Theorized model for e-procurement system in developing countries: evidence from Tanzania

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Abstract

The adoption of e-procurement systems in developing countries is progressing slowly due to several challenges and barriers. Likewise, the adoption of e-procurement systems has been extensively studied, with research focusing on direct effects of factors like transparency and compatibility. This research aimed to evaluate the direct and indirect effects of relative advantage and performance expectancy on the adoption of e-procurement systems by combining components from the Technology, Organization, and Environment model with a modified Unified Theory of Acceptance and Use of Technology. This was accomplished by analyzing the function of attitude as a mediator and the legal framework as a moderator in the suggested study model. This study used a cross-sectional survey research design, together with a stratified sampling technique, to acquire a sample size of 367 respondents. The data were acquired via the distribution of questionnaires and the examination of relevant documents. The collected data underwent descriptive analysis using IBM SPSS statistics version 26, and inferential analysis was performed using PLS-SEM with the assistance of SmartPLS 4 software. The study’s results validate a significant statistical moderating impact of the legal framework on the relationship between performance expectancy and attitude towards adoption of e-procurement system. On the other hand, adoption of e-procurement system is impacted by performance expectancy and relative advantage, which have both direct and indirect significances. Attitudes have a direct impact on the adoption of e-procurement system. This study proposes that future research should include respondents from several countries to improve the applicability of the suggested model.

Article history:
Received 31 December 2023
Received in rev. form 25 Feb. 2024
Accepted 14 March 2024

Keywords:
Attitude, e-Procurement System, Legal Framework, Performance Expectancy, Relative Advantage

JEL Classification:
M15

Introduction

The implementation of e-procurement systems has faced comparable limitations and challenges worldwide, particularly in underdeveloped countries, mainly African nations (Azanlerigu & Akay, 2015; Pitso et al., 2018; Bawole & Adjei-Bamfo, 2019; Aboelmaged, 2010). Likewise, the application of e-procurement systems faces several barriers including the absence of legal frameworks that support such systems, a lack of awareness among users about the perceived benefits of e-procurement systems, a lack of awareness among potential users about the expected performance of e-procurement systems, and the varying attitudes of potential users towards e-procurement systems (Shatta et al., 2020b; Adjei-Bamfo & Maloreh-Nyamekye, 2019; Tutu et al., 2019; Pitso et al., 2018; Ibrahim et al., 2017; Suleiman, 2015; Latif, 2014; Siwandeti et al., 2021b; Aboelmaged, 2018).

To address the challenges and barriers related to the adoption and advancement of e-procurement systems in developing nations, particularly Tanzania, a promising strategy was pursued. This strategy included merging the Technology-Organization-Environment (TOE) model, which embodies the viewpoint of buyers inside companies, with the Unified Theory of Acceptance and Use of Technology (UTAUT), which embodies the viewpoint of suppliers. The integration was thought to provide a thorough and strong model that could effectively explain the events being studied. This theoretical framework was developed through a systematic process of theorizing (Zhou et al., 2017). It was created because previous literature did not include a model that considers the influence of...
buyer’ and supplier’ attitudes, as well as the moderating effect of the legal framework (Venkatesh et al., 2003; Chen et al., 2011; Venkatesh et al., 2012; Venkatesh et al., 2016; Soong et al., 2020; Waithaka & Kimani, 2021b; Ndei & Mutuku, 2021; Ratnawati & Suryawan, 2021; Esimit & Kibet, 2021; Willy & Paul, 2021; Yuliawati & Kurniawan, 2021; Masudin et al., 2021; Elias, 2021; San et al., 2020; Dwivedi et al., 2017; Taluka, 2016; Martawidjaja et al., 2021; Shin et al., 2016; Gambo et al., 2019; Shatta et al., 2020c; Siwandeit et al., 2021a; Soong et al., 2019; Afolabi et al., 2019; Alias, 2018; Almajali, 2023).

In addition, previous literature, including both theoretical and empirical studies, has not completely grasped a particular model that explores the effect of both mediation of attitude and moderation of legislative frameworks on e-procurement acceptance. Several researchers (Giri et al., 2023; Alias, 2018; Almajali, 2023; Hammah & Nani, 2021; Elias, 2021; San et al., 2020; Suliantoro et al., 2015; Makoba et al., 2017; Soong et al., 2020; Mgidiana, 2013; Waithaka & Kimani, 2021b; Ndei & Mutuku, 2021; Ratnawati & Suryawan, 2021; Esimit & Kibet, 2021; Willy & Paul, 2021; Yuliawati & Kurniawan, 2021; Masudin et al., 2021; Mose et al., 2013; Watuleke, 2017; Dwivedi et al., 2017; Taluka, 2016; Martawidjaja et al., 2021; Shin et al., 2016; Adjei-Bamfo et al., 2020; Adjei-Bamfo & Maloreh-Nyamekye, 2019; Alehegn, 2021; Pitso et al., 2018; Tutu et al., 2019; Rotich, 2015; Waithaka & Kimani, 2021a; Dwivedi et al., 2019; Shatta & Shayo, 2021; Ko et al., 2016; Marikyan & Papagiannidis, 2021; Chege & Wang, 2020; Hue, 2020; Kusi et al., 2016; Soong et al., 2021) have not identified this gap and their models have been developed to understand only the direct and indirect effects of e-procurement adoption, highlighting its significance in modern procurement practices. However, a positive attitude towards adoption of e-procurement systems, coupled with environmental considerations, technological infrastructure, and strategic planning, can significantly influence the adoption and effectiveness of e-procurement systems in various industries (Singh & Chan, 2022). On the other hand, the legal framework's role in influencing attitudes is evident in various contexts, from shaping legal policy to promoting justice and fairness (Shatta et al., 2020a). In addition, understanding how legal regulations impact the linkage between performance expectancy and attitudes towards e-procurement adoption is essential for fostering compliance, cooperation, and positive behavioral change (Khai et al., 2024).

