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Re-Designing The Tendering Process Within The Department Of Transport – A Case Of Procurement Management

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Abstract

Background: In South Africa, government procurement of own or local requirements (materials, equipment and services) is decentralised to departments, provinces and municipalities to a large extent. When one considers the number of cases of tender fraud and a lack of services at all levels of government, one should question whether these parties have the knowledge and/or the intention to get the best value for taxpayers' money. The study was an attempt to explore the electronic tendering (e-tendering) process in procurement management and to relook at the current tender process in terms of the challenges.

Objectives: The study objective was to evaluate the elements which contribute to the model of tendering process within KwaZulu Natal Department of Transport.

Method: Quantitative research was undertaken for the study and data were collected using a questionnaire-based Likert-type scale to develop questions. The research population was the employees of construction companies and engineering firms providing service to the KwaZulu Natal Department of Transport in the form of road construction and employees of KwaZulu Natal Department of Transport. The collected data were analysed using descriptive and inferential statistical tools.

Finding: The findings are that the perceived usefulness of electronic tendering and its ease of use significantly leads to the adoption or use of electronic tendering. Furthermore, the use of the electronic tendering process would positively influence buyer/supplier relationships, procurement process, and operational delivery status.

Conclusion: KwaZulu Natal Department of Transport should discuss the perceived usefulness of E-tendering with the main stakeholders so that electronic tendering replaces the paper-based tendering.

Key words: Electronic tendering, KwaZulu Natal Department of Transport, procurement management, Technology Acceptance Model, tender process, supply chain management.

Acronyms

AVE	Average variance extracted
E-tendering	Electronic tendering

ICT	Information and Communication Technology
OBB	Organisational Buying Behaviour model
PLS-SEM	Partial Least Squares Structural Equation model
TAM	Technology Acceptance model
KZNDoT	Kwa-Zulu Natal Department of Transport

I Introduction and Background

The sustainability and viability of South Africa's companies are in jeopardy after the South African National Roads Agency Limited (Sanral) cancelled the adjudicated tenders worth R17.47 billion (Leads2Business, 2022). According to Sanral, the contracts were terminated because at least three projects, including the N2 Wild Coast Mtentu Bridge, the repair of R56 Matatiele, and the Ashburton Interchange, contravened public finance management regulations during the bidding process. It emphasized that the decision to revoke the R17 billion worth of construction tender awards was made to protect taxpayer funds in conformance with South African regulations (IOL, 2022). Considering the above, Sanral took a decision to hand over the tendering process of these contracts to the Development Bank South Africa. According to Minister of Transport Honourable Fikile Mbalula, it would have been negligent of the Board of the South African National Roads Agency SOC Ltd (Sanral) to ignore something that may have led to unlawful expenditure and possible lawsuits, which could have prevented some of these projects from moving forward for years (Sanral, 2022).

In 2020, Afribusiness contested the 2017 Preferential Procurement Regulations amendments on the grounds that the Preferential Procurement Policy Framework Act did not allow the addition of pre-qualification criteria to the public tendering procedure (Mandlana & Tucker, 2022). According to Mandlana and Tucker (2022), Afribusiness' submission was that the pre-qualification requirements in the 2017 Regulations were intended to advance certain "designated groups," and they stipulated that only certain tenderers could respond, including those with a minimum Broad-Based Black Economic Empowerment status level, exempted micro enterprises or qualifying small enterprises, and tenderers subcontracting at least 30% of the work to exempted micro enterprises and qualifying small enterprises that are at least 51% black owned.

On 16 February 2022, the Constitutional Court dismissed the leave to appeal by the Minister of Finance on the judgement by the Supreme Court of Appeal where it was found that the Preferential Procurement Regulations did not follow the Preferential Procurement Policy Framework Act's empowering clauses (South African Government, 2022). On 25 February 2022, the Director General of National Treasury advised all organs of state that tenders advertised before 16 February 2022 be finalised according to 2017 regulations, tenders advertised after that date be on hold and no new tenders to be advertised (South African Government, 2022). According to Mandlana and Tucker (2022), the Constitutional Court judgement left all of South Africa's procurement organisations, which spend ZAR1 trillion through the public procurement system, in a state of complete uncertainty.

It is worth noting that supply chain management is an essential component of public sector procurement in South Africa. As a result, it is used as a tool for managing public procurement practices. Nonetheless, despite the use of supply chain management as a strategic

tool, public procurement in South Africa continues to face enormous challenges (Ambe & Badenhorst-Weiss, 2012). Discussing these predicaments, Migiro and Ambe (2008) argue that many supply chain management actors in the South African public sphere have attended several supply chain management training programmes but they still lack the necessary knowledge for proper implementation. McCarthy (2006) also claims that supply chain management actors lack the capacity and knowledge to manage procurement processes, which has resulted in poor governance.

2 Problem Statement

The outcome of the challenges of public procurement has been researched to an extent. According to the findings of a study conducted by van Greunen et al. (2010) in the Eastern Cape Provincial Administration, it takes at least four months from the time the tender is advertised to the time it is awarded. The delay is attributed to a lack of Information and Communication Technology (ICT) infrastructure, much idle time between processes and the fact that many processes are done manually. According to EC Transport (2020), paper-based tender documents are still used and the time between when a bid is advertised and when it is awarded has not improved since the study by van Greunen et al. (2010). From an organisational standpoint, the lengthy procurement process frustrates in such a way that it extends the process for no less than four months, creating opportunities for the process to be manipulated due to the ever-increasing problem of corruption (Corruptionwatch, 2019).

As a result of the lengthy process, awards are delayed, which delays the start of projects and may result in tender cancellations due to the expiration of tender validity. According to Ryder (2019), this has the consequences of increased costs, project delays and possible under-spending by government entities, which ultimately allows for corruption to occur.

