




# Readiness factors affecting e-procurement in South African government departments



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**Background:** South Africa's government departments use a manual paper-based procurement system with some electronic features despite the high level of human interference contributing to corruption, favouritism and inefficiency associated with manual paper-based procurement system. This suggests a lack of readiness towards full e-procurement adoption in South Africa's public sector. However, studies on readiness factors affecting e-procurement adoption have been scantily investigated in multiple government departments in South Africa.

**Objectives:** This study aims to determine the readiness factors that affect e-procurement in multiple government departments in South Africa.

**Method:** A quantitative research design was adopted to sample 113 public procurement officials using a cluster sampling method from five identified national government departments across five ministerial clusters. The data were collected using an online self-administered survey questionnaire and processed and analysed through Stata Release 15 statistical analysis software.

**Results:** Six factors were identified to influence e-procurement readiness in South African government departments. These include technology and organisation's finance, among others. These factors will aid in effective planning of government departments regarding e-procurement readiness.

**Conclusion:** Government departments should consider the factors that influence e-procurement readiness when deciding to adopt e-procurement system. This would help government departments to plan effectively e-procurement acquisition, running and training of users and thereby streamlining their procurement processes, reducing operating costs and minimising corruption.

**Contribution:** This study fills a lack of knowledge on the readiness factors affecting e-PP adoption in the South African government department context. The knowledge of these factors, generated through empirical analysis, would guide government departments when deciding on e-PP readiness and streamline procurement processes in South Africa.

**Keywords:** public procurement; e-procurement; e-procurement readiness; e-readiness; e-procurement technology adoption.

## Introduction

The advancement in technology is providing opportunities for governments worldwide to revolutionise the way they procure goods, works and services. Procurement function is transitioning from traditional paper-based processes to electronic procurement (e-procurement) (Bartai & Kimutai 2018:45; Boakye, Asante & Dadzie 2019:67). E-procurement is the use of information and communication technology (ICT) to execute part or all the procurement process (Masudin et al. 2021:1). Lately, e-procurement has become one of the tools for electronic government (e-Government) efforts to better serve citizens and business in the digital economy (Mohungoo, Brown & Kabanda 2020:47). In South Africa and globally, governments have transformed their procurement processes to take full advantage of the potential offered by electronic commerce (e-Commerce) by replacing various phases of manual public procurement with electronic means.

The various problems associated with traditional, manual paper-based procurement systems demand the adoption of e-procurement (Ofori & Fuseini 2020:30). These problems include high level of human contacts (Duma 2018:28), favouritism (Keulemans & Van De Walle 2017:328), inefficiency, ineffectiveness and corruption (Daoud & Ibrahim 2018:2; Koto & Kanjere 2021:66;

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National Treasury 2015c). Because of these problems, it is critical to adopt an e-procurement system that automates all processes to eliminate the need for manual processes (Tutu et al. 2019:2). Despite e-procurement emerging as a tool for reforming public procurement, the adoption of e-procurement remains a significant challenge (Masudin et al. 2021:11). Consistent with the government environment, it is stressed that most public institutions in developing countries are still grappling with the proper introduction of e-procurement (Mohungoo et al. 2020:47). This is because the adoption of an e-procurement system is dependent on the development and implementation of policies and strategic planning. It is also necessary to examine the government's expectations, level of technology use, procurement structure and public sector environment for successful e-procurement adoption (Jain, Abidi & Bandyopadhyay 2018:91). The adoption of e-procurement would require electronic readiness (e-readiness) of government departments.

The likelihood (level) of government departments for adopting e-procurement is also influenced by how government departments view the benefits of e-procurement. South African government departments are having difficulty realising the full benefits of e-procurement adoption because of National Treasury's decision that initiates phases in transforming procurement from a traditional paper-based to electronic, where 45% of public procurement is still being conducted manually (Ambe 2016:287; National Treasury 2016:6). In addition, the paper-based procurement system involves high level of human interference, which often negates the integrity and efficacy of the procurement system in the public sector (Duma 2018:28). This contributes to the corruption, favouritism and inefficiency of South Africa's public procurement system (Anthony 2018:44; Daoud & Ibrahim 2018:2; Keulemans & Van De Walle 2017:328; Koto & Kanjere 2021:66; Kramer 2016:11; National Treasury 2015). Despite these inherent challenges of South Africa's public procurement, there are limited studies focusing on readiness factors affecting e-procurement adoption in multiple government departments in South Africa. Therefore, the assessment of readiness of government departments to adopt e-procurement is paramount to fill this literature gap.

This study aims to determine factors that affect e-procurement readiness in South African government departments and make recommendations that will assist government departments in understanding the factors influencing e-procurement readiness.

## Literature review

### Public procurement and e-procurement

Procurement is regarded as a vital tool for meeting government needs for goods, services and works (Yano & Nondi 2018:292) and for potentially creating opportunities for savings and economies of scales (Gurria 2016:3; Organisation for Economic Cooperation and Development [OECD] 2019:3). As public procurement uses a significant proportion of public funds, it is vital that procurement processes to be transparent and well

managed to ensure high-quality service delivery to citizenry (OECD 2017).

