and processes for effective e-procurement or e-commerce adoption. Simultaneously, cultivating alliances with crucial stakeholders and mitigating potential adversaries are vital for a sustainable and successful e-procurement journey. In contrast, Ramanujam (2012) found that organizational goals and vision are the primary strategic factors for automating the procurement process, reducing duplication, enhancing transparency, cutting costs, and expanding the supplier base.

5. Conclusion

The present study examined strategies for e-procurement adoption by SMEs in the Republic of South Sudan. Results highlight the critical importance of strategic planning and resource allocation for the successful implementation of e-procurement. Providing diverse and sufficient resources, assessing current processes, and selecting appropriate solutions and platforms prove to be crucial strategies for organizations that want to effectively integrate e-procurement. Additionally, aligning technology with strategic goals and fostering alliances while deterring resistance are critical to the sustained success of the e-procurement journey.

This study is limited due to lack of resources, lack of access to empirical work, outdated secondary data, and insufficient sample sizes. Results cannot be easily generalized to SMEs in other countries because the focus is on strategies for adopting e-procurement specifically in South Sudan, a newly established country where most resources are lacking, and skills are limited in the local workforce. Future work should compare strategies for adopting e-procurement by SMEs in both developing and developed economies to ensure acceptance of e-procurement among stakeholders in South Sudan through (i) strategic resource allocation, (ii) process evaluation and optimization, (iii) careful solution and platform selection, (iv) alignment with strategic goals, and (v) stakeholder integration and alliance formation. The study suggest that South Sudanese companies and policymakers alike use our herein presented results to position themselves and their industry for sustainable competitiveness and innovation in today's digital landscape.

Acknowledgement

This study is part of a PhD research project on developing strategies for the adoption of e-procurement by small and medium-sized enterprises in the Republic of South Sudan, which may have a similar background and methodology to other works, but has different objectives and areas.

Declaration of Competing Interests

The authors declare that they are not aware of any competing financial interests or personal relationships that may have influenced the work described in this document.

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Appendices

Table 1: Demographic Characteristics of the Respondents

		Frequency	Percentage (%)
Gender	female	30	14.1
	male	183	85.9
Age group (years)	20-25	1	.5
	26-35	80	37.6
	36-50	117	54.9
	51-65	15	7.0
Highest completed education level	Bachelor's Degree	128	60.1
	Certificate	10	4.7
	Diploma	43	20.2
	Doctoral Degree	2	.9
	Master's Degree	30	14.1
Job status	First-level supervisor	9	4.2
	Middle Management	50	23.5
	Non-management	5	2.3
	Top management	149	70.0
Number of years employed in the company	Under 1	2	.9
	1-2	14	6.6
	3-5	65	30.5
	6-10	74	34.7
	Over 10	58	27.2

Table 2: Frequency and Percentage Distribution of Strategies for E-Procurement Adoption