Though the above research studies indicate the problem of delays caused due to the tendering process, there is limited research on specific challenges faced by KZNDoT due to inefficiencies in the tendering process. Many earlier studies on tendering and procurement management have focused on public organisations from different countries in general. Earlier studies focused on the challenges and benefits of the E-tendering system. This left the gap in the literature that this study aims to address, which is the impact of E-tendering on the procurement process and its effectiveness at a state-owned entity or a public company.

The purpose of this study is to predict the construct of the use of E-tendering using key driver constructs based on a modification of the Technology Acceptance model (TAM). The Partial Least Squares Structural Equation model (PLS-SEM) will be used to develop a theory. PLS-SEM will additionally be used to determine how well the variance in the proposed model is explained.

The study will not only add to the body of knowledge with its contribution to the concept of tendering and procurement management in public organisations but also provide important suggestions to the policymakers on the proper efficient tendering process, which may assist in the timely completion of projects and with no cost overruns.

Hence, the research problem statement for this research study, guided by Shaffer (2015), is that the tendering process in KZNDoT, from advertising to award, is severely delayed. The consequence of the prolonged process leads to delayed awards which result in the delayed start of projects, possible cancellations of tenders due to exceeded tender validities, increased costs, and project delays and ultimately allows corruption to take place (Ryder, 2019).

3 Theoretical Overview

3.1 An overview of the literature

Supply chains strive for efficiency by implementing appropriate strategies in the face of fluctuating markets and stiff competition among companies (Dolgui & Proth, 2010; Ivanov et al., 2015). The need for efficiency and quality improvement has prompted logisticians to implement new solutions that provide buyers with greater flexibility in selecting suppliers and sourcing products. The use of the Internet has resulted in the development of these new solutions and processes in supply chain management. These new practices attempt to adhere to the agile reality to provide reactivity to the buyer and thus ensure the best possible choice. A successful supply chain aims to adapt to changes by allowing for the free exchange of information via the E-market and defining roles for each actor (Harvard Business Review, 2004). For these reasons, efforts have been made to make the supply chain capable of responding quickly to changes. The agile supply chain, according to Harvard Business Review (2004), must necessarily promote the various flows between suppliers and customers.

Among all the issues that can arise in a supply chain, the procurement issue has received much attention in the literature, specifically to determine the appropriate number of suppliers and the quantity that customers should order. Traditionally, these decisions are revalued regularly when significant changes in all parameters related to both the buyer and the supplier occur at the same time (Ding et al., 2005, as cited by Chibani et al., 2018). This approach, however, is valid when the activities in the supply chain occur at regular intervals and assume total or partial knowledge of the data (Igoulalene et al., 2015). Nonetheless, the use of the Internet fosters new supply chain management practices. These new practices attempt to adhere to the agile reality to provide reactivity to the buyer and thus ensure the best possible choice. A successful supply chain aims to adapt to changes by allowing for the free exchange of information via the E-market and defining roles for each actor (Lee, 2004).

The TAM model of Sakala and Phiri (2019) was used by Kademaunga and Phiri (2019) to establish successful factors in the adoption of E-procurement in public entities. They found that officials accept and are ready to switch to E-procurement because it is an easy and useful system, however, little is done by the government in moving from paper-based procurement. Davis (1989, as cited by Weng et al., 2018) proposed the TAM to predict or elucidate the factors influencing information technology use. This was based on the theory of reasoned action (Hill et al., 1977, as cited by Weng et al., 2018) in which the TAM was extended and developed and consisted of two beliefs—perceived ease of use and perceived usefulness. The former refers to the perceived ease of use of information technology by users. The easier it is to use, the more widely accepted information technology becomes. The latter refers to the subjective usefulness of information technology as perceived by users. The greater the usefulness, the greater the adoption of information technology. Recognition influences attitudes and encourages behaviours. TAM was used to explain and predict information technology acceptance, with two key variables influencing individuals' use intentions and behaviour—perceived ease of use and perceived usefulness, which are depicted in Figure 1 below.

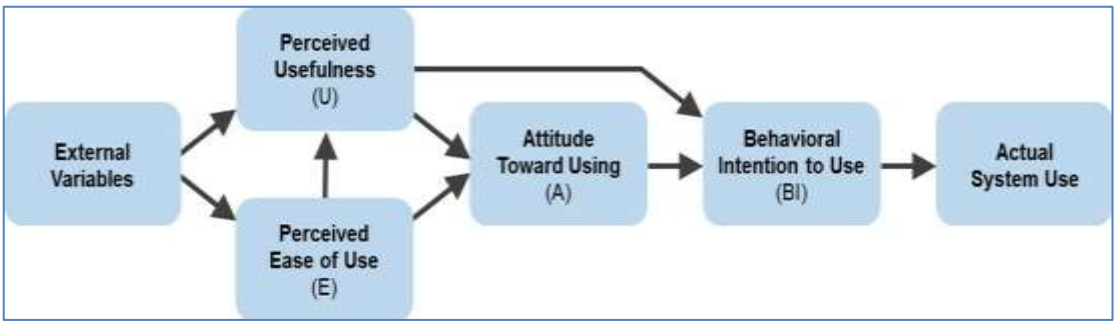

Figure 1: Technology Acceptance model

Source: Adapted from Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989, p. 985). User acceptance of computer technology: A comparison of two theoretical models. Management Science, 35(8):982-1003.

