

**A FRAMEWORK FOR THE IMPLEMENTATION OF E-PROCUREMENT
PRACTICES IN THE SOUTH AFRICAN PUBLIC SECTOR**

by

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ABSTRACT

The use of technology in supply chain management has increased over the years. Procurement is one of the primary supply chain management areas where the use of technology has gained momentum. This has been realised through the use of e-procurement systems. However, the adoption and implementation of e-procurement can be achieved more effectively if available models of technology adoption are taken into consideration. This study tested a conceptual framework integrating the Technology Acceptance Model (TAM) and the Unified Theory of the Acceptance and use of Technology (UTAUT) in the implementation of e-procurement practices in the South African public sector. Although there are several studies that have focused on procurement in the public sector in South Africa, there is no evidence of studies that extended the use of the TAM and the UTAUT within the public sector in South Africa. This study was conducted to fill this gap by proposing a framework combining the TAM and UTAUT and modelling their role in the adoption of e-procurement in the public sector.

The study adopted a survey design and a quantitative research approach was used to evaluate relationships between different variables. The final sample for this study consists of 263 supply chain management (SCM) practitioners drawn from the public sector in the Gauteng Province, South Africa. A self-completion survey questionnaire was used to gather data to measure the eight constructs of the TAM and UTAUT.

An Exploratory Factor Analysis (EFA) procedure was performed to assess the factor structure of the data collected in the study. Descriptive statistics were applied to examine the demographic profile of respondents and the perceptions of respondents towards the research constructs. Pearson correlations were used to test relationships and regression analysis was used to test the hypotheses. In the EFA, two new factors, labelled as Personal Competence and External Assistance, were identified. The results of the hypotheses tests showed that five factors, namely: perceived use, self-efficacy, facilitating conditions, personal competence and external assistance significantly predicted attitudes towards the use of e-procurement systems. However, perceived ease of use was statistically insignificant. The results further show that attitudes towards system use significantly predict behavioural intention, which in turn significantly influences actual e-procurement system use.

The theoretical framework fusing the TAM and UTAUT models provides useful insights for other researchers and adds valuable knowledge to the factors that might contribute to the adoption of e-procurement in the South African public sector. The study further makes significant contributions to SCM professionals in the public sector. It reiterates the challenges faced in SCM in the public sector and then demonstrates how the adoption of e-procurement could improve the system, while reducing service delivery inequality. By indicating the factors either promoting or impeding the adoption of e-procurement in the public sector, the study provides practitioners and other decision makers in SCM with suggestions on how to facilitate more rapid adoption and circumvent the influence of irrelevant factors.

Among other things, the study recommends that to improve the adoption and continued use of e-procurement systems in the public sector in the Gauteng Province, it is necessary to customise the e-procurement system to ensure that it responds to the needs of users. In addition, it is important to increase the confidence and competence of users of the systems, providing the relevant technical infrastructure and support to users in order to positively influence their attitudes and behavioural intention towards the use of e-procurement systems.

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LIST OF ABBREVIATIONS

AGFI	Adjusted Goodness of Fit Index
AMOS	Analysis of Moment Structures
APEC	Asia-Pacific Economic Cooperation
CFA	Confirmatory Factor Analysis
CIPC	Companies and Intellectual Property Commission
CPAR	Country Procurement Assessment Report
DAC	Development Assistance Committee
GDP	Gross Domestic Product
GFI	Goodness of Fit Index
ICT	Information and Communications Technology
MFMA	Municipal Finance Management Act
NBP	Non-Binding Principles on Government Procurement
OECD	Organisation for Economic Co-operation and Development
PFMA	Public Finance Management Act
RDP	Reconstruction and Development Programme
RMSEA	Root Mean Square Error of Approximation
SARS	South African Revenue Service
SCM	Supply Chain Management
SEM	Structural Equation Modelling
SOE	State Owned Enterprise
SPSS	Statistical Package for the Social Sciences
TAM	Technology Adoption Model
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
UNDP	United Nations Development Programme
UTAUT	Unified Theory of Acceptance
DTI	Department of Trade and Industry
SME	Small and Medium Enterprise

CHAPTER 1

OVERVIEW OF THE STUDY

1.1 INTRODUCTION AND BACKGROUND TO THE STUDY

Public procurement has emerged as a leading component in the discourse on service delivery in many countries (Chimwani, Iravo & Tirimba, 2014:1626). Several authors (Kuye & Ajam, 2012:49; Nkwe, 2012:39; Shalle, Guyo & Amuhaya, 2013:308) highlight that national governments are increasingly under pressure to provide quality goods and services to citizens in a timely manner. This provision of goods and services is achieved through the public procurement function of government (Bolton, 2016:4). Public procurement refers to the acquisition of goods and services by government using fiscal resources for distribution to the public (Ambe, 2016:278). According to Ambe and Badenhorst-Weiss (2012:244), public procurement may be perceived as the acquisition of goods, services and development and construction projects by the public sector from suppliers in the local and international market. This process is, however, subject to the general principles of fairness, equitability, transparency, competitiveness, and cost-effectiveness (Turley & Perera, 2014:7). Public procurement also includes many activities that support the service delivery function of government entities (Moeti, 2014:141). In addition to service delivery, public procurement is central to government policy implementation and social and economic development, especially of previously disadvantaged communities (South African National Treasury, 2015:1). Thus, public procurement directly and indirectly supports the social, economic, and political aims of government.

The public sector comprises government departments and state-owned enterprises (SOEs) (International Federation of Accountants, 2013:48). All public sector institutions are owned, run, as well as financed by the government on behalf of the public (Dube & Danescu, 2011:3). Public procurement constitutes a major component of public spending in these institutions. For instance, in the United Kingdom, public procurement represents about 15 percent of the Gross Domestic Product (GDP) and in the Organisation for Economic Co-operation and Development (OECD) countries, expenditure on public procurement represents almost a third of total government expenditure (Cernat & Kutlina-Dimitrova, 2015:2). In the Middle East and Africa,

central government purchases range between nine percent and 13 percent of GDP (Gul, 2010:1). In South Africa, public procurement expenditure has been steadily increasing over the years. In the 2013/14 financial year, for example, the public sector spent ZAR500 billion on goods and services and on construction works (South African National Treasury, 2015:3). Given such a high magnitude of expenditure, there is a need for such funds to be managed prudently and to be driven by values of accountability and transparency. A number of authors (Akinboade, Kinfack & Mokwena, 2012:183; Kuye & Ajam, 2012:50; Francis, 2013:29) suggest that public sector officials should provide leadership and eliminate malpractices such as corruption to deliver public services to citizens. Such actions are important in ensuring that the public procurement function is able to meet the service delivery and economic development goals of government.

Public procurement is a subset of the broader concept of public supply chain management (SCM). Fundamentally, a supply chain is a network of people, organisations, information, activities, and resources involved in the movement of goods and services from the point of origin to the ultimate consumer (Shahzadi, Amin & Chaudhary, 2013:1). SCM itself involves all the strategies and procedures employed to efficiently deliver products and services to the customer in the right quantities, to the right location, at the right time, and at optimal cost (Quesada, González, Mueller & Mueller, 2010:1). It embodies most activities that influence timing, cost, quality and delivery of a service or product (Ambe & Badenhorst-Weiss, 2012:244). In South Africa, SCM in the public sector is highly decentralised (Khalo, 2014:229). This enables the public sector to use SCM as a tool to advance the interests of previously disadvantaged persons and communities who were subjected to discrimination by the apartheid government as well as to link suppliers of goods and services to those tasked with making decisions regarding service delivery (Moeti, 2014:144). According to Mbate (2017:3), decentralisation of public SCM tends to narrow the scope for corruption as public officials interfacing with citizens are pressured to be accountable. This may result in savings on government expenditure and increased reach to citizens with goods and services. Also, the fact that government spends large amounts of money to procure goods and services implies that procurement can perform an important role in the economy (Turley & Perera, 2014:15). Therefore, public SCM has the potential to drive social and economic development in the country (The South African National Treasury, 2015:1).

The widespread adoption of information and communication technologies (ICT) is changing the way governments deliver services to the public (Nkwe, 2012:39). In an effort to improve service delivery, governments the world over have begun to adopt electronic procurement (e-procurement) as part of their SCM activities (Mungai, 2013:591). Traditionally, procurement practices in the public sector included cumbersome paper-based procedures that took time to complete and poor supplier management (South African National Treasury, 2015:5). However, as stated by Swalehe, Cheboson and Chepkulei (2015:564), e-procurement has been prioritised on the e-government agenda of many public sector institutions. However, it has been noted by Horn and Raga (2012:80) that e-procurement practices continue to be performed with non-compliance with SCM policies and regulations. This non-compliance is attributable to ineffective monitoring systems, unclear roles and responsibilities, and the lack of accountability (Gordhan, 2014:28). Research on procurement practices conducted by Ngunyi (2014:24) found that state owned companies selectively adopt and apply e-procurement practices, leading to strategic sourcing and operational challenges for those that do not adopt. However, despite the existence of such challenges, it has been noted by Rotich and Okello (2015:1396) that performance within government departments improved as a result of adopting e-procurement. Therefore, e-procurement continues to provide enormous potential to improve SCM performance in the public sector if it is applied effectively (Fernandes & Vieira, 2015:589; Mahinda, 2015:372).

It can be suggested that the adoption and implementation of e-procurement can be achieved more effectively if available models of technology adoption are taken into consideration. Two of the most popular models for technology adoption include the Technology Adoption Model (TAM) (Davis, 1989:333-334) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Vankatesh *et al.*, 2003). The TAM assists with critical factors that affect how individuals make decisions regarding the adoption of any new technology (Ruzindana & Kalaskar, 2016:128). It is useful in identifying direct and indirect effect of various factors on behavioural intention and actual usage of new technology (Muriithi, Waiganjo & Chepngetich, 2015:158). The UTAUT model is viewed as a more robust technology acceptance model that offers a comprehensive list of technology acceptance determinants and has stronger predictive power and more accuracy than most models in use (Taiwo & Downe, 2013:49). The present study integrated the TAM and UTAUT models to test a conceptual framework for the implementation of e-procurement practices in the public sector. The study proposes that an understanding of the determinants of adoption of e-procurement technology in the public sector

through the use of the TAM/UTAUT is important in contributing towards improving the implementation of e-procurement practices in the South African public sector.

1.2 PROBLEM STATEMENT

Procurement in the public sector in South Africa faces numerous challenges. These include lack of proper knowledge, insufficient skills and capacity as well as inadequate monitoring and evaluation of SCM (Ambe & Badenhorst-Weiss, 2012:249), non-compliance with SCM policy and regulations, unclear roles and responsibilities (Horn & Raga, 2012:80), lack of accountability (Gordhan, 2014:28), as well as widespread corruption and unethical practices (Munzhedzi, 2013:284). Technology adoption also seems to be a challenge, as SCM professionals continue to use manual systems instead of switching to automated procurement systems (National Treasury, 2015:5). These challenges have led to poor service delivery (Madumo, 2012:50), leading to violent public protests (Zitha & Mamabolo, 2016:69), wastage of public funds and resources through corruption (Munzhedzi, 2013:284), and failure to maintain optimum supply chain performance in a rapidly changing and competitive operating environment (Mafini & Poole, 2013:2). It is necessary to generate information to determine whether adoption of e-procurement can be applied as an effective solution in dealing with these challenges. This motivates this study, which is intended to investigate the adoption and implementation of e-procurement practices in the South African public sector.

There are several studies that have focused on procurement in the public sector in South Africa. For example, Ambe and Badenhorst-Weiss (2012) investigated procurement challenges in the South African public sector. Studies by Mantzaris (2014) and Munzhedzi (2013) directed their attention to tendering and corruption in public procurement. Another study by Ambe (2016) explored public procurement trends and developments in South Africa since 2004. Other studies (Tukamuhabwa, 2012; Zitha & Mathebula, 2015; Zitha & Mamabolo, 2016) explored compliance to procurement processes and its impact on service delivery. However, these studies disregarded the role of e-procurement in improving SCM in the South African public sector. Limited studies that examined e-procurement in the SA public sector (Jooste & Van Schoor, 2003; Iben & Laryea, 2015) overlooked the role of technology adoption models such as the TAM and the UTAUT. Elsewhere, these models have been used to assess factors that influence the adoption and actual usage of new technologies in various fields, including e-logistics and e-learning (Oye, Iahad & Rahim, 2012:103; Tan, 2013:1; Thomas, Singh &

Gaffar, 2013:73). The TAM and UTAUT models have also been used to determine the factors affecting the adoption and usage of e-procurement in private companies (Alomar & De Visscher, 2017:1; Ruzindana & Kalaskar, 2016:125; Ibem, Aduwo, Tunji-Olayeni, Ayo-Vaughan & Uwakonye, 2016:1). However, there is no evidence of studies that extended the use of the TAM and UTAUT within the public sector in South Africa. This study is intended to address the gap in the studies on e-procurement in the South African public sector by proposing a framework combining the TAM and UTAUT and modelling their role in the adoption of e-procurement in that sector. The study is significant in that it provides an understanding of the determinants of e-procurement adoption. This may contribute towards the increased adoption of e-procurement and strengthen the currently weak and vulnerable South African public procurement system.

1.3 RESEARCH OBJECTIVES

Three categories of objectives, namely: primary, theoretical and empirical were identified and are presented below:

1.3.1. Primary objective

The primary objective of the study is to test a conceptual framework for the implementation of e-procurement practices in the South African public sector.

1.3.2 Theoretical objectives

In order to achieve the primary objective, the following theoretical objectives are addressed:

- to review literature on SCM in the public sector;
- to explore literature on e-procurement practices in the public sector; and
- to analyse literature on the application of the TAM and UTAUT frameworks.

1.3.3 Empirical objectives

The study focused on and addressed the following empirical objectives:

- to establish the relationship between the perceived usefulness of e-procurement systems and attitudes towards their use in the public sector in the Gauteng Province.
- to explore the relationship between the perceived ease of use of e-procurement systems and attitudes towards their use in the public sector in the Gauteng Province.
- to ascertain the relationship between the self-efficacy of e-procurement systems and attitudes towards their use in the public sector in the Gauteng Province.
- to explore the relationship between facilitating conditions of e-procurement systems and attitudes towards their use in the public sector in the Gauteng Province.
- to determine the relationship between attitudes towards the use of e-procurement systems and the behavioural intention regarding their use in the public sector in the Gauteng Province; and
- to determine the relationship between the behavioural intention of e-procurement systems and actual system use in the public sector in the Gauteng Province.

1.4. THE RESEARCH CONCEPTUAL FRAMEWORK

The research study was directed by the conceptual framework presented in Figure 1.1. The conceptual framework shows the linkages between the constructs derived from the TAM and UTAUT theoretical frameworks that were considered in order to model the adoption of e-procurement practices in the public sector in the Gauteng Province.

In the research conceptual framework, perceived usefulness, perceived ease of use, self-efficacy and facilitating conditions are the predictor variables whilst attitudes and behavioural intention are the mediating variables, and actual e-procurement system use is the outcome variable.

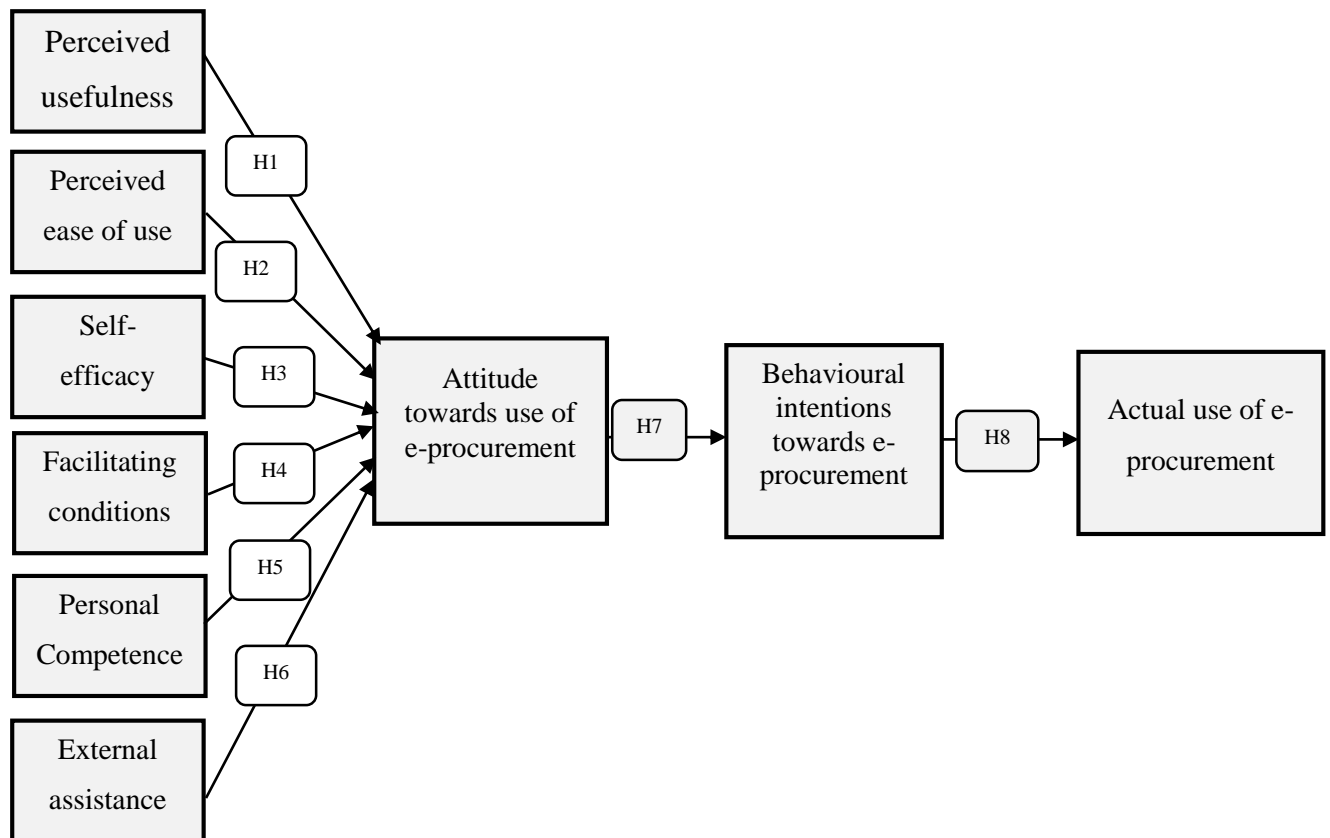


Figure 1.1: Research conceptual framework

1.5. SUMMARY OF HYPOTHESES

Based on the conceptualised research framework, the following hypotheses were tested:

H1: Perceived usefulness positively and significantly influences attitude towards use of e-procurement systems.

H2: Perceived ease of use positively and significantly influences attitude towards use of e-procurement systems.

H3: Self-efficacy positively and significantly influences attitude towards use of e-procurement systems.

H4: Facilitating conditions positively and significantly influence attitude towards use of e-procurement systems.

H5: Personal competence positively and significantly influences attitude towards use of e-procurement systems.

H6: External assistance positively and significantly influences attitude towards use of e-procurement systems.

H7: Positive attitude towards e-procurement systems positively and significantly influences positive behavioural intention in its use in the public sector.

H8: Positive behavioural intention positively and significantly influence actual use of e-procurement systems in the public sector.

1.6. PRE-LITERATURE REVIEW

For this study, literature was reviewed under the following headings: e-procurement, TAM, UTAUT, and SCM in the public sector.

1.6.1 E-procurement

E-procurement is defined as the use of Internet-based (integrated) information and communication technologies (ICTs) to conduct activities in individual or all stages of the procurement process, including search, sourcing, negotiation, ordering, receipt and post-purchase review (Shalle *et al.*, 2013:308). However, to McCue and Roma (2012:5), e-procurement is the use of information technology to facilitate business-to-business purchase transactions for materials and services. Salkute and Manager (2013: 108) define e-procurement as an automated, Internet-based way for a company to purchase the goods and services it needs to conduct business. The use of ICT and the internet feature prominently in the definitions above because e-procurement arose out of the developments in the digital economy (Chirchir, Ngeno & Chepkwony, 2015:26). However, it is important to state that e-procurement is clearly more than online purchasing of goods and services. Furthermore, e-procurement is not restricted to business-to-business transactions. According to Uddin (2015:1), the concept of e-procurement is extended to business-to-consumer or business-to-government purchase and sale of supplies, work, and services.

The major forms in which e-procurement is presented are e-Tendering, e-Marketplace, e-Auction/Reverse Auction, and e-Catalogue/Purchasing (Mose, Njihia & Magutu, 2013:377). Although the concept of e-procurement is fairly recent, its purpose is still the same as traditional paper-based procurement processes (Zhu & Islam, 2012:14). E-procurement removes the tedious manual paperwork and reduces corruption while saving time (Korir, Afande & Maina, 2015:62). It enhances the efficiency and effectiveness of the SCM system (Mungai, 2013:590; Korir *et al.*, 2015:62). The other benefits of e-procurement include cost savings and shorter

business cycles. Furthermore, e-procurement reduces unauthorised buying, and provides for highly organised procurement information and data management (Salkute & Manager, 2013:108). Various studies (White, Afolayan & Plant, 2014; Li, Pillutla, Zhou & Yao, 2015; Giunipero, Ramirez & Swilley, 2017; Mohammed & Desscher, 2017; Li, Chung & Fiore, 2017) on e-procurement have tended to focus on cost efficiency benefits; the impact of e-procurement on governance; e-procurement implementation; and IT infrastructure issues (Shalle *et al.*, 2013:308). This study tested a framework for the adoption of e-procurement practices in the public sector. It is anticipated that this framework would facilitate improved service delivery while reducing costs or wastage of resources in the public sector.

1.6.2 E-procurement in the South African public sector

E-procurement is central to the financial reform processes in the public sector in South Africa (Munzhedzi, 2013:284). Government has committed to training supply chain professionals in the public sector to provide them with the necessary knowledge and skills to execute their duties (Ambe & Badenhorst-Weiss, 2012:243). A recent review of public SCM suggests that government is in the process of implementing procurement strategies with the potential to generate savings of up to R25 billion a year (SCM Review Update, 2016:1). Furthermore, the government is focusing on using public procurement to stimulate the South African economy and continue to create opportunities for growth (Turley & Perera, 2014:15). However, according to the South African National Treasury (2015:3), there are still major challenges in public SCM. These include the inconsistent application of new policies, lack of accountability and effective support structures in SCM (Ambe & Badenhorst-Weiss, 2012: 251). It has also been noted by Franco (2015) that the strategic importance of e-procurement is not well understood in the South African public sector. In addition, about 45 percent of the procurement activities are currently being executed manually, which creates the need for enhanced technological innovations to increase efficiency (South African National Treasury, 2016:6). Other procurement-related challenges include corruption and fraud, lack of technical expertise of procurement staff, poor human resource practices, and political interference (Horn & Raga 2012:80; Janse van Rensburg, 2014:33). There is therefore a need to investigate how SCM practices such as e-procurement can be used to improve procurement in the South African public sector.

1.6.3 Theoretical framework 1: Technology Acceptance Model

The Technology Acceptance Model (TAM) was initially used to understand and predict consumer adoption of new information technologies (Davis, 1989:333-334). The TAM aims to determine behaviours of users towards particular technologies by employing two factors, namely, perceived usefulness and perceived ease of use (Oye *et al.*, 2012:103). Perceived usefulness entails the expectation that using new technology will bring about positive outcomes, and perceived ease of use reflects the expectation that the new technology will be easy to learn and use (Davis, 1989:333-334). The model suggests that individuals make decisions regarding the adoption and use of new technology based on these subjective perceptions. The TAM has been used to assess factors influencing adoption of e-learning, e-logistics and e-procurement in education, health, and other private institutions (Tan, 2013:1; Ruzindana & Kalaskar, 2016:125; Ibem *et al.*, 2016:1).

The technology acceptance model (TAM) is an important analytical tool in the study of the social mechanisms of technology adoption, which has received considerable attention in the literature. Despite its usefulness, some authors (Im & Ha, 2013) state that individual decisions to adopt new technologies may be based on more factors beyond usefulness and ease of use. Although empirical support for the model has varied depending on situation specifics, it remains a popular and useful conceptual framework for analysis of factors contributing to technology acceptance or rejection by the relevant constituencies (Folkinshteyn & Lennon, 2017:220).

For the purposes of this study, the TAM was used to assess e-procurement practices and adoption and gather perceptions of respondents regarding the significance of adopting e-procurement and the relative ease of use of the technology.

1.6.4 Theoretical framework 2: the Unified Theory of Acceptance and Use of Technology

The UTAUT model was developed by Vankatesh *et al.* (2003) and based on social cognitive theory. It combines eight prominent information technology acceptance research models, namely, the Innovation Diffusion Theory, the Technology Acceptance Model (TAM), the model of Personal Computer Utilization, the Theory of Reasoned Action (TRA), the Theory of

Planned Behaviour (TPB), the Motivational Model, the combined TAM and TPB, and the Social Cognitive Theory. The UTAUT aims to explain technology acceptance based on behavioural intention and actual usage. The model states the following four determinants of technology acceptance: facilitating conditions, social influence, effort expectancy, and performance expectancy (Oye *et al.*, 2012:103). These constructs are defined by Thomas, Singh and Gaffar (2013:73) as follows:

- Performance Expectancy: the degree to which the individuals believe that the use of the technologies will result in performance gains. This may also be viewed as the perceived usefulness of the technologies.
- Effort Expectancy: the ease of use of the technologies.
- Social Factors: the extent to which individuals believe that important others believe that they should use the technologies.
- Facilitating Conditions: the perceived extent to which the organisational and technical infrastructure required for the support of the technologies exists.

The UTAUT has similarly been used in the assessment of factors influencing adoption of e-learning, e-logistics, and e-procurement in various institutions (Thomas, Singh & Gaffar, 2013: 73; Alomar & de Visscher, 2017: 1). According to Thomas, Singh and Gaffar (2013:72), the major challenge with most theoretical models, including the UTAUT, is that they have been extensively tested in western countries, casting doubt on their applicability in other contexts. However, the UTAUT model is very comprehensive and has more predictive power than the TAM (Oye *et al.*, 2012:103). The current research combined the two models to produce a more comprehensive framework for assessing e-procurement practices in the public sector in the Gauteng Province.

1.7. SCOPE OF THE STUDY

The geographic scope of this study was confined to the public sector in the Gauteng Province in South Africa. The Gauteng Province was selected ahead of other provinces because it is considered as the economic hub of South Africa (Gauteng Provincial Government, 2015:32). In addition, most public service departments and SOEs are headquartered in the Gauteng Province, where major decisions regarding the use of SCM systems such as e-procurement are

made and implemented. This makes Gauteng the province of choice when deciding on the geographic scope of the study. In terms of respondents, the study focused on the views of supply chain professionals only, since they are the group of employees that work with e-procurement systems within the public sector, which makes their views important. While acknowledging the importance of SCM as a broad concept applicable to the public sector, the study directs its primary emphasis to e-procurement practices, which are a fraction of SCM practices. This ensures that the focus of the study is not diverted to other SCM practices such as, *inter alia* transportation, warehousing, customer relationship management and supplier relationship management that are also relevant and important in the public sector.

1.8. RESEARCH METHODOLOGY

Research methodology refers to the systematic steps taken within the overall research strategy to achieve the research objectives (Myoung-Jae & Sanghyeok, 2011:481; Leedy & Ormrod, 2013:12). The methodology focuses on the relevant research process followed and the tools used to gather data (Neuman, 2014:8). This section describes the research design, sampling design, procedures for data collection, data analysis, and ethical considerations. The section closes with a summary of the thesis chapters.

1.8.1 Research design

The research design provides the foundation upon which the form and structure of the entire study rests and outlines how the study was conducted (Gorard, 2013:203). There are various research designs that are commonly used, namely, experimental, descriptive, explanatory, and exploratory designs (Castro, Gomez, Molina & Tejada, 2017:183). These designs can be applied to quantitative and qualitative studies. The current study used a quantitative approach since it sought to evaluate relationships between different variables. Consistent with quantitative approaches, statistical methods were utilised to analyse data in a more reliable manner (Michael, Kirubel, Adam & Raymond, 2015:311) and to avoid researcher bias (Manuel, Carmo, Infante & Mendes, 2014:282).

The survey design was adopted to guide the collection of data from SCM practitioners in the public sector in the Gauteng Province. A survey research design is one in which data were collected through the use of a questionnaire designed prior to commencing the study (Creswell,

2014:155). The chosen design also adopted the cross-sectional approach and collected data only once from the selected respondents (Hair *et al.*, 2015:205). The cross-sectional design was chosen because it is useful in describing the characteristics of a large population, makes use of large samples, which makes the results statistically significant even during the analysis of multiple variables (Fok *et al.*, 2015:148).

1.8.2 Literature review

In addition to gathering primary data through the survey questionnaire, the study also gathered secondary data through a literature review. The secondary data complemented the primary data in testing the proposed hypotheses and drawing relevant conclusions. The purpose of a literature review is to identify and analyse all information written about a topic as well as to gain insight and understanding into the research problem at hand (Fabiola & Ignasi, 2012:235). The literature review was conducted to address the theoretical objectives of the study. This focused on the TAM and UTAUT theoretical models and their application in SCM and e-procurement. The literature review also addressed key concepts such as SCM, e-procurement and procurement practices in the public sector. The forms of literature included textbooks, academic journals, published and unpublished dissertations, and conference papers. These were sourced from online academic search engines and digital databases such as Google Scholar, Research Gate, Emerald Insight and Science Direct, amongst others. Information was also sourced from appropriate, government documents, magazines, and newspapers.

1.8.3 Empirical study

The empirical study involved the sampling design, procedures for data collection, data analysis, and validity and reliability.

1.8.3.1 Sampling design

Sampling design is the researcher's provisional plan for a quantitative description of trends, attitudes, or opinions of a population by studying a sample of that population (Creswell, 2014:235). The primary aim of sampling is to make some inferences about a given population using the chosen sample (Uprichard, 2013:4). Based on this view, the sampling design for this

study comprised the target population, sampling frame, sample size, sampling approach and sampling technique.

1.8.3.2 Target population

A population is a group of elements or cases, whether individuals, objects, or events, that conform to specific criteria, and to which we intend to generalise the results of the research (McMillan & Schumacher, 2014:64). A target population refers to the entire group or set of individuals from which research data are to be collected (Neil, 2015:3). For this research study, the target population included SCM practitioners in the public sector in the Gauteng Province. Government SCM practitioners are generally responsible for managing the administrative functions such as requests for quotations, competitive bidding and procurement, hence, were central to this study.

1.8.3.3 Sampling frame

A sampling frame refers to a list containing the elements (for example, names of people or organisations) under consideration in a research study (Manuel, Carmo, Infante & Mendes, 2014: 284). For this study, the sampling frame consists of SCM practitioners in the public sector in the Gauteng Province and their contact details that are kept and maintained by government departments and state-owned enterprises.

1.8.3.4 Sample size

Sample size refers to the actual number of respondents in the population from whom data were collected as determined by the researcher (Singh & Masuku, 2014:6). Large sample sizes are often preferred as they increase the level of statistical significance of the results (Lin, Lucas & Shmueli, 2013:3). In this study, the sample size was determined using the historical sampling approach, in which several similar studies were used as reference benchmarks to determine the sampling size. Therefore, based on these studies, the sample size for this study was pegged at n=500 SCM professionals employed in the public sector in the Gauteng Province. Further details regarding how the sample size was determined is outlined in Section 5.8.3.

1.8.3.5 Sampling method

Sampling refers to the selection of a subset of persons or elements from a larger population with the intention of representing a target population (Neuman, 2014:246). Sampling methods can be grouped into two categories: probability or representative sampling; and non-probability or judgmental sampling. In this study both the public sector organisations and the respondents were selected using non-probability sampling. Specifically, public sector organisations were selected conveniently, as only those that were available and willing to participate in the study were selected. However, the actual respondents were selected using the purposive sampling technique, to ensure that only those individuals that possessed the desired knowledge were included in the study. A detailed outline of the sampling design is provided in Section 5.8.

1.8.4 Data collection method and procedure

Data collection is a research process that informs how relevant information to address the research problem will be gathered (Sani 2013:40). A data collection tool is defined as a measurement tool for a research study which has to be reliable and valid (Fabiola & Ignasi, 2012:234). In this study, the primary data collection instrument was a survey questionnaire. This is regarded as a cheap and effective way of collecting data in a structured and manageable form from a large pool of respondents, which makes it appropriate for this study (McLeod, 2014:1). Self-completion survey questionnaires were emailed, and hand delivered, to selected SCM practitioners in the public sector in the Gauteng Province. The respondents completed the questionnaires on their own to maintain anonymity, enhance confidentiality and eliminate interviewer bias (Carpentier & Munos, 2014:179). Respondents were given an adequate time of up to four weeks to complete their questionnaires. A detailed outline of how data were collected is provided in Section 5.9.

1.8.5. Data analysis and statistical approaches

Descriptive and inferential statistics were used to describe and summarise the data. Descriptive statistics were used to analyse respondents' biographical data and inferential statistics were used to analyse data gathered on hypotheses. The Statistical Package for the Social Sciences (SPSS version 26.0) was utilised for the statistical data analysis. Use of these tools was in line with the view held by Liping *et al.* (2015:3691) that statistical software can facilitate better

data management and analysis at different stages in the research process. A detailed description of the types of data analysis used in this study is alluded to in Section 5.10.

1.8.6 Reliability and validity

Tavakol and Dennick (2011:447) define reliability of research as how closely the same constructs in a research instrument replicate similar results. In this study, reliability was measured using the Cronbach alpha, which was expected to be above 0.70 (Christensen, Johnson & Turner, 2011:281-303). Additionally, item-total correlations were also used, which were expected to be above 0.4 (Yusoff, 2011:26). Measurement scales were expected to meet these minimum thresholds to be regarded as reliable.

Validity is the extent to which a test or indicator measures what it claims to measure (Bryman & Bell, 2015:27). Four validities were tested in this study. The first one is face validity, which was checked through a panel review of the questionnaire. The panel was composed of academics who are experts in the field of SCM. The second one is content validity, which was checked through a pilot test of the questionnaire. A conveniently drawn sample of 40 SCM practitioners was used in the pilot study, in line with the suggestion by Yin (2014:96). SCM practitioners that participated in the pilot test were excluded from the main survey. The third type of validity is construct validity, which was tested using factor analysis and inter-factor correlations. The fourth type of validity is predictive validity, which was checked using regression analysis.

1.9. ETHICAL CONSIDERATIONS

There are ethical considerations in research that have to be observed regarding data collection processes and interaction with human subjects (Creswell 2014:92). Permission was sought from public sector institutions involved in the study to identify respondents. Anonymity and confidentiality of the identities and other personal details of respondents were ensured at all times during the research. The research results were not shared with any third party and the names of the respondents were not documented in the research report. All questionnaires were stored for a specified period or disposed of according to university policy. The key ethical considerations observed during the study are informed consent; voluntary participation;

confidentiality and anonymity; protection from victimisation; and freedom to withdraw from the study. These are discussed in greater detail in Section 5.12.

1.10. DEFINITION OF TERMS

Public procurement - a variety of means by which public agencies and organisations acquire supplies and services from outside sources (Snider & Rendon, 2012:329)

Supply chain management (SCM) - an amalgamation of strategies and procedures employed to efficiently deliver products and services to the customer in the right quantities, to the right location, at the right time, and at optimal cost (Quesada, González, Mueller & Mueller, 2010:1).

E-procurement – the conduct on the internet of the equivalent of the manual tendering process, with the ostensible objective of enhancing transparency and efficiency of public procurement (Kohli, 2012:258).

Self-efficacy - people's judgments of their capabilities to organise and execute courses of action required to attain designated types of performances (Bandura, 1986:391).

Personal competence - the process through which individuals use their abilities to take action that results in accomplishment of certain tasks (Nygren, 2015:181).

Perceived usefulness - an individuals' perception that using a new technology will increase or improve their performance (Davis, 1989:320).

Perceived ease of use – the extent to which a person believes that using a particular system will be free of effort (Sun *et al.*, 2012:52).

Self-efficacy – an individual's confidence in his or her ability to organise and execute a given course of action to solve a problem or accomplish a task (Eccles & Wigfield, 2002:110).

Facilitating conditions – the degree to which an individual believes that an organisational and technical infrastructure exists to support use of the system (Venkatesh *et al.*, 2003: 447).

Personal competence – the process through which individuals use their abilities to take action that results in accomplishment of certain tasks (Nygren, 2015:181).

External assistance – the process by which the public sector seeks and engages service providers to perform certain functions and activities and/or to deliver certain services or products (Doellgast & Gospel, 2013:5).

Attitude towards use – an individual's positive or negative feeling about using e-procurement systems in the South African public sector (Fishbein & Ajzen, 1975:15).

Behavioural intention to use – a person's perceived likelihood or subjective probability that he or she will engage in a given behaviour (The Committee on Communication for Behaviour Change in the 21st Century, 2002:31).

Actual use – the deliberate physical use of a system by an individual once they are convinced that the technology is useful and easy to use (Straub & Burton-Jones, 2007:224).

1.11. STRUCTURE OF THE THESIS

This final thesis document is organised as follows:

Chapter 1: Introduction and background

This chapter provides the research background, describes the problem statement, research objectives, states the hypotheses, and provides a preliminary discussion of literature and an overview of the methodology employed.

Chapter 2: Public procurement

This chapter provides a detailed review of literature on the implementation of procurement practices in the public sector.

Chapter 3: Evolution and state of e-procurement

The focus of this chapter discusses literature on the evolution of e-procurement, its implementation and challenges associated with its use.

Chapter 4: Technology Acceptance Model and the Unified Theory of Acceptance and Use of Technology

This chapter analyses literature on the development and application of the TAM and the UTAUT models. Specific reference is given to the application of these two frameworks in SCM.

Chapter 5: Research methodology and design

This chapter outlines the research design, methodology, target population and sampling strategy. The data collection tools, data collection process and analysis are also discussed, together with the ethical considerations.

Chapter 6: Data analysis and interpretation

This chapter focuses on the analysis of quantitative data, interpretation of results and discussion in relation to the research objectives.

Chapter 7: Conclusion and recommendations

This chapter draws conclusions from the analysis, interpretation, and discussion of the results. The conclusions are derived based on the research objectives. Recommendations are also drawn based on the conclusions. Limitations of the study are acknowledged and areas for further research are suggested.

CHAPTER 2

DEVELOPMENT OF PUBLIC PROCUREMENT

2.1 INTRODUCTION

This chapter discusses literature focusing on public procurement. The purpose of this discussion is to lay a solid foundation for the study by putting into context the specific components of public procurement. The chapter thus commences with a review of the conceptualisation of public procurement. An outline of the evolution of public procurement is then provided to set the background for a discussion of public procurement internationally and then in South Africa. Understanding the framework, legislative environment and public procurement procedures in the South African context is critical for creating a springboard to discuss e-procurement in subsequent chapters. The challenges faced within the public procurement arena are also addressed, to anticipate aspects that the study could contribute towards, through making appropriate recommendations. This chapter is therefore focused on providing a broad understanding of public procurement with a focus on the international and South African context.

2.2 CONCEPTUALISATION OF PUBLIC PROCUREMENT

This section provides multiple perspectives of public procurement based on definitions posited by various authors. This serves to demonstrate the broad spectrum of aspects embedded in public procurement thus building an understanding of public procurement from a conceptual point of view. The section also discusses how procurement is located within the broader concept of SCM. The processes and sequence of steps involved in implementing SCM in general and public procurement, in particular, are also shown and described in this section.

The term “public procurement” is also referred to as government procurement by the World Trade Organisation (WTO) and public contracts or government contracts in the United States (Chigudu, 2014:21). The term “procurement” is referred to as a business process operating within a political system (Wittig, 2007:2; Watermeyer, 2011:8). Fourie (2015:38) provides a more comprehensive delineation of procurement by noting that it is a business function with

economic activity, a business process in a political system, and a strategic profession. This characterisation of procurement suggests that public procurement provides a link between government and business in addressing socio-economic challenges among the citizenry.

As noted by Shahzadi, Amin and Chaudhary (2013:1), public procurement is a component of the broader concept of public SCM. According to Quesada, González, Mueller and Mueller (2010:1), SCM encompasses all the strategies and procedures employed to efficiently deliver products and services to the customer in the right quantities, to the right location, at the right time, and at optimal cost. Figure 2.1 shows the various aspects that constitute SCM.