This paper is organized as follows: following the introduction part, a second part is a literature review with theoretical and empirical studies that shed a light on linkage between theory and practice. The third part introduces the background information on research and methodology. After analysis and findings of the study, authors provide discussions and implications. Finally, this paper concludes with key points, recommendations, future research directions and limitations.

**Literature Review**

This part explains the linkage between theory and practice by integrating the components from modified Unified Theory of Acceptance and Use of Technology (UTAUT) and from the Technology, Organization and Environment (TOE) model.

**Theoretical and Conceptual Background**

The Technology, Organization and Environment (TOE) model, created by Tornatzky and Fleischer in 1990, and the Unified Theory of Acceptance and Use of Technology (UTAUT), introduced by Venkatesh et al. in 2003, are widely recognized and empirically supported theories and models that have gained substantial approval in diverse fields. These frameworks seek to understand the elements that influence the end-user's propensity to embrace and use new technologies and systems. The Unified Theory of Acceptance and Use of Technology (UTAUT) is a model that reliably explains around 70 percent of the variation in the adoption of new technologies and people's behavioral intentions towards them (Dwivedi et al., 2017). In addition, the Technology-Organization-Environment (TOE) model was considered appropriate for this research since it incorporates coercive pressure (legal frameworks), perceived benefits (relative advantages), and organizational attitude towards technological innovation. These elements correspond to the three barriers and challenges mentioned earlier that are linked to the implementation of e-procurement in developing countries, particularly African countries (Shatta et al., 2020b; Adjei-Bamfo & Maloreh-Nyamekye, 2019; Tutu et al., 2019; Pitso et al., 2018; Ibrahim et al., 2017; Suleiman, 2015; Latif, 2014).

Nevertheless, the Technology-Organization-Environment (TOE) model has encountered criticism from several authors about its applicability in studies concerning technology adoption and innovation (Shatta, 2020d). Prior studies have expressed reservations about the TOE model's deficiency in providing a complete framework that adequately encompasses the aspects that influence both individual and organizational choices about adoption (Zhang et al., 2020; Shatta et al., 2020b; Masele, 2014). In addition, the TOE model has been criticized for its narrow emphasis on the organizational standpoint, disregarding the individual's perspective (Masele, 2014). To address the identified flaw in the application of the Technology-Organization-Environment (TOE) model, a modified version of the Unified Theory of Acceptance and Use of Technology (UTAUT) was used.

The UTAUT framework was created by Venkatesh et al. (2003) by analyzing different theories and models, including the Combined Theory of Planned Behavior/Technology Acceptance Model (TPB/TAM), Model of PC Utilization (MPCU), Diffusion of Innovation Theory (DIT), Social Cognitive Theory (SCT), Motivational model (MM), Theory of Planned Behavior (TPB), Theory of Reasoned Action (TRA), and Technology Acceptance Model (TAM). Venkatesh et al. (2003) identified two key characteristics that have a direct impact on the adoption of technology: “intentions to use” and “facilitating conditions.” The notion of “intention to use” is influenced by several elements, such as “performance expectancy,” “effort expectancy,” and “social influence.” The combination of these elements, together with “facilitating conditions,” are regarded as the four main catalysts for both the purpose and conduct of
using. Venkatesh et al. (2003) explore how gender, age, experience, and voluntariness of use modulate the effect of the four primary categories on use intention and behavior.

Recently, several researchers have posed substantial criticisms to the theoretical foundations of the Unified Theory of Acceptance and Use of Technology (UTAUT). The research conducted by Dwivedi et al. (2017) presents an updated version of the Unified Theory of Acceptance and Use of Technology (UTAUT). The study reveals that characteristics like as gender, age, experience, and voluntariness have no substantial impact on the behavioral intention to adopt or develop technology. The reasoning indicated above was supported by several prior empirical studies, which did not include the four moderators provided by the original Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. (2003) (Dwivedi et al., 2017; Taluka, 2016). Dwivedi et al. (2017) have put forward a modified version of the Unified Theory of Acceptance and Use of Technology (UTAUT) that clarifies how four factors (performance expectation, effort expectancy, social influence, attitude) indirectly affect use behavior, while emphasizing that only one factor (facilitating circumstances) directly impacts use behavior. In addition, it has been observed that the first Unified Theory of Acceptance and Use of Technology (UTAUT) put up by Venkatesh et al. (2003) does not include the attitude component, which is deemed essential in the realm of technology adoption and innovation (Dwivedi et al., 2017).