Strategies to E-Procurement Adoption	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Involve stakeholders in the e-procurement adoption decision	16(7.5%)	11(5.2%)	35(16.4%)	63(29.6%)	86(40.4%)
Set organization vision and mission to automate procurement	9(4.2%)	11(5.2%)	22(10.3%)	54(25.4%)	115(54%)
Put in place procurement regulatory framework	12(5.6%)	4(1.9%)	23(10.8%)	62(29.1%)	108(50.7%)
Allocate resources for e-procurement adoption	11(5.2%)	8(3.8%)	32(15%)	69(32.4%)	91(42.7%)
Train staff in use of e-procurement software	10(4.7%)	7(3.3%)	19(8.9%)	56(26.3%)	119(55.9%)
Organization size and type	11(5.2%)	16(7.5%)	37(17.4%)	76(35.7%)	72(33.8%)
Analyse existing process	12(5.6%)	8(3.8%)	24(11.3%)	65(30.5%)	102(47.9%)
Process re-engineering	8(3.8%)	9(4.2%)	41(19.2%)	82(38.5%)	71(33.3%)
Choosing correct solution and platform	9(4.2%)	8(3.8%)	27(12.7%)	70(32.9%)	98(46%)
Aline technology with strategy	8(3.8%)	11(5.2%)	33(15.5%)	76(35.7%)	83(39%)
Plan for market research	8(3.8%)	8(3.8%)	25(11.7%)	75(35.2%)	96(45.1%)
Attract allies and deter opponent	11(5.2%)	21(9.9%)	38(17.8%)	65(30.5%)	77(36.2%)
Cost-leadership strategies	8(3.8%)	10(4.7%)	32(15%)	74(34.7%)	88(41.3%)
Just -in-time delivery	13(6.1%)	15(7%)	24(11.3%)	56(26.3%)	104(48.8%)
Competitive advantages	7(3.3%)	14(6.6%)	23(10.8%)	69(32.4%)	98(46%)
Global business opportunities	12(5.6%)	7(3.3%)	21(9.9%)	53(24.9%)	119(55.9%)
Quality improvement	9(4.2%)	8(3.8%)	24(11.3%)	62(29.1%)	109(51.2%)
Degree of risk taking	12(5.6%)	14(6.6%)	39(18.3%)	69(32.4%)	78(36.6%)

Table 3. Component Transformation Matrix for the Strategies to E-procurement Adoption

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10.344	57.5	57.5	10.344	57.5	57.5	6.299	35.0	35.0
2	.964	5.4	62.8	.964	5.4	62.8	5.009	27.8	62.8
3	.877	4.9	67.7						
4	.719	4.0	71.7						
5	.619	3.5	75.1						
6	.559	3.1	78.2						
7	.539	3.0	81.2						
8	.478	2.7	83.9						
9	.421	2.3	86.2						
10	.405	2.3	88.5						
11	.377	2.1	90.6						
12	.349	1.9	92.5						
13	.286	1.6	94.1						
14	.268	1.5	95.6						
15	.235	1.3	96.9						
16	.217	1.2	98.1						
17	.192	1.1	99.2						
18	.152	.8	100.0						

Extraction Method: Principal Component Analysis.

Table 4. Strategies of E-procurement Adoption by SMEs in the Republic of South Sudan

Strategies to E-procurement Adoption	Component	
	1	2
Set the organization's vision and mission to automate procurement	**.810**	.235
Allocate resources for e-procurement adoption	**.777**	.308
Train staff in the use of e-procurement software	**.750**	.354
Analyse existing process	**.731**	.416
Process re-engineering	**.698**	.287
Put in place a procurement regulatory framework	**.694**	.372
Choosing the correct solution and platform	**.636**	.458
Plan for market research	**.632**	.501
Involve stakeholders in the e-procurement adoption decision	**.620**	.353
Quality improvement	**.582**	.518
Global business opportunities	**.559**	.461
Degree of risk-taking	.207	**.784**
Organization size and type	.266	**.756**
Just -in-time delivery	.381	**.731**
Cost-leadership strategies	.471	**.670**
Aline technology with strategy	.430	**.650**
Competitive advantages	.513	**.626**
Attract allies and deter opponent	.454	**.538**

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations.

Table 5. Relative Importance Index for E-procurement Adoption Strategies Among SMEs in the Republic of South Sudan