According to Gabela and Okeke-Uzodike (2020:639), public procurement is a component of supply chain management (SCM) that focuses on the sourcing and purchase of goods, works and services in the public sector. In South Africa, the National Treasury and the Office of the Chief Procurement Officer (OCPO) compel government departments to follow procurement processes and regulations in order to achieve procurement performance in the supply value chain (National Treasury 2015c). As public sector efficiency is accomplished through a streamlined procurement function, the quest for effective and efficient procurement has been raging since the introduction of e-procurement.

The procurement function is transitioning from traditional paper-based approaches to e-procurement as a result of the growing use of the Internet (Bartai & Kimutai 2018:45; Boakye et al. 2019:67). E-procurement, as opposed to paper-based methods, is the automation of the procurement of goods, works and services using information technology (IT) based communication and processing. E-procurement is defined by Croom and Brandon-Jones (2005:369) and Masudin et al. (2021:1) as the use of ICT to carry out a portion or the complete procurement process. The goal of e-procurement is to keep all public entities' procurement systems streamlined (Ahmed 2018:14) and cost efficient. It also aims to minimise direct human involvement affecting procurement processes between suppliers and procurement officials, which is the most common source of corruption in public procurement (United Nations Office on Drugs and Crime 2013:27). Information and communication technology-enabled technologies like e-procurement have emerged as an important tool for reducing the risk of corruption in public procurement processes (Mohungoo et al. 2020:47). Consistent with this view, Chen et al. (2021:4) state that e-procurement lowers mistakes in the provision of goods, works and services, as well as accounting errors and provides speedier payment processes and less bureaucratic procedures. According to Kusi et al. (2016:634), government departments may only use e-procurement to minimise administrative and operational costs if business processes are optimised. In comparison to paper-based procurement, e-procurement is regarded as a standard, secure and trustworthy global communication technology (Kramer 2016:1).

All areas of procurement, including selection, bidding, payment and inventory management, might benefit from an Internet-based procurement process such as e-procurement (Tonkin 2003:7). E-procurement solutions enable to meet a variety of public sector procurement objectives (e.g. efficiency, often referred to as value for money; accountability; transparency and openness; integrity; equal opportunities; fair treatment of service providers; fostering job creation; promoting employment of disabled individuals, just to name these) by reducing administrative costs for both government and business while also increasing monitoring of procurement trends, contracts and price (National Treasury 2016:6).

## E-procurement technology adoption

The adoption of new technology systems has significantly altered the aims of the public sector, and e-procurement could not have come at a better time to connect government departments and suppliers through an online platform that automates the whole public procurement process (Mahmood 2013:120). A goal of e-procurement, according to Ahmed (2018:14), is to increase efficiency and transparency in public procurement by creating a comprehensive e-procurement system that would be used by all departments in government. In reference to this goal, it is important to note that in South Africa government departments and constitutional institutions are under the authority, and custodianship of the National Treasury in so far as systems such as e-procurement is concerned.

The use of e-procurement is necessitated by the need to address the many problems linked with the traditional paper-based procurement method (Ofori & Fuseini 2020:30). At the same time, e-procurement is not a panacea to all of the problems associated with manual procurement processes because it has its own set of challenges that may impede the optimal achievement of the desired procurement goals (Kramer 2016:17; Sithole 2017:42). However, the advantages of e-procurement outweigh the disadvantages, and it is a viable solution for reforming public procurement while maintaining its integrity (Maepa 2022:32).

The procurement literature gives a thorough description of all the benefits of adopting an e-procurement system for both private and public sectors (Belisari, Appolloni & Cerruti 2019:221). The use of e-procurement technology is expected to modernise government procurement and enable the government to:

- reduce the administrative load on government and businesses,
- ensure that procurement information is reported consistently,
- source strategically by analysing procurement data more effectively and
- have effective procurement patterns, contracts and price monitoring experience (National Treasury 2015:60).

## E-procurement systems in South Africa

Electronic features have been integrated into South Africa's manual E-procurement technology adoption since 2015 (National Treasury 2016:6). This coincided with the establishment of the Electronic Tender (eTender) publication portal and the Central Supplier Database (CSD), both of which are maintained by the OCPO (National Treasury 2015:1). Their implementation has simplified procurement processes for both government departments and suppliers. Despite this procurement process improvement, eTender and CSD are part of a fragmented and underused technology system as 45% of South African procurement is still done manually (National Treasury 2016:6).

## eTender portal

One of the OCPO's initiatives is the eTender Publications Portal, which provides access to information on all public sector tenders (National Treasury 2016:7). The eTender publication platform seeks to streamline the procurement process, as well as to increase possibilities for South African businesses to locate and compete for government bidding opportunities (National Treasury 2015).

With the launch of eTender, tender advertisements in newspapers and the government gazette have been phased out (Nene 2015:17). Consequently, government-procuring entities have saved money by reducing the need to print bid documents (National Treasury 2016:7). Nonetheless, the sale of bidding documents remains an impediment to potential suppliers getting information about advertised tenders (National Treasury 2015). Some governmental entities have been seen to sell bidding documents, and bidders are forced to purchase the documents in order to get tender information such as specifications and terms of reference.

The eTender has promoted fairness and opened up competition by ensuring that suppliers have access to the same information at all times. Simply allowing potential bidders to be alerted of announced, cancelled and awarded bids by visiting the portal, eTender has decreased the distance and/or location barrier.