Empirical Review and Hypothesis Development

The government's adoption of e-procurement system entails the intentional decision to fully use an innovation in information and communication technology (ICT) for the execution of public procurement operations (URT, 2011; Kihamba, 2021). On the other hand, e-procurement system in the public sector includes several elements such as service performance, efficiency, transparency, and information quality (Kassim & Hussin, 2013). The successful implementation of new technology relies on several essential resources, including technical, organizational, and environmental resources (Zhang et al., 2020).

The acceptance and innovation of e-procurement system in this inquiry depend on several elements. These factors include the support of a set of laws, applying forceful influence; the expected effectiveness of the system; the perceived superiority or benefits of the system; as well as the attitudes of both people (suppliers) and organizations (buyers) (Rogers, 2003; Kassim & Hussin, 2013; Suleiman, 2015; &Zhang et al., 2020).

Effect of Legal Framework (LF) on e-Procurement Adoption (ePA)

Mrope (2018) defines the legal framework for public procurement as a complete set of legislative instruments that regulate the purchase of commodities, works, and services by public sector bodies. This framework incorporates the essential institutional structures to guarantee the efficient execution of these regulations, including the Public Procurement Act (PPA) of 2011 and its subsequent amendment in 2016, as well as the Public Procurement Regulation (PPR) of 2013 and its subsequent amendment in 2016 (Kihamba, 2021). In this study, the term “legal framework” refers to both the collection of legal instruments identified by Mrope in 2018 and the compilation of legal directives recorded during the amendment process of legal frameworks in 2022, as well as those that will be recorded in the future. However, according to the TOE model suggested by Tornatzky and Fleischer (1990), the existence of coercive coercion in the form of a legal structure has a substantial impact on organization' feeling to adopt new technological systems.

Prior research in the empirical literature has examined the correlation between forceful coercion, specifically in the context of a legal framework, and its impact on people' inclination to utilize technology. The aforementioned research, carried out by Shatta (2020d), Azanlerigu and Akay (2015), and Masele (2014), have consistently revealed findings that corroborate this concept. Shatta (2020a) and Masele (2014) performed research that offers strong evidence to support the idea that coercive limitations, namely in the form of legal frameworks, greatly impact the adoption of technology and innovation. Moreover, it is essential to build legal frameworks to effectively enable the adoption of technology and innovation, with the objective of enhancing public welfare (Masele, 2014).

Moreover, the study done by Azanlerigu and Akay (2015) shown that the legal framework plays a crucial role as a basic cornerstone for all business transactions, irrespective of whether they take place in the public sector or private companies. On the other hand, the legal and regulatory framework is identified as one of the factors affecting the implementation of procurement procedures, alongside technology, procurement staff skills, and organization structure (Samba, 2018; Masele, 2014). The legal framework is a critical component in the adoption of e-procurement, as it provides the necessary guidelines, standards, and enforcement mechanisms to ensure that electronic procurement systems are implemented effectively and in compliance with legal requirements (Indraccolo, 2019; Kusi et al., 2016). Based on the facts noted above, this study hypothesized that the legal framework would act as a moderating factor in the connection between performance expectancy and attitude towards e-procurement adoption.

Effect of Performance Expectancy (PE) on e-Procurement Adoption (ePA)

Research indicates that performance expectancy has a direct effect on the adoption of e-procurement in the private sector and in small and medium-sized enterprises (SMEs) (Soong et al., 2020). As to the study done by Venkatesh et al. (2012), performance expectancy pertains to the degree to which consumers anticipate that using technology would provide benefits in doing certain activities. This phenomenon is thought to influence people’ inclination to interact with technology (Dwivedi et al., 2017). On the other hand, the UTAUT hypothesis, introduced by Venkatesh et al. (2003), suggests that performance expectancy has a substantial impact on the acceptance and advancement of technology. However, some literature suggest that performance expectancy does not have a
statistically significant impact on the adoption of mobile phones and green e-business (Masele & Taluka, 2017; Masele, 2014). Aboelmaged (2010) supported the idea stated in this argument, stating that the usability of a technology is closely related to the expected benefits in terms of improving performance. Therefore, it is evident from these studies that performance expectancy plays a crucial role in influencing the adoption of e-procurement systems, particularly in terms of how individuals perceive the potential benefits of using such systems to enhance their job performance (Khai et al., 2024; Soong et al., 2020).

Irrespective of the accuracy of these findings, this study predicts that the performance expectancy would directly impact attitude and indirectly affect the acceptance of e-procurement system. The influence of performance expectancy on the adoption and innovation of e-procurement system is expected to be mediated by attitude. In addition, performance expectancy in this study was predicted to have a positive impact on e-procurement adoption, as evidenced by various studies and evaluations in the field of supply chain management and technology adoption.