Items to measure the construct 'usefulness', according to Davis (1989), include:

1. Using [this product] at work would allow me to complete tasks more quickly.

2. Using [this product] would help me perform better at work.

3. Using [this product] at work would boost my productivity.

4. Using [this product] would increase my productivity at work.

5. Using [this product] would make my job easier.

6. I believe [this product] would be useful in my line of work.

Items to measure the construct 'ease of use' according to Davis (1989), include:

1. It would be simple for me to learn how to use [this product].

2. It would be simple for me to get [this product] to do what I want it to do.

3. My interaction with [this product] would be clear and easy to understand.

4. I would find [this product] to be adaptable in terms of interaction.

5. It would be simple for me to learn how to use [this product].

6. I believe [this product] is simple to use.

Several examples elucidate the usefulness and applicability of the TAM model. A university conducted a study on the use of mobile devices; according to the findings, there is a strong relationship between perceived usefulness and behavioural intention (Sánchez-Prieto et al., 2017). Another study looked at learning activities on YouTube (Chintalapati & Daruri, 2017). One of the findings demonstrated the significance of the relationship between various variables and behavioural intention, validating the teaching-learning activity using YouTube (Chintalapati & Daruri, 2017). Another finding highlighted the significance of the order in which relevant features between users and systems are integrated. The findings support the TAM by demonstrating the relationship between various variables and behavioural intention. Lu et al.'s (2016) study focused on cognitive-oriented individual differences to integrate the TAM and found that learning styles and teaching styles on using behaviours of E-learning systems affected the intention.

Webster and Wind's (1972) Organisational Buying Behaviour (OBB) model serves as the antecedent to the conceptual framework proposed. The use of E-procurement in an

organisation is preceded by the buying behaviour of the organisation. According to the Webster and Wind model, the variables are environmental, organisational, buying centre and individual, all of which influence the buying decision-making process in a firm.

Hence, the following is hypothesised:

H1: Environmental factors have a significant positive effect on an E-procurement buying decision.

H2: Organisational factors have a significant positive effect on an E-procurement buying decision.

H3: buying centre factors have a significant positive effect on an E-procurement buying decision.

H4: Individual factors have a significant positive effect on an E-procurement buying decision.

The E-procurement buying decision is followed by an issue of technology acceptance in terms of E-tendering. This is further discussed in the next section.

3.1.1 E-tendering as a technology acceptance issue

The TAM's fundamental assumptions are that an individual's use of technology is mediated by their acceptance of that technology, which is decided by two cognitive criteria, perceived usefulness and perceived ease of use. The degree to which an individual feels that employing technology will assist them to improve their job performance is described as perceived usefulness. The degree to which an individual feels that utilising a technology requires no effort is described as perceived ease of use (Venkatesh & Bala, 2008). If a technology performs well on these criteria, it will be used (Autry et al., 2010).

This study's two assumptions are compatible with the original TAM and numerous other investigations (van der Heijden, 2003) and are thus classified together. First, the researcher hypothesises that an individual's usage of an E-tendering system is impacted by the perceived usefulness and perceived ease of use of E-tendering. Thus, the researcher hypothesises that perceived usefulness and perceived ease of use positively influence the use of E-tendering (H2 & H3).

H5: There is a positive relationship between perceived usefulness and use of E-tendering.

H6: There is a positive relationship between perceived ease of use and use of E-tendering.

The researcher also wants to hypothesise that the use of E-tendering that affects the procurement process which is considered hypothesis number H7 since the research aims to study the effect of E-tendering on the procurement process.

H7: Use of E-tendering has a significant effect on the procurement process.

Use of E-tendering, according to the Resource Dependency Theory, can affect the post-contract buyer/supplier relationship. Hence, the researcher hypothesises the following:

H8: Use of E-tendering has a significant effect on the post-contract buyer/supplier relationship.

It is further suggested by the systems theory that the post-contract delivery status of buyer and supplier may be affected by the use of E-tendering. According to the systems theory, it is an ideal situation the buyer and supplier should become part of a whole supply network rather than individual organisations. Hence, the researcher proposes hypothesis number H9.

H9: Use of E-tendering has a significant positive effect on the post-contract delivery status of buyers and suppliers.

The related statistical null hypotheses would be expressed in null (non-relational) form.

H01: Environmental factors have no effect on an E-procurement buying decision.

H02: Organisational factors have no effect on an E-procurement buying decision.

H03: Buying centre factors have no effect on an E-procurement buying decision.

H04: Individual factors have no effect on an E-procurement buying decision.

H05: There is no relationship between perceived usefulness and use of E-tendering.

H06: There is no relationship between perceived ease of use and the use of E-tendering.

H07: Use of E-tendering has no effect on the procurement process.

H08: Use of E-tendering has no effect on the post-contract buyer/supplier relationship.

H09: Use of E-tendering has no effect on the post-contract delivery status of buyers and suppliers.

Figure 2 below proposes that the perceived usefulness and perceived ease of use of E-tendering has a positive relationship with the use of E-tendering. It is further suggested that use of E-tendering has a positive effect on the procurement process, the relationship between the buyer and supplier after the contract and the delivery status of buyer and seller after the contract is concluded.

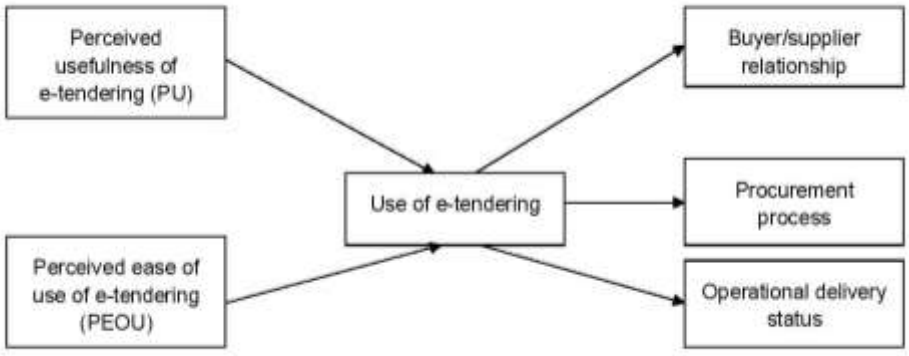

Figure 2: Proposed conceptual framework

3.2 Measurement of variables

For the measurement of the latent variables in the model, the researcher used multiple items based on previously published scales. The researcher adapted the wording of existing items to the specific research setting where appropriate. For perceived usefulness, the researcher adopted four items from the work of Davis (1989). For perceived ease of use, the researcher adopted four items from the works of Thompson et al. (1991) and Moore and Benbasat (1991). Use of E-tendering was operationalised with three newly developed items. The researcher adopted the five dimensions of the procurement process suggested by Gardenal (2013) in the Public E-procurement Impact Dimensions model.