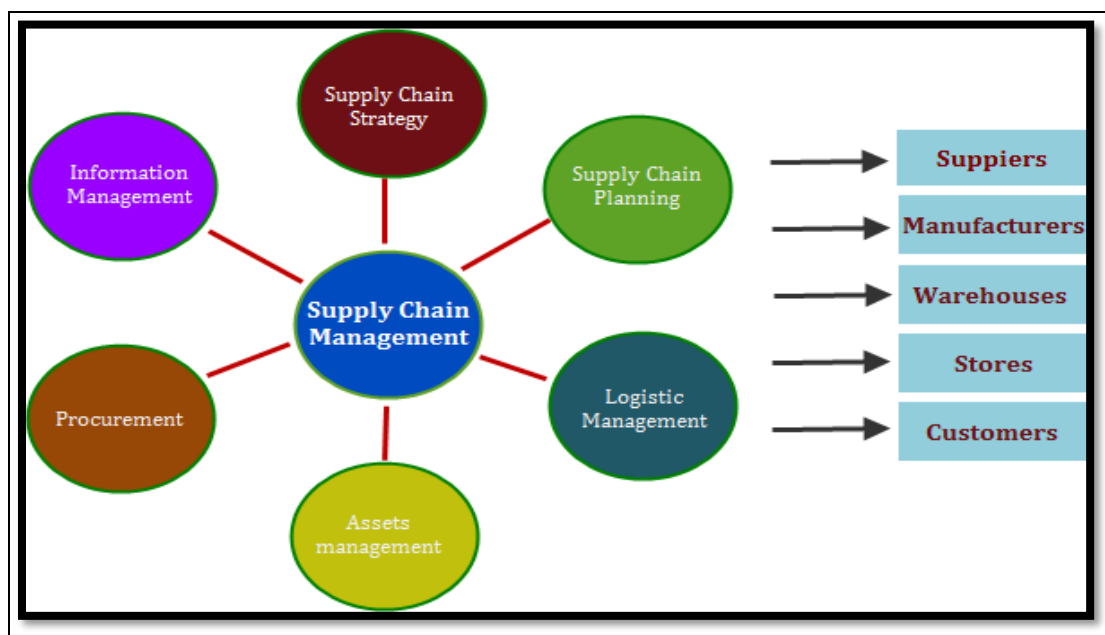


Figure 2.1: Key features of SCM

Source: Futurism (2014:1)

Figure 2.1 shows the various aspects of SCM. The first aspect of any SCM system is the development of a supply chain strategy. This strategy is the basis of the whole system and is based on acquisition and processing of information to ensure that is aligned with other strategic objectives of the organisation. Supply chain planning is a second key feature and entails developing implementation plans that provide the organisation with the best value for money. Logistics management is also crucial in the sourcing and delivery of goods and services. The procurement aspect of the SCM system entails the actual processes for the acquisition of goods and services. The final key feature of supply chain management is information management. This entails, among other things, sourcing and updating information on suppliers and the cost

of goods and services. Figure 2.1 also shows interaction with suppliers, manufacturers, warehouses, stores, and customers as key in the whole SCM system (Futurism, 2014:1).

SCM is also a vehicle for the coordination and management of service delivery and the improvement of long-term performance of the whole system of the provision of goods and services (Mentzer, DeWitt, Keebler, Min, Nix, Smith & Zacharia, 2001:2-3). Procurement is uniquely placed in the whole system and complements the other elements in fulfilling the SCM functions of government.

Different authors have defined public procurement in various ways. According to Nijboer, Senden and Telgen (2017:449), public procurement is merely a process by which government aims to achieve policy goals. This is further supported by Ambe (2016:178), who notes that procurement is a key tool and mechanism enabling the government to implement policies for socio-economic development and transformation. Among the key policy goals governments seek to address, are fostering job creation and promoting fair labour practices. Flanagan (2009:2) further notes that national governments also implement programmes aimed at reducing poverty, improving health and the livelihoods of citizens through public procurement. Therefore, is evident that public procurement is a critical tool for providing essential social services to citizens.

Snider and Rendon (2012:329) posit that public procurement includes a variety of means by which public agencies and organisations acquire supplies and services from outside sources. Other authors also echo this view and state that the supplies and services are acquired from third parties in different contractual forms (Kidalov & Snider, 2011:1; Loader, 2015:103). This suggests that public procurement has a legal aspect embedded in its processes. This aspect is brought to light by Prier and McCue (2009:329), who suggest that public procurement is the “legal authority to advise, plan, obtain, deliver, and evaluate a government’s expenditures on goods and services that are used to fulfill stated objectives, obligations, and activities in pursuant of desired policy outcomes.”. This is further supported by Nijboer *et al.* (2017:450), who state that governments take the responsibility of regulating public procurement through the execution of specific laws and regulations, for example, the Preferential Procurement Policy Framework Act (PPPFA), which enables public procurement functions within a set of legal parameters.

The process of public procurement enables the government to purchase goods and services needed to carry out its functions. Public procurement is viewed as playing a key role in the management of resources to eliminate any pilferage (Ambe & Badenhorst-Weiss, 2012:245). In addition to managing national resources, public procurement also enables efficiency and curbs unnecessary government expenditure (Thai, 2001). Ultimately, public procurement is viewed as a key and vital economic activity for good governance (Kashap, 2004:133). The management of resources and execution of sound governance combine to optimise the quality of service delivery with increased social and economic benefits to society.

Within the context of the United Nations Development Programme (UNDP, 2010:5), public procurement is defined from a process perspective as “acquiring goods, civil works and services, which includes all functions from the identification of needs, selection and solicitation of sources, preparation and award of contract, and all phases of contract administration through the end of services”. This is also supported by the Organisation for Economic Co-operation and Development (OECD) (2015), which also defines a public procurement process as a systematic way of accessing needs, awarding and managing contracts, and receiving payment. According to McKevitt and Davis (2015:79), the public procurement process consists of three stages: Pre-tender, Tender, and Post-contract award. These broad categories have a variety of other processes embedded in them as shown in Figure 2.2. The figure shows an elaborate sequence of steps and processes utilised within the United Nations.

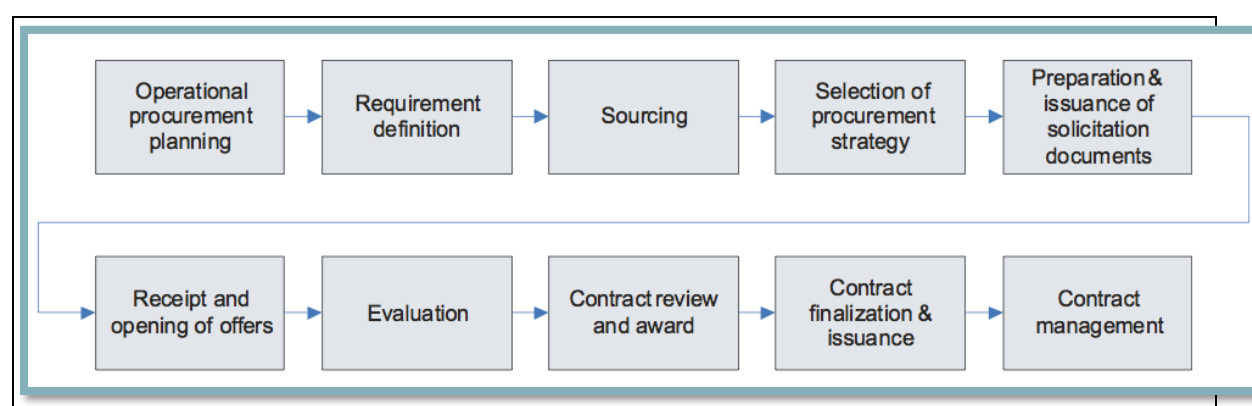


Figure 2.2: The procurement process

Source: UN Procurement Practitioner’s Handbook (2006:31)

Figure 2.2 indicates the procurement process used in the United Nations. It shows that there are ten steps in the procurement process. The first step is operational procurement planning. Procurement planning clarifies what is needed and when it is needed for both user and buyer. Furthermore, it allows for efficient and coordinated actions to acquire goods and services timeously and at a reasonable cost (UN Procurement Practitioner's Handbook, 2006:32). Thus, the first step involves a significant amount of research to gather all the necessary information to guide the procurement process. The second step of the procurement process is procurement definition. This step involves providing a detailed explanation and description of what will be procured (e.g. technical attributes, quality, quantities, budget, etc.) and specifying the requirements regarding reference (UN Procurement Practitioner's Handbook, 2006:37). The critical value of this stage is that it provides an opportunity for competition and fairness in the procurement process by providing as much information as is necessary for bidders to determine their eligibility or capacity to bid. The third stage of the procurement is sourcing. The ultimate purpose of this step is to identify suitable suppliers to invite to the bidding process. Sourcing is conducted through a thorough analysis of the market to determine appropriate products and services on the market and qualified suppliers available to provide those products and services (UN Procurement Practitioner's Handbook, 2006:53). Based on the market research the bid is then advertised as widely as possible to get a wide variety of suppliers.

Selection of a procurement strategy is the fourth step in the UN procurement process and includes determining the choice of the type of arrangement and/or contract to be concluded; choice of the procurement method; and the type of competition to be adopted to purchase the required goods/services/works (UN Procurement Practitioner's Handbook, 2006:60). Once a procurement strategy has been formulated and approved, the next step is to prepare and issue solicitation documents. These solicitation documents are an assemblage of all the necessary information formally provided to potential suppliers to enable them to offer a quotation, bid or proposal to provide the required goods, services or works. The solicitation documents also specify the evaluation criteria for the submissions, providing grounds for fair adjudication of any submitted bids by suppliers (UN Procurement Practitioner's Handbook, 2006:72).

It is expected that once solicitation documents are shared with potential suppliers there will be responses. Thus, the next stage is the receipt and opening of offers from suppliers. The proposals are basically handled according to the instructions provided in the solicitation documents, ensuring that transparency and confidentiality are maintained as specified in the

relevant regulations, rules and procedures (UN Procurement Practitioner's Handbook, 2006:83). The bids are then evaluated based on the stated criteria designed to provide the best value for money. In other words, the evaluation process is designed to determine the best return on investment of the procurement of goods, services or works (UN Procurement Practitioner's Handbook, 2006:89). Once the evaluation is completed, the next step is the contract review and award (UN Procurement Practitioner's Handbook, 2006:101). Once the contract has been reviewed and approved it is then finalised and issued to the prospective supplier as an offer which they can potentially accept or decline. However, it is at this stage that the state-owned enterprise and the supplier come into a contractual agreement through the signing of a contract specifying the terms of agreement (UN Procurement Practitioner's Handbook, 2006:106). It is at this stage also that unsuccessful bidders are informed about the outcome of the process. The final step of the UN procurement process is contract management. This entails project management functions to ensure that all parties to the contract fully meet their respective obligations as efficiently and effectively as possible, delivering the business and operational outputs required from the contract and providing value for money (UN Procurement Practitioner's Handbook, 2006:120).

Beyond utilising public procurement as a policy tool or the management of national resources and quality service delivery, it also has a focus on bidders. According to Kelman (1990:11), public procurement has conventionally had three primary goals: equity – or providing fair access to all bidders; integrity – or avoiding corruption; and economy and efficiency. These objectives enable competitive and fair bidding among suppliers. However, it remains crucial for public procurement to achieve the highest value at minimum cost (Bergman & Lundberg, 2013:75).

This section discussed the conceptualisation of public procurement. The literature indicated that public procurement is essential because it provides a link between government and business in addressing socio-economic challenges among the citizenry. It further emerged that government often uses public procurement to achieve social policy objectives. Also, the literature revealed that public procurement could be a viable tool for managing national resources thus improving service delivery and the well-being of citizens. The next section discusses the evolution of public procurement.

2.3 EVOLUTION OF PUBLIC PROCUREMENT

This section provides a brief overview of the evolution of public procurement from its early origins. Historical evidence of public procurement is found in Syria between 2400 and 2800 B.C. (Coe, 1989:87) and in China and a Greek colony in 800 B.C (Thai & Grimm, 2000:11). Before 1800, in the United States, public procurement was outsourced to commissioners who supplied the government with goods and services and were paid a commission (Thai, 2001:11). In the late 1800s, there was a proliferation of boards set up to play purchasing functions for government institutions. It is reported that Oklahoma was the first state government to create such a committee in 1810 (Thai, 2001:11). Other states followed in subsequent years. For example, the City of Chicago, Illinois (1898), City of Philadelphia, Pennsylvania (1903), City of Minneapolis, Minnesota (1911) and City of New York (1917) (Thomas, 1919:27; Thai, 2001:12). The developments in public procurement evolved over many years culminating in the creation of the 2000 Model Procurement Code for State and Local Governments (American Bar Association, 2000:101; Thai, 2001:13).

In recent years, the World Bank, the OECD and the Asia-Pacific Economic Cooperation (APEC) have made different contributions to the development of well-functioning public procurement systems (Roos & De La Harpe, 2008:7). For instance, the Development Assistance Committee (DAC) developed guidelines for a model public procurement system. The major tenets of a well-functioning public system were stated as integrity and transparency. Furthermore, it was stated that to foster accountability and compliance, there would be a need for independent auditing. Compliance would be further reinforced by the presence of administrative and judicial bodies with adequate legal powers to impose remedial measures for any breach of set regulations (Roos & De La Harpe, 2008:8). The World Bank developed a Country Procurement Assessment Report (CPAR) designed to establish the state of the public procurement system in a country. In 1999, the APEC instituted the development of the Non-Binding Principles on Government Procurement (NBPs). These principles are value for money, open and active competition, fair dealing, accountability and due process, and non-discrimination (Roos & De La Harpe, 2008:9).

One of the major factors linked to the development of public procurement systems globally is the need by governments to link it with addressing social and economic issues such as reducing unemployment, improving health and education outcomes and promoting small businesses

(McCrudden, 2007:93). On the economic front, governments have also viewed public procurement as a tool to stimulate economic development and innovation (Uyarra & Flannigan, 2010:1; Edler & Georghiou, 2007:949).

Historically, public procurement focused on awarding bids based on criteria that ensured the highest quality good or service possible for the least cost (McCue & Gianakis, 2001:72). However, there is now a shift towards broadening the practice, also looking at sustainability and environmental goals when awarding bids to suppliers (Portney, 2003:15). Furthermore, the enactment of legal and regulatory frameworks to guide procurement procedures remains a critical element in the evolution of public procurement (Adewole, 2014:18).

A key challenge in the development of public procurement has been and remains around the shortage of skills among public procurement practitioners (Addo-Duah, Westcott, Mason, Booth & Mahamadu, 2014:3). It has been observed that even where there are necessary procurement legislation and frameworks, public procurement remains inefficient and ineffective when there are no sufficiently skilled staff (Appiah, 2011). Given the increase in the use of technology in procurement and the need to deal with private sector suppliers, the skills set for public procurement practitioners has been expanded. According to Addo-Duah *et al.* (2014:4), Basheka (2010:1) and Tassabehji and Moorhouse (2008:56), general sector procurement practitioners now require technical, strategic, interpersonal, and managerial skills to be effective.

This section has shown that public procurement has a long history with procurement boards being established in the US in the 1800s. Institutions such as the World Bank, OECD and APEC have played significant roles in creating public procurement systems. This has influenced governments utilising public procurement systems to purely purchase goods and services to address social and environmental challenges. It is also evident that a lack of skilled personnel afflicts public procurement systems.

2.4 PUBLIC PROCUREMENT IN THE INTERNATIONAL CONTEXT

This section analyses literature on public procurement from an international perspective. Governments across the globe are implementing public procurement policies as a way of purchasing goods and services while also pursuing a variety of policy objectives (Keulemans

& van de Walle, 2017:329). In Europe, various governments have embraced this practice with a greater focus on achieving more significant benefits to the public (Harland, Telgen & Callender, 2013:375). The utilisation of public procurement for social, economic, and environmental goals was reported close to two decades ago (McCrudden, 2004:257).

Public procurement typically involves vast amounts of money - making government a large buyer. In the European Union, public procurement represents about 17 percent of GDP. Such a magnitude of financial resources suggests that government can impact the market through procurement (Jaehrling, 2015:1). More specifically, public procurement is used to drive innovation both in the private and public sectors (European Commission, 2011:6; Rolfstam, 2012:304; Uyarra & Flanagan, 2010:124). Furthermore, public procurement is used to protect national jobs or national industrial champions, to safeguard vital national interests, or to protect national industries against international competitors (Morettini, 2011:187; Edquist & Zabala-Iturriagagoitia, 2012:6). This is achieved through favouring local suppliers to provide goods and services.

In the US, public procurement is referred to as government contracting and accounts for 15 percent of the total annual federal budget (Snider, 2013:396). Furthermore, public procurement in the US serves as the means by which public goods and services are acquired through contracts with private firms, ranging from municipal services to major weapon systems such as ships, aircraft, and tanks for national defence (Snider & Rendon, 2012:331). Contracting is also used as an administrative function (Snider, 2006:276) to support domestic suppliers and to promote sustainable procurement or “green procurement” (Ganley, 2013:2).

Public procurement also contributes towards service delivery in many African economies. For example, in Nigeria, public procurement has excellent potential for contributing towards the provision of housing and transportation (Mahamadu, Manu, Booth, Olomolaiye, Coker, Ibrahim & Lamond, 2018:2). In Ghana, public procurement has notably improved the provision of water and sanitation and road infrastructure (Foster & Pushak, 2011:1). However, to achieve significant improvements in all these areas, there is a need for adequate skills and capacity within the public procurement system. Unfortunately, in Nigeria, public procurement is fraught with challenges including inadequate capacity (Adewole, 2014:19). Some of the recurrent problems include a lack of professionalism in the execution of the procurement functions; lack of streamlined quality control practices; and lack of knowledge in electronic procurement

(Evenett & Hoekman, 2005:26-30). Despite the enactment of the Public Procurement Act 2007, and other statutes to harmonise public procurement practices and policies, challenges remain (Adewole, 2014:19).

The public procurement sector in Kenya is divided into two categories, namely, project-specific procurement and general consumable procurement. Project-specific procurement refers to the acquisition of goods and services from suppliers for particular government projects while general consumable procurement relates to the purchase of products and services for the functioning of state institutions (Njogu & Gichinga, 2016:197). The government of Kenya enacted legislation to regulate procurement practices with a major focus on maximising economy and efficiency, promoting competition and ensuring that competitors are treated fairly, promoting the integrity and fairness of procurement procedures, increasing transparency and accountability in those procedures, increasing public confidence in those procedures, and facilitating the promotion of local industry and economic development (Njogu & Gichinga, 2016:197). Although there are still significant challenges in public procurement in Kenya, the government has made significant attempts to professionalise public procurement practices in Kenya (Andrew, 2009:103).

The preceding discussion shows that there are commonalities in public procurement across the globe. For instance, public procurement constitutes a significant share of the GDP in Europe, US and Africa and it is also used to protect national interests. However, while public procurement is used to drive innovation and market growth in Europe and the US, many African nations focus on using public procurement chiefly for improving the delivery of social services.

2.5 PUBLIC PROCUREMENT IN SOUTH AFRICA

The National Treasury is empowered by the Public Finance and Management Act (PFMA) (76)(4) to drive SCM in South Africa (Watermeyer, 2011:3). Public procurement in South Africa is implemented within a legislative framework designed to ensure optimum outcomes while adhering to good governance practices. In this regard, the legislation defines and enforces procurement procedures that will produce a productive and efficient result while providing that the process is competitive and fair to suppliers (Mazibuko & Fourie, 2017:107). Given the vast sums of money involved, public procurement has become a critical tool for service delivery in

South Africa (Chigudu, 2014:21). At a broader level, public procurement has been utilised as a policy tool designed to address inequality created by the apartheid regime (Bolton, 2006: 201; Turley & Perera, 2014). The procurement reforms instituted by the government in 1995 were precisely aimed at a non-discriminatory and inclusive process that benefited all citizens. Thus, the government has advocated for and implemented an Affirmative Procurement Policy to enable previously disadvantaged populations and business enterprises to participate and benefit from public procurement (Government Gazette No. 17928, 1997:33). Furthermore, the government has also used public procurement to facilitate transfers of money and resources to impoverished communities (Bolton, 2006:200). The next section describes how public procurement is implemented and regulated in South Africa.

2.5.1 How public procurement is implemented in South Africa

Public procurement in South Africa is implemented within the ambit of governance principles prescribed by the South African Constitution of 1996. The elevation of procurement systems to constitutional status was confirmed in 1994 (Bailey, Cloete & Pillay, 2011:36). Section 217(1) of the Constitution stipulates that organs of state must contract for goods and services by a system which is fair, equitable, transparent, competitive, and cost-effective. Based on these principles, public procurement is implemented according to five pillars, namely: value for money; open and effective competition; ethics and fair dealings; accountability and reporting; and equity (Watermeyer, 2011:3). These pillars are critical for the effective implementation of public procurement. They set the foundation for compliance with procurement processes (Ambe & Badenhorst-Weiss, 2012:248). There are also complementary legislative provisions that empower the government to exercise specific controls to deal with cases of non-compliance (Mazibuko & Fourie, 2017:108). These are elucidated below:

- a) **Value for money:** The ultimate and optimum outcome for government is to deliver value to its citizens through high-quality service delivery. However, such service delivery should be provided at a reasonable cost based on a thorough cost-benefit analysis. When procurement of services cripples the government budget, the citizens' social and economic well-being is undermined (Zitha & Mamabolo, 2016:65).
- b) **Open and effective competition:** Competitive procurement processes enable the government to attract a fair number of bidders with a range of skills and capacity and

allows the government to select the most appropriate service provider (Zitha & Mamabolo, 2016:65). According to Asner (2006:7), open and fair competition gives each bidder an equal chance of winning government bids. When this is compromised, both government and society suffer through pilferage of government resources and delivery of poor-quality services by service providers.

- c) **Ethics and fair dealings:** The practice of good governance and ethics in the public sector is crucial for quality service delivery. Public officials are thus required to uphold and demonstrate ethical practices in order not to compromise service delivery. According to Munzhedzi (2013), public officials should not accept gifts and hospitality from bidders. Furthermore, they should declare any conflict of interest to prevent awarding of tenders to families and friends.
- d) **Accountability and reporting:** According to the General Procurement Guidelines issued by the National Treasury (2005:8), accountability and reporting involve ensuring that individuals and organisations are answerable for their plans, actions and outcomes. Within government structures, Accounting Officers take overall responsibility for procurement decisions and should ensure that decisions made are justifiable and in the best interests of the organisation (Muchainyerwa, 2013:2).
- e) **Equity:** The need to redress past inequalities through observance of specific policies is crucial for the government (Zitha & Mamabolo, 2016:66). The Preferential Procurement Policy Framework Act (Act 5 of 2000) is one such policy deliberately designed to address historical injustices through redistribution of wealth. However, although the equity pillar ought to be observed, procurement decisions should be guided by an objective criterion (Muchainyerwa, 2013:2).

The bid process is based on the Preferential Procurement Regulations (2011), which propose a two-step process as follows:

- Step 1: Assess functionality
- Step 2: Assess price and BBBEE

Step 1: Functional analysis

Assessing functionality follows a series of steps to ensure that the bid meets the technical criteria set out in bid documents. The following steps are typically followed:

1. Evaluate submissions against functional criteria.
2. Rate each submission against each criterion.
3. Apply weightings and calculate the total functional score.
4. Eliminate bidders below the functional threshold.

This step is critical in ensuring that bidders with the relevant skills, experience and capacity are considered for tenders. Only bids scoring above the established threshold are considered for the price and BBBEE assessment.

Step 2: Price and BBBEE assessment

According to the Preferential Procurement Regulations (2011), price points can be calculated out of 80 or 90 as follows:

- Price points are out of 80 and BBBEE preference out of 20 for low-value tenders (less than R1m including VAT); and
- Price points are out of 90, and BBBEE preference points out of 10 for high-value tenders (over R1m).

The points are calculated on their tender prices about the lowest acceptable tender, by a prescribed formula, namely:

- contract with persons or categories of persons, historically disadvantaged by unfair discrimination by race, gender or disability;
- the implementation of the Reconstruction and Development Programme (RDP) as published in the Government Gazette No. 16085 dated 23 November 1994; and

- Any specific goal for which a point may be awarded must be explicitly specified in the invitation to submit a tender (Preferential Procurement Policy Framework Act, 2000) (Act 5 of 2000).

The price points and preference points are then added to determine the total. The two-step bid evaluation process mentioned above supports economic development, reduces fraud and corruption, and ensures fairness and transparency. The process is also fair, transparent and provides for a high level of professionalism in bid selection.

2.5.2 Public procurement legislation

The South African government has a robust legislative framework designed to regulate public procurement in the country. The legislation set by government extends from the national level to the provinces and local government spheres (Hanks, Davies & Perera, 2008:45). The legislative framework consists of a series of pieces of legislation that operate in tandem to ensure that the public procurement processes are conducted within the precepts of the law and in fulfilment of government objectives. The legislation provides for the establishment and management of public-private partnerships in the supply management chain (Quinot & Arrowsmith, 2013:185); and the legal recourse in dealing with offences committed by public officials in the course of executing their duties in the procurement of goods and services (Mazibuko & Fourie, 2017:108).

This section provides brief descriptions of the legislations, which give guidelines on the compliance to procurement processes.

a) The Constitution of the Republic of South Africa (1996)

The Constitution is the supreme law that provides the foundation for the democratic principles and values that guide compliance in the procurement of goods and services in the public sector. According to Section 217(1) of the Constitution of the Republic of South Africa, (Act 108 of 1996), all procurement must take place in a manner, which is “fair, equitable, transparent, competitive and cost-effective.” (Hart, 2016:41). Thus, the Constitution serves both as a governance tool as well as a yardstick for compliance in the procurement process. Any failure then to comply with the principles described above undermines the Constitution and is in breach of the law.

b) Public Finance Management Act (No. 1 of 1999)

The Public Finance Management Act (No. 1 of 1999) gives effect to the principles spelt out in the Constitution with regards to public procurement (Hart, 2016:41). Specifically, the PFMA governs financial management practices in South Africa and establishes a regulatory framework for SCM within national, provincial, and state-owned enterprises. The developmental function of the PFMA is that it enables procurement to be utilised as a policy tool thus allowing it to have a broader impact on society (Zitha & Mamabolo, 2016:62). Therefore compliance to the PFMA has the potential to optimise public procurement processes with the effect of improving the quality of service delivery (Zitha & Mathebula, 2015:18).

c) Preferential Procurement Policy Framework Act (No. 5 of 2000)

Parliament approved the Preferential Procurement Policy Framework Act (No. 5 of 2000) and it's revised regulations to adhere to the requirements of the Constitution of the Republic of South Africa (1996). This act gives effect to the government priority of empowering designated categories of persons through preferential treatment in procurement activities.

d) Preferential Procurement Regulations (2011)

This piece of legislation provides specific stipulations and guidance to government departments concerning the procurement process. It is stated in Part 2 (3) (a-b) of the Preferential Procurement Regulations (2011) that “an organ of state must, prior to inviting tenders, properly plan for, and as far as possible, accurately estimate the costs of the provision of services, works or goods for which an invitation for tenders is to be made; and determine and stipulate the appropriate preference point system to be utilised in the evaluation and adjudication of tenders”. The strong emphasis on planning implies that government departments ought to document procurement plans and budgets. This aspect is critical in safeguarding against irregular or wasteful expenditure. The accounting officers become liable for approving procurement plans and ultimately take responsibility for the entire tender process.

e) Promotion of Administrative Justice Act (2000)

The Promotion of Administrative Justice Act (PAJA) (Act 3 of 2000) gives effect to the right to administrative action that is lawful, reasonable and procedurally fair as well

as to the right to written reasons for administrative action as contemplated in Section 33 of the Constitution of the Republic of South Africa (1996). This Act empowers public officials or tender committees to disqualify bidders and not to award a bid to the bidder with the highest score if such decisions are fair, reasonable, justifiable and can be deemed lawful. However, such decisions have to be made with correct judgement, as any error in judgement will result in costly litigations against the state. When lawsuits are brought against the state, service delivery is negatively affected by the transfer of resources from public coffers.

f) The Public Service Regulations (2001)

The Public Service Regulations (2001) articulate the expected conduct of public officials in the execution of their duties. To bring transparency into the public sector, the Act prohibits public officials from receiving gifts in response to performance of their duties. Senior public officials are also required to declare their personal financial interests in private or public companies, directorships and partnerships, and ownership in land and property (Public Service Commission, 2013).

2.5.3 Public procurement legislative framework in South Africa

As indicated earlier, public procurement is located within the broader concept of SCM. Within the South African context, public procurement is guided by a policy framework as articulated by the White Paper on the Transformation of the Public Service (1995), the Public Service Regulations (2001) and the White Paper on Transforming Public Service Delivery (1997) (Nzimakwe & Mpehle, 2012:279).

The White Paper on the Transformation of the Public Service (1995) was conceived at the dawn of democracy in South Africa and was a robust response to the expectations of the previously disadvantaged communities (Nengwekhulu, 2009:342). The White Paper articulated a policy framework that was widely expected to transform the public service to enable it to deliver more value to all citizens (Nzimakwe & Mpehle, 2012:280). Implicit in the White Paper (1995) was the expectation that service delivery was to improve and livelihood options for all citizens expanded. The subsequent White Paper on Transforming Public Service Delivery (1997) explicitly focused on advocating for a value-driven framework that would improve and accelerate service delivery in the country (Maluka, Diale & Moeti, 2014). These

values were embedded in the Batho Pele principles and located people at the centre of all government activities. These principles are consultation, value for money, redress, the development of service standards, access to information, openness, and transparency, as well as courtesy. According to Nzimakwe and Mpehle (2012:282), these principles were regarded as a yardstick by which to measure the performance of the public service.

As indicated in the previous section, SCM in all government bodies works within a legislative framework (Van der Waladt, 2007:204). The SCM framework is based on norms and standards that must create uniformity, namely: fairness, equity, transparency, competitiveness and cost-effectiveness. The framework is presented in Figure 2.3.

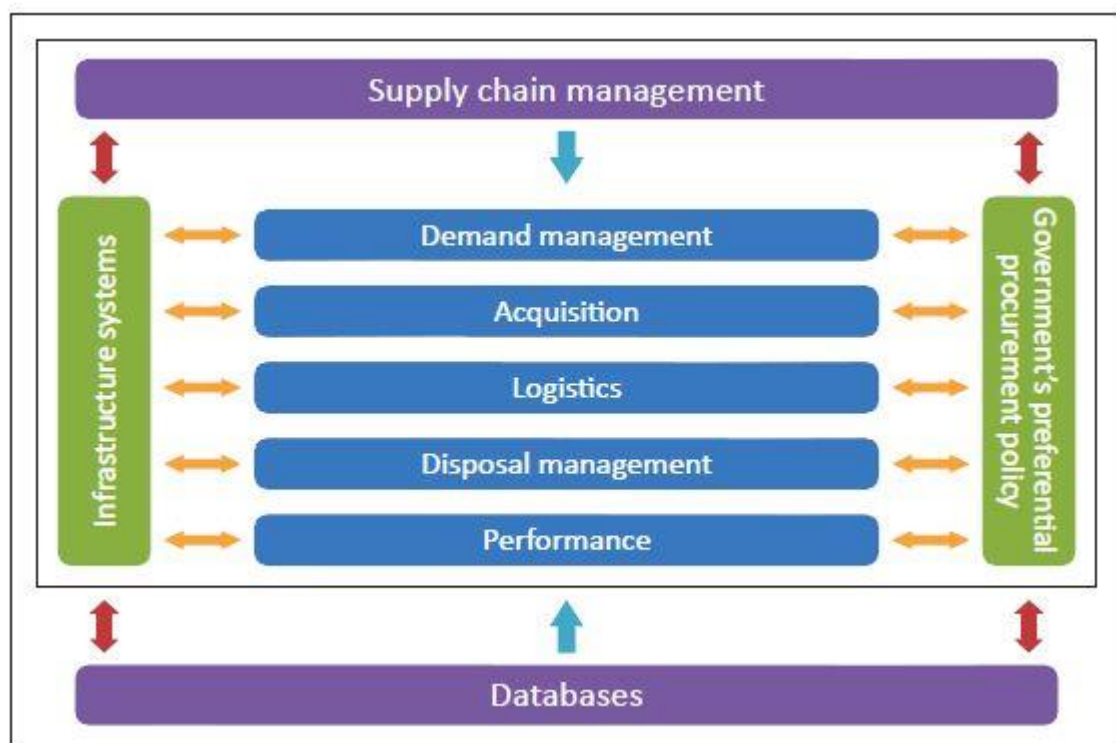


Figure 2.3: Components of the public sector SCM framework

Source: National Treasury (2005:10)

The framework in Figure 2.3 presents the government's commitment to redistribute wealth through the Preferential Procurement Policy. The framework also demonstrates the significance of infrastructure in the delivery of quality services. However, to guide procurement, the framework has five components, namely: demand management, acquisition,

logistics, disposal management and performance. These components are briefly described below.

Demand management: This component sets off the SCM process and involves needs analysis, budgeting, drafting procurement specifications and identifying potential suppliers (Van der Waldt, 2007:205).

Acquisition management: This component involves developing a procurement strategy and plan. The bulk of the activities cover the whole process from preparing bid documents to advertising, adjudicating, awarding and signing contracts with suppliers guided by the Preferential Procurement Policy Framework Act 5 of 2000, the Broad-Based Black Economic Empowerment Act 53 of 2003 and the Municipal Finance Management Act 56 of 2003.

Logistics management: This stage of SCM involves contract and inventory management. The process includes ordering, receiving and coding stock items, distributing stock to customers and managing the warehouse and the transport fleet (Van der Waldt, 2007:205; MFMA [circular 22], 2006:46).

Disposal management: This stage becomes relevant when specific stock becomes redundant and must be disposed of. Proper procedures for determining such stock are employed, and records of all such stock disposed of are maintained as articulated in the disposal policy.

Performance management: This aspect of the framework involves monitoring of the SCM to determine whether or not the intended objectives were met. This is critical for improving the performance of the SCM (Ambe & Badenhorst-Weiss 2012:14).

2.5.4 Benefits or milestones to date

Since the dawn of democracy in 1994, the government has been focused on reforming SCM to introduce international best practice and improve financial management. The reform processes led to the approval of the SCM Policy in 2003 (Ambe, 2016:282). In support of the reform processes, the National Treasury has been instrumental in establishing a legislative framework for the implementation of public procurement at national, provincial, and municipal levels. The Public Finance Management Act (PFMA) and the Municipal Finance Management Act

(MFMA) have been the critical legislation driving public procurement towards being fair, equitable, transparent, competitive, and cost-effective (National Treasury, 2015:7). Through policy reform, the government public procurement became a policy-implementation tool to achieve social and economic development outcomes (National Treasury, 2005:8; McCrudden, 2004:257).

In order to address some of the challenges in public procurement mentioned above, government established the Office of the Chief Procurement Officer to ensure that the procurement system functioned in line with the Constitution and all relevant legislation, and to manage the way in which government does business with the private sector (National Treasury, 2015:6). This, and other developments in public procurement, are expected to save approximately R25 billion a year while stimulating economic growth (National Treasury, 2016:1).

Furthermore, to redress historical imbalances the Preferential Procurement Regulations (2011) were promulgated and implemented in association with the Broad-Based Black Economic Empowerment (BBBEE) policy (Ambe, 2016:283; Bolton, 2016:9; Balshaw & Goldberg, 2008:75).

The government has established an important initiative for supplier development. The Strategic Partnership Programme (SPP) initiated through the Department of Trade and Industry (DTI) is focused on encouraging large private-sector enterprises in partnership with government to support, nurture and develop small to medium-sized enterprises (SMEs) within the partner's supply chain (Molver & Noeth, 2017:214).

Although the government has put in place a legislative framework to guide public SCM, there are still challenges related to non-compliance. However, the office of the Auditor-General (AG) has played a role in ensuring accountability by the various accounting officers and authorities. According to the National Treasury (2015:8), some of the issues of non-compliance reported by the AG include:

- Appointment of suppliers who are not tax-compliant
- Failure to use competitive processes for quotations and bids
- Incorrect use of the preference points system

- Lack of appropriate bid committees
- Use of unqualified suppliers
- Passing over of bids for incorrect reasons
- Use of improper procurement processes about threshold values for quotations and competitive bidding
- Extension of validity periods
- Improper use of the limited bidding process
- Inadequate controls and procedures for handling bids
- Appointment of bid committee members not aligned with policy requirements
- Insufficient motivations for deviations from SCM procedures.

Numerous cases have also been reported where tenders have been awarded without adherence to proper procedures (Auditor General South Africa [AGSA], 2014:18,47,86,157) and mainly to friends and family (Mazibuko & Fourie, 2017:111). Thus, the role being played by the Auditor-General is vital in arresting the pilferage of public resources. If the public procurement system were further improved, it is likely to result in goods, services and infrastructure being acquired at lower costs, economic growth, and innovation. As already demonstrated, the integration of public procurement and BBBEE legislation can provide enormous social and economic change (Hart, 2016:41).

2.5.5 Challenges of public procurement in South Africa

Public procurement faces many challenges, including lack of proper knowledge, skills and capacity as well as inadequate monitoring and evaluation of SCM (Ambe & Badenhorst-Weiss, 2012:249), non-compliance with SCM policy and regulations, unclear roles and responsibilities (Horn & Raga, 2012:80), lack of accountability (Gordhan, 2014:28), as well as widespread corruption and unethical practices (Munzhedzi, 2013:284). Some of the challenges emanate from a lack of proper governance (Manyaka & Sebola, 2013:76). Public officials engage in unethical practices when they pursue personal interests at the expense of public interests and in contravention of public procurement procedures (Tutu, Kofi, Nyako, Ameyaw & Ampofo, 2014:3). Chigudu (2014:21) asserts that large amounts of money flow through public procurement. Public procurement is fundamental to government service delivery as it often involves large sums of money (Chigudu, 2014:21). Mazibuko and Fourie (2017:107) further

suggest that these large sums of money provide the temptation for unethical conduct. The unethical behaviour is usually manifested through corruption, bribery, fraud, and nepotism (Zitha & Mathebula, 2015:21).

The risk and potential for engaging in unethical practices exists throughout all the stages of the procurement process. During the pre-bidding phase, a lack of adequate needs assessment by public officials could lead to poor procurement planning and budgeting (Reinvest Institute for Development Research (RINVEST)/Center for International Private Enterprise (CIPE), 2012:17). According to the National Treasury (2015:10), further challenges emanate from the incorrect interpretation and application of procurement processes.

During the bidding, process information may be restricted to a select group of bidders resulting in a procurement process that is uncompetitive and unfair. This is typically fueled by the failure to furnish all vendors with appropriate documentation to support tender procedures (AGSA, 2014:60,68). Uncompetitive or unfair procurement processes become evident in such situations (Ngugi & Mugo, 2012:2314-2315). Such circumstances are in direct conflict with the requirements in public procurement that indicate that the procurement process should be handled in a manner that promotes competition thereby limiting discrimination against any bidder (Khumalo, Nqojela & Njisane, 2011:2). A large number of uncompetitive or unfair procurement cases have been recorded in the public sector in South Africa over the years. For instance, 222 cases were recorded in 2013/14; 226 cases in 2014/15; and 247 cases in 2015/16 (AGSA, 2014:18,47,86,157). Such statistics demonstrate the magnitude of the problem of uncompetitive or unfair procurement processes, which suggests that some suppliers are likely to have faced discrimination.

As other statistics show, there have also been some discrepancies in the awarding of tenders where employees and family members of public officials benefited. For instance, in 2013/14 there were 36 cases in which employees were awarded tenders worth R119 million; 27 cases in 2014/15 worth R101 million; and 29 cases in 2015/16 valued at R129 million. There were also 39 cases of tender awards given to close family members of public officials with a value of between R1million and R52 million in 2013/14; 47 cases with a value of R994 million were reported in 2014/15; 51 cases were reported in 2015/16, valued at R725 million (Mazibuko & Fourie, 2017:111).

Finally, after bids have been awarded public officials may lack the means to monitor the performance of service providers resulting in poor quality services (Reinvest Institute for Development Research (RINVEST)/Center for International Private Enterprise (CIPE), 2012:17). In most instances, there are no appropriate performance measures in place (AGSA, 2013:70). Contract management is a challenging aspect of the procurement process involving the alignment of values and priorities with external market conditions (Durant & Durant, 2013:157). Furthermore, contract management demands superior relationship management skills to ensure that service providers deliver on their contractual obligations (Pollitt & Talbot, 2004:94-95). Contract management is further negatively impacted by a general lack of proper record keeping and management (AGSA, 2014:18,31).