**Effect of Relative Advantage (RA) on e-procurement adoption (ePA)**

The influence of relative advantage on e-procurement adoption has been studied in various contexts, shedding light on its importance in driving the adoption of electronic procurement systems (Li, 2008). These studies emphasize the significant role of relative advantage in influencing the adoption of e-procurement systems, highlighting its direct and indirect impacts when combined with other factors such as attitude and performance expectancy (Khai et al., 2024; Shatta, 2020d; Suleiman, 2015; Aboelmaged, 2010; Rogers, 2003). Relative advantage pertains to the extent to which individuals regard an innovation to be superior than the existing concept in terms of perceived benefits and costs (Rogers, 2003). However, there are perceived benefits linked to the use of computerized procurement systems, including both direct and indirect gains (Shatta, 2020d). The advantages include a reduction in errors and expenses associated with transactions, improved precision of data, and accelerated tendering procedures (Suleiman, 2015). In the context of this study, relative advantage is defined as the degree to which e-procurement is perceived as better than traditional paper-based procurement methods, influencing the speed and extent of adoption. The TOE model, as described by Tornatzky and Fleischer (1990), suggests that the acceptance and adoption of technologies are impacted by the perceived benefit, which is also referred to as relative advantage. Aboelmaged (2010) found a direct relationship between the user-friendliness of a technology and the expected benefits, often referred to as relative advantage, that come with adopting that technology. The study by Khai et al. (2024) assert that relative advantage positively impacts attitude by influencing perceptions of innovation superiority, adoption speed, and competitive positioning.

Moreover, Ibem et al. (2016) and Zhang et al. (2020) have provided evidence for the validation of the impact of relative advantage on the adoption and innovation of technologies. Zhang et al. (2020) performed a study that demonstrated the importance of the idea of relative advantage in influencing people’s willingness to embrace green innovation technologies. Nevertheless, Ibem et al. (2016) argue that a key element contributing to the extensive use of e-procurement in the construction industry is the perceived benefits linked to its implementation and advancement. In addition, the users’ adoption of the system depends on how they perceive the advantages it provides to the community, which includes both buyers and suppliers (Latif, 2014). Basing on the TOE model proposed by Tornatzky and Fleischer (1990), along with the findings of Zhang et al. (2020) and Ibem et al. (2016), this study suggests that the notion of relative advantage is likely to directly impact attitude, while also indirectly affecting the adoption and innovation of e-procurement system in the public sector.

**Effect of attitude (AT) on e-procurement adoption (ePA)**

Multiple empirical studies have shown a distinct association between attitude and the propensity to adopt new technologies (Dwivedi et al., 2017; Kassim & Hussin, 2013; Aboelmaged, 2010). Attitude plays a crucial role in shaping organizations’ decisions to adopt e-procurement systems and positive attitudes towards the benefits and efficiency gains of e-procurement can drive adoption rates and enhance procurement processes (Masudin et al., 2021). Masele (2014) emphasized that attitude is evaluated via three dimensions: affection, cognition, and conation, which include several components. These categories include affective states, cognitive processes, and behavioral patterns, respectively (Dwivedi et al., 2019; Masudin et al., 2021; Masele, 2014). The Technology-Organization-Environment (TOE) model, created by Tornatzky and Fleischer (1990), suggests that the adoption of new technologies is impacted directly by management attitude, which plays a crucial role in deciding the intention to embrace and use these technologies. On the other hand, Dwivedi et al. (2017) suggests that an individual attitude has indirect impact on the adoption of new technologies. In the context of this study, attitude is defined as the extent to which a person perceives e-procurement system and its adoption to be valuable and beneficial. Therefore, this study theorized that attitudes of buyers and suppliers have positive impact on e-procurement system and its adoption.

Figure 1 presents a conceptual framework that hypothesizes the key success criteria that are expected to influence the adoption of e-procurement system.
The Mathematical Model for Latent Variables and Their Observed Indicators

The study used the mathematical equation $x = lY + e$ to illustrate the connections between latent variables and their visible indicators, as seen in Figure 1. The variable $x$ is used to signify the observable indicator, while $Y$ represents the hidden variable. The loading coefficient is a regression coefficient that quantifies the strength of the relationship between $x$ and $Y$. The variable $e$ denotes the stochastic measurement error (Shatta, 2023; Sarstedt et al., 2022).

Operationalization of the Variables

To facilitate the measurement and implementation of the variables inside the conceptualized model, the following hypotheses were subjected to empirical examination:

$H_1$: Attitude (AT) positively impacts e-Procurement Adoption (ePA)

$H_2$: Legal Framework (LF) positively impacts Attitude (AT)

$H_3$: Legal Framework (LF) positively impacts e-Procurement Adoption (ePA)

$H_4$: Performance Expectancy (PE) positively impacts Attitude (AT)

$H_5$: Performance Expectancy (PE) positively impacts e-Procurement Adoption (ePA)

$H_6$: Relative Advantage (RA) positively impacts Attitude (AT)

$H_7$: Relative Advantage (RA) positively impacts e-Procurement Adoption (ePA)

$H_8$: Legal Framework (LF) x Performance Expectancy (PE) positively impacts Attitude (AT)

$H_9$: Legal Framework (LF) x Performance Expectancy (PE) positively impacts e-Procurement Adoption (ePA).

Research and Methodology

The research philosophy and research design used in this study were positivism and an explanatory cross-sectional survey. The rationale for selecting this philosophy was its ability to test the hypotheses formulated and design was its incorporation of data collection from a targeted audience, including both buyers and suppliers, at a singular instance. The researchers used a sample size of 367 from this demographic to carry out their investigation (Creswell & Plano, 2018). In addition, the current study used a survey approach to gather data, since it allows for the gathering and subsequent quantitative analysis of data using descriptive and inferential statistical methods. In order to meet the criteria of this study, the researchers used the eleventh guideline proposed by Hair et al. (2019) to ascertain the suitable sample size for testing the hypotheses of the research model utilizing PLS-SEM and SmartPLS software. As stated by Hair et al. (2019), the tenth guideline suggests that the minimal sample size required to test the hypotheses of the proposed research model may be calculated by multiplying the number of indicators of the exogenous construct by ten.