## Central supplier database

The CSD is also a part of the OCPO's initiatives, which is a single database that serves as the repository for all government supplier records (Statistics South Africa 2017). Since its inception, the CSD has had a supplier's register with the goal of providing unified, accurate, up-to-date, full and verified supplier information. By minimising duplication of registration of suppliers at various public entities, the government has saved millions of South African Rands (National Treasury 2016:7). New potential suppliers interested in doing business with the government must register with the National Treasury once and are urged to use the CSD's website's streamlined self-registration feature (Nene 2015:17). The initiatives and measures proposed by the government aim to increase SCM performance while reducing operating costs related to the procurement system and software infrastructure maintenance of the database of each government department.

The CSD lacks some capabilities as supplier rotation is not included as it is the responsibility of each department or public entity to establish supplier rotation policy to ensure fairness, openness and compliance (Mpehle & Mudogwa 2020:7). Because there is no mechanism in place to rotate suppliers, procurement officials may choose to rotate their favourite (preferred) suppliers for personal benefit, which will have an impact on service delivery (Zitha, Sebola & Mamabolo 2016:67).

The South African government has been working to restore the lost integrity of SCM, as well as to improve and streamline procurement in the public sector, through the use of electronic features into procurement processes. According to Kramer (2016:6), South Africa's e-procurement system has succeeded in modernising the outdated public procurement system through the introduction of electronic communication channels between government-procuring entities and potential suppliers.

### **E-procurement advantages and challenges**

The extent to which government departments see the advantages of E-procurement technology adoption. This is because government departments must adopt e-procurement if they are instructed to do so based on the advantages thereof. E-procurement advantages in the public sector include decreased transaction errors and costs, better customer service, less paper transactions, a quicker order cycle and improved supplier relationships (Fazekas & Blum 2021:10). These advantages may also be achieved in the public sector by ensuring the best value for money for taxpayers, uniform procurement practices across government departments and environmentally friendly practice as a consequence of a 'paperless' process (Samoei & Ndede 2018:388). Mpehle and Mudogwa (2020:4) further state that through engagement, suppliers should as well be informed about the advantages of e-procurement.

Despite the various advantages of e-procurement, South African government departments must confront a number of challenges when they adopt the system. The challenges of government departments' readiness to use e-procurement, according to Orina (2013:34), include IT and Internet transaction skills, resistance to change and a lack of enthusiasm among officials. United Nations Department of Economic and Social Affairs (2018:3) points out that the main challenge in developing a new procurement system (e.g. e-PP) is changing the mindset of existing procurement officials to accept new approaches and practices.

In South Africa, one of the major challenges to successful e-procurement readiness is the fragmentation of operating systems among government departments (National Treasury 2016:6). Supply chain management processes are currently supported by a variety of procurement systems that are fragmented, underused and have different capacities, scalability and performance (National Treasury 2015c). Procurement systems used by South Africa's national government departments include the Logistical Information System (LOGIS, the ordering system), Basic Accounting System (BAS, the payment system), Intenda, Procure to Pay, Hardcat and System Administrative Processes (SAP), among others (National Treasury 2015:61). It is apparent that disparities in ICT usage are hard to manage and integrate. As Dza, Fisher and Gapp (2015c) point out, ICT usage disparities often lead to cost and effort duplication, as well as confusion and difficulties in procurement decision-making. Because e-procurement systems are incompatible with existing

procurement methods, creating an end-to-end e-procurement system is more difficult (Rukuni, Maziriri & Mulaudzi 2020:411). To prevent this, integrating the hardware and software components with ICT system is an important consideration for organisations that seek to enhance their operational efficiency (Isikdag et al. 2011:117; Patel, Kumar & Khajuria 2016:265). This holds true for government departments that use various procurement systems supported by differing ICT systems, as pointed out by National Treasury (2015c).

The fundamental purpose of adopting e-procurement in the public sector is to decrease the problems associated with traditional paper-based procurement while also supporting a more integrated and open process. Adopting a paperless procurement system will increase procurement efficiency as all relevant data would be accessible and traceable electronically (Costa, Arantes & Tavares 2013:239). However, the challenges stated in the preceding paragraph highlight critical areas that require more investigation in order to achieve successful e-procurement readiness and adoption.

### **E-procurement critical success factors**

A government department's readiness and desire to use E-procurement technology adoption can be determined by various factors. According to Masudin et al. (2021:3), senior management must understand the critical success factors (CSFs) associated with ICT adoption for public-sector institutions to be successful in adopting e-procurement. A survey study conducted by Gunasekaran et al. (2009:169) on small and medium enterprises in the South Coast of Massachusetts identified six CSFs for successfully adopting e-procurement: a clear and viable implementation phase, the engagement of stakeholders, communication between participants, the usage of prototypes and the centralised management and administration of e-procurement initiatives. Similarly, Jain et al. (2018:103) identified administrative support, employee training, location and department of implementation as main CSFs for successful e-procurement implementation in the automotive industry in India. The authors went on to state that any e-procurement implementation might be a waste if these main CSFs are not considered (Jain et al. 2018:103). As a result, CSFs seek to assure the successful adoption and implementation of e-procurement, as a well adopted e-procurement system can connect government departments with suppliers (Ngeta & Kisimbii 2020:16).