Leadership plays a crucial role in the management of public institutions. The role of leadership in the procurement process is often questioned for lack of professionalism (Eyaa & Oluka, 2011:38) and poor ethical conduct (Valentine, Hollingworth & Eidness, 2014:139-140). However, there are huge expectations on public officials to conduct themselves in a manner that results in the safeguarding of national resources and assets. According to the Committee for Standards in Public Life (Chapman, 2000:230-231), there are seven principles that public officials have to uphold and exercise while in office. These are described in Table 2.1.

Table 2.1: The Nolan Committee’s seven principles of public l

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Principle	Explanation
Selflessness	Holders of public office should act solely regarding the public interest. They should not do so to gain financial or other benefits for themselves, their family, or their friends.
Integrity	Holders of public office should not place themselves under any financial or other obligation to outside individuals or organisations that might seek to influence them in the performance of their official duties.
Objectivity	In carrying out public business, including making public appointments, awarding contracts, or recommending individuals for rewards and benefits, holders of public office should make choices on merit.

Accountability	Holders of public office are accountable for their decisions and actions to the public and must submit themselves to whatever scrutiny is appropriate to their office.
Openness	Holders of public office should be as open as possible about all the decisions and actions that they take. They should give reasons for their decisions and restrict information only when the broader public interest demands it.
Honesty	Holders of public office have a duty to declare any private interests relating to their public responsibilities and to take steps to resolve any conflicts arising, in a way that protects the public interest.
Leadership	Holders of public office should promote and support these principles by leadership and example.
Selflessness	Holders of public office should act solely regarding the public interest. They should not do so to gain financial or other benefits for themselves, their family, or their friends.

Source: Chapman (2000:230-231)

The cumulative effect of unethical conduct by public officials robs citizens of value and tarnishes the image of government (Manyaka & Sebola, 2013:76; Mazibuko & Fourie, 2017:107).

This section discussed multiple aspects of public procurement in South Africa. It has been shown that public procurement in South Africa is being used to a greater extent to redress historical inequality in access to economic resources and social services. Public procurement is also implemented within a legislative framework that guides procurement processes and enforces compliance with legal requirements. The public procurement framework is also guided by values and principles such as the Batho Pele principles.

Public procurement has enabled improvements in service delivery and promoted business development for previously disadvantaged communities through preferential procurement. However, the public sector is beset by challenges that have also affected procurement. For example, unethical practices such as corruption and fraud, and awarding of tenders to friends

and family are rife. The public sector also experiences capacity constraints and a lack of appropriate skills and expertise. Leadership is also lacking thereby demanding the promotion of credible, authentic, and accountable leaders to ensure that public procurement is professional.

2.6 CHAPTER CONCLUSION

This chapter aimed to discuss public procurement from a broad perspective, then focusing on the South African context. Specific issues discussed in the chapter include the conceptualisation of public procurement, the evolution of public procurement, and international procurement practices. The chapter also explained how public procurement is practised in South Africa. It emerged that the government of South Africa is using public procurement as a policy tool to redress historical inequalities. The government has also put in place a legislative framework geared towards ensuring that public procurement is performed within the ambit of the law. The chapter further indicated that there are still significant challenges besetting public procurement. These challenges include a variety of unethical practices such as corruption, fraud and awarding of bids to family and friends by public service officials in procurement. Having set the public procurement context, the next chapter focuses on discussing e-procurement in the public sector.

CHAPTER 3

THE EVOLUTION AND STATE OF E-PROCUREMENT

3.1. INTRODUCTION

This chapter discusses literature focusing on e-procurement. The discussion aims to establish an understanding of the evolution and state of e-procurement, especially in the public sector. The chapter commences with a discussion on the conceptualisation of e-procurement. This builds further on the understanding of procurement and the SCM system discussed in Chapter Two. Key milestones in the development of e-procurement to the current situation are presented. It is important to understand the origins of e-procurement and how ICT has played a central role in its adoption. Factors contributing towards the adoption of e-procurement are discussed. It is incumbent upon organisations to be aware of the various factors required to be addressed in order to successfully facilitate the adoption of e-procurement. The benefits associated with the use of e-procurement as well as the challenges or barriers noted in literature are also discussed. The awareness of both the benefits and the challenges of using e-procurement is critical for decision making and resource allocation in both the private and public sectors. The state of e-procurement in the South African public sector is also discussed and it gives an overview of e-procurement development and practices. The challenges impeding the widespread adoption of e-procurement in the South African public sector are highlighted. In summary, the chapter provides an understanding of e-procurement in general and sets the context for the development of a framework for the implementation of e-procurement in the South African public sector.

3.2. CONCEPTUALISATION OF E-PROCUREMENT

This section focuses on defining e-procurement. Various definitions are presented and discussed to provide a spectrum of views regarding e-procurement. The key and specific elements of e-procurement are also highlighted to provide clarity on its nature and form. Electronic procurement is also discussed in the context of SCM, highlighting the automation of various aspects.

3.2.1 Definition of e-procurement

Earlier definitions of e-procurement characterised it as a modern way of using electronic tools, such as the Internet and e-mail for business-to-business purchases online (Presutti, 2003:219). The transition from traditional procurement to e-procurement was a significant milestone in the history of procurement. The introduction of the Internet was viewed as modernising procurement and transforming how organisations conducted business (Kishor, Sajeew & Callender, 2007:72). According to Nkwe (2012:39), the introduction of the Internet and the widespread adoption of ICT have greatly influenced the proliferation of e-procurement. More and more organisations adopted e-procurement in order to be able to do business with the early adopters of the technology. The early adopters were viewed as progressive and as such the adoption and use of e-procurement became a source of competitive advantage (Chirchir, Ngeno & Chepkwony, 2015:26). However, in its most basic form, e-procurement is an automated, Internet-based way for a company to purchase the goods and services it needs to conduct business (Salkute & Manager, 2013:108). According to Nawi, Roslan, Salleh, Zulhumadi and Harun (2016:330), e-procurement converts the traditional manual procurement process to electronic-based procurement on the Internet. This definition is supported by Kohli (2012:258) who states that "...e-procurement is basically conducting on the internet the equivalent of the manual tendering process, with the ostensible objective of enhancing transparency and efficiency of public procurement". The traditional manual procurement practices in the public sector included cumbersome paper-based procedures that were time-consuming (Korir, Afande & Maina, 2015:62; South African National Treasury, 2015:5). Thus, the e-procurement system simplifies the process and enables businesses and government agencies to procure goods and services from their suppliers electronically. However, the purpose of e-procurement remains the same as with traditional paper-based procurement processes (Zhu & Islam, 2012:14).

According to McCue and Roma (2012:5), e-procurement is the use of information technology to facilitate business-to-business purchase transactions for materials and services. Waruguru and Kiruri (2015:303) and Uddin (2015:1) further posit that e-procurement is the business-to-business or business-to-consumer or business-to-government purchase and sale of supplies, work and services through the internet as well as other information and networking systems such as electronic data interchange (EDI). This definition indicates that e-procurement systems can be adopted and utilised in both the business and public sectors. The online system enables linkages between buyers and suppliers of goods and services, as well as customers. Thus, e-

procurement is presented as a framework that guides the seamless application of ICT along the supply chain to accomplish a business goal. This framework also applies to the public sector where e-procurement has been used to improve service delivery (Waruguru & Kiruri, 2015:304).

3.2.2 Core characteristics of an e-procurement system

The preceding section has discussed the various definitions of e-procurement. This section takes the discourse further by outlining the core capabilities that a procurement system ought to have in order to be considered as an e-procurement system. The ten characteristics developed by Lankford (2004:302) are highlighted below.

- **Requisitioning:** An e-procurement system must have the functionality to generate requisitions for goods and services. As such, the buyers must have access to the system and request orders for goods and services as the need arises.
- **Approval routing and workflow:** An e-procurement system contains workflow capabilities and the ability to set up automatic approval routings by goods, services, dollar value and any combination thereof. If one or more element of the requisition is not acceptable, the requisition is denied, and a message is sent to the originator of the requisition with reasons why it is rejected.
- **E-purchase order:** An e-procurement system must be able to generate an automated purchase order. This is critical for buyers as the purchase order contains all relevant data pertaining to the order including the goods and services being ordered.
- **E-receipts:** An e-procurement system must also be capable of automatically producing and delivering a goods and services receipt when appropriate. To enable this, the system should integrate with barcode scanners to allow for automatic recognition of delivered goods.

- **E-invoicing:** An e-procurement system should be capable of accepting and processing electronic invoices in order to trigger the payment process for delivered goods and services.
- **E-payment option:** E-procurement should support multiple electronic payment options such as purchasing cards, electronic fund transfer (EFT), electronic cheque and automatic cheque printing.
- **Taxation support:** The system should be capable of understanding relevant taxation codes and linking into standard tax tables to allow the buyer to accurately compute tax, reconcile tax charged by suppliers and determine any exemptions the organisation is eligible for.
- **Alerts:** The system must also be capable of raising alerts whenever an approval is required, an invoice is received with associated goods, an invoice contains inaccuracies, a payment is due, or another important user defined (and user definable) event occurs.
- **Self-service supplier portal:** an e-procurement system should enable suppliers to access the system in order to register, update profiles and send invoices for payment.

3.2.3 The e-procurement process

In the private sector, Schneider (2007:5) and Ageshin (2001:48) suggest that business-to-business (B2B) or electronic commerce (e-commerce) is also referred to as e-procurement. From this perspective, e-procurement is viewed as a business management tool that integrates the functional processes of procurement and purchase management (Shukla, Khan & Shah, 2016:2). Nawi *et al.* (2016:330) and Shalle *et al.* (2013:308) further elaborate on the definition by stating that e-procurement is an end-to-end application spanning across the entire procurement value chain. The use of integrated IT processes enables organisations to automate parts of or all the procurement functions, from the beginning to the end, that is from searching, sourcing, negotiating, ordering, and receipt, to post-purchase review. Podlogar (2007:713) outlines a series of steps that constitute the e-procurement process originating from the buyer side to the supplier's side (refer to Figure 3.1).

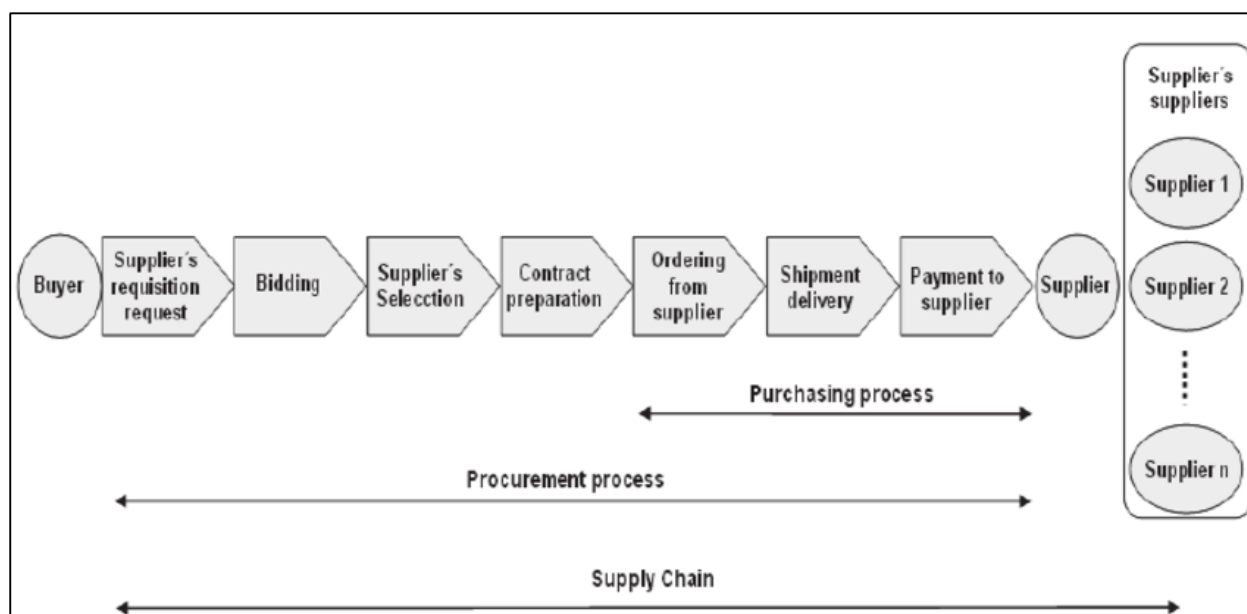


Figure 3.1: Main concepts in e-procurement

Source: Podlogar (2007:713)

According to Podlogar (2007:713), the buyer commences the process through an open request for suppliers based on a request for supply of a specific service(s) or goods. Eligible suppliers will then submit their bids for evaluation by the organisation. Once the evaluation is complete the bidder who meets the stipulated evaluation criteria is then selected and the contract drawn up to ensure that the required services or goods of a specified quality are supplied at an agreed price. An order is then placed and the supplier sources and delivers the goods to the buyer. Upon receipt of the goods the buyer then prepares and processes payment for the supplier.

According to Alor-Hernández, Robles and Sanchez-Ramirez (2011:713), it is important to map out the procurement process to ensure that all suppliers, manufacturers and distributors that use transactions to purchase, manufacture, assemble, or distribute products and services to the customers are included. Therefore, Figure 3.1 is critical in mapping the e-procurement process to determine which aspects can be automated.

According to the United Nations (2006:152), the e-procurement process is implemented in two phases, namely, the pre-award phase and the post-award phases. The pre-award phase comprises the following processes: e-Notification, e-Submission, e-Evaluation and e-

Awarding. The post-award phase consists of the following processes: e-Ordering, e-Invoicing, and e-Payment. The e-procurement process is part of the SCM system and replaces parts of the traditional procurement system. Figure 3.2 shows how e-procurement fits into the tendering process.

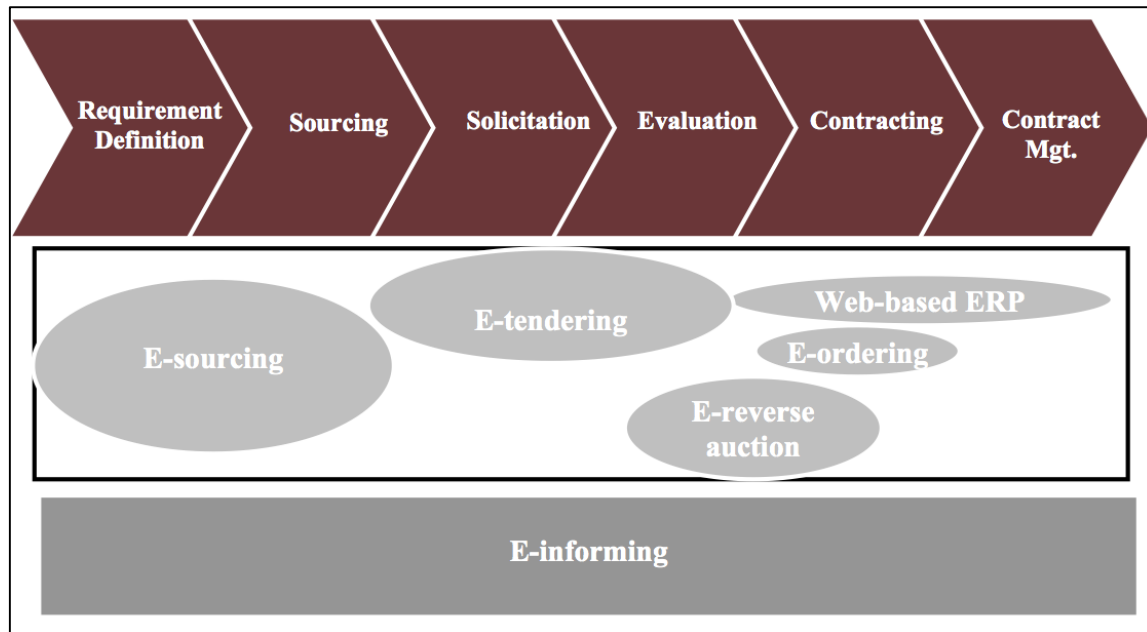


Figure 3.2: E-procurement in the procurement cycle

Source: United Nations (2006:152)

The e-procurement aspects supporting the traditional tendering process are explained below (United Nations, 2006:152):

- E-sourcing supports the specification phase; it identifies suppliers that can be used in the selection phase.
- E-tendering supports the selection phase; it facilitates the Request for Expressions of Interest (REOI), Invitation to Bid (ITB) or Request for Proposals (RFP) activities, usually including support for the analysis and assessment activities.
- E-reverse auctioning supports the contract phase; it enables closing a deal with a supplier;
- E-ordering and web-based ERP is the process of creating and approving procurement requisitions, placing purchase orders, as well as receiving goods and services ordered, by using a software system based on the Internet.

- E-informing is not directly associated with a phase in the procurement process; it is the process of gathering and distributing procurement information both from and to internal and external parties using Internet technology.

The terminology used above is confirmed by McCue and Roma (2012:216), who also state that such technologies like electronic notice, electronic auction, electronic catalogue, electronic dossier, electronic submission, and electronic signature are integral to procurement processes in the public sector. However, there are some variations in the terminology used by different authors. For example, Mose, Njihia and Magutu (2013:377) use e-Tendering, e-Marketplace, e-Auction/Reverse Auction, and e-Catalogue/Purchasing to describe the different e-procurement activities and processes. Despite the differences in terminology, all these processes and activities utilise a variety of e-commerce and e-procurement technologies and tools to facilitate communication and transactions (Hashim *et al.*, 2013:836; Laryea & Ibem, 2014:2). Although there is such a wide range of e-procurement activities and processes, organisations selectively adopt those processes that suit their context and circumstances. In the private sector there is more automation of processes, while in the public sector, adoption has been rather slow and highly selective (Ngunyi, 2014:24).

3.2.4 Impact of e-procurement on the SCM system

In order to fully understand e-procurement, it is also necessary to identify the various aspects of the SCM system that it impacts on. According to Jooste and van Schoor (2003:7), e-procurement impacts the SCM system in the following key dimensions:

- **Information integration:** E-procurement enables information sharing and transparency across the SCM system. This information is accessible in real time enabling both buyers and suppliers to make timely decisions.
- **Synchronised planning:** This involves collaborative planning across the supply chain due to the automated linkages.
- **Workflow co-ordination:** The e-procurement system enables the automation of procedures and processes. Thus, workflow co-ordination is focused on coordinating these automated business processes.

- **New business models:** These include different supply and sell-side models that were previously not present in the off-line world.

In summary, the definitions of e-procurement indicate the central role played by ICT and the Internet. Technology has enabled the transformation of traditional paper-based procurement processes to electronic systems which are more efficient. The use of e-procurement processes can be applied at specific stages or throughout the entire SCM system. The use of e-procurement extends beyond business-to-business to also include business-to-consumer and business-to-government. This is because in all cases there are buyers and suppliers of goods and services involved. The use of internet and e-procurement systems have combined to create business opportunities while at the same time introducing the threat of cyber-attacks. The implementation of e-security provides the much-needed security of organisational information and data.

3.3. DEVELOPMENTS IN E-PROCUREMENT

This section highlights the historical developments leading to the emergence of e-procurement and how it has evolved in recent years. This historical account shows the various technological developments that have led to the transformation of traditional procurement to e-procurement. The historical background provides a basis for understanding how e-procurement has impacted procurement in both the private and public sector organisations.

According to Millman (1998:83), e-procurement was first adopted in the 1960s by companies that were using electronic data interchange technology. Electronic data interchange technology is described as an inter-organisational information system using structured data exchange protocols often through value-added networks (United Nations, 2006:148). Literature by Meyer (1967:107) mentions the use of electronic data interchange by buyers and sellers in the health sector. According to Tonkin (2003:2), electronic data interchange technology was used to manage high volumes of materials or information flows. Several authors note that the use of e-procurement was adopted early in hospitals (Halse, 1983:4; Foster, 1988:22; Anders, 1991:31; Carabello, 2001:82). There is also literature to suggest that the use of inter-organisation electronic systems in procurement in the automotive industry have a relatively long history (Ageshin, 2001:49; Chen & Chen, 1997:64; Cooper

& Yoshikawa, 1994:51; Lauer, 2000:366; Mooney, 1985:22). Other industries that adopted e-procurement early include the retail industry (Bamfield, 1994:32; Cunningham & Tynan, 1993:3; White, 2000:6) and the travel industry (Chircu & Kauffman, 2000:59; Malone & Yates, 1989:166).

According to Tonkin (2003:3), most of the history about the adoption and use of e-procurement is in the private sector. There is scant literature discussing e-procurement in the public sector. Tonkin (2003:3) posits that the use of e-procurement in the public sector was mostly in the military and the public health sector.

With the emergency regarding ICT in the 1990s, the discussions about electronic inter-organisational systems shifted towards the use of the Internet for electronic commerce (United Nations, 2006:148). The use of ICT and the Internet influenced the rapid development of e-procurement (Chirchir, Ngeno & Chepkwony, 2015:26). According to the United Nations (2006:148), e-procurement developed in stages from supporting traditional procurement systems to complementing and then to replacing them altogether. These stages are presented in Figure 3.3.

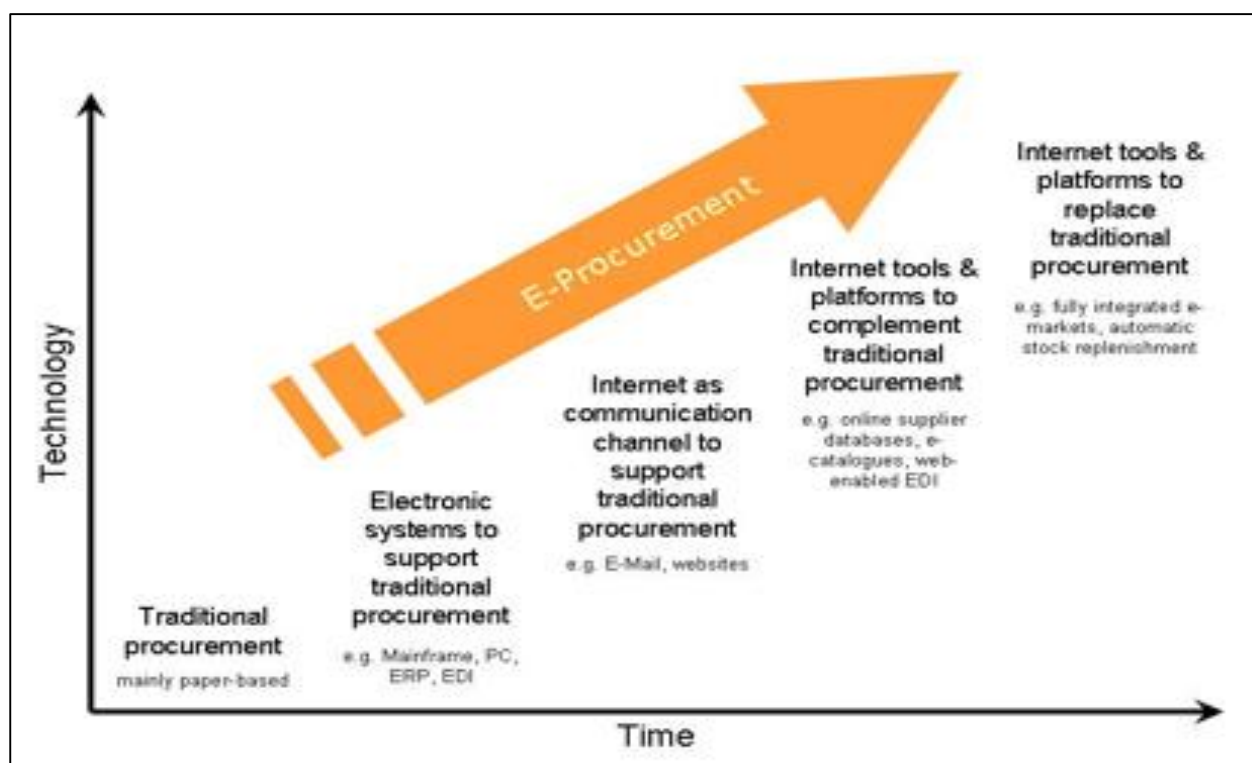


Figure 3.3: Historical development of e-procurement

Source: United Nations (2006:148)

The traditional procurement systems were primarily paper-based and cumbersome. From the paper-based procurement system, electronic systems were developed to support traditional procurement. These include mainframes and personal computers (PC), Enterprise Resource Planning (ERP) and Electronic Data Interchange (EDI). According to the United Nations (2006:149), ERP systems are management information systems that integrate and automate business practices associated with the operations of an organisation. ERP systems were introduced to handle the manufacturing, logistics, distribution, inventory, shipping, invoicing, and accounting processes. The ERP systems were also implemented in support of sales, delivery, billing, production, procurement, inventory management, and human resources management. In addition to aiding the flow of large amounts of information between organisations, the EDI was also used as a communication platform that enabled organisations to exchange electronic messages. These electronic systems thus supported traditional procurement by expediting processes.

The introduction of the Internet provided online-based applications to support traditional procurement. For instance, the use of email facilitates the exchange of electronic messages between buyers and suppliers. Another application that enables organisations to send and receive documents over the internet is the Extensible Markup Language (XML). This application enables organisations to easily share and access tender and other procurement documents (United Nations, 2006:150).

Other internet-based tools that were introduced to support traditional procurement include supplier databases and e-catalogues from which buyers could order goods. According to Baron, Shaw and Bailey (2000:94), e-catalogues are electronic representations of information about the products and/or services of an organisation. The e-catalogues provide detailed information regarding the products and or services available for sale to buyers. This development enables buyers to peruse these e-catalogues online and choose the products they require without physical interaction with suppliers. There are also a variety of other tools that were introduced to replace traditional procurement. These include e-sourcing, e-tendering, e-auctioning, e-ordering and web-based ERP, and e-information (United Nations, 2006:150). These tools have been defined in Section 3.2.3.

For the most part, the organisations that transitioned early from traditional procurement to e-procurement, viewed this shift as a way of enhancing the company's competitive advantage

(Lee, Irani, Osman, Balci, Ozkan & Medeni, 2008:297). Thus e-procurement has been widely adopted by businesses across all industries and to some extent in the public sector based on the desire to gain competitive advantage (Nawi *et al.*, 2016:330). Although the public sector is currently lagging behind regarding adopting e-procurement, it has become a key priority in many public sector institutions (Swalehe, Cheboson & Chepkulei, 2015: 564).

It is clear from the foregoing discussion that the origins of e-procurement date back to the 1960s when the use of data interchange technology started. This technology enabled organisations to handle large volumes of data and information for internal use as well as for sharing with other organisations. It also appears that this technology was mostly being used in the private sector, especially in the automotive industry as well as the retail and travel industries. In the public sector, e-procurement was predominantly used in the military and in hospitals. The rise of the ICT age and digital economy through developments in the use and application of the Internet in business, shaped e-procurement into what it is today. Electronic systems were developed to support traditional procurement and over time further developments led to the replacement of traditional procurement. Even with such developments the public sector is still lagging behind the private sector in adopting e-procurement. However, most governments have made it a key priority to shift towards using e-procurement in the last decade.

3.4. FACTORS CONTRIBUTING TO THE ADOPTION OF E-PROCUREMENT

The adoption of e-procurement remains low, especially within the public sector. This section discusses some of the factors that could facilitate the adoption of e-procurement. The purpose of this discussion is to establish how these factors could enhance the chances of organisations adopting e-procurement.

3.4.1 Leadership and ownership

According to Khanapuri, Nayak, Soni, Sharma and Soni (2011:28), it is incumbent upon organisational leadership to ensure that the environment is conducive for the adoption of e-procurement. The top management is responsible for decision making and as such their involvement is necessary as they will be called upon to make critical decisions in the adoption of e-procurement (Mose, Ninjia & Magutu, 2013:378). According to Subramaniam (2009:26), top leadership should also own the project in order to give support and direction to procurement

practitioners. The United Nations (2011:11) further acknowledge that it is necessary for top management to provide full support and cooperation to the e-procurement initiative as decisions have to be made regarding deployment of resources for successful adoption and implementation.

According to Subramaniam (2009:26), there is a sequential process that organisations can use to approach and implement e-procurement with a higher chance of enabling its adoption (refer to Figure 3.4). According to Figure 3.4, the first step is ensuring that there is leadership involvement from the outset.



Figure 3.4: A schematic approach to adopting a new e-procurement system

Source: Subramaniam (2009:26)

The other steps are discussed in the sections that follow.

3.4.2 Business case for e-procurement

According to Subramaniam (2009:26), it is necessary for procurement practitioners to get the buy-in of management and other users of the system in order to facilitate its adoption. This should be based on a clear business case for the adoption of e-procurement. According to Patel and Khajuria (2016:266), an unclear business case is one of the common barriers to the adoption of e-procurement. Thus, it is important that there is clarity on how e-procurement

contributes to business success. The business problem being addressed should be clearly articulated and the procurement functions targeted for improvement should also be clearly stated as well as understood (Kalakota & Robinson, 2001:203).

3.4.3 Define e-procurement adoption strategy

According to Rajkumar (2001:52), e-procurement adoption can be enhanced if the organisations also commence by defining the e-procurement strategy so that there is clarity on how this will be aligned with the other strategic objectives of the organisation. This is critical in directing the adoption process as well as outlining the roles and responsibilities of all involved. As part of the strategy, the Aberdeen Group (2005:3) suggest that organisations should designate a champion to coordinate, monitor, and manage the deployment of e-procurement technology.

3.4.4 Commit resources for e-procurement adoption

The introduction of e-procurement requires dedicated resources in order to acquire the relevant technology and to set-up the system. As such, organisations have to be prepared to commit resources for the adoption of e-procurement to be possible (Subramaniam, 2009:26). The organisation has to make sure that relevant competencies are available within the organisation or they can be acquired externally. According to Mose, Ninja and Magutu (2013:378), organisations ought to be prepared to commit resources to training staff responsible for using the system as part of strategic decisions that ought to be made.

3.4.5 Evaluate the current procurement system

Before an e-procurement system can be planned for, acquired, and implemented, it is imperative to evaluate the current system in use. This process enables the organisation to make an informed decision pertaining to the elements and capabilities of a new system required (Kalakota & Robinson, 2001:207). The process of evaluating the current system also helps to determine where there are gaps and whether the required solution is to replace the old system or to reengineer specific functions (Presutti, 2003:224). This way the organisation may be in a position to enhance the adoption of e-procurement as well as ensuring attainment of the maximum possible value from the system.

3.4.6 Involve suppliers in the e-procurement project

For the e-procurement system to work, suppliers should be involved and committed to using it for their procurement function. It is suggested that the organisation should gain the suppliers' and users' acceptance of the new system through involving them from the early stages (Patel & Khajuria, 2016:266). This involvement includes ensuring clarity on the technology required and the purpose of transition to e-procurement. Involving suppliers in organisations' e-procurement deployment is important, since it also has a significant impact on suppliers' IT-infrastructure and strategy (Croom & Brandon-Jones, 2007:3). It is also important to demonstrate the benefit of the system to all internal and external stakeholders to get their buy-in. According to Smart (2010:19), the failure to involve suppliers in the e-procurement project can lead to the failure of the system.

3.4.7 Select an appropriate e-procurement application

There are various e-procurement applications that an organisation can choose from depending on their level of automation. Choosing an appropriate application is critical for the successful adoption of e-procurement (Croom & Brandon-Jones, 2007:3). In order to help e-procurement practitioners to select the appropriate e-procurement applications, Kalakota and Robinson (2001:240) suggest four questions that they should ask and answer. The questions are as follows:

- Will the application support the current procurement process?
- Does the application leverage other organisational application investments?
- Will the application work seamlessly with other applications? and
- Is the application extendable?

These questions also suggest that the e-procurement solution must be integrated with the organisation's existing back-office systems in order to work seamlessly with other applications (Patel & Khajuria, 2016:266).

3.4.8 Political commitment in the public sector

With specific reference to the public sector, Sabiiti (2017:18) suggests that national governments should demonstrate political commitment in order to facilitate the successful adoption of e-procurement. This is because there is a fundamental difference between private sector and public sector procurement practices, with the public sector relying mainly on a process of political decisions regarding the acquisition of public goods and services (Nurmandi & Kim, 2015:2002). According to Sabiiti (2017:18), the following critical factors should be in place to ensure the successful adoption of e-procurement in the public sector:

- A national strategy on the adoption of e-procurement should be developed;
- The objectives and outcomes of e-procurement should be defined, and they should demonstrate the benefits associated with system;
- The government should create an appropriate legislative environment with the necessary institutional arrangements and effective government structures;
- An appropriate business model for the ownership, implementation and support, and an acquisition model that optimises existing synergies should be adopted;
- A strong inter-agency coordination mechanism with involvement of non-state actors such as the business community and civil society should be established;
- The government should acquire software that allows them to have the rights to modify, update and control their own e-procurement system; and
- The relevant government department should appoint an official with real authority across departmental and ministerial boundaries to facilitate strategy and decision making regarding the country's ICT architecture, and to assist agencies in their efforts to run more effective and efficient programs.

The discussion in the preceding section highlights the premise that there are several factors that ought to be considered in order to facilitate the adoption and use of e-procurement within an organisation. It emerged that senior management has a critical role to play in the adoption of e-procurement by creating a conducive environment and supporting the necessary processes. Furthermore, senior management has the responsibility of making the decisions related to resource allocation to support the adoption of e-procurement. From a strategic perspective, it was suggested that the organisation should make a business case for the adoption of e-

procurement and ensure there is buy-in within the organisation among the professionals who will use this system. A strategy for the adoption of e-procurement should also be outlined to demonstrate understanding of the necessary processes to be followed in order to set up the e-procurement system. Resources also have to be allocated to finance the setting-up of the e-procurement system. Once these steps are followed it is likely that organisations could successfully adopt e-procurement and reap the benefits associated with the system.

3.5. BENEFITS ASSOCIATED WITH THE USE OF E-PROCUREMENT

This section discusses the various benefits associated with the use of e-procurement. The adoption of e-procurement has been known to usher in a wide range of benefits over the traditional paper-based procurement systems. These benefits are both tangible and intangible and accrue to both private and public sector organisations. Different authors have assessed the benefits accruing from e-procurement according to various taxonomies. For example, White, Afolayan and Plant (2014:26) identify two categories of e-procurement benefits: efficiency and effectiveness, while Mukhopadhyay, Kekre and Murray (2012:1301) divide benefits into three categories: operational, tactical, and strategic. Eakin (2003:16) posits that benefits can be classified as: hard benefits, which are directly measurable, such as, price savings and process cost reduction; soft benefits, which are indirect benefits that are difficult to quantify accurately; and intangibles, which are beneficial but are not directly measurable in financial terms. In this section, the benefits associated with the use of e-procurement are discussed in no particular order.

3.5.1 Efficiency in the SCM system

The advent of ICT and the popularity of the Internet have combined to enable organisations to automate most business processes. The transition from paper-based to electronic procurement systems has demonstrated notable benefits through improved efficiency. Enhanced efficiency in the SCM system brought about by the adoption of e-procurement is exhibited in various forms (Korir *et al.*, 2015:62). One of the ways efficiency has been increased is through the elimination of a significant amount of paperwork previously devoted to invoicing, filling in forms and postal communication (Nevalainen, 2003: 61; Barngetuny & Kimutai, 2015:46). This has in turn freed up time for procurement officials to engage in more strategic and value-adding activities. The digitisation of bidding documentation has also increased efficiency

through increased transparency and accountability of procurement procedures (Mose, Njihia & Magutu, 2013:381). Furthermore, e-procurement has enabled the standardisation of procurement processes making transactions easy to track and reducing errors in process and documentation for buyers (Sabiiti, 2017:6). Electronic procurement has also introduced efficiency through enabling organisations to communicate with suppliers easily and quickly. According to Sabiiti (2017:6), access to market and tender opportunities have become easier as geographic boundaries are made redundant through the use of electronic systems. With e-procurement, organisations are able to submit their bids anytime and from anywhere. Organisations can advertise tenders and place orders electronically while suppliers can invoice, and payments are made electronically. This leads to better control of cash flow and efficient contract management which can lead to lower price quotations (Sabiiti, 2017:6). Ultimately, e-procurement significantly simplifies and shortens the business cycle (Waruguru & Kiruri, 2015:304).

3.5.2 Reduction of corruption in the public sector

One of the major benefits of e-procurement in the public sector is the reduction in opportunities for corruption, fraud and bribery (Kühn & Sherman, 2014:28). This is also supported by Nkwe (2012:41) who states that e-procurement reduces waste and corrupt activities in public service delivery. According to the National Treasury (2016:59), and Kühn and Sherman (2014:19), electronic procurement limits human intervention by operating through standardised protocols. Furthermore, e-procurement strengthens accountability by enhancing transparency of all procurement processes. Procurement processes are also easily monitored by all parties involved thereby reducing the likelihood of human intervention to override the electronic procurement system. As a result, e-procurement reinforces transparency in the SCM system (UNCITRAL, 2014:27). The posting of information regarding tender opportunities online and the disclosure of tender awards further improves transparency as the information becomes available to all suppliers and interest groups. Furthermore, transparency builds confidence in the e-procurement system by all stakeholders (Paterson & Chaudhuri, 2007:159). Transparency further improves confidentiality, integrity, and authenticity of transactions between the procurement entities and the suppliers.

3.5.3 Cost reduction

According to the Asian Development Bank (2013:16), e-procurement benefits both government and suppliers through a reduction in costs. Electronic procurement results in reduced transactional costs on bidders and this translates into lower prices being quoted (Sabiiti, 2017:7). In a study in an Australian municipal council, Ilhan and Rahim (2017:284) concluded that e-procurement produced operational benefits that included cost savings, reduced transaction costs and time savings. The transaction costs typically include operational purchasing activities, such as ordering, expediting and invoicing. E-procurement also results in reduced administration costs through eliminated paperwork (Hashim *et al.*, 2013:836). According to Smart and Harrison (2003), the automation of the procurement process can also reduce costs associated with data errors and inaccuracies inherent to manual processes.

The Organisation for Economic Cooperation and Development (OECD) estimates that organisations can accrue savings from e-procurement ranging from 5 to 8 percent of the procurement value as a result of using e-procurement (Sabiiti, 2017:7). Evidence from Chile indicates that the government saved over \$70 million annually through implementing e-procurement (Ware, Moss, Campos & Noone, 2007:319). The authors further state that the Mexican government reduced administrative costs by 20 percent as a result of using e-procurement. According to Kühn and Sherman (2014:28), estimates by the World Bank indicate that the use of e-procurement systems can generate savings of up to 13 percent. In South Africa, the introduction of the e-Tender Publication Portal as part of the drive by government to switch to e-procurement is expected to save the government R25 billion a year from 2016 to 2019 (Minister of Finance South Africa, 2015:15). According to Nkwe (2012:41), cost savings for the government benefits citizens through the availability of more financial resources for service delivery.

3.5.4 Improved performance management

The use of e-procurement provides timely procurement information that creates the potential for regular analysis and reporting for many stakeholders on different aspects (Sabiiti, 2017:16). According to Patel and Khajuria (2016:266), the fact that all information is available to all stakeholders enables tracking of orders resulting in efficient payment and invoice settlement. A further advantage is that procurement practitioners have access to a variety of data and can

perform data analysis on key indicators and tracking of trends and key behavioural patterns (Sabiiti, 2017:16). The availability of data can also lead to the generation of real-time reports on the number of tenders, total payments, procurement methods, number and type of registered suppliers, running contracts and completed, among other key parameters. According to Patel and Khajuria (2016:266), these reports can also enable organisations to improve productivity of purchasing personnel, enhance spend compliance and improve supplier management and selection processes.

3.5.5 Reduction of maverick buying

The use of e-procurement has proved that the system can reduce unauthorised buying (Salkute & Manager, 2013:108). The use of e-catalogues and compliance to standard order processing and approval processes embedded in e-procurement helps to address the challenge of maverick buying thereby reducing wasteful expenditure. According to Eakin (2003:17), maverick buying can be curtailed through the use of e-procurement as the only purchasing mechanism within an organisation. Furthermore, the author suggests that organisations can greatly reduce unauthorised purchases through the use of the following:

- a simple and quick requisition-to-payment process including a user-friendly interface and pre-sourced catalogues tailored to the requirements of the individual user; and
- a simple and quick strategic sourcing process with standard procurement processes and tools, as well as easily accessible information.

3.5.6 Strategic focus

The automation of the procurement system reduces the amount of time required to implement procurement procedures and processes thereby releasing practitioners from mundane tasks to more strategic activities (Patel & Khajuria, 2016:266). The organisation could improve its market position through better market intelligence as a result of focusing more on customer and supplier needs (Chaffey, 2009:382). Furthermore, managerial efficiency, problem-solving, and decision making can also be improved as a result of implementing e-procurement (Hashim *et al.*, 2013:836). The availability of real time data and information similarly enables organisations to improve their planning functions (Chaffey, 2009:389).