On the other hand, this research incorporates exogenous dimensions such as performance expectancy, relative advantage, and legal framework, each including four indicators. Based on the tenth rule of thumb, the study considered a sample size of 367 respondents to be sufficient for testing the hypotheses. Moreover, numerical values were used to ease and improve the precision of quantitative
data analysis in surveys that included closed-ended questions. The gathered quantitative data of the respondents’ profiles were analyzed using descriptive statistics with the aid of IBM SPSS Statistics Software Version 26. The hypotheses were evaluated by inferential statistical analysis utilizing Partial Least Squares Structural Equation Modeling (PLS-SEM) with the aid of SmartPLS 4 software. The technique of imputing additional responses was used to tackle the problem of incomplete data, using the SmartPLS 4 software. In this study, a value of 99 was used as a surrogate answer to replace the missing twenty (20) values that were not supplied in the questionnaires. Our technique, in contrast, enabled the creation of a clear differentiation between seen data and unseen data (Hair et al., 2019). The detection of outliers was performed using IBM SPSS Statistics version 26. This was achieved by analyzing the variable frequencies based on their degrees of agreement. The current investigation could not identify any outliers.

**Evaluation of Models**

The evaluation procedures for introspective frameworks in this investigation were based on PLS-SEM. The decision was based on the attributes of the components and their indicators in the study model shown in Figure 3. The use of a reflective model was considered appropriate for this study since all indicators depend on their corresponding ideas. The assessment of the measurement model and structural model of the proposed hypothesized research model was performed based on the criteria provided by Hair et al. (2019). The evaluation of the reflective measurement models included many steps. These steps included assessing the reliability value of the indicators, which should exceed 0.708. Furthermore, the composite dependability of constructions should have an internal consistent reliability value that exceeds 0.708. In addition, the convergence validity of the constructs was evaluated by calculating the Average Variance Extracted (AVE) value, which should exceed 0.5. Finally, the discriminant validity was assessed using the Heterotrait-Monotrait Ratio of Correlations (HTMT) criteria, which must be below 0.9. Similarly, the assessment of collinearity was performed for the components of the structural model. Hair et al. (2019) propose that the optimal range for Variance Inflation Factor (VIF) values is about 3 or below.

Upon conducting a collinearity check, the key criteria for assessing the structural model in Partial Least Squares Structural Equation Modeling (PLS-SEM) are as follows: the significance of the path coefficients, with a t-statistic greater than 1.96 at a significance level of 0.05 being considered acceptable, and p-values equal to or less than 0.05 being deemed statistically significant. As per the findings of Hair et al. (2019), R² values of 0.75, 0.50, and 0.25 may be classified as significant, moderate, and weak, respectively. Similarly, the effect sizes F, which have values of 0.02, 0.15, and 0.35, correspond to minor, medium, and large impact sizes, respectively (Hair et al., 2019). Becker et al. (2018) state that the Q² effect size, which quantifies the predictive significance, should be negative. Overall, the results of evaluating both the measurement and structural models were considered good, as they met all the criteria established by Hair et al. (2019).

**Findings and Discussions**

**Findings**

Around 61% of the participants self-identified as buyers, whereas around 39% self-identified as providers. The results of this study contrast with previous research (Siwandeti et al., 2021a; Siwandeti et al., 2021b), which indicated a lesser degree of supplier reaction compared to the findings of the present study. Additionally, it is noteworthy that around 39 percent of the participants had a bachelor's degree. The results of this study are consistent with previous research done by San et al. (2020), where a significant proportion of participants had a bachelor's degree. Thus, the data provided by the participants in this study were comprehensive. Table 1 provides a concise summary of the demographic characteristics shown by the participants.

<table>
<thead>
<tr>
<th>Education Level</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Education</td>
<td>Secondary Education</td>
</tr>
<tr>
<td>Buyers</td>
<td></td>
</tr>
<tr>
<td>Suppliers</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
</tr>
</tbody>
</table>

**Indicator’s Reliabilities, R² Values and Relevance of the Path Coefficients**

The use of the Partial Least Squares (PLS) approach demonstrates that the loadings of all indicators for the specified structures above the required level of 0.708, as suggested by Hair et al. (2019), except for PE2, which is below this threshold. Based on the research conducted by Hair et al. (2019), it is advised to assess indicators with a reliability value below 0.708 for possible elimination. Nevertheless, this action should only be taken if their elimination leads to enhancements in the composite reliability (CR) and Average Variance Extracted (AVE). From the facts provided, it can be deduced that the elimination of PE2 did not significantly affect the internal consistency reliability values of the Composite Reliability (CR) for all structures. These readings exceeded the predetermined threshold of 0.708. Similarly, it can be shown that the Average Variance Extracted (AVE) values for all structures stayed above the stated threshold of 0.5. These findings indicate that the omission of PE2 did not significantly impair the overall validity of the
constructs. According to the study done by Hair et al. (2019), the findings indicate that each factor accounted for more than 50 percent of the variation in the measure, thereby demonstrating a high degree of item dependability. Furthermore, Figure 4 clearly shows that the $R^2$ coefficients for the corresponding variables were 0.523 and 0.575. The findings of this research indicate that around 52% of the variation in attitude (AT) may be accounted for by external factors, namely Legal Framework (LF), Performance Expectancy (PE), and Relative Advantage (RA).