Mose, Njihia and Magutu (2013:375) assessed CSFs and challenges related to e-procurement adoption among large manufacturing companies in Kenya. Their findings identified four CSFs organisations should consider when adopting e-procurement, namely employee and management commitment to e-procurement adoption success, IT and supplier performance dependability, monitoring the performance of the e-procurement system and user acceptance of the e-procurement system. Although both studies were conducted in the private sector and in foreign



countries, South African government departments through National Treasury could refer to or consider these CSFs when migrating from paper-based procurement to e-procurement.

## Electronic readiness in e-procurement adoption

### E-readiness concept

Priambodo et al. (2021:867) define e-Tender portal as a measure that indicates if an organisation is ready to adopt and utilise e-procurement. Brandon-Jones and Kauppi (2018:2) emphasise the need for readiness assessment considering the poor outcome of e-procurement adoption at a Dutch institution. To ensure a successful e-procurement readiness, expectations, level, structure and environment need to be factored and/or assessed altogether (Jain et al. 2018:91). According to the World Bank (2005:10), assessing e-procurement readiness within countries is paramount as it enables effective planning and positive reforms. The purpose of e-procurement readiness assessment is to:

- raise awareness of the capacities that must be in place to ensure a reasonable foundation for success in the e-procurement development process;
- describe the context in which e-procurement development will take place;
- inform the establishment of broad and/or sectoral e-procurement strategies and action plans; and
- provide a tool for monitoring and evaluating e-procurement readiness (UNDESA 2018:42).

### Readiness factors in e-procurement adoption

The readiness to adopt e-procurement results in the automation and streamlining of procurement processes, reducing the time and cost of doing business for both the government and suppliers. Because of greater competition, e-procurement adoption readiness leads to better value for money spent, equal opportunity for all suppliers and eventually eliminates corruption (Oppong 2020:26). In order to determine e-procurement readiness, government departments need to consider e-procurement environments: the operational environment, legal environment, economic environment, organisational environment and technological environment (Australia Department of Finance and Administration 2005:2; Orina 2013:10).

In the operating environment, the government should examine factors such as procurement structures, e-procurement support levels and the drivers of e-procurement adoption. With regard to the legal environment, the government needs to assess readiness by taking into account local, national and international regulations and laws. The economic environment has an impact on both the buyer and the supplier, who should cover the costs of setting up and managing the e-procurement system. The organisational environment is centred on the anticipated degree of adoption. With regard to the technological environment, the government needs to focus on the necessary infrastructure at all levels in order to properly administer the e-procurement system.

## Methodology

### Research design and sampling

This study adopted a descriptive research design. A descriptive research design refers to the collection of data that accurately portrays the characteristics of a topic of interest (Thomas 2021:59). Probability cluster sampling was used to realise a sample size of 113 respondents, as shown in Table 1. These respondents were procurement officials from various levels of management (i.e. low, middle and senior management service) in South African national government departments (Department of Mineral Resources and Energy, DMRE; Department of Health, DOH; Department of Home Affairs, DHA; Department of Small Business Development, DSBD and Department of Tourism, DOT). The sample units comprised five identified national government departments from South Africa's ministerial clusters: economic sectors, investment, employment and infrastructure development; social protection, community and human development; governance, state capacity and institutional development; justice, crime prevention, and security and international cooperation, trade and security. These five national government departments were selected to provide a comprehensive understanding about readiness factors affecting e-procurement adoption in South Africa.

### Data collection and questionnaire

A self-administered online survey questionnaire was used to collect data. The online questionnaire was built via Survey Monkey platform, which has emerged as a commonly used tool for respondent invitation and/or recruitment as well as data collection in quantitative research (McDaniel & Gates 2015:297). It was linked to email addresses of public procurement officials obtained from a database of a consulting company contracted to manage the online survey questionnaire. The questionnaire was an adapted measuring instrument employed in similar studies to ensure contextual suitability and avoid bias, as recommended by Malhotra, Nunan and Birks (2017:328). It comprised questions relative to demographic aspects as well as factors influencing e-procurement readiness in South Africa's government departments. To measure e-procurement readiness constructs, a five-point Likert scale was used, ranging from 5 'strongly agree' to 1 'strongly disagree'.

**TABLE 1:** Breakdown of sample size.

Ministerial clusters	Government departments	Realised sample
Economic sectors, investment, employment and infrastructure development	DMRE	50
Social protection, community and human development	DOH	22
Governance, state capacity and institutional development	DHA	20
Justice, crime prevention and security	DSBD	14
International cooperation, trade and security	DOT	7
<b>Total</b>		<b>113</b>

DMRE, Department of Mineral Resources and Energy; DOH, Department of Health; DHA, Department of Home Affairs; DSBD, Department of Small Business Development; DOT, Department of Tourism.

## Statistical analysis

Data were analysed using Stata Release 15, a data analysis and statistics application (Thomas 2021:164). The discriminatory nature of each value category was assessed by employing factor analysis. Each value category was then analysed through Cronbach's alpha to evaluate the internal consistency within value assessments. Eigenvalues were calculated to determine the number of factors to include in factor analysis. A heuristically accepted approach used in this study was the retention of factors with eigenvalues equal or above 1 ( $\geq 1$ ) (Field, Miles & Field 2012). Eigenvalues show how even the variance distribution in the correlated matrix is (Field et al. 2012). They measurably ascertain the varying amount of the observed variables susceptible of explaining a factor. A factor displaying an eigenvalue 1 explains more variance than one observed variable. Generally, the factors explaining the lowest number of variances are disregarded.