3.5.7 Raise standards within procurement function

According to Eadie *et al.* (2007:103), other recognised benefits of e-procurement are that the electronic platform provides a faster way of sending tender documents; facilitates a simple way of placing orders from electronic catalogues; results in improved tracking and tracing of orders; and it is easier to detect and correct errors on orders. Through the use of e-procurement, buyers can view their orders online, make payment and know when the products would be delivered. These benefits have the combined effect of improving the quality of service delivery between buyers and suppliers as well as businesses and their customers (Ndou, 2004:1).

3.5.8 Improvement in supplier management

E-procurement promotes transparency and sharing of information between buyers and suppliers (Adjei-Bamfo, Maloreh-Nyamekye & Ahenkan, 2019:190). This exchange of strategic information, which can be used to make decisions in real time results in improved relationships between buyers and suppliers (Chaffey, 2009:390). E-procurement systems tend to widen the range of suppliers that buyers can relate to and potentially do business with. As a result, it can be concluded that e-procurement also enables buyers to create and manage new supplier relationships (Chaffey, 2009:390; Subramaniam & Shaw, 2004:162). In a study in an Australian municipal council, Ilhan and Rahim (2017:284) conclude that e-procurement improves relationships with suppliers and enhances reputation and council image.

The benefits associated with the use of e-procurement discussed above can be categorised and summarised from both the buyers' and vendors' perspectives as shown in Figure 3.5. Some of these benefits have already been discussed previously and are summarised here for convenience and to enable the reader to have an aerial view of the diversity of the benefits associated with the use of e-procurement.

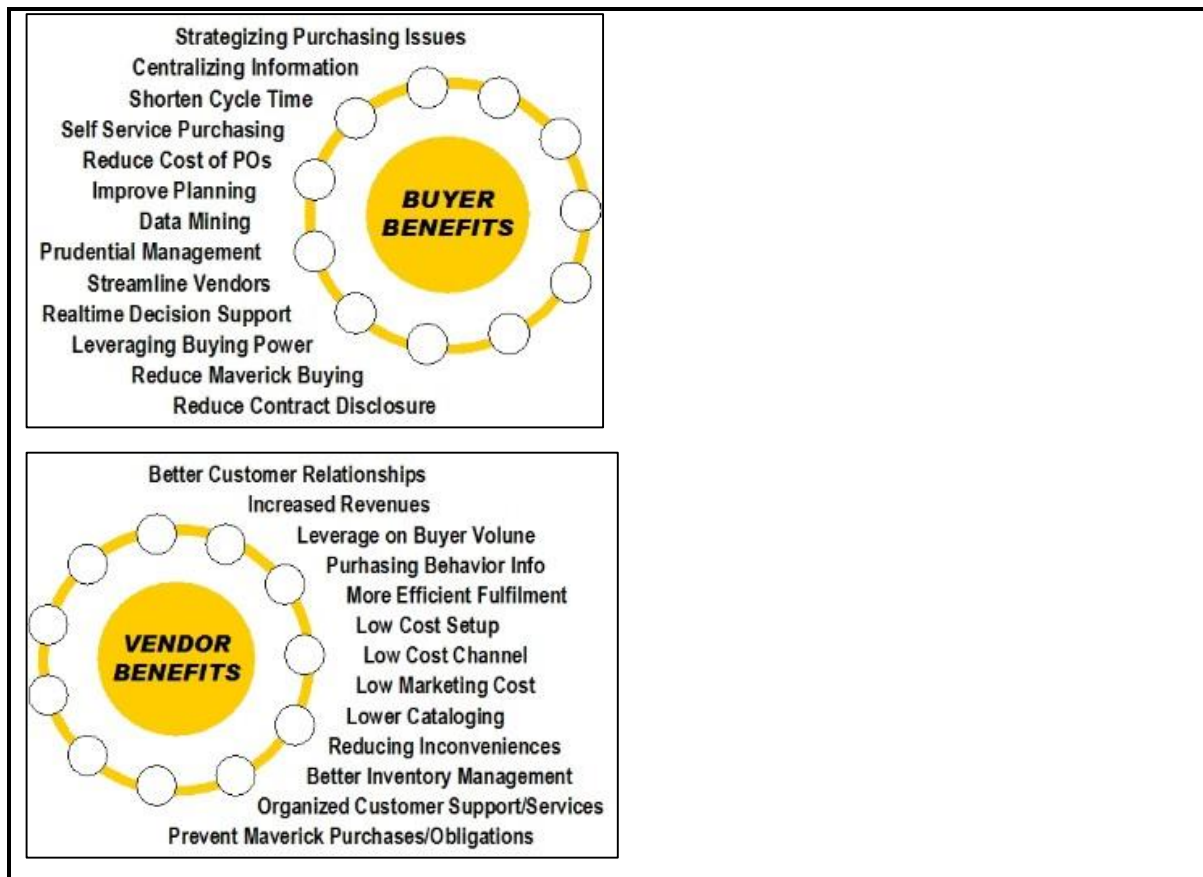


Figure 3.5: E-procurement benefits from buyers' and vendors' perspectives

Source: Strategy BusinessHub (2011)

The benefits accruing to buyers include strategic focus, centralisation of information, shorter bid cycles and real time decision support. The benefits previously not discussed from the vendors' side include low cost set-up and marketing, better inventory management and increased revenues. These benefits are sufficiently significant to encourage organisations to use e-procurement as part of the overall SCM system.

This section discussed the benefits associated with the use of e-procurement. It emerged from the discussion that there are a variety of substantial benefits that can accrue to organisations through the adoption and use of e-procurement. Efficiency in the procurement system was stated as a benefit that occurs as a result of automation of procurement processes and procedures. Resultantly, bid cycles become shorter as cumbersome paperwork is eliminated. In financial terms, the adoption and use of e-procurement results in cost savings emanating from lower transactional and administration costs. Organisations can also save through reduced prices of quotes due to increased competition between and among suppliers. Organisations are

also able to focus on strategic procurement issues when routine tasks are automated thereby allowing staff to be released from such tasks. Automation of processes also enables standard procedures to be followed thereby reducing maverick buying. E-procurement enables organisations to access procurement data and information in real time thereby allowing them to make key decisions thereby improving the performance of the procurement function. E-procurement enables organisations to share data and information with suppliers creating trust and improved business relationships. In the public sector, e-procurement is critical in reducing the level of corruption. The automation of procurement processes limits the need for human intervention to facilitate procurement processes thus reducing opportunities for fraud and wasteful expenditure.

3.6. CHALLENGES ASSOCIATED WITH THE USE OF E-PROCUREMENT

The adoption of e-procurement has brought multiple benefits to organisations in both the private and public sector. Despite these benefits, there are also challenges associated with the use of e-procurement. This section discusses some of these challenges that organisations have to overcome to optimise the use of e-procurement and the benefits thereof.

The use of e-procurement is not a panacea for procurement (Kühn & Sherman, 2014:28). According to Nkwe (2012:41), there are challenges in the implementation of e-procurement depending on the context of the user organisation. These challenges include the following:

- Inability to measure benefits
- High implementation costs
- Technology immaturity
- Lack of financial resources
- Implementation challenges
- Poor supplier/customer management
- Lack of support by internal users
- Inability to address strategic issues
- Security
- Lack of support by management

These challenges are discussed in further detail in the following sections.

3.6.1 Inability to measure the benefits of e-procurement

According to Smart (2010:21), measuring the value of IT investments has been a challenge for most organisations. As a result, creating a business case for investments such as e-procurement remains a difficult undertaking (Patel & Khajuria, 2016:266). The challenge is said to revolve around quantifying the benefits from implementing an e-procurement solution, most of which are intangible and non-financial.

3.6.2 Lack of IT infrastructure

The lack of proper IT infrastructure makes it impossible for an organisation to adopt certain technologies including e-procurement. One of the major challenges in the use of e-procurement, especially in the public sector, is weak IT infrastructure (UNCITRAL, 2014:28). Optimum functioning of e-procurement requires adequate digital and telecommunication infrastructure (De la Harpe, 2015:1588). In the absence of such functional equipment and electronic and digital platforms, e-procurement cannot function well (Williams-Elegbe, 2014:209). Thus, without adequate infrastructure the utilisation of e-procurement systems is likely to be sub-optimal (Eei *et al.*, 2012:15). The geographic coverage and cost of internet is also another critical challenge influencing the use of e-procurement, especially among SMEs who may not have adequate resources (De la Harpe, 2015:1588). Budgetary constraints to invest in the necessary IT infrastructure also affect most governments, resulting in the continued use of traditional paper-based procurement processes.

3.6.3 Immaturity of technology

According to Chaffey (2009:389), immaturity of technology has been often stated as a challenge associated with the use of e-procurement. Immaturity of technology is manifested through challenges such as lack of security, reliability, and poor integration of systems (Engström, Wallström & Salehi-Sangar, 2009:317). System instability and support issues are also manifestations of immaturity of technology. Organisations should be cautious when integrating e-procurement technologies with their internal business applications such as accounting, human resources, accounts payable and cash management. The reliability of organisational information can be compromised if new systems are not introduced carefully.

Integration issues within internal systems and with external supplier systems could also present major challenges to e-procurement implementation (Engström *et al.*, 2009:317).

3.6.4 Lack of technical knowledge

Apart from having the digital and electronic infrastructure to implement e-procurement, it is also necessary to have personnel with relevant IT skills (Timm, 2015). It is only then that organisations can achieve the full benefits of e-procurement (Ware *et al.*, 2007:319). There is generally a lack of computer skills impeding the implementation of e-procurement in the public sector (Nawi *et al.*, 2016:330). However, for any e-procurement system to work, suppliers ought to be able to access and use the system. Thus, there are also challenges when suppliers are unable to use the electronic system because they do not have the relevant skills (Kramer, 2016:21). In such instances, organisations are compelled to provide training for their suppliers as well. For example, in South Africa, the introduction of the e-Tender Publication Portal requires the National Treasury to provide training and support to SMEs in rural and urban areas to provide them with the skills to use the platform for bidding (Kramer, 2016:22).

3.6.5 Lack of clear e-procurement policy

There is a lack of clear policy and regulations on the use of e-procurement. The regulations governing traditional public procurement often do not address the unique requirements of e-procurement. For example, the traditional tendering process requires bidders to purchase tender documents from government offices physically. In this case, e-procurement is rendered non-compliant and cannot be used (Horn & Raga, 2012:80). According to Nawi *et al.* (2016:332), the inadequacy of government legislation results in the use of e-procurement being compromised.

3.6.6 Organisation's internal culture

Internal organisational culture plays a key role in the adoption and usage of e-procurement. It has been observed previously that if top management does not provide the necessary support and leadership, e-procurement cannot be utilised optimally. Furthermore, if the internal organisational culture does not welcome technological innovations it is likely that employees could resist the usage of e-procurement (Patel & Khajuria, 2016:266). This resistance to change

can only be addressed through instituting change management processes, driven and supported by the top leadership and management in order to change organisational culture (Patel & Khajuria, 2016:266). Lack of management support and commitment may also lead to poor understanding of what the e-procurement project hopes to achieve, how employees will be affected, and how the project will benefit the organisation as a whole (Asplund, Persson & Hilletoft, 2010:8).

3.6.7 Buyer and supplier relationships

Although e-procurement has the potential to improve supplier relationship management it can equally create challenges. When organisations transition to e-procurement, processes are automated and open to a wider range of suppliers. As a result, they may no longer remain loyal to specific suppliers and will only deal with those that meet their criteria (Asplund *et al.*, 2010:8). Thus, e-procurement could damage or destroy long-time partnerships (Jap, 2007:146).

3.6.8 Lack of security of transactions

The adoption of e-procurement automates processes between buyers and suppliers. For example, purchase orders are requested online and invoices are also generated and transmitted electronically from the supplier to the buyer. This demands that both parties ensure that the system is secure and is not susceptible to fraudulent activities. However, the increased adoption of e-procurement has also resulted in a lack of security and privacy of organisational information (Waruguru & Kiruri, 2015:305). One of the major issues relates to authentication of identity. In addition, confidential information may be hacked or leaked to unauthorised users who may corrupt the system. The Internet is a very insecure medium of communication which raises serious concerns about the privacy and security of organisational information (Almunawar, 2012:1). This compromises the confidentiality and integrity of information by exposing them to viruses and cyber-attacks. The need for e-security has thus risen leading to further capital investments in e-security to protect their systems According to Waruguru and Kiruri (2015:305), e-security enables privacy, confidentiality and the integrity of information and data embedded in the e-procurement systems.

3.6.9 Cost of development and maintaining e-procurement systems

According to Asplund *et al.*, 2010:8), the cost of securing e-procurement systems and running them is often too high for organisations. Most organisations, especially the public sector, do not have adequate financial resources to make massive IT investments (Kramer, 2016:23). According to Patel and Khajuria (2016:266), a further challenge is that e-procurement software needs to be upgraded with time and this adds to the cost of using the system. Another challenge related to the high costs organisations have to incur in order to transition to e-procurement is the lack of clarity on the value of benefits that accrue to organisations from the utilisation of e-procurement systems (Tatsis, Mena, Van Wassenhove & Whicker, 2006:65). Most organisations are unable to justify the benefits associated with e-procurement.

3.6.10 Maverick buying

Some companies still struggle with eliminating maverick buying even after the implementation of e-procurement. This demonstrates that organisations may have the difficulty of changing purchasing-related behaviour among the company's employees. Without intensive end-user training and educational programs, such behaviour can recur (Angeles & Nath, 2007:111).

3.6.11 Retrenchment of government procurement officials

As discussed above, the automation of procurement processes results in reduced transaction costs as well as bid cycles. The efficiency of the system due to e-procurement can also lead to a significant reduction in the number of procurement staff needed (Henriksen & Mahnke, 2005:92). While these benefits are good for improved procurement in general, in the public sector the inevitable retrenchment of human resources staff can be problematic when governments are trying to create more jobs in the economy.

3.6.12 Other challenges

There are still a variety of other challenges associated with the use of e-procurement that have been identified by various authors. Some of these challenges have been alluded to and are in many ways related to what has been discussed in the previous section. These challenges include resistance to change by employees, resulting in the failure of e-procurement (Eei *et al.*,

2012:18), and reluctance or fear to change from a known system to a new system (Parida, Sophonthummapharn & Parida, 2006:8). Usually, there is uncertainty and anxiety among employees when a new system is introduced. This is because employees may not understand the implications of the new system on their roles and responsibilities. This is a legitimate concern as the introduction of e-procurement invariably results in changes in staff roles and responsibilities (Patel & Khajuria, 2016:266).

According to Patel and Khajuria (2016:266), some challenges associated with the use of e-procurement include poor legacy systems and data and often a misunderstanding of what benefits the technology could deliver. There are also legal uncertainties that may prevent management from supporting the use of e-procurement. Within the public sector bureaucratic processes impede the implementation of e-procurement (Eadie *et al.*, 2007).

According to Asplund *et al.* (2010:8), challenges associated with the use of e-procurement can be viewed from the perspective of both the buyer and the supplier. Table 3.1 shows a summary of e-procurement challenges according to these two categories.

Table 3.1: E-procurement barriers

Barrier	Buyer	Supplier
Technological focus		
• Technological infrastructure/standards	✓	✓
• Integration issues	✓	✓
• Security concerns	✓	✓
Internal organisation		
• Lack of management commitment	✓	-
• Inadequate business processes	✓	-
Supplier relationship		
• Decreased trust and co-operation	✓	✓
• Weak relationship with suppliers	✓	-
Cost		
• Cost of implementation	✓	✓
External issues		
• Language, regulations, culture etc.	✓	✓

Source: Asplund, Persson and Hilletofth (2010:8)

The table indicates that the major challenges associated with the use of e-procurement can be broadly categorised as technology, internal organisation, supplier relationship, cost, and external environment (Asplund *et al.*, 2010:8). According to Table 3.1, both the buyer and supplier are affected by technological challenges such as, technological infrastructure, integration, and security issues. The internal environment relating to issues such as lack of management commitment and inadequate business processes, only affect the buyer. However, suppliers are affected by mistrust between the two parties as well as the cost of implementing e-procurement.

This section discussed the challenges associated with the use of e-procurement. Although the preceding section demonstrated that there are benefits associated with the use of e-procurement, it emerged that there are still major challenges that organisations have to overcome to ensure that they achieve the full benefits of using e-procurement. The key challenges indicate that although organisations are keen to implement e-procurement, they often do not know how to adequately measure the benefits in order to justify investments in the system. Technology also emerged as a major challenge in terms of the lack of adequate infrastructure, lack of skills among staff to utilise the e-procurement system and the high cost of acquisition and maintenance of IT technology. An organisational culture, which is not supportive of technology was also discussed. This often results in the resistance to e-procurement. However, in some instances, resistance to change was as a result of fear associated with uncertainty regarding job security or simply fear of changing to a new and unknown system. From a strategic perspective, e-procurement has opened organisations up to online fraudulent activities due to the risk of security of organisational data and information. In the public sector, the implementation and use of e-procurement has caused concern over the possibility of staff retrenchments as procurement becomes more agile and efficient. Despite all the challenges mentioned and discussed in this section, the benefits of e-procurement are still sufficient to justify the adoption of this technology.

3.7. E-PROCUREMENT IN THE SOUTH AFRICAN PUBLIC SECTOR

This section discusses the state of e-procurement in the South African public sector. The initiatives that have been implemented by the National Treasury to increase the adoption of e-procurement in SCM are also discussed. The benefits that have accrued as a result of using e-procurement in the public sector in South Africa are highlighted, as well as the recurring

challenges impeding efforts to switch from traditional procurement processes to e-procurement.

At the dawn of democracy in South Africa in 1994, the government embarked on financial reform processes in the public sector. Public procurement has been shown to play a central role in these reform processes (Munzhedzi, 2013:284). This is largely because the government is focusing on using public procurement to stimulate growth within the South African economy (Turley & Perera, 2014:15). In addition, procurement is also being used to improve service delivery in municipalities. However, the traditional government procurement processes remain vulnerable to corruption and fraud among other challenges (Horn & Raga, 2012:80). Thus, the adoption of e-procurement in the public sector is viewed as having the potential to address corruption and fraud by automating most of the processes, thereby eliminating opportunities for bribery and corrupt tendencies (UNCITRAL, 2014:26). Furthermore, Ntingi (2014) states that e-procurement has the potential to curb irregular, fruitless, wasteful, and unauthorised expenditure in the public sector.

The National Treasury formally decided to reform the procurement system in the public sector in 2015 with the intention of creating efficiency and transparency in the procurement process (Minister of Finance South Africa, 2015:16). The reform process shift from paper-based procurement to e-procurement was led by the Office of the Chief Procurement Officer (OCPO) (South Africa National Treasury, 2016:5). The strategy focused on introducing and utilising three technology-driven systems. These are the Central Supplier Database (CSD), the e-Tender publication portal, and the eCommerce site (Minister of Finance South Africa, 2015:17). These initiatives were viewed as the initial intervention strategies which would require further innovation to fully modernise public procurement to a fully functional e-procurement system (Kramer, 2016:4). Also, it was anticipated that they would bring the following benefits:

- The reduced administrative burden for government and business;
- Improved consistent reporting of procurement information;
- Intelligent analysis of procurement data and enhanced sourcing strategies; and
- Efficient monitoring of procurement patterns, contracts, and prices (South Africa National Treasury, 2016:6).

3.7.1 Central Supplier Database

The Central Supplier Database (CSD) is a digital repository designed to simplify and standardise the process of registration and verification of supplier information (South Africa National Treasury, 2016:1). All potential suppliers wishing to conduct business with the government are required to register on the CSD at no cost. The registration process also serves as a screening process to prequalify suppliers for tender opportunities. To reduce the administrative burden for the verification of tax clearance certificates and business registration, the CSD interfaces with the South African Revenue Service (SARS) and the Companies and Intellectual Property Commission (CIPC), respectively (South Africa National Treasury, 2016:7). The suppliers only register once and all three spheres of government will have access to this verified supplier information (Minister of Finance South Africa, 2015:17). The CSD is linked to the e-Tender Publication Portal, which will subsequently be discussed in 3.7.2.

3.7.2 e-Tender Publication Portal

This is a centralised online portal that publishes all national, provincial, and local government tender opportunities. The information published on the portal includes advertisements of bids, a list of tenderers and their respective prices, and bid awards (South Africa National Treasury, 2015:1). This effectively phases out the publication of tender advertisements in newspapers and the government gazette (Minister of Finance South Africa, 2015:17). According to Kramer (2016:7), the e-Tender Publication Portal is intended to support fair, equitable, transparent, competitive, and cost-effective procurement in the public sector. The system makes it easy for companies to do business with government through access to all information on government tenders online. The portal enhances the efficiency and transparency of tender award procedures and will ultimately reduce corruption and disputes on tender awards (South Africa National Treasury, 2016:7). According to Gulwa (undated), the e-Tender Publication Portal is expected to save the government an estimated R700 million a year on advertising and printing costs.

Despite the implementation of the technological initiatives described above, e-procurement is not yet fully functional in the South African public sector. About 45 percent of public procurement is still conducted manually (South Africa National Treasury, 2016:6). Access to reliable and fast internet remains a major challenge both for public institutions and SMEs (De la Harpe, 2015:1588). Furthermore, internet services reach only 47 percent of the population.

This greatly affects SMEs in rural and other remote and poor areas where infrastructure is unavailable (STANLIB, 2015). These challenges are likely to prevent the wholesale adoption of e-procurement as both the public sector and suppliers need to have access to the online system for it to work. Besides access to the Internet, the other challenge relates to the high cost of Internet, which further eliminates SMEs and other organisations from using the government e-Tender Publication Portal (UNCITRAL, 2014:30). Power interruptions are another challenge that needs to be addressed as it affects how suppliers do business with the government. Load shedding by Eskom could interrupt access to the Internet and negatively affect the use of the procurement system being rolled out by the government (South Africa National Treasury, 2016:101).

According to Jooste and van Schoor (2003:9), South Africa has unique challenges that continue to affect the widespread adoption of e-procurement. These challenges are listed and explained below:

- **Limited and monopolised supply base:** On-line communities are most successful when they involve a large number of respondents. South Africa has a relatively small supply base per commodity group, and this is usually controlled by a few large respondents. This reduces the possible impact of an online solution such as e-procurement.
- **Limited bandwidth:** This negatively impacts on both the download of information and the upload of web pages. Consequently, users frequently abandon online processes before completion.
- **Social responsibilities:** One of the acclaimed benefits of an e-procurement solution is a reduction in the supply base, which conflicts with South African BEE and SMME development objectives and legislation.
- **E-Procurement affordability:** E-Procurement technology is advanced and costly to South African companies. Usually only large corporations with large expenditure on indirect purchases (such as MRO) consider such systems. This results in an exceedingly small percentage of potential “e-procurement purchases” being made online.

However, current technology has enhanced electronic communication between government and suppliers and has drastically reduced paperwork for both parties. There is still scope to

automate and improve public procurement in South Africa. Caborn and Arrowsmith (2012:305) suggest that e-procurement is likely to address capacity issues in the public sector. So far, the South African public sector has demonstrated a commitment to address the inefficiencies in its SCM through the partial adoption of e-procurement. Although a significant proportion of the procurement processes are being conducted manually, the government has set in motion technology initiatives that are geared towards transforming public procurement. The implementation of these initiatives has already begun yielding some benefits, and it is anticipated that they will result in massive cost savings for the government as the procurement processes become more efficient and effective.

3.8. CHAPTER CONCLUSION

This chapter broadly discussed various aspects of e-procurement. The discussion established an understanding of e-procurement from multiple perspectives. The centrality of ICT and the Internet in the development of e-procurement were discussed. It was noted that e-procurement is beyond simply automating processes but also includes various other activities and applications. The wide range of benefits accruing from the use of e-procurement was also highlighted. These include the potential to reduce corruption through increased transparency, increasing efficiency of the SCM system, shortening the purchasing cycle, and cost savings for both government and suppliers. Challenges associated with the use of e-procurement were also discussed. It was revealed that the technological infrastructure required to implement e-procurement was a major constraint, especially in the public sector. A shortage of technical skills was also indicated as a challenge preventing widespread adoption of e-procurement. Other challenges include lack of support from management, lack of a policy framework for e-procurement, resistance to change and lack of security and privacy of information. The chapter concluded with a discussion on the state of e-procurement in the South African public sector. Although traditional paper-based procurement is still practiced, the government has made some great strides in introducing technology to transform the SCM system. Although the benefits are evident, there is still more that needs to be done to optimise procurement procedures and processes in the South African public sector.

CHAPTER 4

THEORETICAL UNDERPINNING, CONCEPTUAL FRAMEWORK AND HYPOTHESES DEVELOPMENT

4.1 INTRODUCTION

This chapter discusses the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT). The purpose of the discussion is to provide a comprehensive understanding of these models and how they influence the adoption or rejection of technology. The discussion on the TAM focuses on the key determinants for the model, how they are framed and the overall limitations of the model. The Extended TAM2 model is also discussed and introduces additional factors that are important to fully predict system adoption. The UTAUT constructs and variables that make up the model are also discussed with the similar intention to understand their meaning and rationale, including the predictive power of the model. Beyond the TAM, Extended TAM2 and UTAUT models, additional factors affecting the adoption or rejection of technology are discussed. These include personal competence and external assistance. Previous research studies on the TAM and UTAUT conducted in South Africa are highlighted. Although most of these research studies are in the financial, education and construction sectors, they do shed light on how the models were applied, conclusions and recommendations reached. The chapter finally discusses the conceptual framework for the study. The study's conceptual framework is an integrated model of the TAM and UTAUT models. The eight hypotheses developed based on the conceptual framework are discussed. These hypotheses articulate the key determinants and constructs that will guide this research study to determine how these influence the adoption of e-procurement in the South African public sector.

4.2 UNDERSTANDING THE TECHNOLOGY ADOPTION MODEL

This section focuses on providing a brief background and the purpose of the TAM. This background includes highlighting the primary reason why the TAM was developed. This background is crucial as it enables one to distinguish the TAM from other models also intended to predict user acceptance of new technology. The components of the TAM are similarly stated

and discussed in this section. The purpose of this discussion is to facilitate the understanding of the application of the TAM.

The Technology Acceptance Model (TAM) was initially used to understand and predict consumer adoption of new information technologies (Davis, 1989:333-334). The TAM was based on the theory of reasoned action (TRA), developed by Ajzen and Fishbein (1980), and the theory of planned behaviour (TPB) (Ajzen, 1991:179-211), also derived from the TRA. The TRA states that an individual's attitude towards objects is determined by their beliefs. The TAM emanated from the observation that organisations were generally unaware of the key factors that they needed to address in order to enhance technology acceptance. Since then researchers have

recommended the importance of understanding the factors that affect the acceptance of technology in order to promote adoption (Lin, 2011:252-260; Udo, Bagchi & Kirs, 2010:174-193; Wang, Wu, Lin & Wang, 2011:350-359). These authors recommend the importance of gaining an understanding of the factors that affect the usage of such systems to promote their use. The TAM is one of the most popular and acceptable models that researchers and practitioners continue to use to assess user acceptance of new technology (Ibem et al. 2016:1; Kapoor, Dwivedi, Niall, Piercy, Lal & Weerakkody, 2014:736). Furthermore, the TAM is considered as one of the strongest and most rational models used to predict consumer adoption of new technology (King & He, 2006:751). The model has been found to provide logical and strong explanations regarding adoption behaviour of individuals more consistently across sectors than other models (Davis, 1989:319-340; Mathieson, 1991:173-191; Taylor & Todd, 1995:144-176).

According to Ruzindana and Kalaskar (2016:128), the TAM assists with analysing factors that influence the adoption or rejection of new technology by individuals. The TAM provides a basis for identifying and understanding the direct and indirect factors that colour the perceptions, and influences the decisions, of individuals (Muriithi, Waiganjo & Chepngetich, 2015:158). Based on the TAM, researchers are able to determine and predict the level of consumer adoption of a new technology (Davis, 1989:333-334; Folkinshteyn & Lennon, 2017:220).

The TAM has received considerable attention as an analytical tool to decipher individual decision-making processes related to new technology adoption. As such, the TAM has been

used across many sectors and industries such as education, health, banking and tourism. Although the model has been predominantly used in the private sector, it has also been successfully used in the public sector (Tan, 2013:1; Ruzindana & Kalaskar, 2016:125; Ibem et al., 2016:1). This study utilises the TAM to assess e-procurement adoption and practices in the South African public sector.

The TAM consists of four components, namely: perceived usefulness, perceived ease of use, behavioural intention to use and actual use of system. The TAM is shown in Figure 4.1.

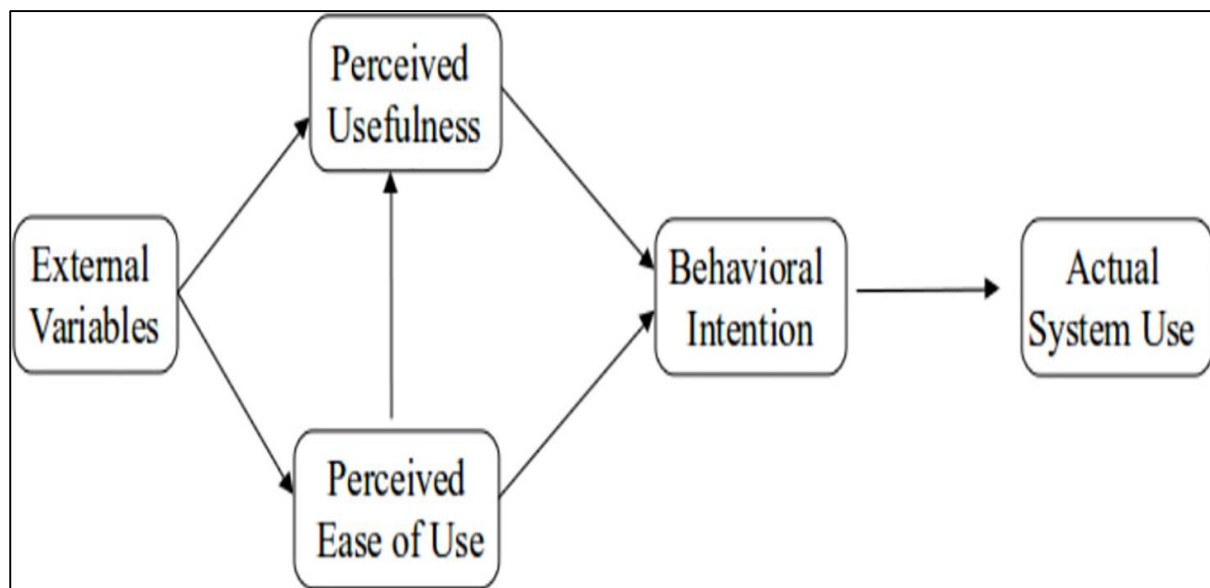


Figure 4.1: Technology Acceptance Model (TAM)

Source: Davis (1989:333)

According to the model, perceived usefulness and perceived ease of use directly influence behavioural intention to use leading to actual system use. The model also indicates that individual perceived ease of use also influences perceived usefulness. These components are subjective and are expected to influence individuals to make decisions regarding the adoption and use of a new technology (Oye, Iahad & Rahim, 2012:103; Davis, 1989:333-334). Each of these components is described in further detail in the following sub-sections.

4.2.1 Perceived usefulness

One of the components of the TAM is the perceived usefulness of new technology as articulated by the individual. Perceived usefulness is very subjective and as such varies among individuals. Perceived usefulness is defined as an individual's perception that using a new technology will increase or improve their performance (Davis, 1989:320; Sun *et al.*, 2012:52). Stated another way, perceived usefulness is related to the extent to which an individual believes that adopting and using a particular technology will enhance their work performance. This factor inherently suggests that the use of the technology being introduced will inevitably enhance an individual's performance (Liu *et al.*, 2010). According to Fagan, Kilmon and Pandey (2012:124), perceived usefulness is also a significant factor in behavioural intention to use information technology. This view is corroborated by Nath, Bhal and Kapoor (2013:90), who demonstrate that perceived usefulness tends to influence an individual's attitude towards using the technology.

In this study, the perceived usefulness of e-procurement by practitioners in the South African public sector will determine their acceptance to use the system. It is therefore assumed that the individuals in the study sample will accept e-procurement as it will be presented in a manner that demonstrates its usefulness in enhancing the performance of the procurement system.

4.2.2 Perceived ease of use

Perceived ease-of-use is another critical factor that influences an individual's attitude towards accepting and using new technology. According to Venkatesh *et al.* (2003:450), perceived ease of use is defined as the degree of ease associated with use of the system. Another definition by Sun *et al.* (2012:52) states that perceived ease of use is the extent to which a person believes that using a particular system will be free of effort. These definitions suggest that individuals are likely to accept and adopt a technology or system if it is perceived to be easy to use.

Thus, if a technology is perceived to be difficult or more cumbersome to use, it is likely to be rejected. These conclusions have been further supported by the work of various researchers (Liu *et al.*, 2010; Chen & Barnes, 2007; Venkatesh *et al.*, 2003; Davis, 1989). Therefore, perceived ease of use of a technology is posited to be a strong predictor of user acceptance (Nath *et al.*, 2014).

4.2.3 Behavioural intention to use

According to the TAM, behavioural intention determines technology acceptance through influencing the actual usage of a given system (Alharb & Drew, 2014:145). The Committee on Communication for Behaviour Change in the 21st Century (2002:31) defines behavioural intention as a person's perceived likelihood or "subjective probability that he or she will engage in a given behaviour". Behavioural intention is influenced both by the attitude towards use and perceived usefulness (Alharb & Drew, 2014:145). Therefore, individuals' attitudes are a key component of assessing the intention to use a system. When an individual has confidence in their ability to use a system this will significantly influence their behaviour. When individuals are inclined towards using a system or willing to attempt using it, perceived usefulness becomes critical in facilitating the decision to use it. When perceived usefulness of the system is high, it is concluded that there is a high probability of adoption. Alharb and Drew (2014:145) further state that the perceived ease of use indirectly influences the behavioural intention to use the system. Therefore, the combination of perceived usefulness, attitude and perceived ease of use are significant factors influencing the behavioural intention to use.

4.2.4 Actual system use

The TAM implicitly assumes that individuals will go ahead and use technology once they are convinced that the technology is useful and easy to use (Straub & Burton-Jones, 2007:224). This assumption is based on the rationale that the subjective perceptions of usefulness and ease of use strongly influence individuals to make a positive decision and they will actually go ahead and use it. A study by Kapoor *et al.* (2014:731) concludes that perceived usefulness and perceived ease of use influence individual attitudes and attitudes significantly influence individuals to use the system. While this is generally true, this construct has been challenged for being too simplistic. Elbanna (2010:83) suggests that there could be social and organisational issues that can prevent individuals from actually using a technology, even if they perceive it to be useful and easy to use. The power dynamics in the organisation may thus influence acceptance or resistance to technology. According to Straub and Burton-Jones (2007:224), actual use of the system has not been sufficiently studied at the organisational level and it remains an assumption that individual acceptance suggests actual use. In this study, the researcher will analyse this construct to establish how other organisational and social factors impact on the decision to actually use the system by individuals, collectively.

4.2.5 Limitations of the Technology Acceptance Model

Although the TAM has proved to be effective in predicting user intentions and behaviours, it has its limitations as well. According to Venkatesh *et al.* (2003:427), and Ajzen and Fishbein (1980:41), behavioural intention to use a system directly leads to actual use. However, according to Bagozzi (2007:245), individuals do not necessarily take action based on intention, rather many actions are taken not so much as ends in and of themselves but rather as means to more fundamental ends or goals. Furthermore, there are other steps necessary between intention to use and the actual use. This is because there can be a time lag between forming an intention and the actual use which may result in unanticipated changes or obstacles that may prevent use. Bagozzi (2007:245) further states that the TAM does not sufficiently address the link between perceived usefulness and ease of use directly to actual use. The perceived usefulness of a system may be so beneficial to individuals that they can directly choose to use a system. This is further supported by Chuttur (2009:16) who states that the theoretical links between constructs are not sufficiently formulated. According to Sun and Zhang (2006:54-55), the TAM has limited explanatory power in predicting behavioural intention. Furthermore, the explanatory power varies between laboratory experiments and in field studies. According to Chuttur (2009:16), one of the main criticisms is that researchers tend to use self-reported data instead of using actual use data to determine the use of a system. According to the author, self-reported data is inherently subjective and therefore not reliable as a measure of system use. Furthermore, another major limitation of the TAM is that it has mostly been tested with students and based on self-reporting by research respondents (Chuttur, 2009:16). Thus, the researcher suggests testing the TAM with professionals in a business environment.

As a result of these and other recurring limitations, the TAM has evolved with additional variables being added to the original model (Adams, Nelson & Todd, 1992:227-247; Jackson, Chow & Leitch, 1997:357-389; Venkatesh & Davis, 1996:451-481).

4.2.6 The Extended Technology Acceptance Model

The extended TAM model was developed by Venkatesh and Davis (2000:186-204). The TAM2 model added theoretical constructs involving social influence processes (subjective norm, voluntariness, and image) and cognitive instrumental processes (job relevance, output quality,

result demonstrability, and perceived ease of use) as shown in Figure 4.2 (Venkatesh & Davis, 2000:187).

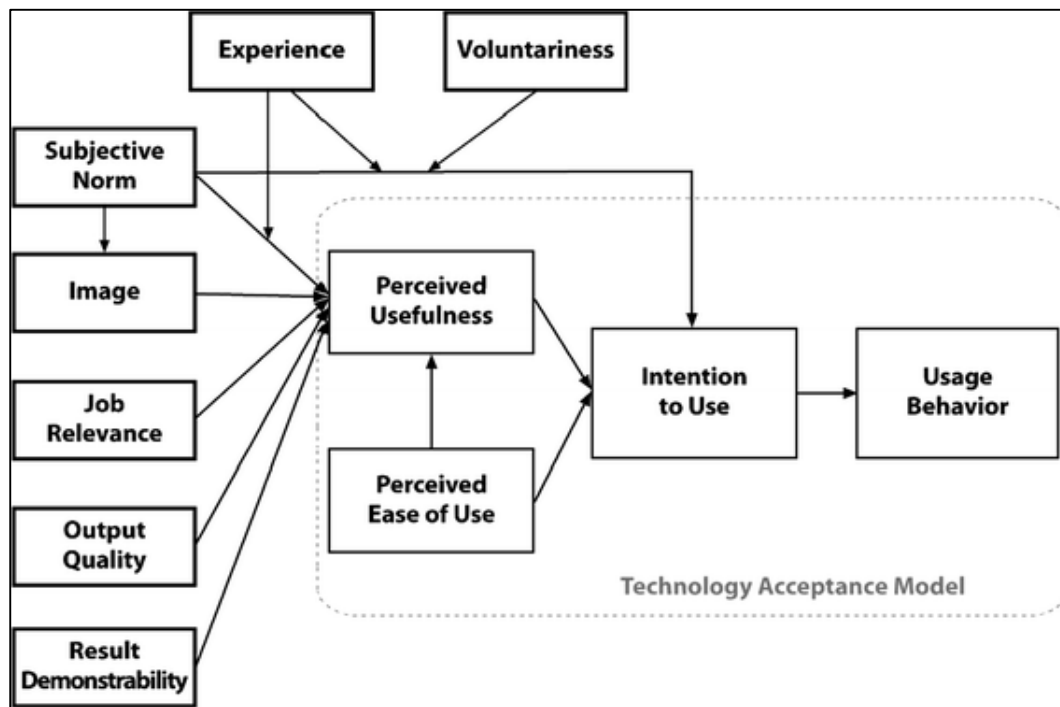


Figure 4.2: Extended TAM (TAM2)

Source: Venkatesh and Davis (2000:188)

According to the TAM2 model, subjective norm, image, job relevance, output quality and result demonstrability directly influence perceived usefulness. Subjective norm also directly influences intention to use. The subjective norm is also influenced by experience and whether the action is voluntary or mandatory. The model also suggests that perceived ease of use directly influences intention to use and also affects perceived usefulness. Finally, the intention to use affects use behaviour.

As shown in Table 4.1, in the TAM2, the variables are aggregated under two key constructs: social influence and cognitive determinants. The variables under social influence include subject norm, voluntariness, image and experience. Variables under cognitive instrumental, include job relevance, output quality and result demonstrability. The following table provides definitions of the variables constituting TAM2.