Strategies for E-procurement Adoption	Mean (M)	Standard Deviation (SD)	Relative Importance Index	Ranking	Importance Level
Train staff in the use of e-procurement software	4.2654	1.07158	0.8531	1	High (H)
Global business opportunities	4.2264	1.12096	0.8453	2	High (H)
Set organization vision and mission to automate procurement	4.2085	1.09724	0.8417	3	High (H)
Quality improvement	4.1981	1.06134	0.8396	4	High (H)
Put in place procurement regulatory framework	4.1962	1.08963	0.8392	5	High (H)
Plan for market research	4.1462	1.02219	0.8292	6	High (H)
Choosing the correct solution and platform	4.1321	1.05377	0.8264	7	High (H)
Analyse existing process	4.1232	1.11866	0.8246	8	High (H)
Competitive advantages	4.1232	1.06189	0.8246	8	High (H)
Cost-leadership strategies	4.0566	1.04705	0.8113	10	High (H)
Just-in-time delivery	4.0519	1.20116	0.8104	11	High (H)
Allocate resources for e-procurement adoption	4.0474	1.09876	0.8095	12	High (H)
Align technology with strategy	4.0190	1.05090	0.8038	13	High (H)
Process re-engineering	3.9431	1.02194	0.7886	14	High-Medium (H-M)
Involve stakeholders in the e-procurement adoption decision	3.9100	1.20966	0.7820	15	High-Medium (H-M)
Degree of risk-taking	3.8821	1.14795	0.7764	16	High-Medium (H-M)
Organization size and type	3.8585	1.12649	0.7717	17	High-Medium (H-M)
Attract allies and deter opponents	3.8302	1.17616	0.7660	18	High-Medium (H-M)

Table 7. Pairwise Comparison Matrix of Competitive Factors

				Strategies	Strategies	Strategies	Strategies	Strategies	Strategies	Strategies	Strategies	Strategies	Strategies	Strategies
				F1	F1	F1	F1	F1	F1	F1	F2	F1	F1	F1
Objective	Criteria	Sub Criteria	RII	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Strategies	F1	C1	0.8095	1	6	6	7	5	6	7	8	9	9	9
Strategies	F1	C2	0.8246	0.1666667	1	6	7	5	6	7	8	9	9	9
Strategies	F1	C3	0.8264	0.1666667	0.1666667	1	7	5	6	7	8	9	9	9
Strategies	F1	C4	0.8453	0.1428571	0.1428571	0.1428571	1	4	5	6	7	8	8	8
Strategies	F1	C5	0.782	0.2	0.2	0.2	0.25	1	4	5	6	7	7	7
Strategies	F1	C6	0.8292	0.1666667	0.1666667	0.1666667	0.2	0.25	1	6	7	8	8	8
Strategies	F1	C7	0.7886	0.1428571	0.1428571	0.1428571	0.1666667	0.2	0.1666667	1	5	6	6	6
Strategies	F1	C8	0.8392	0.125	0.125	0.125	0.1428571	0.1666667	0.1428571	0.2	1	5	5	5
Strategies	F1	C9	0.8396	0.1111111	0.1111111	0.1111111	0.125	0.1428571	0.125	0.1666667	0.2	1	4	4
Strategies	F1	C10	0.8417	0.1111111	0.1111111	0.1111111	0.125	0.1428571	0.125	0.1666667	0.2	0.25	1	4
Strategies	F1	C11	0.8531	0.1111111	0.1111111	0.1111111	0.125	0.1428571	0.125	0.1666667	0.2	0.25	0.25	1

Table 8: Pairwise Comparison Matrix of Strategic Factors

				Strategies	Strategies	Strategies	Strategies	Strategies	Strategies	Strategies
				F2	F2	F2	F2	F2	F2	F2
Objective	Criteria	Sub Criteria	RII	C12	C13	C14	C15	C16	C17	C18
Strategies	F2	C12	0.8038	1	6	6	7	6	7	7
Strategies	F2	C13	0.766	0.1666667	1	5	6	5	6	6
Strategies	F2	C14	0.8246	0.1666667	0.2	1	7	6	7	7
Strategies	F2	C15	0.8113	0.1428571	0.1666667	0.1428571	1	5	6	6
Strategies	F2	C16	0.7764	0.1666667	0.2	0.1666667	0.2	1	5	6
Strategies	F2	C17	0.8104	0.1428571	0.1666667	0.1428571	0.1666667	0.2	1	6
Strategies	F2	C18	0.7717	0.1428571	0.1666667	0.1428571	0.1666667	0.1666667	0.1666667	1