The items used in the conceptual model are presented below.

3.2.1 Perceived usefulness items used

1. I find the system useful in my job.

2. Using the system enables me to accomplish my ordering activities more quickly.

3. Using the system increases my productivity.

4. Using the system makes it easier to do my job.

3.2.2 Perceived ease of use items used

1. Using the system takes too much time from my normal duties.

2. Working with the system is so complicated, it is difficult to understand what is going on.

3. Overall, I believe that the system is easy to use.

4. Learning to operate the system is easy for me.

3.2.3 Use of E-tendering items used

1. I expect to keep using the system.

2. If a product or service can be procured through the system, I will surely do so.

3. If possible, I would rather procure a product or service outside of the system.

3.2.4 Procurement process items used

1. Reduced procedure lead time;

2. Increased procurement quality;

3. Increased supplier participation and competitiveness;

4. Reduced paper consumption and archiving costs; and

5. Increased quality and availability of information.

3.2.5 Buyer/supplier relationship items

Based on the Resource Dependency Theory, the following items are used:

1. Power;

2. Authority; and

3. Access to additional resources.

3.2.6 Operational delivery status items

Based on the system theory, the following item is used:

1. Supply network

4 Research Methodology

The researcher's pragmatic research paradigm guides the design of this study, which holds that knowledge can be gained through careful observation and measurement of the objective reality that exists in the world by developing numeric metrics of those observations (Creswell & Creswell, 2018). To address the research problem, an exploratory research design will be used. It is important to note that exploratory research is used when the topic or issue is new. Exploratory research is flexible and can address research questions of all types (what, why, how). Exploratory research is often used to generate formal hypotheses.

Hence, exploratory research would assist in exploring/investigating a new process of E-tendering and generating hypotheses to ascertain the impact of E-tendering on the dependent variable, procurement.

The collected data were analysed using descriptive and inferential statistical tools. To predict the use of E-tendering, the researcher used key driver constructs through modification of the TAM model used as a conceptual model. Webster and Wind's (1972) OBB model was thus used as the antecedent to the conceptual framework. PLS-SEM was used to determine collinearity value to check the impact of the independent variable (use of E-tendering) on

the dependent variable (buyer/supplier relationship, procurement process, and operational delivery status).

4.1 Reliability and validity

According to Hair Jr et al. (2017), due to the Cronbach's alpha restrictions, Composite Reliability is preferable to Cronbach's alpha: (it is a good indicator of reliability for internal consistency, although it could be used more prudently). To compare the discriminant validity of constructs, the average variance extracted (AVE) of each construct is usually compared w.r.t its corresponding inter-construct squared correlations. Fornell and Larcker (1981) explained discriminant validity by comparing the AVE of a construct with its respective inter-construct squared correlations. Discriminant validity using Fornell and Larker's Criterion was checked whereby the under the root of AVEs of constructs on diagonal was greater than its inter-item correlation values. Diagonal values for each column are not maximum as a rule of thumb.

Use of E-tendering, perceived usefulness of E-tendering, ease of use of E-tendering, organisational buying behaviour, buyer/supplier relationship, procurement process, and operational delivery status have a strong differentiation with one another and the constructs are therefore suitable for modelling.

5 Research Findings and Discussion

This research study aimed at investigating the impact of E-tendering on the procurement process in KZNDoT. The researcher, for investigating the same, proposed a conceptual model earlier. However, the factors affecting the E-tendering buying process were also investigated as an antecedent to the proposed conceptual model. The researcher initially proposed nine hypotheses, however, after the final PLS-SEM model was developed using structural equation modelling, the researcher finally developed and tested 10 hypotheses using statistical tools. The first four hypotheses are proposed to test the antecedent to the conceptual model and the remaining six hypotheses are tested to investigate the impact of E-tendering on the procurement process in KZNDoT. The chapter presents and discusses each of the hypotheses along with the literature reviewed on the subject.

The factors affecting buying decisions were included in the study after conducting CFA. All the factors with an Eigen value >1 were included in the study.

5.1 Environmental factors have an effect on an E-procurement buying decision

H1: Environmental factors have a significant positive effect on E-procurement buying decisions.

After the statistical test on H1 (Environmental factors [$\beta = 0.293$, $p<0.000$]) it became clear that environmental factors which include technological environmental factors, economic environmental factors, physical environmental factors, cultural environmental factors and legal environmental factors have an effect on E-procurement buying decisions; it affects the E-procurement buying decision process. However, it only explains 3.746% of variance in the buying decision-making process. Hence, the effect is not major.

Webster and Wind (1972, as cited by Sanderson et al., 2015) argued that demand management is conceptually based on a model/models of OBB. The Webster and Wind model of OBB is a comprehensive model. It takes into account four sets of variables: environmental, organisational, buying centre, and individual, all of which influence the buying decision-making process in a firm.

The Webster and Wind model further suggests that the external environment that may influence an organisation's buying behaviour includes political, economic, cultural, legal,

technological, and physical environments. Webster and Wind (1972, as cited by Sanderson et al., 2015).

The findings of this study are consistent with the Webster and Wind model as it is statistically analysed that external environment factors affect E-procurement buying decisions at KZNDoT. However, the investigation into the effect of the environment on E-procurement buying decisions only suggests 3.746% of variance. Hence, more than 96% of E-procurement buying decisions are due to factors other than external environment.

5.2 Organisational factors have an effect on an E-procurement buying decision

H2: Organisational factors have a significant positive effect on E-procurement buying decisions.