Table 4.1: Extended TAM2 variables

Process	Variable	Definition of variable
Social influence	Subjective norm	A person's perception that most people who are important to him/her think he/she should or should not perform the behaviour in question (Fishbein & Ajzen, 1975:302).
	Voluntariness	Extent to which potential adopters perceive the adoption decision to be non-mandatory (Venkatesh & Davis, 2000:188).
	Image	The degree to which use of an innovation is perceived to enhance one's status in one's social system (Moore & Benbasat, 1991:195).
	Experience	The direct effect of subjective norm on intentions may subside over time with increased system experience (Venkatesh & Davis, 2000:189)
Cognitive instrumental	Job relevance	An individual's perception regarding the degree to which the target system is applicable to the individual's job. Job relevance is a function of the importance within one's job of the set of tasks the system is capable of supporting (Venkatesh & Davis, 2000:191).
	Output quality	In perceptions of output quality, users will take into consideration how well the system performs the tasks that match their job relevance (Davis, Bagozzi & Warshaw, 1992:985).
	Result demonstrability	Tangibility of the results of using the innovation will directly influence perceived usefulness (Moore & Benbasat, 1991:203).

Source: Sargolzaei (2017:181)

The TAM2 provides more variables that help to explain and predict use behaviour under various contexts. These variables increase the predictive power of the TAM. Despite the introduction of the TAM2, the use and effectiveness of the original TAM is acknowledged.

According to the TAM, use acceptance of technology is greatly influenced by perceived usefulness and perceived ease of use. The two factors combine to influence the attitudes of individuals towards the technology, resulting in either its acceptance or rejection. The above discussion has shown that indeed these factors influence user acceptance. However, there are also suggestions that there could be other factors that could be at play in influencing users.

Social and organisational factors that relate to power dynamics have been said to influence acceptance or resistance of technology beyond individual perceptions of usefulness and ease of use. Furthermore, the actual use of technology was challenged to be more complex than what is portrayed by the TAM. It is not necessarily a linear progression as there could be other factors that are not immediately visible. However, despite the above critique, the TAM remains a popular and useful conceptual framework for analysis of factors contributing to technology acceptance or rejection (Folkinshteyn & Lennon, 2017:220).

4.3 UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY (UTAUT)

This section discusses the Unified Theory of Acceptance and Use of Technology (UTAUT) model. The origins of the UTAUT are discussed as well as the constructs and variables that make up the model. The application of the model is also discussed including its predictive power and limitations.

According to Williams, Rana and Dwivedi (2015:444), and Vankatesh *et al.* (2003:447), the UTAUT is also one of the most popular models for technology adoption. The UTAUT model is viewed as a more robust technology acceptance model that offers a comprehensive list of technology acceptance determinants and has stronger predictive power and more accuracy than most models in use (Taiwo & Downe, 2013:49).

The UTAUT model was developed by Vankatesh *et al.* (2003:425-478) with the intention to integrate various fragmented theories on individual acceptance of information technology into a unified theoretical model. Thus, the UTAUT combines eight prominent information technology acceptance research models, namely: the Innovation Diffusion Theory, the Technology Acceptance Model (TAM), the model of Personal Computer Utilisation, the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB), the Motivational Model, the combined TAM and TPB, and the Social Cognitive Theory. Each of these models attempts to predict the adoption of innovation by users using a set of independent variables. The UTAUT model was constructed based on the conceptual and empirical similarities across these eight models. The model combines the individual variables and the resultant model presents a more complete picture than was previously possible with individual models (Alshehri, 2012:54). Furthermore, the UTAUT has emerged with more predictive power than previous models. While the TAM has been noted to have the ability to predict technology

adoption success at 30 percent and the TAM2 can predict accurately at 40 percent, the UTAUT has been estimated to have predictive power of up to 70 percent (Oye *et al.*, 2012:103).

The UTAUT model suggests that four key constructs determine technology acceptance by individuals. These are performance expectancy, effort expectancy, social influence, and facilitating conditions (Oye *et al.*, 2012:103; Vankatesh *et al.*, 2003:447). The UTAUT model is shown in Figure 4.3.

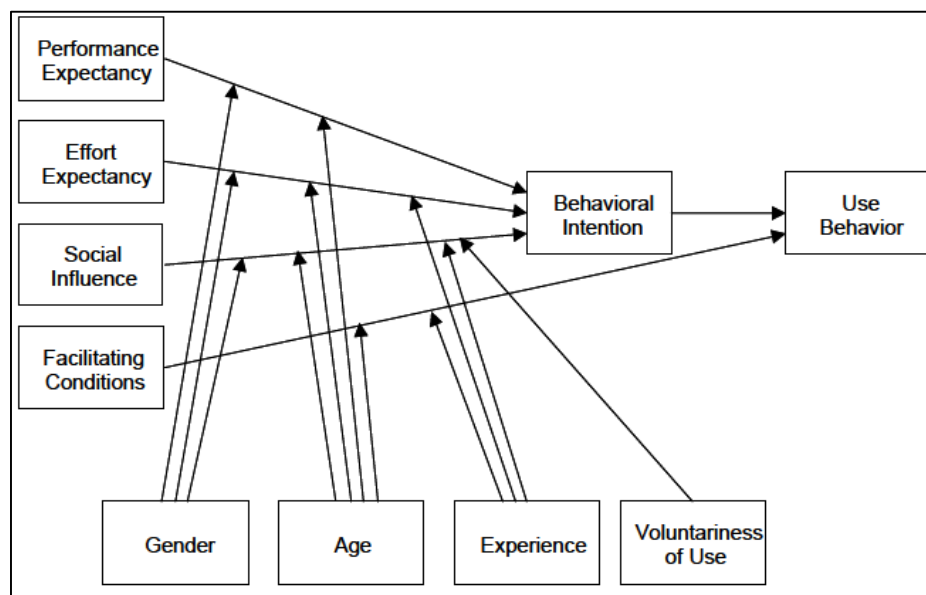


Figure 4.3: Framework of the UTAUT model

Source: Venkatesh *et al.* (2003:447)

According to the UTAUT model, performance expectancy, effort expectancy and social influence directly affect the behavioural intention of individuals, which in turn influences use behaviour. Facilitating conditions directly influence use behaviour. Demographic factors such as age, gender, experience and voluntariness of use determine the strength of the relationships between the four key constructs and behavioural intention.

The four constructs making up the UTAUT model are described as follows (Vankatesh *et al.*, 2003:447-453):

- **Performance expectancy:** the degree to which the individuals believe that the use of the technologies will result in performance gains. This may also be viewed as the perceived usefulness of the technologies.

Performance expectancy in the UTAUT model is derived from a combination of five similar constructs: perceived usefulness, extrinsic motivation, job fit, relative advantage and outcome expectations. According to Alshehri (2012:55), performance expectancy is the strongest predictor of intention across the models combined in developing the UTAUT model.

- **Effort expectancy:** the degree of ease associated with the use of the technologies. Effort expectancy relates to the perceptions of ease of use and complexity. It also influences perceived usefulness, thereby similarly making it a strong predictor of technology use.
- **Social influence:** the extent to which an individual perceives that it is important that others believe they should use the technologies. Social influence is extended to embrace the group culture in which an individual exists, and the perceptions of image enhancement associated with adoption of technology within a specific social system. This suggests that the opinion of others has an influence on individuals and how they make decisions to adopt or reject innovations.
- **Facilitating conditions:** the degree to which an individual believes that organisational and technical infrastructure required for the support of the technologies exist. Thus, perceived organisational support influences technology adoption.

According to the UTAUT model, performance expectancy, effort expectancy and social influence directly affect behavioural intention, which further influences use behaviour, while facilitating conditions only directly affect use behaviour. As already stated above, the UTAUT is based on the integration of eight individual models. The four constructs defined above were

similarly condensed from different individual models. Table 4.2 indicates the origins of each of the four constructs of the UTAUT model.

Table 4.2: Root constructs for the four factors

Construct	Root constructs
Performance expectancy	<i>Perceived usefulness</i> from TAM and C-TAMTPB, <i>extrinsic motivation</i> from MM, <i>job-fit</i> from MPCU, <i>relative advantage</i> from IDT, and <i>outcome expectations</i> from SCT.
Effort expectancy	<i>Perceived ease of use</i> from TAM, <i>complexity</i> from MPCU, and <i>ease of use</i> from ID.
Social influence	<i>Subjective norm</i> from TRA, TAM2, TPB and CTAM-TPB, <i>social factors</i> from MPCU, and <i>'image'</i> from IDT.
Facilitating conditions	<i>Perceived behavioural control</i> from TPB, C-TAM-TPB, <i>facilitating conditions</i> from MPCU, and <i>compatibility</i> from IDT.

Source: Oye *et al.* (2012:103)

The four constructs described in Table 4.2, are further moderated by gender, age, experience, and voluntariness of use (Venkatesh *et al.*, 2003:447; Thomas, Singh & Gaffar, 2013:73; Williams *et al.*, 2015:444). According to Figure 4.3, gender and age interacts with performance expectancy, effort expectancy, and social influence constructs, to influence behavioural intention. Age further interacts with social influence. The experience factor interacts with facilitating conditions, social influence, and effort expectancy, to influence behavioural intention. Voluntariness of use interacts with social influence to influence behavioural intention. According to Venkatesh *et al.* (2003:452), social influence became a significant predictor of use when individuals were under mandatory conditions to use a system. When individuals voluntarily chose to use a system, social influence proved to be insignificant.

At the core, the UTAUT model uses behavioural intention as a predictor of the technology use behaviour. In the model, performance expectancy, effort expectancy, and social factors have direct effects on behavioural intention, which along with facilitating conditions have direct effects on use behaviour (Thomas *et al.*, 2013:72-73).

The UTAUT has similarly been used in the assessment of factors influencing adoption of e-learning, e-logistics and e-procurement in various institutions (Thomas *et al.*, 2013:73; Alomar & de Visscher, 2017:1). According to Thomas *et al.* (2013:72), the major challenge with most theoretical models, including the UTAUT, is that they have been extensively tested in western countries, casting doubt on their applicability in other contexts. However, the UTAUT model is very comprehensive and has more predictive power than the TAM (Oye *et al.*, 2012:103). The current research study will combine the two models to produce a more comprehensive framework for assessing e-procurement practices in the public sector in the Gauteng Province.

Among the four key constructs of the UTAUT that are discussed above, this study considers facilitating conditions as a predictor of behavioural intention to use technology. Hence, a broader discussion of facilitating conditions is provided in the next sub-section.

4.3.1 Facilitating conditions

Facilitating conditions are defined as the degree to which an individual believes that an organisational and technical infrastructure exists to support use of the system (Venkatesh *et al.*, 2003: 447). The authors further extend the definition to include personal knowledge of the individual to use the system. Therefore, both the individual perceptions and the institutional resources are important in determining the use of the system. It has also been noted that the interaction between age and facilitating conditions and experience and facilitating conditions also influences the use of the system (Venkatesh *et al.*, 2003:454-455).

In this study, facilitating conditions include the availability of the technical infrastructure to support e-procurement systems and the provision of technical support to individuals in the form of training or troubleshooting when the system fails.

4.3.2 Attitude towards use

According to Fishbein and Ajzen (1975:15), an attitude is defined as an individual's positive or negative feeling about performing the target behaviour. In this case, this relates to the use of e-procurement systems in the South African public sector. Attitude was flagged as a key element in the Reasoned Action Theory proposed by Fishbein and Ajzen (1975:1-578). This variable formed a significant theoretical basis of the TAM.

In summary, the four key constructs underlying the UTAUT model have been discussed. These are performance expectancy, effort expectancy, social influence, and facilitating conditions. It was demonstrated how these constructs influence the adoption of technology. The role of gender, age, experience, and voluntariness of use were also factors noted to interact with the four constructs to influence system use. Furthermore, self-efficacy and attitude towards use were also described and it is clear that the more confident individuals are in their abilities and the more positive the attitude they have, the greater the likelihood of them using the system.

The UTAUT model has been widely used, tested and validated in various contexts. While it remains valid and fairly accurate, Taiwo and Downe (2013:48) state that the outcome of empirical studies has been inconclusive in respect to the magnitude, direction and significance of the relationships amongst the model. However, this result is not uncommon given the complexity in human behaviour.

4.4 OTHER FACTORS INFLUENCING TECHNOLOGY ADOPTION

In this study, self-efficacy has been included as another factor influencing technology adoption, hence this section analyses literature on it.

4.4.1 Self-efficacy

According to Bandura (1986:391), self-efficacy refers to "people's judgments of their capabilities to organise and execute courses of action required to attain designated types of performances." According to Schunk (1995:112), self-efficacy involves one's beliefs about accomplishing a task. Another definition by Eccles and Wigfield (2002:110) refers to self-efficacy as an individual's confidence in his or her "ability to organise and execute a given course of action to solve a problem or accomplish a task". The theory as formulated by Bandura (1977:193), hypothesises that self-efficacy affects the choice of activities, effort, persistence, and achievement. Schunk (1995:112) suggests that individuals with high self-efficacy are more confident of their abilities and tend to readily participate and focus on accomplishing tasks or achieving desired outcomes. Therefore, efficacy is a major determinant of effort, persistence, and goal setting.

According to Bandura (1994:72), there are four sources of self-efficacy, namely: mastery experiences, vicarious experiences, verbal persuasion, and emotional and physiological states. When individuals have mastered a task or activity, their belief in themselves increases as opposed to when they fail. Thus, self-efficacy can be achieved through perseverance in overcoming challenges and obstacles. This process builds resilience to the extent that the individual will not be easily discouraged by failure. The second way of creating and strengthening self-belief of efficacy is through the vicarious experiences provided by role models. Observing other people similar to ourselves succeeding at certain tasks conveys the idea that we too can accomplish the same. Therefore, individuals will apply themselves with the knowledge and evidence that it can be done. Individuals will strive until they too succeed thereby building their self-efficacy further.

Verbal persuasion is another source of self-efficacy. This source of self-efficacy is particularly strong when it comes from influential people such as parents, teachers and coaches. Their belief in our capabilities ignites the courage to attempt mastering a specific task or activity. That way, individuals can be persuaded to develop new skills and strive to perform at a higher level than before. Conversely, if individuals are persuaded that they lack certain skills, they will tend to avoid challenging tasks because of heightened self-doubt. Lastly, emotional and physiological states of individuals can either boost or destroy their self-efficacy. When individuals feel confident about attempting a task, it can help improve their self-efficacy. However, if they feel stress or tension regarding performing a particular task, their confidence is reduced and they will shy away from attempting it (Bandura, 1994:72-73).

In this study, it can be concluded that respondents who have used e-procurement systems before are likely to have confidence and the motivation to keep using the systems. It is also possible that individuals could use e-procurement systems if they see their peers using the systems. Based on their observation they will be motivated to also learn to do the same. Procurement managers and other officials who may be looked upon as role models could also verbally persuade their subordinates to use the system by suggesting to them that they have the requisite skills and qualities to do so. Finally, individuals may use or reject e-procurement systems based on their reaction to the challenge. If they feel intimidated, their self-doubt will set in and they will avoid using the system. However, if their reaction is positive, their confidence will propel them to attempt to use the system.

4.4.2. Personal competence

In the context of this study, personal competence is a new concept in technology adoption, and was discovered during the exploratory factor analysis procedure performed to check the factor structure of the constructs (c.f., Section 6.4). Initially, the study had identified four predictor variables, namely: perceived usefulness, perceived ease of use, self-efficacy and facilitating conditions. An earlier definition by Vogten, Koper, Martens and van Bruggen (2008:85) characterises a competence as the ability of an individual to deal with specific challenges or tasks. Nygren (2015:181) posits that competence denotes the process through which individuals use their abilities to take action that results in accomplishment of certain tasks. Vogten *et al.* (2008:86) further suggest that individuals can develop specific competencies through informal and experiential learning. In this regard, such competencies can be demonstrated in everyday conduct or within a specific job-setting. For the purpose of this study, personal competence is defined as a combination of skills, knowledge, attributes and behaviours that enables an individual to satisfactorily perform assigned tasks.

The concept of personal competence has been applied in research studies in human resources management to inform succession planning processes (Grudzinskiya, Zakharova, Bureeva, Leonova & Mahalin, 2015:586–595) and in executive coaching project management (Ballesteros-Sanchez, Ortiz-Marcos & Rodriguez-Rivero, 2019:1-16). The concept has also been applied in information management (Yatim, Nasharudin, Samsudin, Said & Tarsik, 2019:21-23); in the education sector for qualification certification (Kireev, Guseva & Silenko, 2015:150-158); and in teaching and learning in schools (Malkova & Kiselyovab, 2014:254-258; Vogten *et al.*, 2008:83-100).

According to Kunsakaja (2018:197), there are various personal competences that are relevant for individuals to perform certain functions in the workplace. These include critical thinking and analysis, technology knowledge, and research capabilities. For the purpose of this study personal competencies are critical for the adoption and use of e-procurement technology in the public sector. Where such competencies are absent it is necessary for individuals to have the willingness to go through processes for the development of competence in order to acquire the requisite skills (Adomaitienė & Zubrickienė, 2011:89). Individual skills and competencies are beneficial to the public sector's development and ability to deliver services (Mačerinskienė & Bartuševičienė, 2012: 98). Furthermore, the development of personal competencies bridges the

gap between education and training thereby increasing the capabilities of individuals in executing their tasks or assigned responsibilities in the workplace (Vogten, 2008:85).

It is assumed in this study that where individuals already have personal competencies in the use of technology, they are likely to adopt and use e-procurement. Individuals may feel intimidated by the new technology if they do not already possess competencies in technology. However, individuals may be willing or be persuaded to develop such competencies in order for them to be well-equipped to use the new technology.

4.4.3. External assistance

External assistance is also a new concept in technology adoption that was discovered during the exploratory factor analysis procedure performed in this study to check the factor structure of the constructs (c.f., Section 6.4). External assistance has traditionally been mainly associated with foreign aid flowing from developed to developing countries to support various sectors, for example, democratic and political reforms (Phillips, 2016:629-645; Boyce, 1995:2101-2116); agriculture and food marketing (Mittendorf, 2008:1-22); health (Gupta & Gumber, 2002:1-57); and housing and human settlements (Okpala, 1990:205-229). As such, the concept of external assistance is essentially an international phenomenon.

At a more localised level, the concept of external assistance has been viewed as outsourcing of work at an organisational level. According to Doellgast and Gospel (2013:2), outsourcing has been driven by a variety of factors including the need to cut costs and focus on core business, emergence of new and competitive markets and the need for more flexibility, especially in the public sector. Doellgast and Gospel (2013:5) further indicate that most organisations outsource certain aspects of their SCM such as such as IT, advertising, accounting and HRM.

In a more general sense, external assistance has also been used to describe activities provided by external or consulting organisations, for example, supporting learning and teaching in schools (Hogan & Thompson, 2017:1). For the purposes of this study, external assistance is defined as the process by which the public sector seeks and engages service providers to perform certain functions and activities and/or to deliver certain services or products. In this regard, external assistance will be addressed with regards to the adoption of e-procurement systems in the public sector.

4.5. PREVIOUS RESEARCH ON THE TECHNOLOGY ACCEPTANCE MODEL AND UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY IN SOUTH AFRICA

There have been a number of studies conducted in South Africa using the TAM and UTAUT models. Some of these studies are described in this section. The list is not exhaustive but illustrative of the variety of sectors in which these studies have been conducted.

Wentzel, Diatha and Yadavalli (2013:1-15) conducted a study on the application of the extended TAM in understanding technology-enabled financial service adoption in South Africa. The study intended to establish the determinants of adoption of technology-enabled financial services. The study was prompted by the proliferation of the use of cell phones in South Africa and the growing internet penetration. The study concluded that in addition to the standard TAM constructs, social factors, self-efficacy, fun, trust and task were significant constructs that explained the adoption intention of potential customers for technology-enabled banking services (Wentzel *et al.*, 2013:1-15).

Laryea (2015:364-384) conducted a study on e-procurement use in the South African construction industry. The study found that the use of e-procurement technologies in the firms that participated in the study was predominantly influenced by the speed of transactions, lower transaction cost and ease of use. The major factors preventing the use of e-procurement systems included unreliable IT infrastructure, established cultures and security concerns.

Ndayizigamiye (2013:92-93) conducted a study to explore the determinants of ecommerce adoption among SMMEs using the UTAUT model. The four determinants tested are: i) customer's payment by credit card through the SMME's website, ii) customers placing orders through the SMME's website, iii) providing customer services through the SMME's website, and iv) placing orders with suppliers over the Internet. The results reveal that although facilitating conditions have not influenced the decision to adopt e-commerce in the surveyed SMMEs, social influence, effort expectancy and performance expectancy are determinants of e-commerce within the selected SMMEs.

Mgidhlana (2014:1-78) conducted research on the factors affecting the adoption of e-procurement technologies from the supplier perspective in the plumbing industry. The study used a theoretical framework based on the TAM. The study results showed that e-procurement adoption in the plumbing industry is driven by three major factors: internal needs, labour cost reduction and improvement in customer relationships.

Liebenberg, Benade and Ellis (2018:160-173) conducted a study on the “Acceptance of ICT: Applicability of the Unified Theory of Acceptance and Use of Technology (UTAUT) to South African Students. The results showed that performance expectancy (PE_x), facilitating conditions (FC) and effort expectancy (EfEx), had high practically significant relationships with behavioural intention (BI). self-efficacy (SE) and attitude towards using technology (ATT) as mediators of the model were confirmed. However, gender as a moderator did not reflect the original results of the UTAUT.

Moyo (2015:1-189) conducted a study on: “Elementary school children’s acceptance and use of digital school libraries at Crawford Preparatory Pretoria School in Gauteng, South Africa”. The study adopted the TAM theory. The results revealed that similar to adults, children make decisions regarding accepting and using the digital school library based on how easy it is to use and how relevant it is to their needs. The study recommends that software designers, teachers and librarians work with the children when designing digital school libraries to ensure use.

Based on the above, it is evident that there have been several studies conducted in South Africa using the TAM and UTAUT models. The studies are across a variety of sectors. The current study will make a significant contribution to understanding e-procurement adoption in the South African public sector.

4.6 CONCEPTUAL FRAMEWORK

The conceptual framework for this study is based on an integrated model of the TAM and UTAUT models. This conceptual framework is used to test the implementation of e-procurement practices in the public sector and to develop a framework that could be used to enable widespread adoption of e-procurement systems in the public sector. The conceptual framework thus assists in building an understanding of the determinants of the adoption of e-

procurement technology in the public sector. The conceptual framework is shown in Figure 4.4.

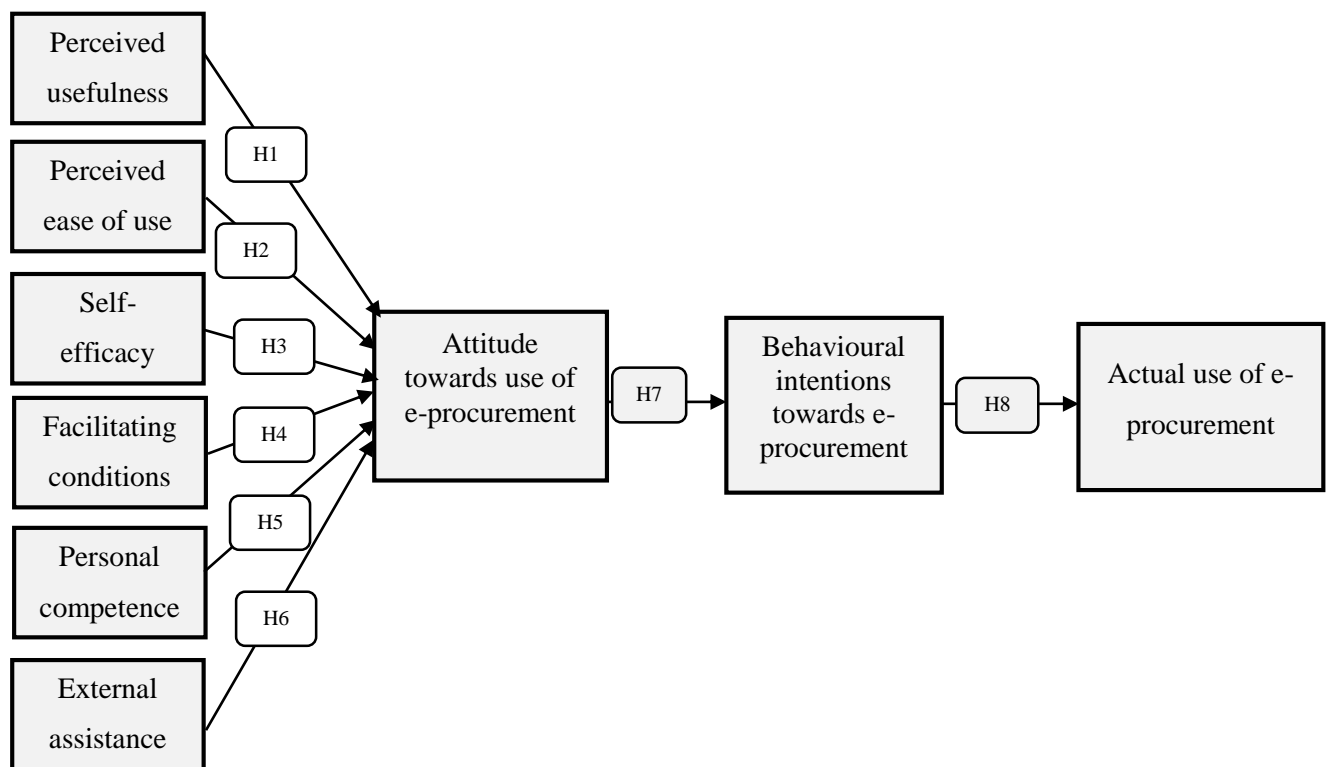


Figure 4.4: Conceptual framework

Source: Author's own work

The conceptual framework shows the TAM and UTAUT variables already discussed in previous sections. The eight study hypotheses have been developed in line with the conceptual framework. These hypotheses are discussed in the next sections and are tested in the study.

4.6.1 Perceived usefulness and attitudes towards use

In the TAM, perceived usefulness is presented as one of the key determinants of the model. Perceived usefulness influences individuals to use a system through the effect it has on individual attitudes towards the system (Chen *et al.*, 2011:125). Wong, Osman, Goh and Rahmat (2013:93) explicitly state that perceived usefulness has a direct impact on the intention to use. This is further supported by Suki and Suki (2011:2). who state that perceived usefulness directly affects a person's attitude. Literature reviewed above regarding perceived usefulness

has demonstrated the significance of this factor in understanding how individuals make decisions regarding the choice to use a system (Davis, 1989:320; Sun *et al.*, 2012:52). Based on the above, the following null and alternative hypotheses were formulated:

H_{o1}: There is no relationship between perceived usefulness and attitude towards use of e-procurement systems in the South African public sector.

H_{a1}: Perceived usefulness positively and significantly influences attitude towards use of e-procurement systems.

The null and alternative hypotheses are specifically tested with respect to the adoption and use of e-procurement systems in the South African public sector. The results from these hypotheses inform the improvement and design of e-procurement systems that demonstrate higher levels of effectiveness in the way individuals perform their work.

4.6.2 Perceived ease of use and attitudes towards use

Various studies have demonstrated that perceived ease of use positively affects the individual's attitude and intention to use a system (Chen *et al.*, 2011:125; Suki & Suki, 2011:3; Ramayah & May-Chiun, 2007:422). According to Wong *et al.* (2013:93), perceived ease of use influences intention to use indirectly through attitude. Individuals also tend to be drawn to systems that require less effort to use (Venkatesh *et al.*, 2003:450; Sun *et al.*, 2012:52). Various authors have also demonstrated that perceived ease of use is an important predictor on the decision to not only adopt a technology but also to continue to use that technology (Guriting & Ndubisi, 2006:6; Ignatius & Ramayah, 2005:69). Based on the above, the following null and alternative hypotheses were formulated:

H_{o2}: There is no relationship between perceived ease of use and attitude towards use of e-procurement systems in the South African public sector.

H_{a2}: Perceived ease of use positively and significantly influences attitude towards use of e-procurement systems in the South African public sector.

The study examines and tests these hypotheses to determine the perceptions of individuals regarding the ease of use of the e-procurement systems. The outcome of the study informs the

design and improvement of e-procurement systems in the public sector in order to make them more user-friendly.

4.6.3 Self-efficacy and attitudes towards use

The concept of self-efficacy has been defined by Bandura (1986:391), Schunk (1995:112), and Eccles and Wigfield (2002:110). According to the definitions, it is suggested that individual's perceptions of their abilities to accomplish a task and their beliefs determine their actions. Therefore, when an individual feels confident that they can accomplish a task they are more likely to take action. Such individuals are also likely to persist with a task until they accomplish the results (Schunk, 1995:112).

Self-efficacy is determined by mastery experiences, vicarious experiences, verbal persuasion, and emotional and physiological states (Bandura, 1994:72). These sources of self-efficacy have been discussed above. However, in summary, the theory states that when individuals have mastered a task, they tend to have more confidence to persist and to overcome obstacles. Secondly, when individuals observe their role models, they develop a sense of courage to attempt tasks. This is more effective when the role models share similar characteristics with the individuals observing them. Observing other people similar to ourselves succeeding at specific tasks conveys the idea that we too can accomplish the same. Thirdly, self-efficacy can be developed through verbal persuasion especially by people in influential positions. The belief and encouragement provided by these people triggers courage and confidence to take on tasks previously that looked difficult. Lastly, emotional and physiological states of individuals can either boost or destroy their self-efficacy. A feeling of confidence enables individuals to attempt tasks while feelings of tension and stress dissuade individuals from attempting the same tasks (Bandura, 1994:72-73). Based on the above, the following hypothesis has been developed:

H₀₃: There is no relationship between self-efficacy and attitude towards use of e-procurement systems.

H_{a3}: Self-efficacy positively and significantly influences attitude towards the use of e-procurement systems.

4.6.4 Facilitating conditions and attitudes towards use

The fourth hypothesis relates to the facilitating conditions for the adoption and use of e-procurement systems. Facilitating conditions are critical in influencing individuals to use a system. Individuals need to feel supported by the institution through provision of relevant technical infrastructure and other support services (Venkatesh *et al.*, 2003: 447). Facilitating conditions represent the external constraints on the intention to use. In addition to infrastructure. Kasse, Musa and Nansubuga (2015:247-248) suggest that finance and human capital can also constrain the adoption of systems. The authors further state that the variable, ‘facilitating conditions’, has not been sufficiently studied in comparison to the other variables (Kasse *et al.*, 2015:246). This study explores the perceptions of public officials in relation to the support available in terms of organisational and technical infrastructure to adopt and continue using the system (Venkatesh *et al.*, 2003:454-455). The hypothesis is stated as follows:

H₀₄: There is no relationship between facilitating conditions and attitude towards use of e-procurement systems.

H_{a4}: Facilitating conditions positively and significantly influence attitude towards use of e-procurement systems.

The study explores the organisational support structures and services available to assist individuals to use e-procurement systems. Facilitating conditions also include the technical infrastructure necessary to enable efficient usage of e-procurement. The study therefore assesses the extent to which the public sector creates an enabling environment for public servants to use e-procurement. In this regard, availability of technical skills within procurement departments and the availability and efficiency of internet connectivity are assessed. The study also provides recommendations on how best to support procurement staff including provision of the necessary infrastructure.

4.6.5 Personal competence and attitude towards use

Personal competence is an important concept in technology adoption. It encompasses individual abilities, skills and knowledge required to accomplish certain tasks (Nygren, 2015:181). Although personal competencies are discussed here in relation to technology

adoption in the workplace, they are also important in relation to individual daily life in society. As a human phenomenon, the concept of personal competence is widely applied across various sectors and industries including education, human resources and information management (Grudzinskiya *et al.*, 2015:586–595; Yatim *et al.*, 2019:21-23; Malkovaa & Kiselyovab, 2014:254-258). Given the increase in the use of technology in the workplace, this study explores the importance of personal competence in technology adoption in the public sector. The hypothesis is stated as follows:

H₀₅: *There is no relationship between personal competence and attitude towards use of e-procurement systems.*

H_{a5}: *Personal competence positively and significantly influences attitude towards use of e-procurement systems.*

The study examines and tests these hypotheses to determine whether personal competence and attitude towards use of the e-procurement systems hold true. The result may be used to inform the design of support services that may be required to develop requisite personal competencies. It is assumed that with relevant personal competencies, public sector officials in the SCM will readily adopt and use new e-procurement systems.

4.6.6 External assistance and attitude towards use

The increase in Foreign Direct Investments (FDIs) flowing into many countries in the African continent has resulted in the restructuring of business processes including promoting outsourcing in order to respond to global trends (Kuada & Hinson, 2015:48). Both private and public organisations are seeking to increase efficiencies and cut costs by engaging external service providers to provide services and/or supply products. It is assumed that for this study, external assistance is relevant with respect to the provision of support services, such as IT training or maintenance of e-procurement systems. The hypothesis is stated as follows:

H₀₆: *There is no relationship between external assistance and attitude towards use of e-procurement systems.*

H_{a6}: *External assistance positively and significantly influences attitude towards use of e-procurement systems.*

The study examines and tests these hypotheses to determine whether external assistance is a significant factor in influencing the adoption and use of e-procurement systems by public sector officers. This is important given the possibility that public sector officials may be intimidated by the use of external assistance as this may lead to redundancy of some jobs. However, the outcome of the study informs the design of support services that may be necessary to be provided through external assistance.

4.6.7 Attitude towards use and behavioural intention

Attitude is a significant variable in determining and explaining behavioural intention (Fishbein & Ajzen, 1975:15; Hee-Dong & Youngjin, 2004:19). In social psychology, it is stated that attitude has both affective and cognitive components (Hee-Dong & Youngjin, 2004:19). An individual's attitude can either be positive or negative and thus will influence their decision to either adopt and use a system or to reject it. The significance of attitude in technology adoption was studied extensively in the Reasoned Action Theory proposed by Fishbein and Ajzen (1975:1-578). Attitude strongly influences behavioural intention to use a system (Alharb & Drew, 2014:145). Attitude is also greatly influenced by other factors such as perceived usefulness and ease of use (Kapoor *et al.*, 2014:731).

The seventh hypothesis relates to attitude towards use of e-procurement systems. The study explores the nature of the attitudes public officials have towards using e-procurement systems. The hypothesis is stated as follows:

H₀₇: There is no relationship between attitude towards e-procurement systems and behavioural intention to use.

H_{a7}: Positive attitude towards e-procurement systems positively and significantly influences positive behavioural intention in its use in the public sector.

The study examines this hypothesis to determine the nature of user attitudes towards e-procurement systems. The factors influencing attitude towards the use of e-procurement systems including social influences will be explored. The results for this hypothesis inform public sector officials on how to package and position the messaging around the introduction and continued use of e-procurement systems. The purpose of this drive would be to instil positive attitudes towards the use of these systems.

4.6.8 Behavioural intention and actual system use

Literature reviewed above indicates that behavioural intention is a key variable in determining technology acceptance (Alharb & Drew, 2014:145). Individuals will make the decision to use a system or reject it based on the intentions that they set. However, behavioural intention is also influenced by other factors including attitude towards use and perceived usefulness (Alharb & Drew, 2014:145). Other studies have also confirmed that behavioural intention exerts a positive effect on usage (Bagozzi, Davis & Warshaw, 1992:659-686; Szajna, 1996:85-92; Morris & Dillon, 1997:58-65). The eighth hypothesis relates to the behavioural intention of the users of e-procurement systems in the South African public sector. The hypothesis is stated as follows:

***Ho8:** There is no relationship between behavioural intention and actual use of e-procurement systems in the public sector.*

***Ha8:** Behavioural intention positively and significantly influences actual use of e-procurement systems in the public sector.*

The study will explore the behavioural intentions of new users being introduced to e-procurement. The study also examines the behavioural intentions of current users to determine if they intend to continue using the e-procurement systems already in place. The results provide recommendations to management to enable them to promote the uptake and continued usage of the e-procurement systems.

4.7 CHAPTER CONCLUSION

The TAM and UTAUT models have been described and discussed in this chapter. The TAM was developed based on the TRA. The purpose of the TAM and its predecessors remains focused on predicting and explaining user acceptance and use of new innovations or systems. The TAM focuses mainly on the perceived usefulness and perceived ease of use as the main predictors of user acceptance. These two variables interact and combine to influence behavioural intention leading to the actual usage of a system. Although the TAM proved to be effective it also had its limitations resulting in the model being extended to develop the TAM2. The extended TAM2 introduced several other variables related to social influence that added to the predictive power of the TAM. As researchers continued to examine user acceptance

models, the UTAUT was developed through the integration of eight earlier models. This unified model had significant predictive power. The UTAUT combined and condensed similar and related variables across all the earlier models to come up with new constructs. This study sought to use the best of each model and, therefore, developed a conceptual framework that combines components of the TAM and UTAUT. In addition to the factors affecting adoption or rejection of technology depicted in these models, two additional factors are discussed. These are personal competence and external assistance. Eight hypotheses were then developed based on this conceptual framework. These hypotheses have been discussed above, and it is anticipated that the results derived from testing these hypotheses are crucial in promoting the adoption and use of e-procurement systems in the South African public sector.

CHAPTER 5

RESEARCH METHODOLOGY

5.1 INTRODUCTION

This chapter discusses the details of the research methodology adopted for this study. The first section describes research reasoning and provides justification for adopting deductive reasoning. This is followed by a discussion of research paradigms to demonstrate the philosophical underpinnings of the study. Thereafter, qualitative, quantitative and mixed method research approaches are outlined. The justifications for adopting the quantitative approach are presented. The chapter further discusses research designs including presenting reasons for choosing the survey design, as well as the research strategy. This chapter further provides highlights of the literature review conducted in the study followed by a discussion on the sampling design. The survey questionnaire and data collection procedures, data analysis and the ethical considerations are elucidated. The chapter concludes with a conclusive summary of the key methodological aspects discussed.

5.2 RESEARCH REASONING

There are predominantly two major forms of reasoning employed by researchers in conducting studies. They are inductive or deductive reasoning. According to Neuman (2014:70), inductive reasoning refers to the process of developing or confirming a theory based on acknowledged empirical evidence and then extending the logic towards creating more abstract concepts and establishing other theoretical relationships. Inductive reasoning, therefore, implies that the study reflects and analyses current evidence before formulating new theories. New and additional ideas emerge and become more refined and precise through inductive reasoning. Neuman (2014:69) also provides a definition of deductive reasoning, characterised as an approach that unlike inductive reasoning, begins with abstract concepts that are then analysed to produce concrete empirical evidence and further demonstrates that the process of deductive reasoning involves generating an idea, theorising and then testing the theory against empirical evidence to reach logical conclusions. Thus, deductive reasoning is concerned with testing hypotheses in order to ascertain their logic.

This study laid out eight hypotheses that were to be tested against empirical evidence to either accept or reject them. Based on the discussion above, deductive reasoning is suitable for this study. The hypotheses stated are based on assumptions made from a literature review of studies conducted on SCM in general and specifically on e-procurement in South Africa, regionally and globally. However, these hypotheses were tested within the context of e-procurement in the South African public sector. Historical studies on e-procurement in the South African public sector have been reviewed to provide secondary evidence. Through the statistical analysis of the data collected for the study, empirical evidence was then presented, and conclusions reached.

5.3 RESEARCH PARADIGMS/PHILOSOPHY

According to Neuman (2014:96), a paradigm forms the foundation for any study by specifying basic assumptions, key issues studied, and the methods employed to address research objectives. An earlier definition by Maxfield and Babbie (2011:32) suggests that a paradigm is a model or framework that guides the study to understand what is being studied. A paradigm is, therefore, a system of thinking guided by certain specific acceptable theories and models. According to Hakansson (2013:4), a paradigm provides the basis for assessing the validity and suitability of the study. There are various paradigms researchers utilise in conducting studies. These include positivism, post-positivism, phenomenology, and pragmatism (Babbie & Mouton, 2010:79-84; Engel & Schutt, 2013:18-21).

The basic premise of the positivism paradigm is that scientific study is necessary in order to establish objective reality (Maxfield & Babbie, 2011:35). This is notwithstanding the acknowledgement that individuals embody subjective reality based on their experiences. The paradigm states that individual experiences can be observed and studied to establish causality (Neuman, 2014:97) and general patterns or trends in human behaviour (Lincoln *et al.*, 2011:107-108). Although both subjective and objective reality is acknowledged in the positivism paradigm, there is more emphasis on the objective reality, which can be validated through observation, recording and measurement (Kachingwe, 2013:118; Muijs, 2010:4). The use of scientific methodologies to understand phenomena is, therefore, central to the positivism paradigm (Luyirika, 2010:42). The post-positivism paradigm came into being to counteract the emphasis on scientific inquiry and negation of social realities. According to Creswell (2014:36), the post-positivism paradigm seeks to identify and assess the causes that influence

outcomes in social and human behaviour. The post-positivism paradigm, therefore, seeks to describe and explain phenomena within social contexts (Henderson, 2011:342). This approach suggests that both social and scientific approaches can be used to understand human behaviour and experiences in real life.