Table 9. Normalized Matrix of Competitive Factors

Criteria	Sub Criteria	ROW TOTAL	E1 NORMALIZED	Eo NORMALIZED	Diff
Competitive Factor	Allocate resources for e-procurement adoption	540939.06276	0.32501	0.27042	0.05459
Competitive Factor	Analyze existing process	374515.85249	0.22502	0.21888	0.00614
Competitive Factor	Choosing correct solution and platform	256621.68158	0.15418	0.17176	-0.01757
Competitive Factor	Global business opportunities	149541.02839	0.08985	0.10961	-0.01976
Competitive Factor	Involve stakeholders in the e-procurement adoption decision	107540.47174	0.06461	0.07874	-0.01413
Competitive Factor	Plan for market research	89285.84293	0.05365	0.06662	-0.01297
Competitive Factor	Process re-engineering	52647.60634	0.03163	0.03574	-0.00410
Competitive Factor	Put in place procurement regulatory framework	35314.04966	0.02122	0.02092	0.00030
Competitive Factor	Quality improvement	23745.50787	0.01427	0.01195	0.00231
Competitive Factor	Set organization vision and mission to automate procurement	19049.42465	0.01145	0.00850	0.00295
Competitive Factor	Train staff in use of e-procurement software	15175.12184	0.00912	0.00687	0.00225
	SUM	1664375.65026	1.00000	1.00000	0.00000

Table 10. Normalized Matrix of Strategic Factors

Criteria	Sub Criteria	ROW TOTAL	E1 NORMALIZED	Eo NORMALIZED	Diff
Strategic Factor	Aline technology with strategy	62516.03870	0.44101	0.39065	0.05037
Strategic Factor	Attract allies and deter opponent	32404.52976	0.22859	0.24338	-0.01479
Strategic Factor	Competitive advantages	21744.06034	0.15339	0.18658	-0.03319
Strategic Factor	Cost-leadership strategies	10892.44732	0.07684	0.09208	-0.01524
Strategic Factor	Degree of risk taking	7100.04486	0.05009	0.05005	0.00003
Strategic Factor	Just -in-time delivery	4432.95518	0.03127	0.02358	0.00769
Strategic Factor	Organization size and type	2666.13778	0.01881	0.01368	0.00513
	SUM	141756.21395	1.00000	1.00000	0.00000

Table 12. AHP Weightages and Ranking of Strategies for E-Procurement Adoption

Objective	CRITERIA	SUB CRITERIA	AHP Weightage	AHP Ranking
Strategies	Competitive Factor	Allocate resources for e-procurement adoption	0.3250	1
Strategies	Competitive Factor	Analyze existing process	0.2250	2
Strategies	Competitive Factor	Choosing correct solution and platform	0.1542	3
Strategies	Competitive Factor	Global business opportunities	0.0898	4
Strategies	Competitive Factor	Involve stakeholders in the e-procurement adoption decision	0.0646	5
Strategies	Competitive Factor	Plan for market research	0.0536	6
Strategies	Competitive Factor	Process re-engineering	0.0316	7
Strategies	Competitive Factor	Put in place procurement regulatory framework	0.0212	8
Strategies	Competitive Factor	Quality improvement	0.0143	9
Strategies	Competitive Factor	Set organization vision and mission to automate procurement	0.0114	10
Strategies	Competitive Factor	Train staff in use of e-procurement software	0.0091	11
Strategies	Strategic Factor	Aline technology with strategy	0.4410	1
Strategies	Strategic Factor	Attract allies and deter opponent	0.2286	2
Strategies	Strategic Factor	Competitive advantages	0.1534	3
Strategies	Strategic Factor	Cost-leadership strategies	0.0768	4
Strategies	Strategic Factor	Degree of risk taking	0.0501	5
Strategies	Strategic Factor	Just -in-time delivery	0.0313	6
Strategies	Strategic Factor	Organization size and type	0.0188	7

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