Cronbach's alpha calculations were performed to test the internal consistency of the items associated with e-procurement adoption readiness. Cronbach's alpha values for the 24 items of the questionnaire range between 0.653 and 0.856, as shown in Table 2. These values surpassed 0.60, the minimum requirement for internal consistency, as recommended by Nunnally (1978).

The Cronbach's alpha metric is generally accepted and used for scale reliability, which is an important step in factor analysis (Field et al. 2012). A factor analysis with varimax rotation was also employed to determine the factorial structure of the items. Statistical values obtained for both sample adequacy and sphericity met the preconditions for performing factor analysis, showing 0.820 for the Kaiser-Meyer-Olkin (KMO) measure and  $p < 0.001$  for the Bartlett's test in Table 3 (the KMO value exceeded the recommended value of 0.6 and the statistically significant  $p$  value is consistent with the correlation matrix factorability principle), as advocated by Pallant (2007).

## Ethical considerations

This study obtained ethical clearance by Faculty of Management Sciences Research Ethics Committee (FCRE) of

**TABLE 2:** Item internal consistency statistics.

Questionnaire	Cronbach's alpha	Number of items
<b>Item range</b>		
IR 4_5; 5_1 – 5_6	0.856	7
IR 2_1 – 2_5	0.759	5
IR 3_2_3_4	0.653	3
IR 1_3_1_4; 3_1; 4_6; 5_8	0.725	5
IR 4_1 – 4_4	0.707	4
<b>Total questionnaire items</b>		<b>24</b>

**TABLE 3:** Kaiser-Meyer-Olkin and Bartlett's test values.

<b>Kaiser-Meyer-Olkin measure of sampling adequacy</b>	<b>0.820</b>
<b>Bartlett's test of sphericity</b>	
Approx. chi-square	1245.755
Df.	351
Sig.	0.000

Tshwane University of Technology on 03/06/2022 (FCRE2020/FR/04/003-MS).

## Results and analysis

Factor analysis was performed using the principal factor extraction with a varimax rotation method. Table 4 provides the variance percentage and cumulative variance percentage for each factor. In total, 27 factors for six main criteria were assessed. These main criteria factors altogether accounted for 59% of the variance. All factor loadings are above 0.4, cut-off point considered as meaningful and significant (Hair et al. 2019:151; Laher, Fynn & Kramer 2019:56) and 10 factors display factor loadings higher than 0.7.

Each factor is very important for effective readiness, adoption and implementation of e-procurement within South African government departments, and each is briefly defined as follows.

### Technological factor

The technological factor deals with the use of required infrastructure to enable organisation, including the government, to disseminate and monitor and e-procurement service (Orina 2013:10). It plays a vital role in establishing the readiness of government departments in the adoption and implementation of e-procurement (Roy & Upadhyay 2017:67). The implementation of e-procurement requires due consideration of:

- **Leadership:** The involvement and support of leadership in the oversight of e-procurement adoption project and allocation of necessary resources are paramount for government departments to ensure readiness in adopting and implementing e-procurement system effectively.
- **E-procurement adoption challenges:** A progressive migration towards e-procurement adoption and implementation comes with challenges that government departments in South Africa need to address. These include, among others, staff resistance to change, lack of IT and Internet transaction skills and lack of staff enthusiasm (Orina 2013).
- **Systems compatibilities:** When using a mixture of traditional paper based with some e-procurement features, as is the case of South Africa (National Treasury 2015c), IT systems employed need to be compatible to ensure effective running of the IT machinery of government departments.
- **System software infrastructure, network system adequacy:** Government department users need to be able to operate an adequately built and maintained system software infrastructure with a reliable network system in order to deliver required services to citizens and trade with their service providers of goods, services and works.
- **Information technology staff preparedness and user upskilling:** IT staff need to be prepared to use the e-procurement system and train users of their various divisions or functional units to use e-procurement system

**TABLE 4:** Factor structure of principal factors extraction and varimax rotation.

Item number	Factor loadings	% of variance explained	Cumulative % of variance explained
<b>Factor 1: Technological factor (TF)</b>			
Impact of leadership on e-procurement adoption (TF1)	0.439	-	-
Migration from paper-based to e-procurement challenges (TF2)	0.581	-	-
System compatibilities in implementing the new IT system (TF3)	0.638	29.870	29.870
Systems software infrastructure (TF4)	0.708	-	-
Network system adequacy (TF5)	0.808	-	-
IT Staff preparedness (TF6)	0.742	-	-
<b>Factor 2: Legal factor (LF)</b>			
National legislations on the adoption of e-procurement (LF1)	0.747	-	-
International laws on the adoption of e-procurement (LF2)	0.494	-	-
Current South African legal framework (LF3)	0.781	8.000	37.870
Impact of anticipated changes to the South African legal framework on e-procurement adoption (LF4)	0.612	-	-
Favourable legal framework to adopt e-procurement (LF5)	0.508	-	-
<b>Factor 3: Financial factor (FF)</b>			
Financial challenges (FF1)	0.567	-	-
Perceived hidden costs (short term or long term) (FF2)	0.703	5.830	43.700
Economic challenges relative to sourcing for clients (FF3)	0.739	-	-
<b>Factor 4: Procurement structure factor (PSF)</b>			
Use of partial electronic features (PSF1)	0.406	-	-
Overall level of e-procurement adoption (PSF2)	0.717	-	-
Decrease of operating costs (PSF3)	0.588	5.400	49.100
System implementation (PSF4)	0.434	-	-
Technical challenges in e-procurement system adoption (PSF5)	0.684	-	-
<b>Factor 5: Leadership factor (LDF)</b>			
Ethical challenges in e-procurement adoption (LDF1)	0.449	-	-
Negative attitude of employees towards adoption of e-procurement system (LDF2)	0.800	-	-
Transparency challenges in e-procurement adoption (LDF3)	0.455	5.260	54.360
Accountability issues in e-procurement adoption (LDF4)	0.615	-	-
System implementation (LDF5)	0.468	-	-
<b>Factor 6: Procurement policy factor (PPF)</b>			
Effect of government's procurement policy on e-procurement system implementation (PPF1)	0.711	5.000	59.360
Government's procurement structural system (PPF2)	0.529	-	-