Phenomenology is a philosophical approach that is based on the notion that human experiences are subjective and are shaped by how individuals relate to their context. This context relates to the individual physical environment, objects, and people they relate to in different situations. The purpose of the phenomenology approach is to describe, reflect upon and interpret these experiences into meaningful information (Zikmund, Babin, Carr & Griffin, 2013:136).

Based on the preceding discussion, the post-positivism paradigm leans towards and is associated with quantitative studies. Its scientific nature resonates with methodologies designed to gather quantitative data which can be analysed through mathematical and statistical computations to explain social phenomena (Henderson, 2011:343). The post-positivism paradigm was, therefore, suitable for this study. This study focused on gathering quantitative data to empirically test hypotheses regarding the perceptions and attitudes of SCM professionals in the South African public sector towards the adoption of e-procurement.

5.4 RESEARCH APPROACH

There are three major research approaches, namely: quantitative, qualitative and mixed methods. The choice of the research approach is influenced by the nature of the study and the posited hypotheses. The quantitative approach is used for testing objective theories by examining the relationships among variables (Creswell, 2014:32). The quantitative approach suggests that the best way to measure properties of phenomena is through quantitative measurement. Thus, the perceived quality of things or attributes of human behaviour are measured in numerical terms (Babbie & Mouton, 2016:49).

According to Zikmund (2011:134), researchers employing quantitative approaches use numeric scales to measure concepts and to enable them to make statistical computations. The focus of quantitative approaches is on determining objective conclusions based on the scientific analysis of data. Furthermore, quantitative approaches adopt deductive reasoning (De Vaus, 2013:56) and are suitable for studies seeking to test specific hypotheses related to attitudes and

beliefs about specific phenomena (Muijs, 2010:6). In contrast, the qualitative approach focuses on describing and understanding human behaviour rather than explaining or making predictions (Creswell, 2014:32; Babbie & Mouton, 2016:53). The qualitative approach seeks to gather and document the views, perceptions, and experiences of individuals in their own contexts (Flick, 2014:14; Ponteretto, 2005:128). Thus, the focus of qualitative approaches is on the subjective views of respondents.

The mixed method approach combines both the qualitative and quantitative methods in a complementary manner (Saunders, Lewis & Thornhill, 2012:153). The adoption of the mixed methods approach is often beneficial when either method alone will not sufficiently address the research questions. Therefore, with a mixed method approach, the study benefits from the strengths of each method (Zou *et al.*, 2014:320). According to Creswell and Clark (2011:12-13), and Neuman (2014:5), the mixed method approach provides more comprehensive evidence for studying a research problem than either qualitative or quantitative research alone and enables triangulation of information to enhance the validity of the study.

This study adopted a quantitative approach. The focus of the study was to establish the factors affecting the adoption of e-procurement within the South African public sector. This was accomplished by gathering empirical data and performing statistical analysis in order to reach concrete conclusions. The quantitative approach also carries the attributes of scientific inquiry necessary to reach objective conclusions. These include gathering data using a structured questionnaire with scales that enable the translation of the gathered data into numeric values and the analysis of such numeric data to produce definitive conclusions. This deductive reasoning approach also complements the analysis by testing the hypotheses formulated as part of the theoretical and conceptual framework guiding the study (Muijs, 2010:7).

5.5 RESEARCH DESIGN

A research design is defined as a tactical plan or plan of action that lays out the outline and key aspects of the research study (Gordon, 2013:43; Punch, 2013:206). The plan includes details on the type of data to be collected, the methods to be used to gather and analyse data and the justifications for using these methods. There are various research designs that researchers can adopt depending on the nature of the research study. For the quantitative studies, the research

designs include survey, observation, experimental, descriptive and correlation (Creswell, 2009:31).

This study adopted the survey design to collect data through the use of a structured questionnaire designed before commencing the study (Creswell, 2014:155). In utilising the survey design, the researcher systematically asks a large number of people the same questions and then records their answers (Neuman, 2014:49). The survey design enables the researcher to gather quantitative or numeric data that can describe trends, attitudes, or opinions of a population by studying a sample of that population (Creswell, 2014:41). In this study, the survey design enabled the collection of data from SCM practitioners in the public sector in the Gauteng Province on the factors that influence their adoption of e-procurement.

5.6 RESEARCH STRATEGY

A research strategy refers to a blueprint that guides the implementation of the study. This blueprint serves as a road map that enables the researcher to conduct the research using methods consistent with the requirements of the study. The nature of the research influences the choice of a research strategy. Given that this study is quantitative, there are specific strategies that are relevant for this type of study. These include case study, longitudinal, cross-sectional and ex-post facto (Hakansson, 2013:6).

A case study refers to a study of a particular person, group, organisation or event (Zikmund *et al.*, 2013:139). Sekaran and Bougie (2013:110) posit that a case study is a strategy that focuses on gathering data and information on a particular subject or problem. According to Yin (2013:6), the case study approach is relevant for studies seeking to understand the how or why of phenomena in a particular context, space and time. According to Neuman (2014:42), data collected using a case study approach is often detailed, varied, and extensive. Besides, case studies are usually used in qualitative studies. Research strategies can be based on timeframe and frequency of data collection. For instance, when information is collected from multiple units or cases across more than one point in time, this suggests a longitudinal strategy (Neuman, 2014:44). According to Ployhart and Vandenberg (2010:97), a longitudinal strategy may involve gathering information from the same respondents repeatedly over a period of time. The intention of this strategy is often to gather information that can be used to determine patterns of behaviour over a period of time. By contrast, the cross-sectional strategy focuses on

gathering information on many cases at one point in time (Nueman, 2014:44). Rather than producing time series data, this strategy produces a ‘snapshot’ that describes phenomena at a particular time. The ex-post facto strategy as the name suggests is focused on the study and analysis of an event after it has occurred with the intention to establish causation (Simon & Goes, 2013:1). This strategy is suitable for any study that seeks to establish the causes of specific phenomena after their occurrence.

For the purposes of this study, the cross-sectional strategy was used. The cross-sectional design was chosen because it is useful in describing the characteristics of a large population, makes use of large samples, which makes the results statistically significant even during the analysis of multiple variables (Fok, Henry & Allen, 2015:148). This strategy was suitable for this study as the study is focused on establishing the factors that influence SCM professionals in the South African public sector to adopt e-procurement. The information was collected on pre-determined variables from SCM professionals in Gauteng, only once, and then analysed.

5.7 LITERATURE REVIEW

A literature review involves the review of documented information and knowledge regarding the research question the researcher seeks to explore. A literature review is a necessary aspect of any study. According to Neuman (2014:126), and Welman, Kruger and Mitchell (2005:38-39), reviewing literature at the onset of the study has several advantages including the following:

- Enables the development of a deeper understanding of major issues in the research area, which in turn enhances competence and ability to conduct the research. From the reader’s perspective, this builds credibility.
- Demonstrates the linkage of the research to previous studies and defines the context and relevance of the study.
- Provides a comprehensive synopsis of current knowledge showing areas of agreement, disagreement, and major questions that remain within the focus area. This enables the researcher to point to the direction in which future research is going.

- Stimulates new ideas within the researcher based on what others have discovered and concluded in their studies. The literature review serves as a launch pad for the researcher to formulate new hypotheses and benchmark techniques and methodologies to copy or replicate in other contexts.

In this study, a comprehensive review of the literature was conducted and is reported on in Chapters Two, Three and Four. Chapter Two focused on the development of public procurement. Some of the subjects that were discussed in this chapter include the conceptualisation of public procurement, the evolution of public procurement, public procurement in the international context and public procurement in South Africa. Chapter Three reviewed literature on the evolution and state of e-procurement. The major subjects that were discussed include conceptualisation of e-procurement, development in e-procurement, factors contributing to the adoption of e-procurement, benefits associated with the use of e-procurement, challenges associated with the use of e-procurement, e-procurement in South Africa. Chapter Four focused on the theoretical underpinning, conceptual framework and hypotheses development, modelling the adoption of e-procurement in the South African public sector. The major subjects that were discussed include: understanding the TAM and UTAUT models, previous research on the TAM and UTAUT models' use of technology in South Africa, the conceptual framework, and the study hypotheses.

5.8 SAMPLING DESIGN

Sampling design is the researcher's provisional plan for a quantitative description of trends, attitudes or opinions of a population by studying a sample of that population (Freeborn, Wooster & Roberts, 2011:475; Creswell, 2014:235). The sampling design consists of the definition and description of the population, target population, sample size and sampling method.

5.8.1 Population

In research, population refers to a group of elements or cases, whether individuals, objects, or events, that conform to specific criteria and to which we intend to generalise the results of the

research (McMillan & Schumacher, 2014:119). Babbie and Mouton (2016:173) refer to a population as an aggregation of all elements in the study. For this study, the study population comprised SCM practitioners in the public sector in South Africa. Supply chain practitioners are stakeholders who are involved in the supply chain of a good or product, from the manufacturing of a good or service up to its distribution through the public sector supply chain up until it reaches the end user.

5.8.2 Target population

The target population is the aggregation of elements from which the study sample is selected (Babbie & Mouton, 2016:174). For this study, the target population consists of SCM practitioners in the public sector in the Gauteng Province. The study focused on government departments that have e-procurement systems in place, and which are also fully operating the new procurement system. This requirement was necessary in order to ensure that the study objectives were sufficiently addressed. Therefore, data were gathered from the following 26 departments in the Gauteng Province as shown in Table 5.1.

Table 5.1: Gauteng provincial departments that participated in the study

1. Agriculture, Forestry and Fishery	2. Arts and Culture
3. Defence and Military Veterans	4. Basic Education
5. Energy	6. Communication
7. Environmental Affairs	8. Correctional Services
9. Justice and Constitutional Development	10. Health
11. Labour	12. Home Affairs
13. National Intelligence Agency	14. Human Settlements
15. Rural Development and Land Reform	16. The Presidency
17. SAPS	18. Tourism
19. Social Development	20. Transport
21. Statistics South Africa	22. Water Affairs
23. Police	24. Women's Affairs
25. Public Works	26. National Treasury

Source: Author's own work

5.8.3 Sample size

Sample size is the actual number of individuals in the population that is going to be surveyed (Flick, 2011:253; Kumar, 2011:194). Sample size estimation is the most problematic activity in studies that employ statistical techniques (Siddiqui, 2013:285). It depends both on the nature of research and the statistical technique to be employed in research. Studies that employ multivariate statistical techniques often require very large samples from which to make valid conclusions about the population from which they were selected (Hair, Black, Babin & Anderson, 2011:703). The first criterion applied in this study is the historical sampling technique, where reference was given to sample sizes used in previous similar studies. Table 5.2 indicates some of the studies that were considered.

Table 5.2: Basis for the sample size

Previous study	Focus	Country /region	Sample size
Giunipero, Ramirez and Swilley (2017)	E-purchasing tools Usage in Supply Chain Management	Asia	899
Laryea (2015)	E-procurement use in the South African construction industry	South Africa	603
Mohammed and Desscher (2017)	E-public procurement adoption	Belgium	760
White, Afolayan and Plant (2014)	Challenges to the adoption of e-commerce technology for supply chain management	Nigeria	300
Li et al. (2015)	E-procurement systems	China	211
Li et al (2017)	Attitude towards e-auctions	China	210
Tan (2013)	Applying the UTAUT	Taiwan	176
Snider and Rendon (2012)	Public procurement: public administration and public service perspectives	USA	169

Previous study	Focus	Country /region	Sample size
Njeru, Ngugi, Arasa and Kahiri (2014)	Procurement policies and implementation of effective procurement practices	Kenya	160
Lean, Zailani, Ramayah and Fernando (2012)	Use of e-government services	Malaysia	150
Rotich and Okello (2015)	Relationship between e-tendering and procurement performance	Kenya	120
Mahinda (2015)	E-procurement challenges	Kenya	100
Oye, Iahad and Rahim (2012)	Impact of the UTAUT Model	Nigeria	100
Omany, Njeri and Mungai (2013)	Factors affecting use of e-procurement	Kenya	105

Source: Compiled by author

As shown in Table 5.2, studies on e-procurement have been conducted in many countries in Africa as well as Asia and Europe. Most studies indicated in Table 5.2 used sample sizes ranging between 100 and 800. A recent study by Laryea (2015:83) on e-procurement in the construction industry used a sample of 603 respondents. According to Lin, Lucas and Shmuelim, (2013:3), large sample sizes increase the level of statistical significance of research results thereby giving a true picture of the characteristics in the population (Singh & Masuku, 2014:8; Sedgwick, 2015:2). Based on the sample sizes presented in Table 5.2, the sample size of this study was pegged at n=500. According to Singh and Masuku (2014:11), researchers can use the same sample size as those of studies similar to the current study.

Other considerations regarding sample size were also contemplated in this study. Tabachnick and Fidell (2018:534) suggest that when using multivariate analysis, it is recommended that the sample size be above 200, with the more the better. Also, Hair, Black, Babin, Anderson and Thatham (2014:573-4) state that there should be a minimum of 10 respondents for every one variable in order to use linear regression analysis. As such, the predetermined sample size of n=500 for this study was considered to be adequate in this study.

5.8.4 Sampling approach

Sampling refers to the selection of a subset of persons or elements from a larger population with the intention of representing a target population (Neuman, 2014:246). The primary aim of sampling is to make some inferences about a given population using the chosen sample (Uprichard, 2013:4). Sampling inevitably saves the research with respect to costs and time given the difficulties associated with gathering information from all individuals from an entire population. There are basically two major sampling approaches, probability and non-probability sampling (Hair *et al.*, 2014:20; Wretman, 2010:29). In probability sampling, all individuals or elements in a population have a known non-zero and equal chance of being selected (Babbie & Maxfield, 2014:222). Probability sampling is used to select a sample that has characteristics that closely resemble the population from which it was selected. Thus, probability sampling enables researchers to select representative samples from large populations (Babbie & Mouton, 2016:175).

Sampling methods can be grouped into two categories: probability or representative sampling; and non-probability or judgmental sampling. These samples can be drawn through various methods including simple random sampling, systematic and stratified sampling (Babbie & Mouton, 2016:189-191). With non-probability sampling, the samples are drawn based on a judgement approach with the intention to assemble individuals or elements that fit predetermined criteria (Wretman, 2010:31). Non-probability is often used in qualitative studies to select small samples of individuals with specific attributes or knowledge about a particular topic (Blumberg, Cooper & Schindler, 2008:257). There are various types of non-probability sampling, including purposive and convenience sampling. According to Neuman (2014:273), purposive sampling involves using various methods to access all possible cases that fit particular criteria; and convenience sampling involves using any methods that are convenient to the researcher to access select study respondents.

In this study, non-probability sampling was adopted to select the research respondents, in the form of the convenience sampling technique. The convenience sampling method was applied in selecting the public sector organisations that were available and willing to participate in this study. Convenience may be interpreted as ease of access to research respondents (Robinson, 2014:25). Etikan, Musa and Alkassimandero (2016:2) argue that the convenience sampling

technique is conducted through selecting research respondents on the basis of their availability and willingness to take part in the study. It ensures substantial representation from the earmarked public sector organisations (Levine, Berenson, Bernard, Krehbiel, & Stephan, 2011:7).

After selecting organisations on a convenience basis, the actual respondents were then selected using the purposive sampling technique from each participating organisation. Purposive sampling is a technique that is based on the researcher's knowledge and understanding of the relevance and usefulness of the respondents which are used to select the desired characteristics (Naidoo, Van Wyk & Joubert, 2016:22). Purposive sampling is selected by some arbitrary method because it is known to be representative of the total population, or it is known that it will produce well matched groups. The idea is to pick out the sample in relation to some criteria, which are considered important for the particular study (Singh & Masuku, 2014:91). SCM practitioners with at least two years' experience were chosen to participate in the study and also these practitioners had to have used e-procurement before.

5.9 DATA COLLECTION PROCEDURES

Data collection is a critical phase in the research process. Sani (2013:40) defines data collection as the actual process of gathering information and data necessary to answer the research questions and address the research objectives. In order to prepare for the data collection process, the researcher designed the questionnaire or data collection tool (discussed further in Section 5.9.1). The questionnaire was designed as a self-administered tool and was pre-tested to ensure that it is appropriate for gathering relevant data to answer the research questions. The pilot study was conducted in February 2018 with 40 SCM professionals from the City of Tshwane and the departments of Defence, Correctional Services, Arts and Culture, and Energy, in the Gauteng Province. The feedback received from the pilot sample was used to refine the questionnaire before final approval. Feedback and approval by the academic advisors was requested. Once the questionnaire was approved, the government departments in the Gauteng province that have e-procurement systems were identified. However, before contacting these departments and sampling respondents to complete the questionnaires, ethical clearance was requested, and the university granted permission with support from the academic supervisors.

Questionnaires were delivered to locations predetermined by the respondents who would then complete the said questionnaires. The researcher then subsequently collected the completed questionnaires from respondents. This approach enabled respondents to complete the questionnaires privately thus eliminating researcher bias, maintain anonymity and enhance confidentiality (Carpentier & Munos, 2014:179). Furthermore, the method enabled a better response rate (McGuirk & O'Neill, 2016:246; Fowler, 2013:61; De Vaus, 2013:55), as respondents committed to completing the questionnaires aware that the researcher would return to collect them at a predetermined time.

In some cases, the questionnaire was emailed to the respondents who in turn sent back the completed questionnaires electronically. This approach also enabled the researcher to reach as many respondents as possible without the limitations of the time and logistics required to deliver and collect the completed questionnaires physically. Although it was estimated that completing the questionnaire would take no more than 20 minutes, the researcher allowed the respondents up to between two and three weeks to complete the questionnaires and ensure they were ready for collection. This allowance was made in recognition of the fact that the respondents would require to set aside time after work to complete the questionnaire in order not to interfere with their work schedules. In all cases, respondents were neither provided with incentives nor coerced into participating in the study. All respondents voluntarily participated as required according to ethical considerations that apply to social research. Respondents were not given any incentives for participating in the study

5.9.1 Research instrument

This study uses a structured research questionnaire to collect data from the SCM practitioners in the public sector. A questionnaire is a measurement tool designed and used for the purpose of gathering data for a specific study (Fabiola & Ignasi, 2012:234). The choice of a structured questionnaire was motivated by its merits, which include being regarded as a cheap and effective way of collecting data in a structured and manageable form from a large pool of respondents (McLeod, 2014:1).

The questionnaire consists of two major sections. Section A is designed to gather demographic information of the research respondents. The information gathered included the gender of the respondents, age, highest qualification, years of experience in the public sector, monthly net

income, nature of employment, department, and position in the organisation. The age and number of years of experience are especially relevant as these variables impact on the level of knowledge regarding SCM and e-procurement issues. Included in the research instrument are questions pertaining to the management level of respondents and the type of employment contract. This kind of information is deemed necessary as it has a bearing on the depth and reliability of information provided in the study. As such, the researcher needed such information to validate the results obtained from the analysis.

Section B focuses on gathering information on e-procurement practices. This section consists of a series of questions on seven constructs, namely: perceived usefulness, perceived ease of use, self-efficacy, facilitating conditions, attitudes towards use, behavioural intention, and actual system use. Perceived usefulness was measured using four questions adapted from Zikmund *et al.* (2013:176). Perceived ease of use was measured using three questions adapted from Mulili (2011:129). Self-efficacy questions were adapted from Sekaran and Bougie (2013:47). Facilitating conditions was measured using five questions adapted from Rajasekar, Philominathan and Chinnathambi (2013: 4). Attitude towards the use of e-procurement was measured using five questions adapted from Zou *et al.* (2014:203). Behavioural intentions and actual system use were measured using four questions from Snider and Rendon (2012:329).

The adaptation of the questions was performed by rephrasing them in order to suit the current study. The researcher was cognisant of the fact that the central or core meaning of the questions should remain unchanged. Therefore, the questions were either shortened or slightly expanded to address the unique needs of the study.

The responses to the various statements under each construct, using a five-point Likert scale, was calibrated as follows:

1 = *Strongly disagree*; 2 = *Disagree*; 3 = *Neutral*; 4 = *Agree*; and 5 = *Strongly agree*.

The use of the Likert scale has numerous advantages that contributed to it being chosen for use in the questionnaire. Among these advantages is the view that the Likert scale is a universally accepted tool for use in a questionnaire and that it is easily comprehensible. Furthermore, the responses on a Likert scale are easy to calculate and quantify through the use of quantitative analysis (Allen & Seaman, 2007:73). The scale does not ask for elaborated responses from the

respondents, neither does it ask for a yes or no answer from them, rather it asks from them the extent to which they agree, are neutral, or disagree with given statements, which relieves the pressure on a respondent of having to give a definite response. Additionally, the Likert scale provides respondents with an option for scenarios where they are unsure or undecided by giving the option of neutral responses (Maxfield & Babbie, 2011:65). As a result, the responses from a Likert scale are easily coded during analysis. The Likert scale questionnaires are also among the fastest, cheapest and more effective ways of collecting data. They are highly flexible in the ways they can be distributed, being able to be sent through email, on the internet or by hand (Zou *et al.*, 2014:132).

Therefore, the five-point Likert scale was chosen for this study to achieve a high response rate, improve the quality of the responses and also to reduce the respondents' frustrations of having to answer difficult questions in their own words (Mulili, 2011:114).

5.10 DATA ANALYSIS PROCEDURES

The Statistical Package for Social Sciences (SPSS version 26.0) was used to process and analyse the data collected through the questionnaire survey. Before the final analysis was performed, the data went through several series of tests to determine their quality. The collected questionnaires went through screening to remove those with errors. After that, each question was allocated a number code, before all data from the questionnaire was entered onto the Excel spreadsheet. Data from the Excel spreadsheet were then exported to the SPSS software for initial analysis. The statistics that are used in the study include descriptive statistics, exploratory factor analysis (EFA) and regression analysis.

5.10.1 Descriptive statistics

Descriptive statistics gather information from a sample of the population that would be used to describe and analyse data (Schmitt, 2011:109). They aim to provide a summary of data and are analysed using numerical data (Shields & Nandhini, 2013:234). They convert large volumes of quantitative data into a meaningful and easily interpretable form (du Plooy-Cilliers & Bezuidenhout, 2014:75). The present study used several descriptive statistics such as frequencies, percentages, mean scores and standard deviations.

5.10.1.1. Frequencies and percentages

Frequencies and percentages are used once data coding has been completed. Frequencies record the number of times a variable occurs, for instance, the number of males and females who participated in the study. Similarly, percentages are used to present personal information such as demographics, age groups and race, among others. Percentages are computed by using the frequency of each category and dividing it with the total number of respondents and then multiplying by 100 (Mayer, 2015:76). Thus, percentages are easier to interpret than most of the other available statistics. In this study, frequencies and percentages were used to analyse the demographic details of respondents and to determine the perceptions of respondents towards the research constructs. These results are presented in Sections 6.1 and 6.2.

5.10.1.2. Mean scores

The mean is a measure of central tendency, which is calculated as the sum of all observations divided by the total number of observations (Rossell, 2012:342). It is also known as a measure of location. After data collection, responses from different respondents to a statement on a Likert scale are calculated to find the average response to that statement, which is also known as the mean (Seidman, 2014:234).

In the present study, the mean was employed in identifying the leading and trailing attitudes/perceptions of respondents towards the research constructs. Those items with higher mean scores represent the leading perceptions/attitudes amongst the respondents. These results are indicated in Section 6.3.

5.10.1.3. Standard deviations

The standard deviation is used to calculate and describe the variability and spread of the data. The standard deviation is used in combination with the mean and is used to calculate the differences of each observation from the mean (Bryant, Fred, Satorra & Albert, 2012:45).

In this study, the standard deviation was similarly used in conjunction with the mean to determine the degree of spread of the scores about the mean. These results are presented in Section 6.5.

5.10.2 Exploratory factor analysis

Exploratory factor analysis is used to reduce data to summarised variables and to explore more about its underlining theoretical structure (Matsunaga, 2010:83). It is used to explore the relationship between the respondent and the variable. For this study, EFA was used to determine the factor structure of the constructs which were under study.

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (MSA) and the Bartlett's Test of Sphericity were used to determine whether the data were factorable. The factor structure was determined using the scree plot criteria, the eigenvalues and the factor loadings. Only factors with eigenvalues greater than one were selected together with those items with factor loadings greater than 0.5 (Li & Cheng-Hsien, 2015:56). The results for the factor analysis are presented in Section 6.6.

5.10.3 Correlation analysis

Correlation is one of the most common and useful statistical tests used to analyse data (Corbin & Strauss, 2013:89). Correlation analysis is performed to assess the existence and direction of the relationship between two numerical data variables (Saunders *et al.*, 2012:723; Samuels & Gilchrist, 2014:1). According to Salkind (2012:110), correlation shows the extent to which two quantitative variables vary in relation to each other. The measure of correlation is represented by the statistic “ r ”, the correlation coefficient, which is scaled between -1 and +1. The further from zero in either the positive or negative direction, the stronger the relationship between the two variables. When r is close to 0 this means that there is little relationship between the variables.

Generally, there are two major correlation coefficients (Lui, Tang, Chen, Lu, Feng & Tu, 2016:115). The first one is the Spearman's rank correlation. It is a nonparametric rank statistic measure of the strength of an association between two variables (Hauke & Kossowski, 2011:87). Spearman's rank correlation is used when analysing associations between different constructs when using data that are not normally distributed (Mukaka, 2012:69; Lui *et al.*, 2016:117). The second type of correlation coefficient is known as Pearson's correlation coefficient. It is a measure of the linear relationship between two interval or ratio variables

(Mukaka, 2012:69). According to Chok (2010:4), it is used when dealing with data that are normally distributed.

In this study, the Pearson's correlation coefficient was applied to determine the association between constructs and implementation of e-procurement, namely: perceived usefulness and attitude towards system use; perceived ease of use and attitude towards system use; self-efficacy and attitude towards system use; facilitating conditions and attitude towards system use; personal competence and attitude towards system use: external assistance and attitude towards system use; attitude towards system use and behavioural intention; and behavioural intention and actual system use (Section 6.8). Pearson's correlation was used because the variables are of a quantitative nature.

5.10.4 Regression analysis

Regression analysis is a statistical technique used to analyse relationships between one independent and one dependent variable (Sarstedt & Mooi, 2014:194). Regression analysis is also used for prediction and to determine causality (Muijs, 2010:61). According to Collis and Hussey (2014:62), through regression analysis, a prediction can be made on variables based on their scores observed in another or several other variables. While correlations determine whether or not there is a relationship between two variables and establish the direction of this relationship, regression is better suited for analysing linear relationships given its predictive power. In this study, regression analysis was used to determine whether any predictive relationships exist between the dependent (attitude towards use) and independent variables (perceived usefulness, perceived ease of use, self-efficacy, facilitating conditions, personal competence, and external assistance). This was deemed important because it would establish the independent variables with a strong predictive relationship with Attitudes towards use of e-procurement systems.

Three regression models are specified in the present study. In the first regression model, the six predictor variables are the independent variables while Attitude towards use is the dependent variable. In the second regression model, attitude towards use is the independent variable while behavioural intention is the dependent variable. In the third regression model, behavioural intention is the independent variable while actual e-procurement use is the

dependent variable. Regression analysis results are presented in Section 6.9 where the proposed relationships between constructs are tested.

5.11 RELIABILITY AND VALIDITY

This section discusses the procedures implemented to ensure that the study has acceptable validity and reliability.

5.11.1 Reliability

Reliability may be perceived as the degree to which a measurement instrument is consistent and repeatable (Chakrabartty, 2013:2). The Cronbach's alpha was used to measure the internal consistency of each set of items on the Likert scale; it is also known as the measurement of the scale reliability of the questionnaire items (Ibid). According to Giliem and Giliem (2003:54), a minimum value of 0.7 for the Cronbach's alpha is acceptable. Also, item-total correlations were used to determine reliability. Item-total correlations refer to the correlation between an individual item and the total score without that item and are useful as a measure of the reliability of a multi-item scale and a tool for improving such scales (Flom, 2017:1). Item-total correlations will be more than 0.4 if the scale is reliable (Yusoff, 2011:26).

5.11.2 Validity

Validity is concerned with ensuring that to a larger extent, the instrument chosen for a particular study actually measures what it claims to measure (Bryman & Bell, 2015:27). This implies that efforts should be made to ensure that the research instrument is suited for its purpose. In that regard, for the current study, four different types of validity were tested, which include face validity, content validity, construct validity and predictive validity.

5.11.2.1 Face validity

Face validity is used to determine whether the operational definitions of a study are accurately presented in the resultant questionnaire. Therefore, a face validity test involves evaluating the extent to which the conclusions drawn from the study are a true reflection of the measurements

used, the research design and the context in which the study was carried out (Boomsa, 2000:234).

To ensure face validity, a review was conducted by two experts in the subject area who evaluated the contents of the questionnaire, after which comments were provided on whether the questions were sufficient to elicit the information required by the study (Blumberg, Cooper & Schindler, 2008:275).

5.11.2.2 Content validity

Content validity is concerned with measuring the extent to which the research instrument adequately examines the items in each construct (Pennington, 2003:37). Thus, content validity was used to ascertain the adequacy of the questions in the questionnaire. For content validity to be ascertained, a pilot study was conducted using 40 conveniently selected respondents. Feedback from the pilot study was also used to make relevant changes to the questionnaire to improve it.

5.11.2.3 Construct validity

Construct validity is concerned with determining if the research instrument truly measures the construct it purposes to measure (Anderson & Gerbing, 1988:405). According to Bryman and Bell (2015:27), construct validity can be measured through ensuring convergence and divergence. Construct validity can be demonstrated if the research instrument is proven to be homogeneous, which implies that it should be found to be measuring a single construct. On the other hand, divergence implies that there is sufficient evidence to prove that the indicators that are expected to measure different concepts are actually doing so. To demonstrate construct validity, correlation tests were applied. According to Brown (2010:10), construct validity can be established through calculation of correlation coefficients, factor analysis or ANOVA. In this study, construct validity was assessed through correlations and factor analysis. These results are presented in Chapter Six.

5.11.2.4 Predictive validity

Predictive validity is concerned with prediction of future experiments or tests based on a set of research results (Frey, 2018:1). In this study, the high beta values between any two constructs is evidence that the outcome can be used to correctly predict similar relationships (Saunders *et al.*, 2012:36). In this study, regression analysis was used to establish predictive validity based on the relationships between the dependent (attitude towards use) and independent variables (perceived usefulness, perceived ease of use, self-efficacy, facilitating conditions, personal competence, and external assistance). These results are presented in Chapter Six.

5.12 ETHICAL CONSIDERATIONS

Researchers are bound by a range of ethical considerations intended to protect the interests of respondents participating in the study (Neuman, 2014:146). The researcher is also required to follow certain processes and fulfil specific requirements while collecting data from and interacting with respondents (Creswell, 2014:92). These ethical considerations are discussed in this section with a view to demonstrate that the study was conducted in compliance with the tenets of social research.

As a starting point, the researcher applied for ethical clearance from the Higher Degrees Committee at the Vaal University of Technology. Permission was granted on the basis that the research focus and proposed processes did not in any way endanger respondents or infringe upon their rights as is discussed further in Section 5.12.4. Once this clearance was obtained, the researcher sought permission from the selected public sector institutions involved in the study, to conduct research with the respondents that were subsequently selected. Individual public sector institutions granted the researcher permission to conduct the study. Once the public sector granted the researcher permission to conduct the study, the researcher engaged with the respondents, selecting individuals available and willing to participate in the study. The key ethical considerations observed during the study are: informed consent, voluntary participation, confidentiality and anonymity, protection from victimisation and freedom to withdraw from the study. These are discussed in the following sections.

5.12.1 Informed consent

Informed consent is when a person knowingly and voluntarily consents to participate in a study. It is usually not adequate to seek voluntary participation from individuals. They need to be aware of what it is that they are agreeing to take part in. According to Neuman (2014:151), informed consent is a statement, usually written, that explains aspects of a study to respondents and asks for their voluntary agreement to participate before the study begins. In this study, the respondents were provided with a brief explanation of the nature and focus of the study, which they were required to sign before commencing the completion of the questionnaire. Respondents were also informed that they could revert to the researcher should they have need for further clarification regarding the study. Therefore, respondents were clear on the fact that the study was an academic study and did not make any promises to improve the functioning of their departments or institutions.

5.12.2 Voluntary participation

The respondents were informed that there were no incentives for participating in the study. This means that there were no rewards for participating. The researcher also did not coerce the respondents to participate in the study. Therefore, the choice to participate in the study was voluntary. This ethical consideration is significant in that it provided every opportunity for respondents to make unbiased contributions to the study.

5.12.3 Anonymity and confidentiality

The researcher informed respondents that their identities would be protected by ensuring that they did not record their names on the questionnaires. Therefore, their identity would remain unknown to anyone but the researcher. In this way, the anonymity of the respondents was upheld. However, there are always challenges with the principle of anonymity as researchers have to engage directly with respondents. The principle of confidentiality provides an amicable solution to this dilemma. Confidentiality involves putting in place mechanisms to prevent individual respondents being linked to certain responses in the data set (Neuman, 2014:155). In this study, the questionnaires were identified through a number system to ensure that they cannot be traced back to individual respondents. Furthermore, the analysis of data produced aggregate statistics that made it difficult to link data to individual respondents.

5.12.4 Protection from victimisation

As suggested by Neuman (2014:148), the researcher did not place respondents in any situation that could cause them physical harm, psychological abuse, stress, or any activity that might cause a loss of self-esteem. The researcher delivered the questionnaires to the respondents or emailed them and allowed sufficient time to complete them without exerting any undue pressure for them to do so. Thus, to the extent possible, the researcher ensured that the study did not in any way place respondents in a position where they could be susceptible to victimisation (Myers & Venable, 2014:803).

5.12.5 Right to withdraw from study

Although the researcher ensured that respondents were informed that their participation was voluntary and based on informed consent, it was further clarified that should they choose to withdraw from the study before completion of the questionnaire they were free to do so. Respondents were informed that it was within their rights to withdraw from the study at any time and for any reason (Myers & Venable, 2014:803).

5.13 CHAPTER CONCLUSION

The chapter has discussed the details of the research methodology adopted for this study. The chapter discussed the reasoning behind the research and the reasons for adopting deductive reasoning. The philosophical underpinnings of the research were demonstrated in a discussion of the research paradigms. The qualitative, quantitative and mixed method research approaches were also discussed, and motivation for the selection of the quantitative approach was provided. The chapter further indicated that a survey design was selected for this study and the reasons why it was chosen for this study were elucidated. The chapter also highlighted how the literature review was conducted in this study, and this was followed by an explanation of the sampling design. The survey questionnaire and data collection procedures were also reported on, including the data analysis methods employed in the study, such as the descriptive and inferential statistics. The chapter ended with a discussion of the ethical principles observed during the course of the study. The next chapter discusses the research results.

CHAPTER 6

DATA ANALYSIS AND INTERPRETATION

6.1 INTRODUCTION

This chapter presents results pertaining to the conceptual framework for the implementation of e-procurement practices in the South African public sector. The chapter comprises ten sections. Section 6.2 provides results from the pilot study conducted prior to undertaking data collection for the final analysis. Results from the main survey study are presented from sections 6.3 to 6.8. Section 6.3 and 6.4 present frequencies of respondents' demographic profiles, while statistical results from the exploratory factor analysis (EFA) conducted are presented in Section 6.4. Section 6.5 dealt with the descriptive statistics of all constructs for the study. Section 6.6 presents the Pearson correlations while the results of the regression analysis are presented in Section 6.7. Next follows the hypotheses decisions in Section 6.8. Subsequently Section 6.9 presents the scale reliability test results of questionnaire items under each of the nine dimensions built into the conceptual framework of e-procurement implementation in the public sector in South Africa. Section 6.10 then presents the statistical validity results for the questionnaire items under each of the ten constructs.

6.2 RESULTS OF THE PILOT STUDY

Prior to the collection of primary data in the field, the research instrument went through pilot testing after a review by a panel. A pilot study is done to test the questionnaire so as to improve the items on the measurement scales, reduce any inherent errors and also to ensure that overall, the questionnaire is aligned to the objectives of the study (Yin, 2013:79). The pre-test is done to improve the overall quality of the questionnaire and also to make sure that there is a clear presentation of the study information and that there are no areas which are ambiguous to the respondents (Zikmund *et al.*, 2013:213). This is essential because it enhances the understanding of the study context. Where adjustments are made, it is imperative that the core meaning of what the measurement items intended to solicit is not lost; retaining the core meaning is

important because it is also based on socially and culturally constructed meanings from the respondents' background (Matsunaga, 2010:154).

The review of the questionnaire was done by a panel which comprised experts and academics on SCM from the Vaal University of Technology upon the request of the researcher. Areas which were reviewed included the structure of the sentences, which focused on suggesting the most appropriate wording to ensure that the questionnaire captured accurately the information it required. The other purpose of the review was to ensure that the study and its context remained transparent to the respondents in a way that they were not misled about the actual purpose of the survey.

After making the suggested revisions to the questionnaire, a pilot study was carried out to test the validity and reliability of the content in the research instrument. The pilot study was done using 40 (n=40) respondents conveniently sampled from the Gauteng Province public sector. The choice of the region was based on the fact that the public sector employees in that region were going to be excluded in the final survey. From the questionnaires returned, 37 (n=37) were usable and the results of the subsequent analyses which follows are presented in Table 6.1 as shown.

Table 6.1: Results of the pilot test

Scale	Sample	Means	Variance	Average item-total correlation	Cronbach Alpha Before deletion	Number of items	Number of items deleted	Number of remaining items	Revised Cronbach Alpha
Perceived usefulness	37	4.077	0.65	0.686	0.940	6	0	6	0.940
Perceived ease of use	37	3.957	0.289	0.626	0.676	7	2	5	0.791
Self-efficacy	37	3.751	0.266	0.866	0.817	10	0	10	0.817
Facilitating conditions	37	3.968	0.038	0.852	0.941	5	0	5	0.941
Attitudes	37	4.177	0.068	0.792	0.930	7	0	7	0.930
Behavioural intention	37	4.363	0.002	0.875	0.965	7	0	7	0.965
Actual system use	37	3.821	0.237	0.687	0.853	6	0	6	0.853

Source: Author's own compilation

Table 6.1 shows that most of the respondents in the pilot study strongly agreed with the statements on the questionnaire. This is depicted by a mean score which averaged $\bar{x}=4.13$ for all scales. For the correlation of measurement scale items, an analysis of measurement scores shows that all the scales exceeded the minimum recommended score of 0.3 suggested by Shields and Nandhini (2013:34), with scales such as perceived usefulness, perceived ease of use, self-efficacy, facilitating conditions, attitudes, behavioural intention and actual systems use registering the values shown above: $\alpha=0.686$; $\alpha=0.626$; $\alpha=0.866$; $\alpha=0.852$; $\alpha=0.792$; $\alpha=0.875$ and; $\alpha=0.687$, respectively. Only the section on Perceived ease of use had two items deleted because of a lower total-item correlation as compared to other sections. The removal of the two items subsequently impacted the reliability measurement of the Cronbach's alpha for perceived ease of use with the construct improving from $\alpha=0.676$ before the deletion, to $\alpha=0.791$ after the deletion.

Therefore, the number of items measuring perceived ease of use were reduced from seven at the beginning of the pilot to five at the completion of the pilot study. All the other scales were deemed acceptable and thus no removal of items was done. Table 6.1 also shows that all measurement constructs were reliable as all figures on the revised Cronbach's Alpha column exceeded the minimum acceptable value of 0.70 as proposed by Ambrose, Marshall and Lynch (2010:123). Perceived usefulness scored an α value = 0.940, perceived ease of use an α value = 0.791, self-efficacy an α value = 0.817, facilitating conditions an α value = 0.941, attitudes an α value = 0.930, behavioural intention an α = 0.965 and actual system use registered a α value = 0.853.

6.3 RESULTS OF THE MAIN SURVEY

6.3.1 Response rate

The response rate is defined as the number of usable survey units divided by the total number of samples for the survey (Fan & Yan, 2010:132). Table 6.2 presents a summary of the actual response rate for the study.

Table 6.2: Response rate

Description	Frequency
Total number of questionnaires distributed	500
Total number of questionnaires returned	321
Unusable responses discarded	58
Valid questionnaires retained	263
Response rate (%)	53

Source: Author's own compilation

Table 6.2 shows the overall distribution of the questionnaires for the survey. Five hundred questionnaires were distributed to the sampled public sector employees. From the 500 questionnaires distributed, a total of 321 were returned and from these, 58 were found to be unusable for the study as they were not properly completed. The unusable questionnaires had numerous errors such as double selection of responses, for instance, the selection of both male and female in the demographics section and also the selection of double choices simultaneously on the Likert scale responses. Such errors rendered them unusable for final analysis thus they had to be discarded. The final number for valid questionnaires was thus 263, which translates to a 53 percent response rate. According to McGuirk and O'Neill (2016:246), this response rate is within the acceptable response rate range.