The statistical test for the hypothesis ($\beta = 0.203$, $p<0.05$) shows that organisational factors which include organisational climate, organisational structure and organisational goals, have a positive effect on E-procurement buying decisions. However, the extracted factor explains only 2.553% of variance in the buying decision-making process.

Webster and Wind (1972, as cited by Sanderson et al., 2015) suggest that organisational factors influence behaviour in a variety of ways. The goals and objectives of the company define the parameters of activity. In terms of the policies and procedures that are followed, the organisation's structure and resources act as constraints on its culture. All these factors influence buying behaviour.

Another study postulates that several factors influencing business buyers' purchasing decisions are internal to organisations and under their control. Organisational, interpersonal, and individual variables are included (Inoni et al., 2019). Similarly, according to Kotler et al. (2013), each buying organisation has its own policies, objectives, strategies, structure, systems, and procedures, and the business marketer must understand these factors in order to sell their products in a competitive business world. Size, organisational structure, organisational goals and tasks, and technological constraints to the procurement process are all organisational factors that influence business-buying behaviour.

The finding of the study is consistent with the Webster and Wind model and also with Kotler et al. (2013) as it is statistically investigated that organisational environment factors affect E-procurement buying decisions at KZNDoT. However, the investigation into the effect of organisational factors on E-procurement buying decisions only suggests a 2.553% of variance. Hence, more than 97% of E-procurement buying decisions are due to factors other than organisational environment factors.

5.3 Buying centre factors have an effect on an E-procurement buying decision

H3: buying centre factors have a significant positive effect on E-procurement buying decisions.

The statistical test for the hypothesis ($\beta = 0.346$, $p<0.000$) shows that buying centre factors which include learning of buyers, motivation of buyers, leadership, buyers and buying technology have a positive effect on E-procurement buying decisions. The extracted factor explains 83.070% of variance in the buying decision-making process. Hence, buying centre factors are the most important factors affecting E-procurement buying decisions.

A study suggests the buying centre factors by enlisting the five roles of the buying centre: (1) users - those members of the organisation who use the purchased products and services; (2) buyers - those with formal responsibility and

authority for contracting with suppliers; (3) influencers - those who directly or indirectly influence the decision process by providing information and criteria for evaluating alternative buying actions; (4) deciders - those with authority to choose among alternative buying actions; and (5) gatekeepers - those who control the flow of information (Webster & Wind, 1972).

There are several lists of product-vendor attributes available in the literature that affect buying decisions (Kiser et al., 1975; Lehmann & O'Shaughnessy, 1974; Wind et al., 1968). Buyers when selecting a vendor or supplier commonly refer these to as relevant selection criteria used. The lengths of the lists range from 10 to 65 items.

The study's findings are consistent with the suggestions of Webster and Wind (1972), as well as other literature on factors referred to as buying centre factors. The literature suggests various buying factors that influence purchasing decisions, and the study discovered five buying centre factors that influence buying decisions. However, some of the study's buying centre factors differ from those suggested in the literature. This could be due to the study's specific research objective and research population. Leadership is one of the factors examined in the study that was not found in the literature. This broadens the scope of buying centre factors that can be studied further in future studies.

5.4 Individual factors have an effect on an E-procurement buying decision

H4: Individual factors have a significant positive effect on E-procurement buying decisions.

The statistical test for the hypothesis ($\beta = 0.188$, $p<0.05$) shows that individual factors which include personal and organisational objectives, motivation due to organisational structure, and learning from organisational environment of E-tendering, have a positive effect on E-procurement buying decisions. The extracted factor explains 1.926% of variance in the buying decision-making process. Hence, individual factors are the least important factors affecting E-procurement buying decisions. Individual factors have a very small role in affecting the E-procurement buying decision.

Several previous studies postulate a variety of factors that may influence a firm's decision to adopt and implement a specific ICT, including E-procurement. Kwon and Zmud (2007) classified variables that may influence ICT adoption into five broad categories: individual, task and innovation-related, organisational, and environmental. According to Kwon and Zmud (2007), these factors may be important to varying degrees depending on the context or technology. Individual factors such as age or education, for example, are frequently more relevant with individual adoption of technology than with organisational innovation, where decisions are made by committees.

Furthermore, Thong (1999) demonstrated that positive perceptions of ICT benefits provided an incentive to adopt ICT. Drew (2003) also concluded that many managers rejected the idea that E-commerce could be useful to their businesses because they were unaware of the potential E-commerce benefits, whereas Walczuch et al. (2000) discovered that the main barriers to Internet adoption and use are simply managers' concerns and perceptions that the Internet would not result in increased efficiency or lower costs.

The findings of the study are consistent with the findings of earlier research studies regarding individual factors affecting decisions regarding adopting and implementing a new information technology system. This study clearly suggests that individual factors affect E-procurement buying decisions. This is consistent with the findings of Kwon and Zmud (2007) who also suggest that five factors, including individual

factors, affect ICT adoption. Similarly, Drew (2003) and Walczuch et al. (2000) also postulated that managers' perceptions and decisions affect E-commerce and ICT adoption.

5.5 There is a relationship between the perceived usefulness of E-tendering and the use of E-tendering

H5: There is a significant relationship between the perceived usefulness of E-tendering and use of E-tendering

The PLS-SEM model indicates that the perceived usefulness of E-tendering (β, 0.608) has the most influence on use of E-tendering. Hence the perceived usefulness of E-tendering will lead to use of E-tendering at KZNDoT. The perceived usefulness of E-tendering significantly affects use of E-tendering and thus KZNDoT needs to show the usefulness of E-tendering to the relevant stakeholders so that E-tendering may be used.