successfully. This would address e-procurement adoption challenges highlighted by Orina (2013) and improve service delivery to both citizens and communication with their service providers.

## Legal factor

Legal and regulatory framework outlines guidelines in the e-procurement administration and practice. This framework includes national legislations and international laws:

- National legislation: South Africa's current legislation that governs public procurement does not make specific references to e-procurement (Anthony 2018:44; Mpehle & Mudogwa 2020:5). Bausa et al. (2013) caution that lack of e-procurement legal framework prevents government departments from increasing procurement efficiency.
- International laws: The United Nations Commission on International Trade Law (UNITRAL) is an important international tool that governs e-procurement (Mazibuko 2018:31). This tool provides necessary guiding principles embedded in international trade charters and laws that government departments can refer to and determine their e-procurement readiness if government departments want to use services of international firms.

- Anticipated changes to legal framework affecting e-procurement adoption: The South African public sector could demonstrate e-procurement readiness by revising the current legal framework and align it with some internationally recognised legal practices that favour full adoption of e-procurement in government departments and thereby improving procurement efficiency.

## Financial factor

Finance is a crucial factor that determines how ready government departments are with regard to e-procurement adoption. This is because e-procurement adoption and operation require economic and financial considerations in order to establish and manage perceived hidden costs, economic challenges relative to sourcing of clients and handle financial challenges:

- Perceived hidden costs refer to expenses incurred in operating e-procurement in the short or long term and include maintenance and support, modernisation and upgrade (Huai 2012:1161). To manage perceived hidden costs efficiently, proper planning and competent technical staff need to be given due diligence.
- Economic challenges are associated with the provision of training and other forms of support to both public procurement officials and suppliers so as to use

e-procurement system successfully (Asian Development Bank 2013:2; Mpehle & Mudogwa 2020:4).

- Financial challenges refer to investment costs in the form of financial commitments needed when adopting and implementing the e-procurement system. Given the use of a partial e-procurement in South Africa's public sector, substantial financial commitments are needed to support an end-to-end e-procurement system (Kramer 2016:24).

### Procurement structure factor

The e-procurement readiness depends on the nature of procurement system, level of e-procurement adoption (full e-procurement adoption or partial e-procurement adoption), operating costs, system implementation and technical challenges related to e-procurement system adoption:

- South Africa's procurement system currently consists of some electronic features (e-tender and CSD) and paper-based transactions. This means that South Africa uses a partially electronic procurement structure (National Treasury 2015d).
- Level of e-procurement adoption: The South Africa's government, through National Treasury, decided for a partial e-procurement adoption, as indicated above (National Treasury 2015d). This decision makes government departments' procurement processes prone for information transparency tracing difficulty and corruption.
- Operating costs: South Africa's public sector has seen a decrease in operating costs since the introduction of the e-procurement system in the form of e-Tender and CSD (National Treasury 2016:7). These could decrease further if the procurement system becomes fully electronic.
- System implementation: The use of a fragmented operating system negatively affects the effectiveness of the procurement processes because of system incompatibility. This emerges as a barrier for successful e-procurement operation and therefore requires urgent attention from the government (National Treasury).
- Technical challenges in e-procurement system adoption: e-procurement adoption in the public sector faces technical challenges. In the South African context, these technical challenges could be associated with or caused by a partially adopted e-procurement system.

### Leadership factor

Leadership plays a vital role for the successful adoption and implementation of e-procurement, as already indicated on the technological factor. It needs to create readiness conditions in government departments for effective e-procurement adoption and operation. These readiness conditions are to emphasise, support and favour ethical adherence to address procurement irregularities (e.g. bribery, nepotism, corruption and fraud), positive attitude of public procurement officials towards e-procurement adoption, transparency of procurement information to all role players, accountability in the procurement process and system implementation in e-procurement adoption and implementation.

### Procurement policy factor

The procurement environment in South Africa is governed by procurement policy together with procurement legislation, which provides guidelines to be adhered to by procurement officials in the procurement process. Determining the effect of government's procurement policy on e-procurement implementation and assessing government's procurement structural system for efficiency are important aspects for establishing e-procurement readiness in government departments:

- Government's procurement policy and e-procurement implementation: The current government's procurement policy operates in a procurement environment where a paper-based procurement system with some electronic applications (e-tender and CSD) is used (National Treasury 2015d). This procurement environment withholds e-procurement potential capabilities to improve procurement processes and exposes the South African public procurement for transparency issues and corruption. National Treasury (2016:7) identified South Africa's current paper-based procurement system as the single largest source of corruption in government departments.
- Government's procurement structural system: The current fragmented operating system coupled with a partial e-procurement adoption makes the public procurement system in South Africa to be ineffective as compared to countries that have moved to full e-procurement adoption and operation.