Furthermore, it is crucial to emphasize that approximately 58% of the variation in e-procurement Adoption (ePA) can be attributed to the combined influence of external factors, specifically Legal Framework (LF), Performance Expectancy (PE), and Relative Advantage (RA), along with the mediating factor of attitude (AT). Moreover, it is crucial to emphasize that all proposed connections, save for one, had positive route coefficients. This discovery indicates that an increase of one standard deviation in the exogenous variables, namely Performance Expectancy (PE) and Relative Advantage (RA), together with the mediator attitude (AT), resulted in a higher rate of mindset change among both consumers and suppliers. Consequently, this led to a subsequent increase in the speed of adoption or advancement in the field of e-procurement. Nevertheless, the moderator exhibited a negative path coefficient, indicating that a one standard deviation increases in the legal framework resulted in a decrease in the rate of change of the mentality (attitude) of buyers and suppliers towards the adoption and innovation of e-procurement, and vice versa. Figure 2 displays the loadings of all indicators for the constructions.

**Figure 2**: Indicator’s Reliabilities, $R^2$ Values and Relevance of the Path Coefficients

**Reliability and Convergent Validity Analysis Results**

According to Hair et al. (2019), a construct is deemed reliable if its composite reliability (CR) value is better than 0.708. Additionally, for a construct to have convergent validity, it is advised that its Average Variance Extracted (AVE) value be greater than 0.5. All constructs in this investigation achieved a composite reliability (CR) value more than 0.708, indicating high reliability. Additionally, the convergent validity of all constructs was confirmed with an Average Variance Extracted (AVE) value over 0.5. The results suggest that there were favorable response patterns seen in this investigation, and each construct came together to explain the variability of its item (Hair et al., 2019). The findings on the reliability and validity of the constructs are shown in Table 2.
Table 2: Reliability and Convergent Validity Analysis Results

<table>
<thead>
<tr>
<th></th>
<th>Cronbach's Alpha</th>
<th>Composite Reliability</th>
<th>Average Variance Extracted (AVE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude (AT)</td>
<td>0.923</td>
<td>0.942</td>
<td>0.767</td>
</tr>
<tr>
<td>Legal Framework (LF)</td>
<td>0.852</td>
<td>0.900</td>
<td>0.693</td>
</tr>
<tr>
<td>Performance Expectancy (PE)</td>
<td>0.720</td>
<td>0.825</td>
<td>0.543</td>
</tr>
<tr>
<td>Relative Advantage (RA)</td>
<td>0.789</td>
<td>0.863</td>
<td>0.612</td>
</tr>
<tr>
<td>e-Procurement Adoption (ePA)</td>
<td>0.928</td>
<td>0.940</td>
<td>0.664</td>
</tr>
</tbody>
</table>

Discriminant Validity Analysis (HTMT Results)

For all relationships examined in the research model, the HTMT values were less than 0.90. This indicates that each component of the proposed research model was empirically separate from the other components in the structural model (Hair et al., 2019). Table 3 displays the results of the discriminant validity study using the HTMT measure.

Table 3: Discriminant Validity Analysis (HTMT Results)

<table>
<thead>
<tr>
<th></th>
<th>Attitude (AT)</th>
<th>Legal Framework (LF)</th>
<th>Performance Expectancy (PE)</th>
<th>Relative Advantage (RA)</th>
<th>e-Procurement Adoption (ePA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legal Framework (LF)</td>
<td>0.661</td>
<td>0.661</td>
<td>0.72</td>
<td>0.739</td>
<td>0.815</td>
</tr>
<tr>
<td>Performance Expectancy (PE)</td>
<td>0.72</td>
<td>0.665</td>
<td>0.739</td>
<td>0.665</td>
<td>0.877</td>
</tr>
<tr>
<td>Relative Advantage (RA)</td>
<td>0.739</td>
<td>0.665</td>
<td>0.739</td>
<td>0.665</td>
<td>0.877</td>
</tr>
<tr>
<td>e-Procurement Adoption (ePA)</td>
<td>0.815</td>
<td>0.535</td>
<td>0.772</td>
<td>0.665</td>
<td>0.877</td>
</tr>
<tr>
<td>Legal Framework (LF) x Performance Expectancy (PE)</td>
<td>0.431</td>
<td>0.494</td>
<td>0.358</td>
<td>0.430</td>
<td>0.307</td>
</tr>
</tbody>
</table>

Q² Predict Results

The study found that the values of $Q^2$ for attitude (AT) and e-Procurement Adoption (ePA) were negative, indicating that the exogenous constructs (Legal Framework (LF), Performance Expectancy (PE), and Relative Advantage (RA)) in the research model had predictive power. The findings of $Q^2$ for the endogenous components of the proposed research model are shown in Table 4.