A study by Daud et al. (2013) suggests that perceived usefulness is a belief that using information technology will improve users' job performance or assist users in doing their job. Perceived usefulness to technology can be measured by several factors, including: first, adopting technology can increase user productivity, second, job performance, and third, user efficiency process (Davis et al., 1989; Guriting & Ndubisi, 2006, as cited by Daud et al., 2013). Daud et al. further argue that someone will adopt a new information technology system, particularly E-procurement, if that system is useful for their job and achievement. In other words, the level of usefulness influences the user's behavioural intention.

Hence the findings of this study are totally consistent with the findings of the literature reviewed with regard to the effect of perceived usefulness on use of E-tendering. Furthermore, the study suggests that perceived usefulness has the most/greatest influence over use of E-tendering. If E-tendering has to be used at KZNDoT, its usefulness needs to be highlighted and explained to the relevant and important stakeholders.

5.6 There is a relationship between ease of use of E-tendering and the use of E-tendering

H6: There is a significant relationship between the ease of use of E-tendering and use of E-tendering.

The PLS-SEM model indicates that the perceived ease of use (β, 0.153) has a negligible effect on use of E-tendering. It is statistically found that there is no significant relationship between the ease of use of E-tendering and use of E-tendering. Hence, the perceived ease of use of E-tendering will not lead to use of E-tendering at KZNDoT. The perceived ease of use of E-tendering has a negligible effect on use of E-tendering and thus KZNDoT need not discuss the ease of use of E-tendering to the relevant stakeholders. It will have no effect on the decision-making of stakeholders.

According to Davis et al. (1989), there are two reasons why people accept or reject information technology. To begin, people tend to use or not use an application based on whether the technology will help them perform their jobs better. Second, people believe that the system is too difficult to use and that the performance benefits outweigh the effort required to use the application. Davis et al. (1989) opine that perceived ease of use and perceived usefulness are important because they are the motivations for using information technology. The user will feel clear and understandable when using information technology if it is perceived to be easy to use. The definition of perceived ease of use indicates that a system will make it easy for its to operate and complete their tasks, and that the system is not designed to make users difficult (Davis et al., 1989; Guriting et al., 2006, as cited by Daud et al., 2013). The

perceived ease of use of E-procurement indicates that the system is simple to understand and operate. As a result, users will be more likely to use the system on a regular basis.

The literature hence suggests that perceived ease of use of E-procurement will lead to the use of E-procurement. However, the findings of the study are contrary to the literature reviewed. It is found that perceived ease of use of E-tendering will not lead to use of E-tendering at KZNDoT.

5.7 There is a relationship between organisational buying behaviour and the use of E-tendering

H7: There is a significant relationship between organisational buying behaviour and use of E-tendering.

The PLS-SEM model indicates that organisational buying behaviour (with β, 0.202) has a minor effect on use of E-tendering. It is statistically found that there is a significant relationship between organisational buying behaviour and use of E-tendering. Hence, the organisational buying behaviour of KZNDoT will have a minor effect on the use of E-tendering at KZNDoT. A positive buying behaviour will support the use of E-tendering.

The literature reviewed mainly focused on the Webster and Wind model of OBB. It took into account four sets of variables: environmental, organisational, buying centre, and individual, all of which influence the buying decision-making process in a firm (Webster & Wind, 1972, as cited by Sanderson et al., 2015). Sanderson et al. (2015) further postulate that organisational factors influence behaviour in a variety of ways. The goals and objectives of the company define the parameters of activity. In terms of the policies and procedures that are followed, the organisation's structure and resources act as constraints on its culture. All these factors influence buying behaviour. Consequently, organisational buying behaviour in the case of E-procurement may be influenced by several factors.

The findings of this study are consistent with the findings of the literature reviewed. The findings suggest a significant relationship between organisational buying behaviour and the use of E-tendering, though the effect was found to be negligible. This is consistent with literature review findings, which also suggest organisational factors along with other factors affect buying decision-making process in a firm.

5.8 The use of E-tendering has an effect on the procurement process

H8: Use of E-tendering has a significant effect on the procurement process.

The PLS-SEM model indicates that use of E-tendering has the most influence on the procurement process (β, 0.928). It is statistically proven that use of E-tendering has a significant effect on the procurement process. Hence, use of E-tendering at KZNDoT can greatly influence its procurement process. To bring a change in the procurement process, KZNDoT can use E-tendering.

According to research, E-tendering reduces lead time, supply cost, and transparency. The introduction of technology into the market has resulted in the creation of E-markets in every business sector. This paved the way for faster connectivity between business-to-business, business-to-consumer, and business-to-government transactions (Alsac, 2017).

In another study, Mahdillou and Akbary (2014) discovered that the use of E-tendering was associated with transactional benefits. E-tendering streamlines any transaction process. The E-payment system has supported the entire tendering process, from requisition creation to online payment. Because of the electronically enabled relationships with suppliers, elimination of trivial activities, greater data

accuracy, and facilitating supplier performance improvements, electronic processing of tendering activities was associated with significant time savings and improved efficiency.

Similarly, Morosan and Jeong (2008) found that firms must maximise the use of internet-based technologies (including E-tendering) in all aspects of the business, linking across all supply chain members, increasing the speed of information transfer, and reducing non-value-adding tasks.

As a result, it can be argued that the study's findings are consistent with the findings of the reviewed literature. According to the findings, there is a significant relationship between E-tendering and the procurement process. This is consistent with the findings of the literature review, which also suggests various benefits of E-tendering for the procurement process.

5.9 The use of E-tendering has an effect on the post-contract buyer/supplier relationship

H9: Use of E-tendering has a significant effect on the post-contract buyer/supplier relationship.

The PLS-SEM model indicates that use of E-tendering has an influence on the effect of the post-contract buyer/supplier relationship with (β, 0.793). It is statistically proven that use of E-tendering has a significant effect on the post-contract buyer/supplier relationship. Hence, use of E-tendering at KZNDoT can greatly influence the post-contract buyer/supplier relationship. To bring a positive change in the relationship with its suppliers, KZNDoT can use E-tendering.