6.3.2 Demographic details of respondents

6.3.2.1 Demographic results

Table 6.3 presents the demographic results which constitute the first part of the analysis of results. The table presents results related to age, gender, race, monthly income and academic qualifications.

Table 6.3: Descriptive statistics results

Variable and category	Frequency (N)	Percentage (%)
Gender		
M	123	46.8
Female	140	53.2
Total	<i>N</i> = 263	100
Race		
African	201	76.4
White	43	16.3
Indian/Asian	2	0.8
Coloured	17	6.5
Total	<i>N</i> = 263	100
Age		
18-25 years of age	8	3.0
26-33 years of age	53	20.2
34-41 years of age	105	39.9
42-49 years of age	81	30.8
50> years of age	16	6.1
Total	<i>N</i> = 263	100
Highest level of education		
Matric	7	2.7
Certificate	57	21.7
Diploma/Honours	192	73.0
Masters and higher	7	2.7
Total	<i>N</i> = 263	100
Net monthly income		
Less than 10 000	12	4.6
Between 10 000 and 15 000	84	31.9
Between 15 001 and 20 000	96	36.5
Between 20 001 and 25 000	42	16.0
Above 25 000	29	11.0
Total	<i>N</i> = 263	100

Source: Author's own compilation

The discussions for each category are presented in sections 6.3.2.1.1 for gender, 6.3.2.1.2 race, 6.3.2.1.3 age, 6.3.2.1.4 academic qualifications, and 6.3.2.1.5 monthly income of respondents.

Gender of respondents

Table 6.3 and Figure 6.1 show that 123 respondents who participated in the survey were male while 140 respondents were female. This translates to 53 percent females and 47 percent male. Figure 6.1 provides a graphical presentation of these percentages showing slightly more female government employees than males.

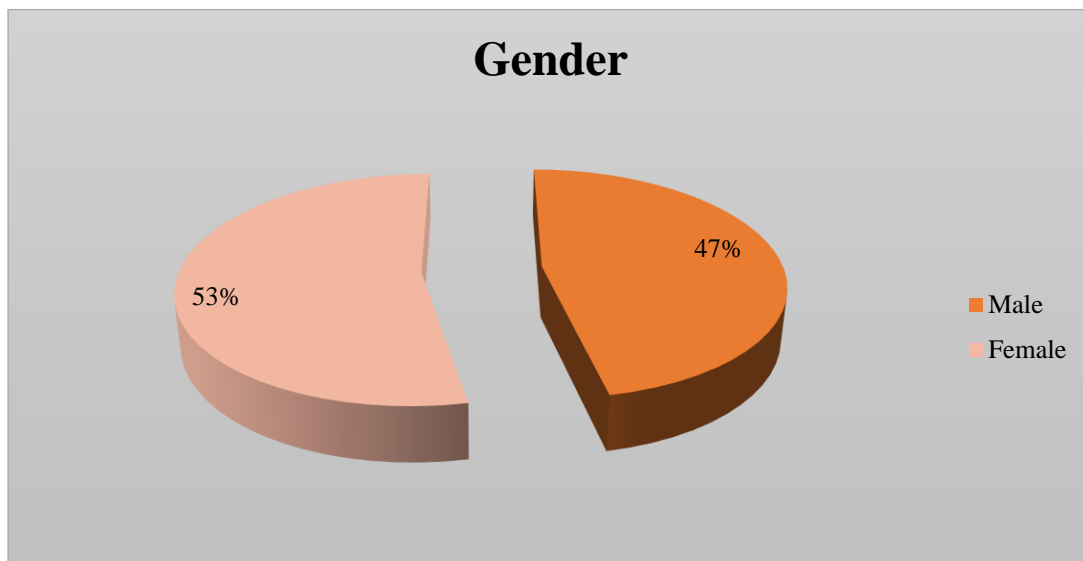


Figure 6.1: Gender distribution of respondents

Source: Author's own compilation

6.3.2.1.1 The racial distribution of respondents

Concerning the distribution of respondents by ethnicity there were interesting results. The majority of the respondents were Africans. From the 263 respondents, 76.4 percent (n=201) were African, followed by the white respondents 16.3 percent (n=43), Indian/Asian respondents 0.8 percent (n=2) while the coloured respondents made up 6.5 percent (n=17) of the sample. These results are also shown in Figure 6.2.

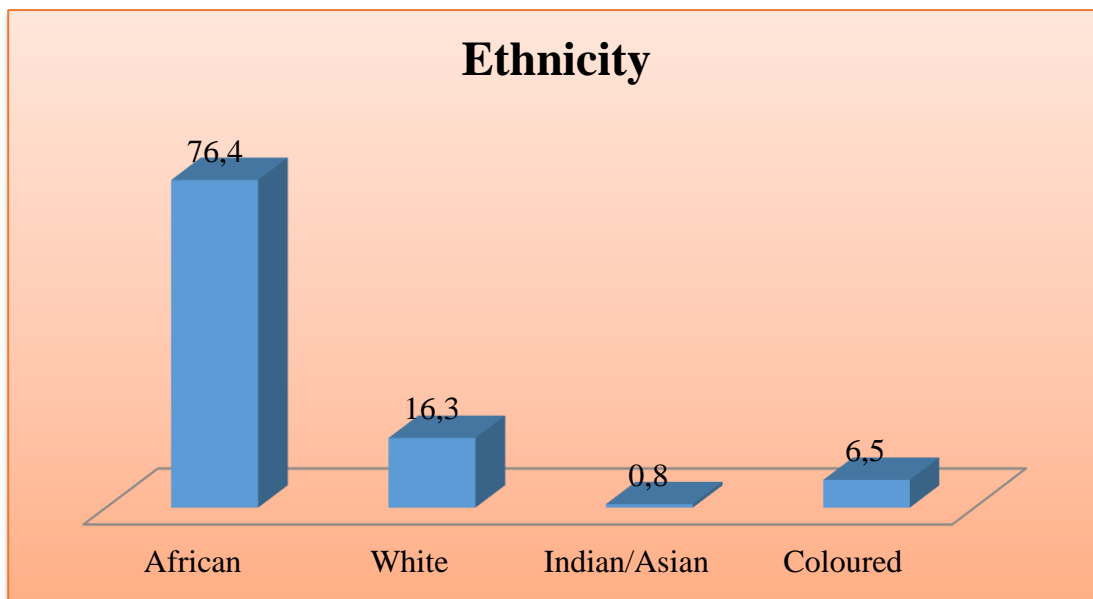


Figure 6.2: Ethnic composition of the sample

Source: Author's own compilation

6.3.2.1.2 Age distribution of respondents

The age of respondents is reported on in Figure 6.3. The majority of the respondents were in the age group between 34-41 years ($n=105$; 40%), followed by those who were in the age group between 42-49 years ($n=81$; 30.8%), those in the age group between 26-33 years ($n=53$; 20.2%) and finally those in the age group 18-25 years ($n=8$; 3%).

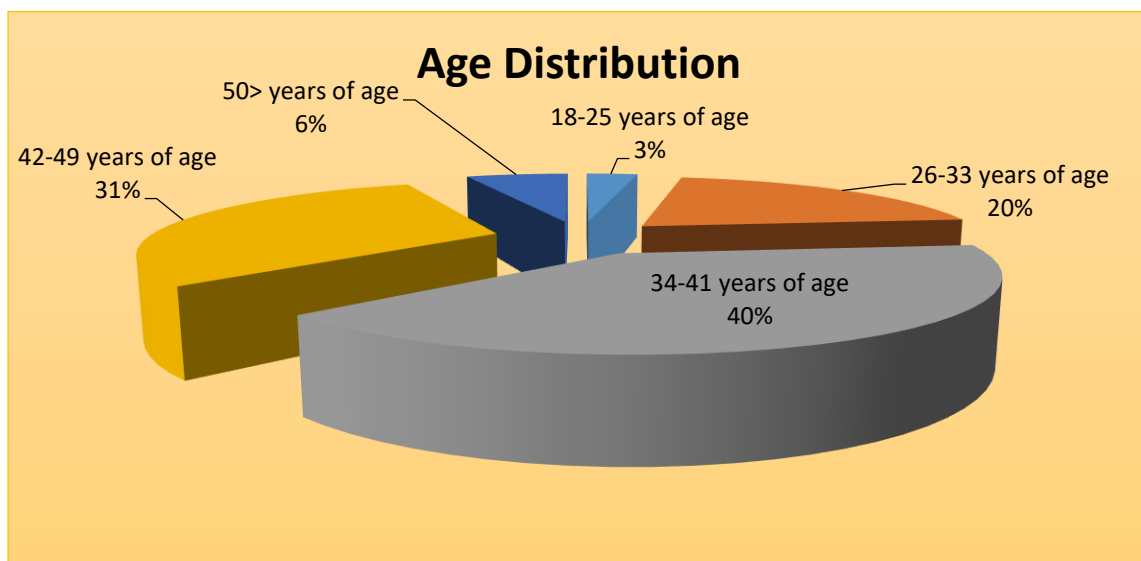


Figure 6.3: Age distribution

Source: Author's own compilatio

6.4.3.1.4 Highest qualification of respondents

The qualifications of the respondents are reported on in Figure 6.4. From the 263 respondents who participated in the study, the majority (n=192) of the public sector employees were in possession of a diploma and/or honours degree which is 73 percent of the total respondents, 21.7 percent were holders of certificates (n=57), 2.7 percent had matric as their highest academic qualification while only 2.7 percent (n=7) had a Masters' qualification or higher.

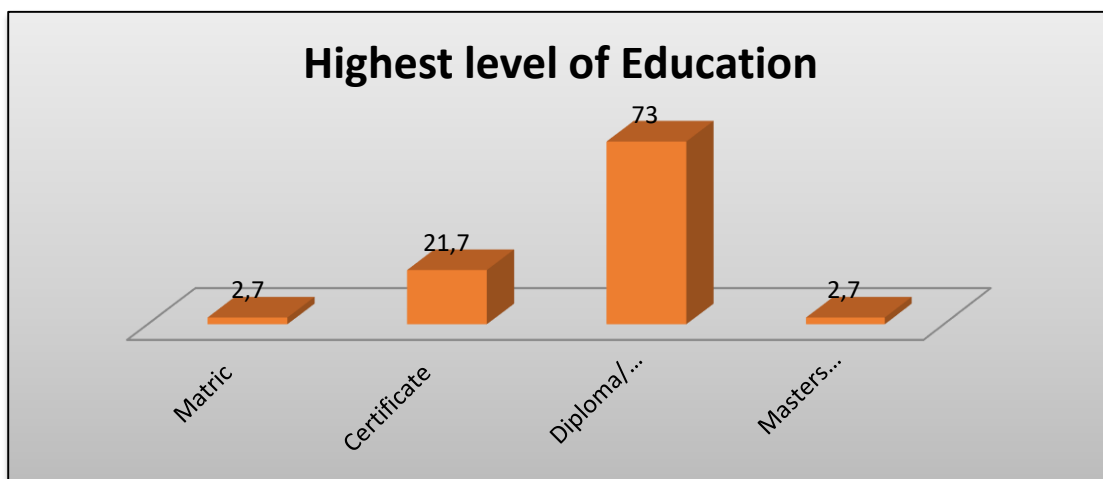


Figure 6.4: Highest level of education

Source: Author's own compilation

6.3.2.1.5 Monthly income of respondents

The results of the monthly income of respondents are presented in Figure 6.5. The majority of the respondents fell into the R15 000 to R20 000 group which had 95 respondents (36%). This was followed by the R10 000 to R15 000 income category which had 32 percent (n=84) of respondents. A total of 53 respondents (n=53) earned R20 000 to R25 000 which accounts for 16 percent of all respondents, 11 percent of the respondents earned above R25 000 a month and lastly 13 respondents earned less than R10 000 per month which translates to 5 percent of the total number of all respondents. These results can be seen in Figure 6.5.

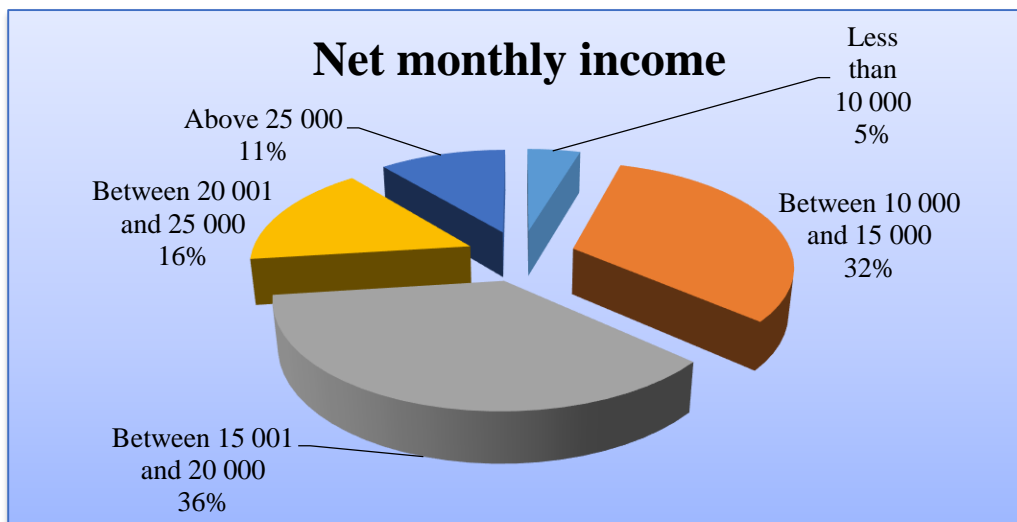


Figure 6.5: Monthly income of respondents

Source: Author's own compilation

6.3.2.2 Profile of respondents in relation to nature of work and experience

As part of an analysis of the demographic profile of the employees, the second phase of the survey sought to find out the nature of the work and experience of the respondents. The results of that investigation are shown in Table 6.4. The respondents were profiled according to the nature and type of their employment, the number of employees in employment and the number of years they have been in employment.

Table 6.4: Profile results

Variable and Category	Frequency (N)	Percentage (%)
Type of employment		
Permanent	261	99.2
Part-time	2	0.8
Total	N= 263	100
Number of years in the organisation		
Less than 1 year	6	2.3
1 to 3 years	51	19.4
4 to 6 years	60	22.8
7 to 9 years	104	39.5
10 years and above	42	16.0
Total	N= 263	100

Source: Author's own compilation

6.3.2.2.1 Nature of employment

The study sought to investigate the nature of employment of respondents and the results are presented in Figure 6.6. Based on the results shown in Figure 6.6, it can be seen that most government workers are permanent employees (n=261; 99.25%). whilst only two are part-time employees which make up only 0.8 percent of the sample.

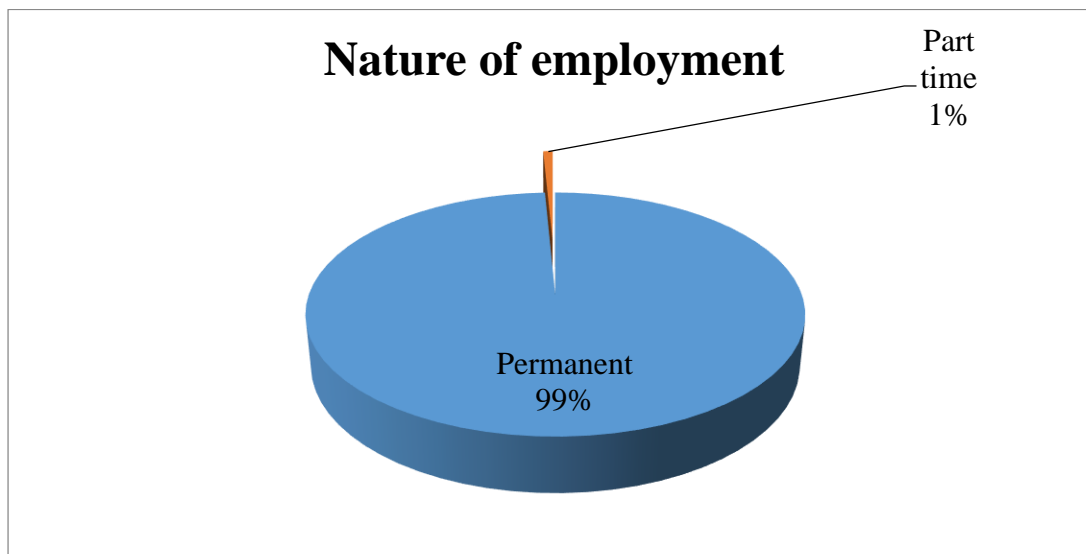


Figure 6.6: Nature of employment

Source: Author's own compilation

6.3.3.2.2 Number of years in organisation

The study also sought to find out the number of years the respondents have been with the organisation, and the results are presented in Figure 6.7. The majority of the respondents have been in business for 7 to 9 years (39.5% ; n=104), while 22.8 percent (n=60) of the government employees had been operating for 4 to 6 years and 19.4 percent (n=51) were employed for 1 to 3 years. Sixteen percent (n=42) of public sector employees had been operating for 10 years and above. Finally, the table shows that only 2.3 percent (n=6) of employees have been in operation for less than a year. All in all, the majority of the employees had been employed for more than seven years.

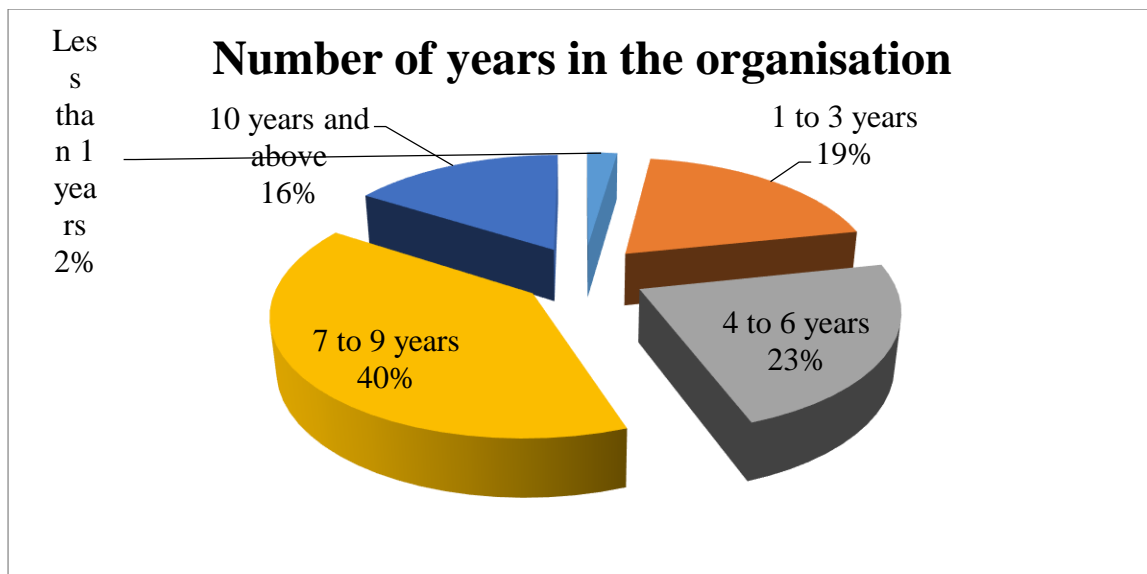


Figure 6.7: Number of years in the organisation

Source: Author's own compilation

Having examined the demographic characteristics of the respondents, it is important that the research moves on to look at the factors that are pertinent to this research. The following paragraphs look at exploratory factor analysis.

6.4. EXPLORATORY FACTOR ANALYSIS

An Exploratory Factor Analysis (EFA) procedure was performed to ascertain the factor structure of the data collected in the study. The EFA was conducted using the Varimax with Kaiser Normalization rotation. In line with the procedure undertaken by Bradley (2010:410), the default measure was to retain items with factor loadings greater than or equal to 0.50, with an eigenvalue either equal to or greater than 1. In addition, the percentage of explained variance and the scree plot criteria guided the extraction of factors. Varimax rotation is a statistical technique that is used at one level of factor analysis to clarify relationships among variable factors (Abdi, 2003:799). A Kaiser-Meyer Olkin (KMO) test of sampling adequacy and the Bartlett's test of sphericity were performed to assess whether or not data collected were suitable for EFA. The KMO value was 0.895 for the perceived usefulness construct, 0.811 for the perceived ease of use (PEOU) construct, 0.791 for the self-efficacy, 0.884 for the attitude construct, and 0.884 for the behavioural intention construct, as well as 0.878 for the actual system use construct. These values were above the 0.5 minimum threshold suggested by Kaiser (1974).

The Bartlett's test yielded significant chi-square values equal to 5582.661 (df=351) for the e-procurement predictors scale, 1132.242 (df=21) for the attitudes construct, 771.882 (df=21) for the behavioural intention construct, and 870.326 (df=15) for the actual system use construct. These test results were all significant at $p = 0.000$; $p < 0.05$. Since the results of the Bartlett's and the KMO tests were above the recommended thresholds, the data structure was deemed factorable, hence EFA could be performed. The results of the Bartlett's and the KMO tests are presented in Table 6.5.

Table 6.5: The KMO measure and the Bartlett's test results

Scale	KMO MEASURE	BARTLETT'S TEST		
		Approximate Chi-Square	Degrees of freedom	Significance level
E-procurement predictors	0.822	5582.661	351	0.000
Attitude	0.884	1132.242	21	0.000
Behavioural intention	0.884	771.882	21	0.000
Actual system use	0.878	870.326	15	0.000

Source: Author's own compilation

The next section presents the results of the EFA procedure performed on the e-procurement predictors.

6.4.1. Exploratory factor analysis for the e-procurement predictors scale

Upon applying the EFA procedure to the e-procurement predictors scale, one item was removed from the entire set of items due to loadings lower than the 0.5 minimum threshold. The item removed is "Code: SE3- I could use e-procurement systems if I had used similar packages before this one to do the same job". The factor extraction procedure produced a six-factor structure. Table 6.6 shows the factor solution results of the e-procurement predictors scale.

Table 6. 6: Six-factor structure for the e-procurement predictors scale

ITEM CODE	Description	Factor					
		1	2	3	4	5	6
PU1	Using e-procurement technology would enable me to accomplish my tasks more quickly	.909	.018	-.042	-.006	.134	-.024
PU2	Using e-procurement technology would make it easier for me to carry out my tasks	.920	-.025	-.040	-.044	.120	-.037
PU3	The e-procurement system has improved my quality of work	.939	-.057	-.019	-.007	.135	.056
PU4	The e-procurement system has improved my productivity	.939	-.083	.023	-.030	.133	.061
PU5	The e-procurement system gives me greater control over my job	.912	-.070	.012	.001	.178	.072
PU6	The e-procurement system enhances my effectiveness on the job	.899	-.073	-.013	.028	.185	.077
PE1	My interaction with the e-procurement system has been clear	.040	.001	.109	.837	-.070	.005
PE2	My interaction with the e-procurement system has been understandable	.029	.061	.208	.827	-.059	.059
PE3	Overall, the e-procurement system is easy to use	-.041	-.003	.226	.815	.068	.018
PE4	Learning to operate the e-procurement system was easy for me	-.075	.003	.103	.812	.162	.068
PE5	I rarely become confused when I use the e-procurement system	.284	.142	-.027	.079	.864	.106
PE6	I rarely make errors when using the e-procurement system	.324	.141	-.015	.036	.881	.092
PE7	I am rarely frustrated when using the e-procurement system	.271	.190	-.039	-.010	.887	.078
SE1	I could use e-procurement systems if someone showed me how to do it first.	.097	.051	.069	.059	.139	.909
SE2	I could use e-procurement systems if someone else had helped me get started	.054	.212	.066	.099	.107	.879
SE4	I could use e-procurement systems if I had a lot of time to complete the job for which the software was provided	-.042	.682	.085	-.064	.001	.223
SE5	I could use e-procurement systems by myself without someone else to help me	.014	.665	.060	-.059	-.098	.405
SE6	I could use e-procurement systems if I had never used a package like it before	-.012	.672	.061	-.013	.142	.093
SE7	I could use e-procurement systems if there was no one around to tell me what to do as I go	-.067	.830	-.002	.024	.118	-.084
SE8	I could use e-procurement systems if I had only the software manuals for reference	-.026	.766	.096	.054	.061	-.002
SE9	I could use e-procurement systems if I had just the built-in help facility for assistance	-.060	.791	.049	.022	.083	-.004
SE10	I could use e-procurement systems if I had seen someone else using it before trying it myself	-.044	.713	.154	.090	.094	-.029
FC1	I have the resources necessary to use the e-procurement system	-.064	.003	.773	.110	-.142	.077
FC2	I have the necessary knowledge to use the e-procurement system	-.106	.121	.795	.233	-.092	.124
FC3	The e-procurement system is compatible with other systems I use	.026	.070	.720	.058	.044	-.073
FC4	A specific person (or group) is available for assistance with system difficulties	-.050	.207	.788	.120	.044	-.005
FC5	Management supports the use of the e-procurement system	.102	.071	.724	.167	.054	.078
Eigenvalue		6.197	5.077	3.469	2.025	1.625	1.460
Total variance explained		22.951	18.802	12.849	7.499	6.019	5.408
Cumulative variance explained		22.951	41.753	54.602	62.101	68.120	73.528

Source: Compiled by author

As revealed in Table 6.6, six factors were extracted from the EFA procedure for the e-procurement predictors scale. These six factors contributed to 73.528 percent of the variance in e-procurement predictors. Factor 1 was labelled perceived usefulness. This Factor 1

consisted of six items (PU1-PU6), had an eigenvalue of 6.197, and contributed 22.951 percent of the total variance explained for the e-procurement predictors scale. Factor 2 was allocated the label, self-efficacy, and was composed of items SE3, SE4, SE5, SE6, SE7. This factor had an eigenvalue of 5.077. and contributed 14.764 percent of the variance. Factor 3 was labelled as facilitating conditions and consisted of five items, had an eigenvalue of 3.469, and contributed 12.849 percent of the total variance. Factor 4 was labelled as perceived ease of use, and was composed of four items (PE1, PE2, PE3 & PE4). This factor had an eigenvalue of 2.025 and contributed 7.499 percent of the variance. Factor 5 was labelled as personal competency and was composed of three items, PE5, PE6 and PE7. This factor had an eigenvalue of 1.625 and contributed to 6.019 percent of the variance. Factor 6 was labelled as external assistance and was composed of items SE1 and SE2. The factor had an eigenvalue of 1.460. and contributed 5.408 percent of the variance.

6.4.2. Exploratory factor analysis for the ‘attitude’ scale

The EFA was conducted for the attitude construct, two items (AT1 & AT 2) were discarded for cross loadings. The factor solution is presented in Table 6.7.

Table 6.7: Unidimensional factor structure for the attitude scale

Item Code	Description	Factor
		1
AT3	I believe that the e-procurement system will improve the efficiency of my work	.829
AT4	Using the e-procurement system makes me feel good about my job	.870
AT5	Using the e-procurement system makes me feel positive	.895
AT6	I feel that the use of the e-procurement system increases my expertise	.879
AT7	I will encourage other practitioners to use the e-procurement system	.636
Eigenvalue		4.399
Total variance explained		62.842

Source: Author’s own compilation

Table 6.7 reveals that only one attitude factor with an eigenvalue greater than one was extracted in the EFA. The Factor 1 consisted of five items and had an eigenvalue of 4.399 and contributed 62.842 percent of the total variance explained.

6.4.3. Exploratory factor analysis for the behavioural intentions scale

The EFA was similarly conducted for the behavioural intention construct. None of the items were removed from the construct's complete set of items due to either cross-loadings or loading lower than the 0.5 minimum threshold. Results of the rotated factor solution of the respective construct are presented in Table 6.8.

Table 6.8: Unidimensional factor structure for the behavioural intention scale

Item Code	Description	Factor
		1
BI1	I intend to use e-procurement facilities in the public sector in the near future	.625
BI2	I predict that I will use e-procurement facilities in the public sector in the near future	.806
BI3	I plan to use e-procurement facilities in the public sector in the future	.773
BI4	I intend to acquire the necessary knowledge in order to effectively use the e-procurement system in the near future	.792
BI5	I plan to support efforts to popularise the use of e-procurement systems in the public sector in the near future	.766
BI6	I commit to help others to understand and use the e-procurement system	.785
BI7	I plan to work with others to continuously improve the e-procurement system	.773
Eigenvalue		4.065
Total variance explained		58.073

Source: Author's own compilation

Table 6.8 shows that only one attitude factor with an eigenvalue greater than one was extracted in the EFA. The Factor 1 consisted of seven items, had an eigenvalue of 4.065 and contributed 58.073 percent of the total variance.

6.4.4. Exploratory factor analysis for the A=actual system use scale

The EFA was similarly conducted for the actual system use construct, and the results are presented in Table 6.9.

Table 6.9: Unidimensional factor structure for the actual system use scale

Item Code	Description	Factor
		1
AU2	I am using the e-procurement system much more than I originally expected	.814
AU4	I use the reports or output provided by the e-procurement system	.854
AU3	I encourage the end users of the reports or outputs provided by the e-procurement system to use them	.806
AU1	I keep studying the e-procurement system so that I can fully utilise its capacity	.847
AU5	I look for more efficient ways to use the e-procurement system	.789
AU6	The more I use the e-procurement system the more my competence increases	.783
Eigenvalue		3.995
Total variance explained		66.575

Source: Author's own compilation

Table 6.9 indicates that only one actual system use factor with an eigenvalue greater than one was extracted in the EFA. The Factor 1 consisted of six items, had an eigenvalue of 3.995 and contributed 66.575 percent of the total variance.

6.5 DESCRIPTIVE STATISTICS FOR THE CONSTRUCTS

Section B of the questionnaire focused on the constructs to measure the implementation of e-procurement practices in the public sector. Descriptive statistics were analysed for the various constructs in order to establish respondents' perceptions towards the constructs. The results to be presented include results of the constructs: perceived usefulness, perceived ease of use, self-efficacy, facilitating conditions, attitudes, behavioural intention and actual systems use. These are presented in Sections 6.5.1 to 6.5.8.

6.5.1 Descriptive statistics of perceived usefulness

The results of the descriptive statistics relating to perceived usefulness are presented in Table 6.10.

Table 6.60: Descriptive statistics of perceived usefulness

Item code	Item description	N	Minimum	Maximum	Mean	Standard deviation
PU1	Using e-procurement technology would enable me to accomplish my tasks more quickly	263	1	5	4.13	1.312
PU2	Using e-procurement technology would make it easier for me to carry out my tasks	263	1	5	3.14	1.289
PU3	The e-procurement system has improved my quality of work	263	1	5	3.18	1.285
PU4	The e-procurement system has improved my productivity	263	1	5	3.21	1.294
PU5	The e-procurement system gives me greater control over my job	263	1	5	3.26	1.273
PU6	The e-procurement system enhances my effectiveness on the job	263	1	5	3.30	1.243
Overall scale					3.26	.200
Scale: 1=Strongly disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly agree						

Source: Author's own compilation

Table 6.10 shows that the construct item PU1 (Using e-procurement technology would enable me to accomplish my tasks more quickly) had the highest mean of 4.13, while the item PU2 (Using e-procurement technology would make it easier for me to carry out my tasks) had the lowest mean of 3.14. The overall mean for the scale is 3.26, which is inclined towards the neutral position on the scale.

Overall, the results demonstrate that there is no adequate understanding or appreciation among public sector employees of the actual usefulness of e-procurement technology with regards to: an improvement in the speed at which tasks are accomplished; the ease with which tasks are carried out; the improvement in the quality of work done; improvement in productivity; greater control over one's job; and improving ones' effectiveness on a job. These findings contrast with the assertion by Caborn and Arrowsmith (2012:305) who suggest that e-procurement addresses capacity issues in the public sector. Seemingly therefore, the public sector employees within the procurement domain do not quite appreciate the perceived usefulness in terms of improving their performance, both in the short-term and long-term.

6.5.2 Descriptive statistics of perceived ease of use

The study sought to establish the perception of SCM practitioners on the ease of use of e-procurement, and Table 6.11 presents the descriptive statistics thereof.

Table 6.11: Descriptive statistics of perceived ease of use

Item code	Item description	N	Minimum	Maximum	Mean	Standard deviation
PEOU1	My interaction with the e-procurement system has been clear	263	1	5	4.22	.659
PEOU2	My interaction with the e-procurement system has been understandable	263	1	5	4.25	.819
PEOU3	Overall, the e-procurement system is easy to use	263	1	5	4.30	.741
PEOU4	Learning to operate the e-procurement system was easy for me	263	1	5	4.33	.660
Overall scale					4.28	.721
Scale: 1=Strongly disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly agree						

Source: Author's own compilation

The results presented in Table 6.11 indicate that item PEOU4 (Learning to operate the e-procurement system was easy for me) had the highest mean of 4.33 while item PEOU1 (My interaction with the e-procurement system has been clear) had the lowest mean of 4.22. The lowest value was above 4, serving as evidence that the respondents at least agreed to the questions posed on perceived ease of use. Thus, overall, the results show that most of the surveyed government employees think that the e-procurement system is easy to use, and this view is supported by a mean score for the whole scale of 4.28.

The results are a demonstration that the e-procurement system is not a complex system to use for employees. The results suggest that there have been clear interactions between the system and employees, a good level of understanding of the system shown by the employees and also not many challenges have been encountered by the employees with regards to learning to

operate the e-procurement system. However, there are still some minor issues such as confusion when operating the e-procurement system, errors made when using the system and sometimes moments of frustrations when using the system as well. All in all, the e-procurement system has been fairly easy to use by public sector employees. This is a positive development as it can be used as a predictor of acceptance. This result supports the work of Sun *et al.* (2012:52) who claim that individuals are likely to accept and adopt a technology or system if it is perceived to be easy to use. Chen and Barnes (2007) state that if a technology is perceived to be difficult or more cumbersome to use, it is likely to be rejected. Therefore, perceived ease of use of a technology is posited to be a strong predictor of user acceptance (Nath *et al.*, 2014).

6.5.3 Descriptive statistics of personal competency

Of significance to this study was an assessment of the personal competency of e-procurement users in the public service sector. The descriptive statistics for personal competency are presented in Table 6.12.

Table 6.12: Descriptive statistics for personal competency

Item code	Item description	N	Minimum	Maximum	Mean	Standard deviation
PEOU5	I rarely become confused when I use the e-procurement system	263	1	5	3.17	1.350
PEOU6	I rarely make errors when using the e-procurement system	263	1	5	3.01	1.425
PEOU7	I am rarely frustrated when using the e-procurement system	263	1	5	3.03	1.427
Overall scale					3.07	1.401
Scale: 1=Strongly disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly agree						

Source: Author's own compilation

From Table 6.12, it can be noted that the lowest mean value of 3.01 was obtained from item PEOU6 (I rarely make errors when using the e-procurement system) and the maximum was value of 3.17 was obtained from PU5 (I am rarely frustrated when using the e-procurement system). The overall mean score was 3.07, which implies that most of the respondents were

generally neutral to the concerns raised in the personal competency construct. The fact that the values are above 3 (“Neutral”) is evidence that the respondents are moving towards the “Agree” scale. Incompetence has been blamed for causing problems within the public procurement system in South Africa (Ambe, 2016:243). The fact that there is some level of personal competency among SCM practitioners in the public sector in South Africa is encouraging in relation to the use of e-procurement.

6.5.4 Descriptive statistics of self-efficacy

The study also examined the role of self-efficacy in the adoption of e-procurement in the public sector in South Africa. Table 6.13 presents these results.

Table 6.13: Descriptive statistics of self-efficacy

Item code	Item description	N	Minimum	Maximum	Mean	Standard deviation
SE4	I could use e-procurement systems if I had a lot of time to complete the job for which the software was provided	263	1	5	3.45	1.058
SE5	I could use e-procurement systems by myself without someone else to help me	263	1	5	3.68	1.003
SE6	I could use e-procurement systems if I had never used a package like it before	263	1	5	3.46	1.090
SE7	I could use e-procurement systems if there was no one around to tell me what to do as I go	263	1	5	3.46	1.072
SE8	I could use e-procurement systems if I had only the software manuals for reference	263	1	5	3.63	.987
SE9	I could use e-procurement systems if I had just the built-in help facility for assistance	263	1	5	3.69	.916
SE10	I could use e-procurement systems if I had seen someone else using it before trying it myself	263	1	5	3.60	.987
Overall scale					3.71	1.016
Scale: 1=Strongly disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly agree						

Source: Author’s own compilation

From the results presented in Table 6.13, it can be noted that item SE9 (I could use e-procurement systems if I had just the built-in help facility for assistance) had the highest mean value of 4.14. From the same table it can be noted that SE4 (I could use e-procurement systems if I had a lot of time to complete the job for which the software was provided) had the minimum mean value of 3.45. This depicts that all the mean values on the construct items were well above 3 (“Neutral”) scale. The results demonstrate that most employees are not sure of their own ability to handle the e-procurement processes. From the results it can be concluded that most employees are not sure if having someone to assist them when using e-procurement for the first time will benefit them. They are also not sure that help in getting started will be beneficial to them or if the use of similar packages before could be of assistance to them. They doubt if they could use e-procurement systems even if they were given more time to grasp them on their own. However, it is positive to note that self-confidence in using the e-procurement system would increase if manuals were made available and if there was the presence of a built-in help facility for assistance.

6.5.5 Descriptive statistics for the external assistance scale

The descriptive statistics for the external assistance scale are indicated in Table 6.14.

Table 6.14: Descriptive statistics for external assistance

Item code	Item description	N	Minimum	Maximum	Mean	Standard deviation
SE1	I could use e-procurement systems if someone showed me how to do it first	263	1	5	4.08	.654
SE2	I could use e-procurement systems if someone else had helped me get started	263	1	5	4.14	.738
Overall scale					4.11	.696
Scale: 1=Strongly disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly agree						

Source: Author’s own compilation

The results show that on item one (SE1), most of the respondents agreed with the statement that they could use e-procurement systems if someone showed them how to do it first. This is indicated by the mean score of 4.08. Similar results emerged for the second item (SE2), where a mean of 4.14 was calculated, indicating that SCM professionals could use e-procurement systems if someone showed them how to do it first. The overall mean of 4.14 confirms that external assistance is important for SCM professionals. These results show that respondents agree on the importance of the role of consultants or such other IT specialists who could offer training to SCM practitioners as they use e-procurement systems. This confirms the inadequacy of the skills amongst SCM practitioners in the public sector, making e-procurement training an area that requires attention.

6.5.6 Descriptive statistics of facilitating conditions

Facilitating conditions was another variable of interest in this study. Table 6.15 shows the results of the respondents' perceptions concerning facilitating conditions concerning the use of e-procurement systems.

Table 6.15: Descriptive statistics of facilitating conditions

Item code	Item description	N	Minimum	Maximum	Mean	Standard deviation
FC1	I have the resources necessary to use the e-procurement system	263	2	5	4.06	.705
FC2	I have the necessary knowledge to use the e-procurement system	263	1	5	4.06	.872
FC3	The e-procurement system is compatible with other systems I use	263	2	5	4.13	.653
FC4	A specific person (or group) is available for assistance with system difficulties	263	1	5	4.17	.704
FC5	Management supports the use of the e-procurement system	263	1	5	4.18	.753
Overall scale					4.12	.737
Scale: 1=Strongly disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly agree						

Source: Author's own compilation

The results show that Item FC5 (Management supports the use of the e-procurement system) scored the highest mean value. The lowest mean-value was scored for FC1 (I have the resources necessary to use the e-procurement system) and FC2 (I have knowledge necessary to use the e-procurement system), which both scored a mean of 4.06. The overall mean score for the facilitating conditions scale was 4.12, which is slightly above the ‘agree’ position on the Likert scale. The results reflect that there are favourable conditions in place to facilitate the effective use of the e-procurement systems for public sector workers. Enough resources are in place, the knowledge to use the e-procurement system is there, people are available to provide assistance where necessary and management supports the use of the new system.

6.5.7 Descriptive statistics of attitude towards use of e-procurement

Table 6.16 presents the results from a series of statements designed to measure the respondents’ attitudes towards the use of e-procurement systems.