Table 4: $Q^2$ Predict Results

<table>
<thead>
<tr>
<th></th>
<th>SSO</th>
<th>SSE</th>
<th>$Q^2 = 1 - SSE/SSO$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude (AT)</td>
<td>1835</td>
<td>1112.532</td>
<td>0.394</td>
</tr>
<tr>
<td>e-Procurement Adoption (ePA)</td>
<td>2936</td>
<td>1833.835</td>
<td>0.375</td>
</tr>
</tbody>
</table>

Collinearity Statistics by VIF Metric for Inner Model

The study examined collinearity statistics using the Variance Inflation Factor (VIF). The results for all items were below 3, indicating that there were no issues with collinearity in the predictor constructs of the proposed research model. Table 5 displays the collinearity statistical results for the inner model of the suggested research model, utilizing the VIF metric.

Table 5: Collinearity Statistics (VIF) for Inner Model Results

<table>
<thead>
<tr>
<th></th>
<th>Attitude (AT)</th>
<th>e-Procurement Adoption (ePA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude (AT)</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Legal Framework (LF)</td>
<td>1.694</td>
<td></td>
</tr>
<tr>
<td>Performance Expectancy (PE)</td>
<td>1.949</td>
<td></td>
</tr>
<tr>
<td>Relative Advantage (RA)</td>
<td>2.076</td>
<td></td>
</tr>
<tr>
<td>Legal Framework (LF) x Performance Expectancy (PE)</td>
<td>1.310</td>
<td></td>
</tr>
</tbody>
</table>
**F² Values Results**

As stated by Hair et al. (2019), F² effect sizes are considered small, medium, and big when they exceed the values of 0.02, 0.15, and 0.35, respectively. The study found that the effect sizes (F²) for all associations were 0.018, 0.055, 0.085, 0.089, and 1.354. These values indicate the existence of negligible, modest, and high impact sizes for all hypotheses in the research model. The study's F² values findings are shown in Table 6.

<table>
<thead>
<tr>
<th>Construct</th>
<th>F² Values Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude (AT)</td>
<td>0.018</td>
</tr>
<tr>
<td>Legal Framework (LF)</td>
<td>0.085</td>
</tr>
<tr>
<td>Performance Expectancy (PE)</td>
<td>0.055</td>
</tr>
<tr>
<td>Relative Advantage (RA)</td>
<td>0.089</td>
</tr>
<tr>
<td>Legal Framework (LF) x Performance Expectancy (PE)</td>
<td>0.018</td>
</tr>
</tbody>
</table>

**R² Values Results**

As stated by Hair et al. (2019), R² values of 0.75, 0.50, and 0.25 may be categorized as considerable, moderate, and weak, respectively. The investigation yielded R² values of 0.523 and 0.575, indicating a reasonable level of predictive ability for the endogenous components. According to the established criteria by Hair et al. (2019), the R² values of 0.523 and 0.575 in this research exceed the minimal threshold values. These findings suggest that attitude, performance expectation, relative advantage, and legal framework together account for 57.5% of the variability in the adoption of e-procurement. Additionally, performance expectancy, relative advantage, and legal framework collectively account for 52.3% of the variability in the attitude of buyers and suppliers. The R² values findings are shown in Table 7.

<table>
<thead>
<tr>
<th>R-square</th>
<th>R-square adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude (AT)</td>
<td>0.523</td>
</tr>
<tr>
<td>electronic Procurement Adoption (ePA)</td>
<td>0.575</td>
</tr>
</tbody>
</table>

**Statistical Significance of the Tested Hypotheses**

The findings shown in Figure 3 of this investigation demonstrate that all anticipated associations were statistically significant (with all p-values < 0.05). These results indicate that the suggested research model may be used in decision-making procedures. This phenomenon may be explained by the fact that all hypothesized connections become evident in reality.
Summary of Statistical Significance of the Hypotheses Tested

Table 8 displays a concise overview of the results gained from verifying the direct and indirect assumptions generated from the theoretical model.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Path</th>
<th>Influence</th>
<th>P-value</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>H₁</td>
<td>AT -&gt; ePA</td>
<td>Direct</td>
<td>0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>H₂</td>
<td>LF -&gt; AT</td>
<td>Direct</td>
<td>0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>H₃</td>
<td>LF -&gt; AT -&gt; ePA</td>
<td>Indirect</td>
<td>0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>H₄</td>
<td>PE -&gt; AT</td>
<td>Direct</td>
<td>0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>H₅</td>
<td>PE -&gt; AT -&gt; ePA</td>
<td>Indirect</td>
<td>0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>H₆</td>
<td>RA -&gt; AT</td>
<td>Direct</td>
<td>0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>H₇</td>
<td>RA -&gt; AT -&gt; ePA</td>
<td>Indirect</td>
<td>0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>H₈</td>
<td>LF x PE -&gt; AT</td>
<td>Indirect</td>
<td>0.007</td>
<td>Supported</td>
</tr>
<tr>
<td>H₉</td>
<td>LF x PE -&gt; AT -&gt; ePA</td>
<td>Indirect</td>
<td>0.007</td>
<td>Supported</td>
</tr>
</tbody>
</table>

Importance-Performance Map Analysis Results

The attitude construct is positioned above the average of the importance and performance of the target construct, namely e-procurement adoption. This posture implies a rational priority of emphasizing the modification of the mentality (attitude) of buyers and suppliers throughout the adoption and reformation of the e-procurement system, justifying the need for more expenditure in this aspect. Nevertheless, it is evident that the legal framework, performance expectation, and relative advantage constructs are rated below average in terms of their importance to the aim of e-procurement adoption. This implies that these structures have a relatively little impact on the adoption of e-procurement. However, it is recommended to give priority to implementing and improving the e-procurement system on structures that are positioned above the average performance level. Figure 4 presents the importance-performance map analysis results.
Discussion