Rao et al. (2003) defined two types of bonds that result in positive interpersonal relationships between buyer and supplier. These are 'social bonds,' which are non-economic investments of time and energy, and 'technical bonds,' which are formed when two organisations adapt to each other in some economic or technical way. They concluded that the extent to which these bonds are used positively affects them, resulting in increased trust, commitment, and satisfaction, which can be linked to the improved business performance of the organisations and partners. In contrast to the preceding findings, Carr and Smeltzer (2002) discovered that increased use of information technology between buyer and supplier does not improve levels of trust between buyer and seller.

Hence literature suggests contrasting findings with regard to the development of trust between buyer and seller as a result of using information technology. However, it is agreed that the use of information technology affects the buyer/supplier relationship.

The researcher, therefore, argues that the KZNDoT needs to use E-tendering with care and caution to foster an environment of trust with its suppliers.

5.10 The use of E-tendering has an effect on the post-contract delivery status of buyers and suppliers

H10: Use of E-tendering has a significant effect on the post-contract delivery status of buyers and suppliers

The PLS-SEM model indicates that use of E-tendering has an influence on the effect of post-contract operational delivery status with (β, 0.889). It is statistically proven that use of E-tendering has a significant effect on the post-contract delivery status of buyers and suppliers. Hence, use of E-tendering at KZNDoT can greatly influence the post-contract delivery status of buyers and suppliers. To bring a positive change in the relationship with its suppliers, KZNDoT can use E-tendering.

According to Agwata (2017), E-procurement practices were efficient methods of finding and connecting new sources, as well as a lean

communication channel. A lot of time was spent on paper invoicing in terms of writing, filing, and postal communication but with E-procurement, the staff has enough time to engage in strategic procurement issues. Ombat (2015) stated in another study that E-procurement practices result in less paperwork, which leads to lower administration costs.

According to further research, improved relationships with existing suppliers may be attained through the constant exchange of tactical and strategic information between buyer and supplier (Wu et al., 2007). E-procurement applications that promote inter-organisational collaboration frequently facilitate information exchange and increased transparency (Tatsis et al., 2006; Yu et al., 2008). E-procurement systems also allow for the exploration of new supplier relationships (Attaran, 2001).

As a result, it can be argued that the study's findings are consistent with the findings of the reviewed literature. According to the findings, there is a significant relationship between E-tendering and the delivery status of buyers and suppliers. This is consistent with the findings of the literature review, which also suggests information sharing between buyers and suppliers, collaboration, less paperwork and good relationship.

The researcher, therefore, argues that the KZNDoT needs to use E-tendering to have continued strategic collaboration with its suppliers in a seamless manner, thereby reducing administrative costs.

6 Summary of the Hypotheses

Overall, nine of 10 hypotheses were proven correct, and only hypothesis number 6 (perceived ease of use affects the buying decision process) was rejected.

Hypotheses 1 to 4 were used as an antecedent to the conceptual model proposed. All the hypotheses were accepted and were found to be statistically significant. Hypothesis numbers 5 to 7 were used to test the factors affecting use of E-tendering. Hypotheses 5 and 7 were accepted, while hypothesis 6 was rejected. Hypotheses 8 to 10 were used to test the effect of use of E-tendering. All three hypotheses were accepted. Table 1 summarizes the findings of the hypotheses.

Table 1: Results from research hypotheses

	Hypothesis	Result	Effect
1	Environmental factors have a significant positive effect on the E-procurement buying decision	Supported and significant	explains only 3.746% of variance in the buying decision-making process.
2	Organisational factors have a significant positive effect on the E-procurement buying decision	Supported and significant	explains only 2.553% of variance in the buying decision-making process
3	Buying centre factors have a significant positive effect on the E-procurement buying decision	Supported and significant	explains 83.070% of variance in the buying decision-making process
4	Individual factors have a significant	Supported and	explains 1.926% of variance in the

	positive effect on the E-procurement buying decision	significant	buying decision-making process
5	There is a significant relationship between perceived usefulness of E-tendering and the use of E-tendering	Supported and significant	major influence on the use of E-tendering.
6	There is a significant relationship between ease of use of E-tendering and the use of E-tendering	Not supported	
7	There is a significant relationship between organisational buying behaviour and the use of E-tendering	Supported and significant	organisational buyer behaviour has a minor effect on the use of E-tendering
8	The use of E-tendering has a significant effect on the procurement process	Supported and significant	use of E-tendering has a major influence on the procurement process
9	The use of E-tendering has a significant effect on the post-contract buyer/supplier relationship.	Supported and significant	use of E-tendering has a big influence on the post-contract buyer/supplier relationship.
10	The use of E-tendering has a significant effect on the post-contract delivery status of buyers and suppliers	Supported and significant	use of E-tendering has a big influence on the post-contract delivery status of buyers and suppliers.

7 Summary of findings

In summarising the findings, the research objectives and sub-objectives guided the study. The main research objective was aimed at evaluating the elements which contribute to the model of the tendering process within KZNDoT through the modified TAM. The sub-research objectives were aimed at analysing the efficiency of the E-tendering process at KZNDoT, evaluating the impact of the E-tendering process of KZNDoT as well as establishing the criteria to improve supply chain management processes for the tendering system of KZNDoT which will ultimately benefit the South African public procurement process.

PLS-SEM was used to determine collinearity value to check the impact of the independent variable (use of E-tendering) on the dependent variable (buyer/supplier relationship, procurement process and operational delivery status. The findings revealed that the perceived usefulness of E-tendering and its ease of use significantly lead to the adoption or use of E-tendering. It was noted that the use of the E-tendering process would positively influence buyer/supplier relationships, procurement process and operational delivery status. There is a relationship between the perceived usefulness of E-tendering and use of E-tendering. It was found that perceived ease of use of E-tendering will not lead to the use of E-tendering at

KZNDoT but there is a relationship between organisational buying behaviour and the use of E-tendering.