### Discussion of factors extracted

This study extracted readiness factors that affect e-procurement among procurement officials in South African government departments by means of factor analysis. These factors are an empirical reference for National Treasury to consider when making e-procurement adoption and operation decisions. The extracted factors include technology, legal framework, finance, procurement structure, leadership and procurement policy, as shown in Table 4. Technology has emerged as the most critical factor affecting government departments' e-procurement readiness. However, IT system incompatibilities (including hardware and software) in procuring entities in the South African public sector seem to stand as a barrier to e-procurement readiness. In this regard, Isikdag et al. (2011:117) and Patel et al. (2016:265) advise that the hardware and software components used are integrated properly with the organisation's IT infrastructure to ensure compatibility. These views have been established empirically by a study by Rukuni et al. (2020) that found that the successful implementation of e-procurement and systems compatibility were statistically significantly related.

As e-procurement systems are also reliant on a fast and stable network system, slow download speeds and poor Internet connections outside of major economic centres (rural/poorer areas) may impede attempts to prepare government departments for e-procurement readiness.



This study identified legal framework among the factors that affect the e-procurement readiness of government departments. South African government departments are not yet adequately capable of permitting full use of e-procurement, because the legislation governing public procurement does not specifically include e-procurement (Mpehle & Mudogwa 2020:5). This study established that the legal environment of public procurement in South Africa constitutes a minimum provision in the e-procurement legal and regulatory framework. This is consistent with the view of Anthony (2018:45) who states that there is a need for a consolidated piece of law that addresses the specific needs of an e-procurement system. The *Electronic Communications and Transactions Act* (ECTA), which intends to provide electronic transactions, and to encourage the use of e-government services, appears to be a legislative enabler for the adoption of e-procurement (The Presidency 2002:16). However, this study takes a different position, arguing that the present regulatory framework (laws and regulations) needs to be reformed in order to achieve successful e-procurement readiness.

This study found that finance is one of the factors influencing government departments' readiness for e-procurement. Substantial finances are required to hire, train and develop procurement officials who are involved in the day-to-day running of the e-procurement system (Eadie, Perera & Heaney 2011; Korir, Afande & Maina 2015; Rukuni et al. 2020). Within this context, given South Africa's procurement system has some electronic features, developing an end-to-end e-procurement system will necessitate a significant financial commitment (Kramer 2016:24). Such a commitment needs to be directed towards the training of procurement officials and suppliers using the e-procurement system and the IT infrastructure supporting e-procurement. Huai (2012:1161) and Mpehle and Mudogwa (2020:4) support this view and argue that incurring hidden costs (short-term or long-term) such as maintenance costs may be higher without the requisite technical expertise.

Procurement structure factor was found to influence e-procurement readiness in government departments. Government departments in South Africa do not use a single or integrated procurement system (National Treasury 2015c). This study's finding is consistent with Kramer's (2016:36) and Sithole's (2017:169) finding that introducing e-procurement technologies one at a time into an existing traditional system will result in a haphazard e-procurement system. The study also identified the need for a complete e-procurement overhaul in order to reform public procurement in light of emerging technology capabilities and improve the efficiency of public procurement processes.

This study identified leadership as one of the factors affecting government departments' e-procurement readiness. This study found that a lack of leadership at the top of the hierarchy to steer government departments towards readiness to adopt e-procurement is likely to permeate the entire public sector and cripple e-procurement readiness

efforts. In line with this finding, Koech, Ayoyi and Mugambi (2016:22) and Anthony (2018:43) indicate that adequate leadership support is needed in order to be ready for successful e-procurement adoption. Such endeavour would prevent excessive resistance and sabotage towards the implementation of the e-procurement system in government departments (Kusi et al. 2016:643).