The Hypotheses Tested for the Theorized Research Model

This study proposed that the existence of a legal framework would operate as a moderating variable in the correlation between performance expectation and attitude towards the adoption or innovation of e-procurement. The findings revealed a negative path coefficient, suggesting that a one standard deviation increase in the legal framework led to a decrease in the pace of change in the mindset (attitude) of buyers and suppliers towards e-procurement adoption/innovation, and vice versa. In addition, the results demonstrated a statistically significant degree of moderation, as shown by a p-value below 0.05. The aforementioned results are regarded as a theoretical supplement since they deviate from existing theories and models.

However, this study proposed that the degree of performance expectation would directly influence people’s attitudes and indirectly affect the acceptance and innovation of e-procurement. The results showed that there were positive path coefficients, indicating that a one standard deviation increase in performance expectation would lead to a higher rate of change in attitude among buyers and suppliers, as well as an increase in the adoption of e-procurement and innovation. The findings of this study are consistent with previous investigations carried out by Dwivedi et al. (2017), Venkatesh et al. (2012), and Venkatesh et al. (2003). These studies have also shown that performance expectation has a statistically significant positive impact (p value < 0.05) on persons’ attitudes towards and adoption of technology. Nevertheless, it is crucial to acknowledge that these results contrast with the previous studies done by Masele and Taluka (2017) and Masele (2014). These researches determined that performance expectation did not have a substantial impact on technology adoption, as shown by a p-value over 0.05.

Furthermore, this study proposed the hypothesis that the component of relative advantage would directly influence attitude, and indirectly influence the adoption and innovation of e-procurement in the public sector. The results reveal that an increase in relative advantage by one standard deviation is connected with a favorable shift in attitude among buyers and suppliers, as well as increased adoption of e-procurement and innovation. The results of this study align with previous research done by Shatta et al. (2020a) and Shatta & Shayo (2021), which showed a statistically significant positive impact (p < 0.05) of relative advantage on the adoption of e-procurement.

Conclusions

The results of this study provide concrete evidence that supports the accuracy of the suggested research model and its hypotheses in the context of decision-making, particularly in regards to prioritizing investment in the implementation and advancement of e-procurement systems.
This research has effectively filled a gap in the current theoretical literature by thoroughly considering the influence of several elements in the context of technology adoption. The research has specifically examined the impact of the legal framework as a moderator, the relative advantage as a predictor using the TOE model, the performance expectancy as a predictor using the modified UTAUT, and the attitude as a mediator using both the TOE model and modified UTAUT.

The suggested theoretical model suggests that the legal framework has a moderating effect on the connections between different components. The alteration of the legislative framework has direct consequences for the correlation between the anticipated performance and the attitude of suppliers in the private sector and buyers in the public sector. In the end, this connection has an impact on the practical implementation of the e-procurement system. The statistical importance of performance expectancy in both direct and indirect contacts indicates that buyers and suppliers rely heavily on the perceived performance of the systems when deciding whether to adopt and use e-procurement system. The results also suggest that relative advantage has a statistically significant indirect effect on adoption of e-procurement system, but a statistically negligible direct effect. Basing on these findings, buyers and suppliers do not make choices based on the relative benefits of e-procurement platforms. Nevertheless, it is plausible that the inherent benefits of these systems might indirectly shape their thinking and eventually result in their adoption of e-procurement system.

This study utilized a restricted set of concepts, namely "legal framework, relative advantage, and management attitude" taken from the TOE model created by Tornatzky and Fleischer (1990), as well as "performance expectancy and attitude" from the modified UTAUT model suggested by Dwivedi et al. (2017). The combination of these constructs explained 57.5% of the observed variance in the adoption and innovation of e-procurement, as shown in Figure 4. The current study proposes that further research should include more elements from Tornatzky and Fleischer's (1990) Technology-Organization-Environment (TOE) framework and from the revised Unified Theory of Acceptance and Use of Technology (UTAUT) by Dwivedi et al. (2017). It is advisable to include this measure to improve the rate of e-procurement adoption/innovation, raising it from a modest 57.5 percent to a significant level. According to Hair et al. (2019), R² values of 0.75, 0.50, and 0.25 may be classified as substantial, moderate, and weak, respectively. Similarly, this study used just Tanzanian buyers and suppliers as participants. Based on this observation, it is recommended that future study should include suppliers and buyers from many countries to improve the applicability of the proposed model for the implementation and advancement of e-procurement system.

Acknowledgments

Authors acknowledge the contributions of a thesis titled Critical Success Factors for Adoption of National Electronic Procurement System in the Public Sector in Tanzania (Published PhD thesis). The Open University of Tanzania which appeared online and was conducted in 2020.

All authors have read and agreed to the published version of the manuscript.

Author Contributions: Conceptualization, formal analysis, investigation, resources, writing original draft preparation, Deus N. Shatta, writing review and editing, Bahati K. Mabina

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Conflicts of Interest: The authors declare no conflict of interest.

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