Further findings are that the use of E-tendering influences the procurement process the post-contract buyer/supplier relationship and the post-contract delivery status of buyers and suppliers. Furthermore, there is a significant difference in the perception of employees from different age groups regarding the effectiveness of the E-tendering process, procurement processes and supply chain management processes. Mostly young employees in the age bracket of 18 to 25 years have a stronger perception of the effectiveness of E-tendering processes, procurement processes and supply chain management processes. There is no significant difference in the perception of employees from different types of companies for the effectiveness of the E-tendering process, procurement processes, and supply chain management processes. Furthermore, there is also no significant difference in the perceptions of male and female employees regarding the effectiveness of the E-tendering process, procurement processes, and supply chain management processes.

7.1 Conclusion of the main findings

To address the research study's empirical goals, statistical tests were run. Nine of the 10 proposed hypotheses were accepted and found to be significant based on the outcomes of the tested hypotheses. More specifically, environmental, organisational, individual and buying centre factors significantly affect the buying decision-making process at KZNDOT. Out of these four factors, the buying centre factors have the greatest influence on the buying decision process.

Similarly, it was also found that there is a significant relationship between the perceived usefulness of E-tendering and use of E-tendering between organisational behaviour and use of E-tendering. However, there is no relationship between the ease of use of E-tendering and use of E-tendering.

The effect of the use of E-tendering was also found in the study. The use of E-tendering has a significant effect on the procurement process, buyer/supplier relationship and the post-contract delivery status of buyers and suppliers.

7.2 Conclusion on factors affecting the use of E-tendering

The conceptual model presented using PLS-SEM suggested two significant relationships. The first relationship was: What affects use of E-tendering? For this purpose, perceived usefulness, perceived ease of use and organisational buying behaviour and their effect on the use of E-tendering were empirically tested. The results of the investigation showed that use of E-tendering will be positively impacted by perceived usefulness and organisational buying behaviour. The results also showed that there is a statistically significant association between these factors, however, use of E-tendering will not be impacted by perceived ease of use. As a result, it is now clear that perceived usefulness and organisational buying behaviour are the most important variable in the conceptual model.

7.3 Conclusion on the effect of use of E-tendering

The conceptual model presented using PLS-SEM suggested two significant relationships. The first relationship was discussed above. The second relationship presented was: What is the effect of use of E-tendering? For this purpose, the effect of use of E-tendering on buyer/supplier relationship, procurement process and operational delivery status was empirically tested. The results of the investigation showed that use of E-tendering will have a significant impact on the buyer/supplier relationship, procurement process and operational delivery status .

Hence, it was empirically proven that use of E-tendering has a significant impact on the procurement process, the buyer/supplier relationship and operational delivery status. However, the factors, which affect the use of E-tendering were also investigated and it was found that perceived usefulness and organisational buying behaviour are the factors that affect use of E-tendering.

KZNDoT should discuss the perceived usefulness of E-tendering with the main stakeholders so that E-tendering replaces the paper-based tendering process. Similarly, the buying behaviour at KZNDoT needs to be influenced by discussing the perceived usefulness of E-tendering. This will in turn result in use of E-tendering.

8 Limitations and Suggestions for Future Research

This research study is delimited to the KZNDoT, South Africa. It is considered representative of public organisations in South Africa. The study is also delimited to the service providers doing business with KZNDoT as well as the employees of KZNDoT. The limitation of this study is that the questionnaire will be completed online by the respondents in their own time, thus the researcher assumes that the answers are truthful. This study was tested on a traditional tendering process where the buyer, the implementing agent and the service provider were working independently. For further research, first, this model could be tested on other types of procurement processes like turnkey projects whereby the service providers are involved during the designs as well as implementation and execution. Furthermore, it should be tested on public-private partnership procurement. Second, leadership is one of the buying centre factors examined in the study that was not found in the literature. This broadens the scope of buying centre factors that can be studied further in future studies.

9 Recommendations

The prolonged procurement process at KZNDoT from advertising to award is severely delayed. The consequence of the prolonged process leads to delayed awards which result in the delayed start of projects, possible cancellations of tenders due to exceeded tender validities, increased costs, and project delays and ultimately allows corruption to take place. The study found that an introduction to the use of E-tendering in the procurement process will improve the current inefficiencies of the process. The use of a paper-based procurement process prolongs the process and exposes it to external factors like fraud and corruption. KZNDoT needs to establish a procurement system that will work entirely online to advertise, price and adjudicate tenders remotely. Forms of offers can be completed and signed online, and the list of bidders and bidding amounts be made available on the closing date and time in real-time without any interference from human beings. The system should meet the "procurement transformation checklist'' as advised by Governing Institute (2017). The system should be cloud-based, integrate E-procurement and enterprise resource planning, assess the latest E-procurement systems, improve contract management, train users and use advanced technology to monitor performance.

One of the findings was that the young respondents who fall into the category of 18 to 25 years had a stronger perception of use of E-tendering. This further strengthens the notion that Generation Y and Z and more technologically inclined and thus, the use of E-tendering will complement their love for technology and remote working, which will reduce or eradicate the use of paper and ultimately improve "going green" for the environment. The use of E-tendering will see most of the employees of KZNDoT working from home, which will reduce costs of travelling to and from work, overhead costs and improve service delivery at KZDoT and all

public entities.

Further findings are that there is a relationship between organisational buying behaviour and use of E-tendering, and that use of E-tendering influences the post-contract buyer/supplier relationship. The introduction of E-tendering will strengthen the relationship with the buyer and the service providers in terms of transparency, rapid project awards and project execution. For this to be possible, the E-tendering system should allow suppliers to post tendering questions and the buyer should be able to respond in the form of an addendum, strictly electronically.

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