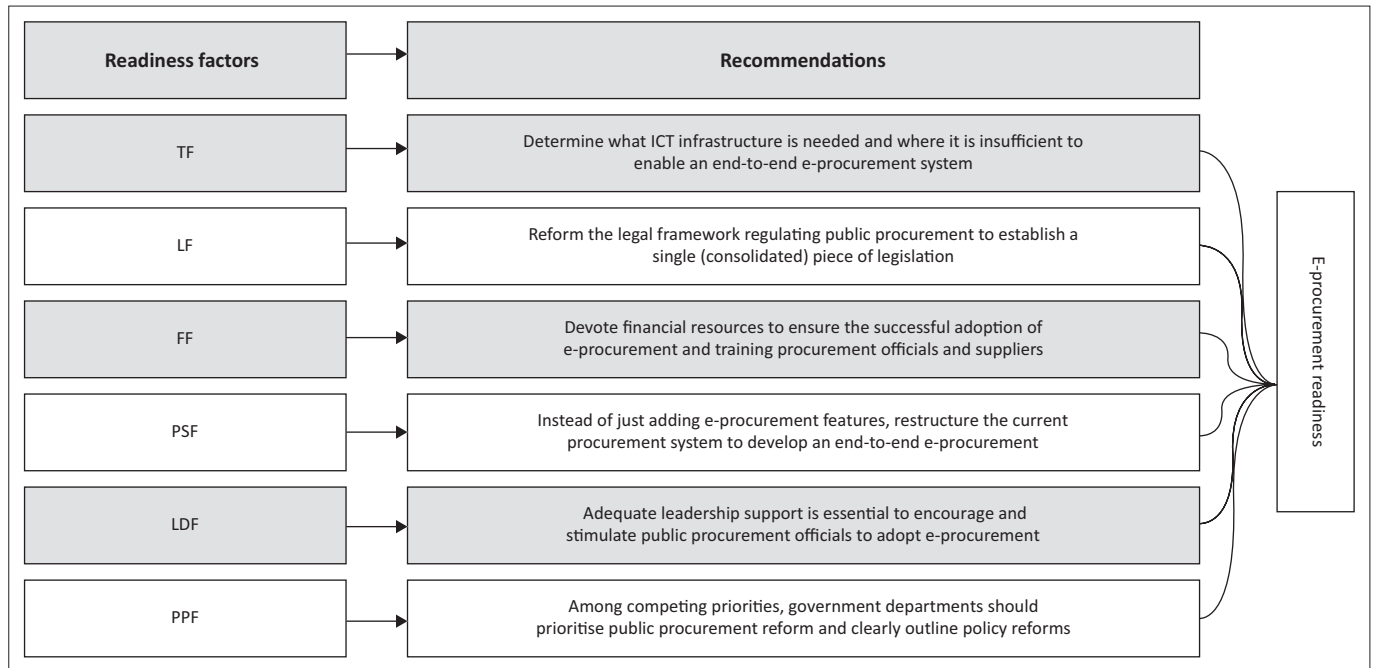
This study found procurement policy to being one of the most important factors affecting e-procurement readiness in government departments. A lack of public policy on e-procurement is a barrier to e-procurement readiness. This is why e-procurement has been successful in European governments where it has been prioritised, as well as where policy reforms have been clearly outlined and implemented (European Bank 2015:5). This study established that South Africa's procurement system is highly decentralised. This finding is consistent with the National Treasury report (2015c), which acknowledges that South Africa's public procurement is at this stage supported by a number of systems that are 'fragmented, underutilised, and vary in functionality, scalability, and performance'. Sithole's (2017:169) research also revealed that the Gauteng Department of Infrastructure Development lacks an integrated e-procurement system and that the systems in use are fragmented. Government departments should examine and capitalise on the possibilities of centralising procurement system.

## Conclusion

This study provided significant insights into factors that affect e-procurement readiness in the South African government departments. These factors include technology, legal framework, organisation's finance, procurement structure, leadership and procurement policy. The extraction of factors was based on their relationship to one another. The study provided a theoretical and empirical contribution towards e-procurement readiness literature. From this contribution, it is evident that South Africa's government (including government departments) needs to take cognisance of or consider such factors when deciding on its readiness to adopt e-procurement and take heed of the recommendations formulated. In order to fully benefit from e-procurement adoption and experience better efficiency, government departments should be ready in terms of legislative framework, finances, leadership support, staff enthusiasm and training and cost-cutting initiatives. Understanding the factors that affect e-procurement readiness provides National Treasury with reasons why e-procurement must be used as end-to-end system to prevent system fragmentation, lack of transparency and corruption. This can allow for better e-procurement adoption planning and fewer system implementation challenges.

## Recommendations

Based on the findings from factor extraction, different recommendations for the study are graphically represented in



TF, Technological Factor; LF, Legal Factor; FF, Financial Factor; PSF, Procurement Structure Factor; LDF, Leadership Factor; PPF, Procurement Policy Factor; ICT, Information Communication Technology.

**FIGURE 1:** Recommendations on how to enhance e-procurement readiness.

Figure 1, which when heeded would enhance e-procurement adoption and implementation within government departments.

This study can be used by public policy makers (National Treasury) as an empirical reference in understanding e-readiness factors and the procurement system in South Africa and the effect of using a partial e-procurement system on the efficiency of procurement processes. Although this study focusses on government departments, its findings can, however, be applied to other public entities governed by the *Public Finance Management Act* in South Africa. Government departments and other public entities need to take cognisance of factors that enhance e-procurement readiness and e-procurement efficiency.

## Limitations and future research

Aside from the contribution to the literature on procurement and SCM, it is important to note the limitations of this study in order to spur future research. Firstly, owing to the COVID-19 outbreak in South Africa, all non-COVID-19 research was halted, making it difficult to distribute questionnaires to public procurement officials. Secondly, the study only covers the perspectives of public procurement officials employed in the public sector. Other staff involved in the procurement process such as project owners, user divisions, members of three bid committees and e-Tender and CSD maintenance. Finally, this study was limited to five selected national government departments in South Africa's ministerial clusters.

Further research might improve on the present findings by investigating the readiness and willingness of suppliers to embrace e-procurement. A similar study might be carried out through employing additional research methodologies

and techniques to collect rich data and generate in-depth analysis and insights from a new viewpoint.

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The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

## Authors' contributions

D.N. Maepa wrote the full article from her master's dissertation under the supervision of Mpwanya and Phume. M.F. Mpwanya reviewed the full paper with substantial changes of the initial draft and Phume read and gave green light for submission.

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## Data availability

Raw data were collected without identifiers and statistically analysed and interpreted in relation to the research objectives.

## Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of any affiliated agency of the authors.

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