Table 6.16: Descriptive statistics of attitude towards use of e-procurement

Item code	Item description	N	Minimum	Maximum	Mean	Standard deviation
AT3	I believe that the e-procurement system will improve the efficiency of my work	263	1	5	3.73	1.083
AT4	Using the e-procurement system makes me feel good about my job	263	1	5	3.81	1.022
AT5	Using the e-procurement system makes me feel positive	263	1	5	3.92	.675
AT6	I feel that the use of the e-procurement system increases my expertise	263	1	5	4.03	.682
AT7	I will encourage other practitioners to use the e-procurement system	263	1	5	4.05	.557
Overall scale					3.91	.804
Scale: 1=Strongly disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly agree						

Source: Author’s own compilation

Table 6.16 indicates that Item 3 (AT3- I believe that the e-procurement system will improve the efficiency of my work) scored the lowest mean of 3.73. The highest mean was scored by item 7 (AT7- I will encourage other practitioners to use the e-procurement system). These results show that SCM practitioners have a positive attitude towards the use of e-procurement systems in their workplaces. The overall mean score was 3.91, which is adjacent to the ‘agree’ point on the Likert scale, indicating that respondents have a generally favourable attitude towards the use of e-procurement in their public organisations. This gives a hint that they are confident about the benefits of e-procurement to the public sector and are convinced that its adoption and implementation will be crucial in addressing public sector procurement challenges, especially in improving their work.

6.5.8 Descriptive statistics of behavioural intention

Table 6.17 is a representation of the results related to the respondents’ behavioural intention with regards to public sector e-procurement.

Table 6.17: Descriptive statistics of behavioural intention

Item code	Item description	N	Minimum	Maximum	Mean	Standard deviation
BI 1	I intend to use e-procurement facilities in the public sector in the near future	263	2	5	4.30	.549
BI 2	I predict that I will use e-procurement facilities in the public sector in the near future	263	2	5	4.30	.602
BI 3	I plan to use e-procurement facilities in the public sector in the future	263	2	5	4.36	.601
BI 4	I intend to acquire the necessary knowledge in order to effectively use the e-procurement system in the near future	263	2	5	4.37	.608
BI 5	I plan to support efforts to popularise the use of e-procurement systems in the public sector in the near future	263	2	5	4.37	.621
BI 6	I commit to help others to understand and use the e-procurement system	263	2	5	4.39	.613
BI 7	I plan to work with others to continuously improve the e-procurement system	263	2	5	4.46	.584
Overall scale					4.36	.597
Scale: 1=Strongly disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly agree						

Source: Author’s own compilation

The results show that on item 1 (BI1 - I intend to use e-procurement facilities in the public sector in the near future), most of the respondents agreed with the claim that they intended to use e-procurement facilities in the public sector in the near future. This is indicated by the mean score of 4.30 for item 1. All the scores for the other factors were above 4.0 and the overall mean was 4.32, which leans towards a strong degree of agreement for most responses as most of the responses are confined between 4 and 5. Hence, the overall results point to the suggestion that positive behavioural intentions exist among SCM practitioners, as they intend to use the e-procurement system in the near future. They also intend to acquire the necessary knowledge to do so, plan to support efforts to popularise e-procurement, are committed to help others understand it and plan to work continuously to improve the system.

6.5.9 Descriptive statistics of actual system use

Actual system use is the dependent variable in this study and Table 6.18 shows the results of the respondents' perceptions concerning the actual systems use.

Table 6.18: Descriptive statistics of actual system use

Code	Item description	N	Minimum	Maximum	Mean	Standard deviation
AU1	I am using the e-procurement system much more than I originally expected	263	1	5	4.13	.687
AU2	I use the reports or output provided by the e-procurement system	263	1	5	4.16	.665
AU3	I encourage the end users of the reports or outputs provided by the e-procurement system to use them	263	1	5	4.26	.661
AU4	I keep studying the e-procurement system so that I can fully utilise its capacity	263	1	5	4.30	.728
AU5	I look for more efficient ways to use the e-procurement system	263	1	5	4.32	.640
AU6	The more I use the e-procurement system the more my competence increases	263	1	5	4.33	.699
Overall scale					4.25	.682
Scale: 1=Strongly disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly agree						

Source: Author's own compilation

From the results presented in Table 6.18, it can be noted that AU6 (The more I use the e-procurement system the more my competence increases) had the highest value of the mean at 4.33, a value way above the “Agree” scale. Additionally, the item AU1 (I am using the e-procurement system much more than I originally expected) had a mean value of 4.13, also above the “Agree” scale. Therefore, the overall results show that most employees would like to use the e-procurement system. Supporting this assessment is the fact that the average mean score for the whole scale is 4.25. The results are a clear demonstration that the e-procurement system is enjoying widespread use by the SCM practitioners. The entrepreneurs are using the e-procurement system much more than they expected originally, use the reports that emerge from it, keep on learning about the system and constantly seek more efficient ways to use the system. In addition, the employees acknowledged that the more they use the system, the more their competence increases, which is a positive sign on actual systems use.

The previous paragraphs discussed the descriptive statistics that summarised the responses on the items for each construct. In order to ensure a more robust examination of the relationship between variables, it was necessary to apply Pearson’s correlations. The next section discusses the results of the correlation analysis.

6.6. PEARSON’S CORRELATIONS

Correlations are intended to study the degree and direction of association occurring between variables (Nikolic, Muresan, Feng & Singer, 2012:69). It represents the interdependency amongst variables for correlating two phenomena (Pallant, 2016:37). In this study, the Pearson’s correlation coefficient, which assesses the degree to which quantitative variables are linearly related in a sample (Moore, Notz & Flinger, 2016:179), and used to determine the association between constructs and implementation of e-procurement. Pearson’s coefficient of correlation is represented by “r”. The coefficient of correlation “r” measures the degree of linear relationship between two variables such as x and y (Nikolic *et al.*, 2012:65). The results of the correlation analysis are presented in Table 6.19.

Table 6.19: Pearson's Correlation results

Factors	PU	PEOU	SE	FC	PC	EA	AT	BI	AU
PU	1.000								
PEOU	-.024	1.000							
SE	-.080	.058	1.000						
FC	-.043	.358**	.219**	1.000					
PC	.443**	.067	.232**	-.021	1.000				
EA	.125*	.141*	.259**	.140*	.244**	1.000			
AT	.406**	.122*	.198**	.186**	.267**	.203**	1.000		
BI	.114	.152*	.102	.309**	-.002	.049	.361**	1.000	
AU	.128*	.313*	.008	.365**	.004	.129*	.345**	.530**	1.000
PU=perceived usefulness; PEOU=perceived ease of use; SE= self-efficacy; FC= facilitating conditions; PC= personal competency; EA=external assistance; AT= attitude towards use of e-procurement; BI= behavioural intention; AU= actual system use									
** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).									

Source: Author's own compilation

Inter-factor correlations (r) show the associations amongst the variables while the significance is indicated by the p value. The idea is to elaborate on how an association may occur between the variables chosen for this study (Mahdavi & Namazi, 2017:369). The strongest correlation occurred between behavioural intention (BI) and actual use (AU) ($r = 0.530$; $p = 0.000$) while the weakest negative correlation was observed between the personal competency (PC) and behavioural intention (BI) factors ($r = -0.002$; $p = 0.969$).

6.6.1 Correlations between perceived usefulness and attitude towards system use

Table 6.19 reveals that there is a moderate positive and significant correlation between PU and attitude towards the use of e-procurement ($r = 0.406$; $p = 0.000$). This result implies that if the perceived usefulness of e-procurement systems increases in the public sector in South Africa, attitudes of users towards these systems will improve moderately. A study by Aboelmaged (2010:405) showed similar results where it was revealed that perceived usefulness significantly influences employees' attitudes towards use of technology in e-procurement. Guthrie, Rosen, Salas, Nelson, & Bolia (2007:28), who examined the importance of e-procurement in the public

sector in Poland, also found that perceived use plays an important role in the implementation of e-procurement. These results show a logical connection between perceived usefulness in the use of technology and attitude towards the e-procurement adoption decision. It is evident that users are highly likely to adopt e-procurement systems if they consider them to be useful and relevant to service needs.

6.6.2 Correlation between perceived ease of use and attitude towards system use

In Table 6.19, it is indicated that there is a weak positive and significant correlation between perceived ease of use and attitude towards the use of e-procurement ($r = 0.122$; $p = 0.049$) in the public sector in South Africa. This result implies that if the users of e-procurement perceive that it has become easier to use e-procurement systems, their attitudes towards the use of these systems would improve marginally. Kaliannan, Raman, and Dorasamy (2009:190), who conducted a similar study on procurement involving 502 registered eligible ministries and federal government agencies also arrived at a similar conclusion.

6.6.3 Correlations between self-efficacy and attitude towards system use

The study sought to investigate the relationship between self-efficacy and attitude towards system use. A further analysis of Table 6.19 reveals a weak but positive and significant correlation ($r = 0.198$; $p=0.01$) between self-efficacy and attitude towards the use of e-procurement in the public sector in South Africa. This result implies that as the self-efficacy of e-procurement users increases, they are likely to adopt more positive attitudes toward the use of such systems. Conversely, a decline in self-efficacy will lead to a deterioration of the attitudes of users towards the use of e-procurement. These results are consistent with the results of Kademaunga and Phiri (2019:1711), who studied the factors influencing the successful adoption of electronic procurement in government institutions in Zambia and uncovered that self-efficacy is central to the adoption of e-procurement systems. Mathenge and Wausi (2018:21), who investigated the critical factors for successful implementation of e-procurement in the Kenyan public sector also found an association between self-efficacy of systems users' attitudes towards system use.

6.6.4 Correlations between facilitating conditions and attitude towards system use

The results of the correlation analysis (Table 6.19) reveal a weak positive and significant correlation ($r = 0.186$; $p = 0.02$) between facilitating conditions and attitude towards use of e-procurement in the public sector in South Africa. This result demonstrates that as the perception by employees that their organisations have adequate facilities and technical resources improves, so does their attitude towards the use of e-procurement. However, the improvement is marginal, as illustrated by the weak correlation. In relation to technology acceptance, facilitating conditions measure the users' insight in relation to the availability of support and necessary infrastructure that enables the use of the new technology (Klingberg, Sawe, Hammar, Wallis & Hasselberg, 2019:9). This implies that for the South African public sector to increase the uptake of e-procurement, there is a need to ensure that the facilitating conditions are available. These will motivate users to change their attitude towards e-procurement.

6.6.5 Correlations between personal competence and attitude towards system use

Table 6.19 shows that there is a positive and significant correlation between personal competence and attitude of users towards the use of e-procurement ($r = .267$; $p = .000$) in the public sector in South Africa. This result implies that if personal competency increases in the public sector in South Africa, attitude towards use of e-procurement will also increase relatively. A study by Adeoti, Lawal, Adebisi, Olawale and Soturi (2018:19), on the impact of personal competence on service quality delivery in hospitals in Ilorin metropolis in India, showed that personal competence is a significant antecedent of attitude towards use. Various other authors such as Bartel (2014:32), Cascio and Montealegre (2016:25), and Huselid (2015:8) have demonstrated a significant relationship that occurs between personal competence and attitude towards system use. These studies demonstrate the value created by high personal competence towards attitude of using modern technology and highlight the fact that highly skilled labour has a positive attitude towards the use of advanced technology. This implies that competent people have a positive attitude and are eager to adapt to modern technologies like e-procurement. As such, in order to promote improved attitude towards the use of e-procurement, there is a need to improve on personal competence.

6.6.6 Correlations between external assistance and attitude towards system use

Table 6.19 indicates that there is a positive and significant correlation between external assistance and attitude towards the use of e-procurement ($r = .203$; $p = .001$) in the public sector in South Africa. The results imply that if external assistance increases, users' attitudes towards the use of e-procurement will also increase. In other words, attitude towards the use of the system directly varies with the availability of external assistance. However, any decrease in external assistance will cause a decrease in attitude towards the use of e-procurement. Kruger's (2017:99) study on e-procurement demonstrated that if external assistance is provided to the employees on the use of technology, attitude towards the use of modern technology will improve.

6.6.7 Correlations between attitude towards use and behavioural intention

Table 6.19 indicates that there is moderate positive and significant correlation between attitude towards use of the system and behavioural intention ($r = .361$; $p = .000$) in the public sector in South Africa. This result implies that a positive change in attitude towards the use of e-procurement will cause a moderate change in the behavioural intention of the users. However, a negative change in a user's attitude towards use of the system will lead to a decrease in behavioural intention. In support of this tenet, a study by Forsman and Temel (2015:355) concluded that behavioural intention is influenced by attitude. In a study on e-procurement adoption, Brandon-Jones and Kauppi (2018:23) also revealed that there is a positive and significant correlation between attitude towards use and the behavioural intention to use.

6.6.8 Correlations between behavioural intention and actual system use

Table 6.19 reveals that there is strong positive and significant correlation between behavioural intention and actual use ($r = .530$; $p = .000$) in the public sector in South Africa. This result shows that if behavioural intention increases, actual use of the system will also increase. These results resonate with the results obtained from previous studies (Hossain, Hasan, Chan & Ahmed, 2017:28; Yeop, Yaakob, Wong, Don & Zain, 2019:780) wherein it was affirmed that behavioural intention is a good predictor of actual system use.

6.7 REGRESSION ANALYSIS

Regression analysis is a statistical technique to determine the linear relationship between two or more variables. As with correlation, regression is used to analyse the relation between two continuous (scale) variables (Bartel, 2014:36). However, regression is better suited for determining prediction or causality based on the idea that correlation does not imply causality (Forsman *et al.*, 2011:356). In the present study, the ‘enter’ method of regression analysis was used to ascertain whether any predictive relationships existed among the independent and dependent variables. Three regression models were run to test the proposed relationships.

6.7.1 Regression analysis six predictors and attitude towards use

The first regression model tested the relationships between the six predictor variables and attitude towards use. The six predictors were entered into the regression model as the independent variables while attitude towards use was entered as the dependent variable. The results are presented in Table 6.20.

Table 6.20: Regression model 1: six predictors and attitude towards use

Independent variables: Six e-procurement constructs	Dependent variable: attitude towards use					Tolerance	Variance inflation factor (VIF)
	Unstandardised coefficients		Standardised coefficients	T	Sig (p)		
	B	Standard error	Beta				
Perceived usefulness	.244	.037	.406	6.604	.0008	.761	1.314
Perceived ease of use	.090	.069	.076	1.297	.196	.843	1.187
Self-efficacy	.157	.057	.165	2.762	.006*	.805	1.241
Facilitating conditions	.175	.074	.139	2.346	.020*	.818	1.222
Personal competence	.145	.032	.267	4.485	.000*	.685	1.460
External assistance	.223	.066	.203	3.355	.001*	.861	1.161
R=.517	R ² = .268		Adjusted R ² =.245		F=11.607 * sig at p<0.05		

Source: Author’s own compilation

In testing the hypotheses, several multiple regression analyses were computed. In Regression model 1, the six constructs of e-procurement (adjusted $R^2=0.245$) explained approximately 25 percent of the variance of the attitudes toward e-procurement use. The study also considered the possible impact of multicollinearity in this study. Multicollinearity is a potential problem in all regression analyses (Thompson, Kim, Aloe & Becker, 2017:88). Multicollinearity refers to a scenario in which two or more of the independent variables are correlated, which leads to inaccurate predictions between the independent and dependent variables. Tolerance and the variance inflation factor values were used to determine the effects of multicollinearity in this study. Tolerance values measure the strength of the relationship between one independent variable and the other independent variables and should be: $T > 0.5$ (O'Brien, 2017:673). VIF is a measure of the impact of collinearity amongst the variables under consideration in a regression model and should ideally be: $VIF < 10$ (O'Brien, 2017:673). In the current study, tolerance and VIF values for all independent variables were within recommended limits and did not indicate any serious multicollinearity threat. In the first multiple regression analysis, PU, PEOU, SE, FC, PC and EA were tested to determine if they were predictors of attitude towards use of e-procurement. It was found that PU ($\beta = .406, p = .000$), PC ($\beta = .267, p = .000$), SE ($\beta = .165, p = .006$) FC ($\beta = .139, p = .020$) and EA ($\beta = .203, p = .001$) were significant predictors of attitude towards systems use. However, PEOU ($\beta = .760, p = .196$) did not predict attitude towards use.

6.7.1.1 Perceived usefulness and attitude towards system use

In the regression analysis, perceived usefulness exerted a significant positive influence on attitude toward the use of e-procurement systems ($\beta=0.406; t=6.604; p=0.000$). This result demonstrates that attitudes toward the use of e-procurement systems are based on or shaped by the way users perceive that the systems are useful. This result is consistent with previous studies conducted by Guthrie *et al.* (2007:28), and Mensah, Nani, and Ameyaw (2019:30), which also showed a positive connection between perceived usefulness and attitude towards the use of technology-based systems. Other empirical research results have also suggested that the attitude of users towards online systems can be motivated by making sure the system is perceived to be useful by the users (Alsabawy, Cater-Steel & Soar, 2016:850; Hanjaya, Kenny & Gunawan, 2019:200). The results can be attributed to the fact that when users find a system useful in the fulfilment of their needs, they generally would be willing to make use of the

system. The more useful a system becomes, the more the attitude towards use changes positively.

From a practical point of view, it can be surmised from the empirical evidence above that the perception of e-procurement system users in relation to the usefulness of the system is important in altering the attitude towards use. Perceived usefulness thus acts as a strategic driver that alters the attitude towards use. The observed results for this hypothesised relationship suggest that significance should be placed on those aspects of e-procurement system promotion that target the perception of users on the usefulness of the system. This infers that packages accompanying the promotion and installation of e-procurement systems should clearly state how users can navigate the system to their desired outcomes. This will to a large extent promote a positive change in the attitude of e-procurement system users towards use.

6.7.1.2 Perceived ease of use and attitude towards system use (ATSU)

The results from the study show that PEOU has a positive but insignificant impact on attitude towards use. The results obtained showed that $\beta = 0.76$; $t = 1.297$ and $p = 0.196$. The p-value for PEOU is greater than the common alpha level of 0.05, which indicates that the impact of PEOU as a predictor of attitude towards the use of technology is not statistically significant. The results are in contradiction to Elkaseh *et al.* (2016:201), whose study found a positive and significant relationship between PEOU and ATSU, as well as the work of Rahman, Musa, Radzai and Hamdan (2019:14), who studied the adoption and implementation of e-procurement in Malaysia and concluded that PEOU positively and significantly influences ATSU.

The reason for the unusual result between perceived ease of use and attitude towards system use could be that the development and advancements in technology have made it easy for users to adapt quickly to new systems. This being the case, perceived ease of use, which in the past has been a matter of concern, no longer merits consideration today. As such, the relationship between perceived ease of use and attitude towards use came out as insignificant.

The results from this hypothesised relationship present a number of possibilities. The findings from the present study could imply that focusing on promoting usability of a system would not compliment the efforts to alter the users' attitudes towards use. From a practical perspective, this conflicting result may prompt further probing into alternative antecedents of attitude

towards use in technology adoption. Research into alternative factors influencing attitude towards use may reveal outcomes that might be useful for organisations. The results further suggest that in the process of introducing an e-procurement system, the organisation should concentrate predominantly on other areas rather than altering the perception on ease of use. Such areas include altering the users' perception towards the usefulness, which may guarantee a change in the attitude towards system use of the e-procurement system.

6.7.1.3 Self-efficacy and attitude towards system use

Self-efficacy showed a significant positive relationship with attitude towards systems use ($\beta = 0.165$; $t = 2.762$; $p = 0.006$). The results are in line with those of Jeng and Tseng (2018:10), who indicate that self-efficacy contributes positively with attitude towards technology use. Also, the results align to those obtained from a study by Suliantoro and Ririh (2019:14), who investigated enhancing usage behaviour of e-procurement, which revealed a positive and significant relationship between self-efficacy and attitude towards use.

The positive relationship between self-efficacy and attitude towards use suggests that the introduction and application of new systems is anchored on non-cognitive capabilities such as self-efficacy. To this end, the empirical evidence of this study can be inferred to support the use of non-technical and complimentary methods to promote positive attitude towards use. Other previous studies seem to support the notion that self-efficacy is central to positive attitude towards a system (Yeşilyurt, Ulaş & Akan, 2016:588; Altıok, Baser & Yukselturk, 2019:788). The complexity and difficulty of some technology related tasks may require that a person possesses both cognitive and non-cognitive abilities in order to navigate through the systems. This means that regarding the adoption of procurement systems within the context of organisations, this study provides important insights and hopeful findings. It suggests that e-procurement adoption initiatives must be accompanied by the promotion of users' self-efficacy. Furthermore, self-efficacy can safely be accepted as an enabler of positive attitude towards use in e-procurement adoption.

6.7.1.4 Facilitating conditions and attitude towards system use

The study also hypothesised the relationship between facilitating conditions and attitude towards system use. A significant predictive relationship was also found between the two

constructs ($\beta = .139$; $t = 2.346$, $p = .020$). Facilitating conditions is a construct defined as “the degree to which an individual believes that an organisational and technical infrastructure exists to support use of the system” (Venkatesh, Morris, Davis & Davis, 2003:428). These results are in line with the results obtained from studies by Klingberg *et al.* (2019:9); Sichone *et al.* (2018:56) and Teo and Zhou (2014:133), whose studies reveal that there is a significant relationship between facilitating conditions and attitude towards use of technology.

The above finding has valuable implications in terms of understanding how the attitudes of users can be positively changed towards the use of a system. In addition, these results, which show a positive and significant relationship, provide a critical piece of empirical evidence for supply chain research. Investigating the factors influencing e-procurement adoption in the public sector is a key step towards realising the value of automation in supply chains (Padhi, & Mohapatra, 2010:43). Hence, the results from this study can be practically inferred to mean that the journey towards automation of supply chains through e-procurement hinges partly on organisations’ ability to provide facilitating conditions. From this study, it is evident that facilitating conditions affect both the breadth and depth of attitude towards use. This outcome of the hypothesis can thus be inferred as empirical evidence in the context of the adoption of broader supply chain automation systems.

6.7.1.5 Personal competence and attitude towards system use

The results presented in Table 6.28, show that personal competence has a significant predictive relationship with attitude towards systems use ($\beta = .267$; $t = 4.485$; $p = .000$). Empirical evidence on e-procurement has also supported the results obtained in this study (Bartel, 2014:32; Huselid, 2015:8; Cascio and Montealegre, 2016:25; Oh, Yang & Kim, 2014:4489); Altioik, Baser & Yukselturk, 2019:789; Yeşilyurt *et al.*, 2016:588; Adeoti *et al.*, 2020:19). This positive and significant result on the impact of personal competence can have significant implications for SCM and procurement in the public sector. The attitude of users towards the use of e-procurement is a confirmed by-product of the level of personal competence among users. As such, organisational policies may need to be guided by the desire to improve personal competencies. The positive outcome of this hypothesised relationship confirms that if organisations direct their efforts towards incentivising the development of personal competencies among e-procurement system users, there is a greater possibility that the attitude

towards use will change. Personal competencies towards development programs and incentives may therefore be considered as a means to positively impact positive attitude towards use.

6.7.1.6 External assistance and attitude towards system use

External assistance also showed a positive significant relationship with attitude towards systems use ($\beta = .203$; $t = 3.355$; $p = .001$). These findings are in line with the findings of Ibem, Aduwo, Tunji-Olayeni, Ayo-Vaughan and Uwakonye (2016:64), that provide similar insights into the relationship between external assistance and attitude towards use of e-procurement systems. The results indicate that external assistance is a predictor of attitudes towards the use of e-procurement systems. The inference of this result is that entities putting together procurement plans should not undermine the significance of providing users with external assistance. Hence, it can be noticed that both plans and budgetary allocation for external assistance with the use of a system are critical if the organisation is to ensure that the attitudes of users towards an e-procurement system are to be positive. The results further suggest that strategic partnerships with players or consultants that specialise in e-procurement systems might bring about positive intended results in terms of altering the attitude of users. Hence, external assistance, as an important conduit for positive attitudes towards the use of e-procurement, deserves special recognition along with other aforementioned influential factors.

6.7.2 Regression analysis: attitudes toward e-procurement use and behavioural intention

The second regression model tested the relationships between attitude toward use and behavioural intention. The attitude items were entered into the regression model as the independent variables while behavioural intention was entered as the dependent variable. The results are presented in Table 6.21.

Table 6.71: Regression Model 2: attitudes toward e-procurement use and behavioural intention

Independent variables:	Dependent variable: behavioural intention					Tolerance	Variance inflation factor (VIF)
	Unstandardised coefficients		Standardised coefficients	T	Sig		
	B	Standard error	Beta				
Attitudes towards u se	.228	.036	.361	6.261	.000*	1.000	1.000
R=.361 R ² = .131 Adjusted R ² =.127 F=39.205. Sig = statistically significant at p<0.05							

Source: Author's own compilation

The results from the study indicate that ATSU ($\beta = .3.61$; $t = 6.261$; $p = .000$) significantly predicts the behavioural intention. These results are in line with the results of Zahid and Din (2019:13) who studied the determinants of intention to adopt e-government services in Pakistan. Their results also indicate a positive and significant relationship between attitudes toward e-procurement use and behavioural intentions. In addition, Renny, Guritno and Siringoringo (2013:212) obtained similar results in their study on perceived usefulness, ease of use, and attitude towards online shopping usefulness, in relation to online airlines ticket purchase in Indonesia. The results are largely in line with the results in existing literature.

The results of the study provide adequate statistical and empirical evidence to support the claims that attitude toward e-procurement use is a predictor of behavioural intention to use the e-procurement system. This implies that in order to improve the behavioural intentions of users, it is important to focus predominantly on altering the attitude towards use. The results also offer important implications in the context that they confirm that attitude towards use positively and significantly mediates the relationship between perceived usefulness, self-efficacy, external assistance, facilitating conditions and behavioural intention. At the same time, it acts as a significant predictor of actual use as mediated by behavioural intention. The findings of this research study imply that an increased usage of e-procurement systems can be significantly affected by how organisations deal with the users' attitudes towards use. Hence, focusing on this construct is significant for the successful implementation of e-procurement systems.

6.7.3 Regression analysis: behavioural intention and actual e-procurement system use

The relationship between behavioural intention and actual e-procurement system use was also tested in this study. Behavioural intention was entered into the regression model as the independent variable while actual e-procurement use was entered as the dependent variable. The results are presented in Table 6.22.

Table 6.22: Regression Model 3: behavioural intention and actual e-procurement system use

Independent variables:	Dependent variable: Actual e-procurement use					Tolerance	Variance inflation factor (VIF)
	Unstandardised coefficients		Standardised coefficients				
	B	Standard error	Beta				
behavioural intention	.647	.064	.530	10.108	.000*	1.000	1.000
R=.551 R ² = .304 Adjusted R ² =.223 F=38.256. Sig = statistically significant at p<0.05							

Source: Author's own compilation

The results indicate that BI ($\beta = .530$; $t = 10.108$; $p = .000$) is a significant predictor of actual use of e-procurement systems. The results are reminiscent of those of Delmonico, Jabbour, Pereira, Jabbour, Renwick and Thom  (2018:70) who studied public procurement in Latin America and found that BI is also a significant predictor of actual use of e-procurement systems. Purchase and Dooley (2010:470) also observe a similar relationship between BI and actual e-procurement use.

The results of this study indicate that behavioural intention is a significant and positive predictor of actual use of an e-procurement system. The broad understanding of this hypothetical relationship is that the higher the level of behavioural intention that exists among potential and current users, the higher the inclination towards actual use will be. The results suggest that supply chain practitioners who strive to promote the use of e-procurement systems should focus on fostering behavioural intentions. When dealing with potential users, it is the

implication of this study that emphasis should be placed on those aspects that modify the behaviour of users towards the desire to use the system. Furthermore, from a practical perspective, the results may be extended to understand how adoption of other supply chain automation systems may be enhanced within the public sector in South Africa.

6.8 HYPOTHESES DECISIONS

Table 6.23 summarises the results from this study and states the decisions relating to the hypotheses made in this study.

Table 6.23: Hypotheses decisions

Hypothesis	Relationship	Beta coefficient	t Value	p-Value	Supported/not supported
H1	PE → ATSU	.406	6.604	0.000*	Supported
H2	PEOU → ATSU	.076	1.297	0.196	Not supported
H3	SE → ATSU	.165	2.762	0.004*	Supported
H4	FC → ATSU	.139	2.346	0.002*	Supported
H5	PC → ATSU	.267	4.485	0.000*	Supported
H6	EA → ATSU	.203	3.355	0.001*	Supported
H7	ATSU → BI	.361	6.261	0.000*	Supported
H8	BI → APSU	.530	10.108	0.000*	Supported
PU=perceived usefulness; PEOU=perceived ease of use; SE= self-efficacy; FC= facilitating conditions; PC= personal competency; EA=external assistance; ATU= attitude towards use of e-procurement; BI= behavioural intention; AU= actual system use					

Source: Author's own compilation

Of the eight hypotheses proposed in this study, only one (H2) was not supported because its p-value was greater than the acceptable level of .005 in order to be statistically significant. All the other hypotheses were supported. For the other hypotheses, H1, H3, H4, H5, H6, H7 and H8, the p-values ranged between 0.000 and 0.006, hence, were less than 0.05 and acceptable. In addition, these hypotheses had positive values indicating support for the propositions made in the hypotheses section.

Having discussed the hypotheses proposed in this study and how these results fared in relation to these hypotheses, it is important to consider the underlying internal consistency and validity concerns relating to the measurement instrument. The following paragraphs discuss the internal consistency and validity test results.

6.9. INTERNAL CONSISTENCY

The internal consistency or scale reliability coefficients of the questionnaire items were assessed based on the Cronbach's alpha criterion. The tests for scale reliability coefficients of items under each construct were conducted to evaluate the magnitude to which the questionnaire's survey items revealed internal consistency. Cronbach's alpha coefficients were computed to assess the degree to which similar responses could be obtained from the respondents should the same questions be directed to the same respondents under similar conditions. The coefficients of internal consistency items for each of the seven dimensions are presented in Table 6.24.

Table 6.24: Scale reliability

Construct	Question items	No. of items	Cronbach's alpha
Perceived usefulness	Using e-procurement technology would enable me to accomplish my tasks more quickly Using e-procurement technology would make it easier for me to carry out my tasks The e-procurement system has improved my quality of work The e-procurement system has improved my productivity The e-procurement system gives me greater control over my job The e-procurement system enhances my effectiveness on the job	6	0.972
Perceived ease of use	My interaction with the e-procurement system has been clear My interaction with the e-procurement system has been understandable Overall, the e-procurement system is easy to use Learning to operate the e-procurement system was easy for me	7	0.770
Self-efficacy	I could use e-procurement systems if I had used similar packages before this one to do the same job I could use e-procurement systems if I had a lot of time to complete the job for which the software was provided I could use e-procurement systems if someone else had helped me get started I could use e-procurement systems if I had never used a package like it before I could use e-procurement systems if there was no one around to tell me what to do I could use e-procurement systems if I had only the software manuals for reference I could use e-procurement systems if I had just the built-in help facility for assistance	10	0.850

	I could use e-procurement systems if I had seen someone using it before trying it myself		
Facilitating conditions	I have the resources necessary to use the e-procurement system I have the necessary knowledge to use the e-procurement system The e-procurement system is compatible with other systems I use A specific person (or group) is available for assistance with system difficulties Management supports the use of the e-procurement system	5	0.821
Personal competence	I rarely become confused when I use the e-procurement system I rarely make errors when using the e-procurement system I am rarely frustrated when using the e-procurement system	3	0.945
External Assistance	I could use e-procurement systems if someone showed me how to do it first I could use e-procurement systems if someone else had helped me get started	2	0.874
Attitude towards e-procurement	I feel that the e-procurement system is beneficial to the public sector I feel that the e-procurement system is valuable in addressing procurement challenges in the public sector I believe that the e-procurement system will improve the efficiency of my work Using the e-procurement system makes me feel good about my job Using the e-procurement system makes me feel positive I feel that the use of the e-procurement system increases my expertise I will encourage other practitioners to use the e-procurement system	7	0.898
Behavioural intention	I intend to use e-procurement facilities in the public sector in the near future I predict that I will use e-procurement facilities in the public sector in the near future I plan to use e-procurement facilities in the public sector in the future I intend to acquire the necessary knowledge in order to effectively use the e-procurement system in the near future I plan to support efforts to popularise the use of e-procurement systems in the public sector in the near future I commit to help others to understand and use the e-procurement system I plan to work with others to continuously improve the e-procurement system	7	0.879
Actual system use	I am using the e-procurement system much more than I originally expected I use the reports or output provided by the e-procurement system I encourage end users of reports/outputs provided by the e-procurement system to use them I keep studying the e-procurement system so that I can fully utilise its capacity I look for more efficient ways to use the e-procurement system The more I use the e-procurement system the more my competence increases	6	0.901

Source: Author's own compilation

The Cronbach's alpha coefficients for items under each of the seven constructs of the e-procurement system framework, namely: perceived usefulness ($\alpha = 0.972$), perceived ease of use ($\alpha = 0.770$), self-efficacy ($\alpha = 0.850$), facilitating conditions ($\alpha = 0.821$), attitude towards e-procurement ($\alpha = 0.898$), behavioural intention ($\alpha = 0.879$), and actual system use ($\alpha = 0.901$) all exceeded the 0.7 minimum threshold.

6.10. SCALE VALIDITY

This section discusses how four validities, namely: face, content, construct and predictive were ascertained in this study.

6.10.1 Face validity

Face validity relates to the extent to which a psychological test or assessment appears effective in terms of its stated aim (Wilson, Pan & Schumsky, 2012:197). In this study, face validity was tested through an examination of the questionnaire items by the two promoters of this study. Through their input, some changes were made to the questionnaire in terms of wording of questions, length of the questionnaire and other technical aspects.

6.10.2 Content validity

Content validity refers to the extent to which the items on a test are fairly representative of the entire domain the test seeks to measure (Wilson *et al.*, 2012:197). To ensure that the content of the questionnaire is valid, a pilot study was conducted. The pilot study involved the distribution of the questionnaire to 40 conveniently selected respondents who were SCM practitioners in various public sector departments in the Gauteng Province. The results of the pilot study are reported on in Section 6.2 and showed satisfactory reliability of all research constructs. Also, feedback from the pilot sample was applied in modifying the questionnaire to ensure that it is simpler and clearer to respondents. All SCM practitioners that participated in the pilot study were excluded from the final survey.

6.10.3 Construct validity

Construct validity is concerned with determining if the research instrument truly measures the construct it purposes to measure (Anderson & Gerbing, 1988:405). In the present study, construct validity was first tested using EFA. As recommended by Brown (2010:10), factor loadings above 0.5 provide an indication of acceptable construct validity. The results of the EFA (c.f., Section 6.4) indicate that the items retained in the study all achieved factor loadings above 0.5, confirming that construct validity was adequate in this study. Furthermore, the correlations between constructs in this study varied from 0.75 to 0.90, thereby meeting the

criteria for acceptable construct validity (Amann, Subudhi, Walker, Eisenman, Shultz & Foster, 2004:1718).

6.10.4 Predictive validity

Predictive validity is concerned with prediction of future experiments or tests based on a set of research results (Saunders *et al.*, 2011:23). The results of the regression analysis (c.f., Section 6.7) showed positive predictive relationships between the dependent and independent variables, which confirms that predictive validity was satisfactory in this study.

6.11 APPLICATION OF THE TAM AND UTAUT THEORIES TO THE RESEARCH RESULTS

The TAM was reviewed in detail in Section 4.2. The TAM has gained popularity for its efficacy in predicting consumer adoption of new technology (King & He, 2006:751). The model has been used across a variety of industries and it has been found to consistently provide the most plausible explanations with regards to technology adoption (Davis, 1989:319-340; Mathieson, 1991:173-191; Taylor & Todd, 1995:144-176). The TAM model also provides a framework for the analysis of factors influencing technology adoption in order to reach logical conclusions (Ruzindana & Kalaskar, 2016:128). Based on the TAM model, researchers have been able to predict the factors influencing the likelihood for adoption or rejection of a technology (Folkinshteyn & Lennon, 2017:220).

The four components of the TAM, namely: perceived usefulness, perceived ease of use, behavioural intention to use and actual use of the system were employed in this study to develop and test the following four constructs: perceived usefulness and attitude towards system use; perceived ease of use and attitude towards system use; attitude towards use and behavioural intention; behavioural intention and actual system use. These constructs are analysed and tested in Sections 6.8 and 6.9.

The UTAUT is also a popular model for testing factors influencing the adoption or rejection of technology (Williams, Rana & Dwivedi, 2015:444; Vankatesh *et al.*, 2003:447). Given the limitations of the TAM model, the UTAUT framework is robust and covers a wider range of technology adoption determinants. The model pulls together aspects of eight (8) technology adoption models into a single model (Vankatesh *et al.*, 2003:425-478), thus giving it more

predictive power and accuracy (Taiwo & Downe, 2013:49). The UTAUT model suggests that the four key elements: performance expectancy; effort expectancy; social influence; and facilitating conditions (Oye *et al.*, 2012:103; Vankatesh *et al.*, 2003:447) affect the behavioural intention of individuals, which in turn influence use behaviour. In this study, the UTAUT model was used to develop and test the following construct: facilitating conditions and self-efficacy. Similarly, these constructs are analysed and tested in Sections 6.8 and 6.9.

Consistent with the TAM, there were positive relationships between factors such as perceived usefulness, attitude towards use, behavioural intention to use and actual use of system in the present study. Moreover, in line with the UTAUT, the study included self-efficacy and facilitating conditions. These were also positively related to attitudes towards system use, consistent with the suggestions of the UTAUT. The results of the present study therefore indicate that both the TAM and the UTAUT are relevant models for the use of e-procurement in the South African public sector. Furthermore, the study introduces a unique model that is a combination of both the TAM and UTAUT. Moreover, the study introduces two new factors, namely personal competence and external assistance, which are not part of the TAM and the UTAUT. Thus, the study extends beyond the TAM and UTAUT models by identifying additional factors in order to ensure comprehensive coverage of the determinants in the adoption of e-procurement in the public sector.

6.12 CONCLUSION

This chapter presented the empirical results regarding the data collected from SCM practitioners on the implementation of e-procurement practices in the South African public sector. The data were analysed using descriptive and inferential statistics. Descriptive statistics were applied to analyse the demographic profiles of respondents and the perceptions of respondents towards the research constructs. Notable results include the identification of two additional factors, namely personal competence and external assistance in the EFA. Furthermore, relationships were established between the attitudes towards the use of e-procurement and five predictor factors, namely: perceived usefulness, self-efficacy, facilitating conditions, personal competence and external assistance. An exception was the perceived ease of use of the e-procurement systems, which did not influence attitudes towards their use. Reliability and validity tests conducted in the chapter also indicated that all scales used in the study met the recommended cut-off values. To sum up, the results contained in this chapter

provide evidence that the empirical objectives of the study have been met. The conceptual framework to implement e-procurement practices in the South African public sector has thus been tested. The next chapter discusses the conclusions and recommendations.

CHAPTER 7

CONCLUSIONS, RECOMMENDATIONS, LIMITATIONS AND POTENTIAL FUTURE RESEARCH

7.1 INTRODUCTION

This chapter provides a summary of the study and is organised into nine sections. Section 7.1 provides the chapter outline. Section 7.2 provides a summary review of the study outlining the primary objective and describing the layout and content of the various chapters. Section 7.3 outlines the theoretical and empirical objectives of the study and indicates where these have been realised. The conclusions regarding the theoretical objectives are stated in Section 7.4 while the conclusions based on the empirical objectives are presented in Section 7.5. In Section 7.6, the suggested recommendations are stated based on the results. The contribution of the study is highlighted in Section 7.7. The limitations of the study are acknowledged in Section 7.8 and areas for further research are suggested in Section 7.9. Finally, the chapter provides the overall conclusion to the study in Section 7.10.

7.2 REVIEW OF THE STUDY

The primary objective of the study was to test a conceptual framework for the implementation of e-procurement practices in the South African public sector. The thesis is organised into seven chapters. The first chapter provides the research background, describes the problem statement, research objectives, states the hypotheses, and provides a preliminary discussion of literature and an overview of the methodology employed. The second chapter provides a review of literature on the implementation of procurement practices in the public sector. The third chapter focuses on reviewing literature on the history, application and challenges associated with e-procurement. The fourth chapter analyses literature on the development and application of the TAM and the UTAUT models. In Chapter Five, the research methodology is described with a focus on the research design, methodology, target population and sampling strategy, data collection tools, data collection process, data analysis and ethical considerations. In Chapter Six, quantitative data analysis was performed and the results are also interpreted. This chapter provides a discussion on the research conclusions, recommendations, limitations, and potential areas for future research.

7.3 REALISATION OF THE OBJECTIVES OF THE STUDY

The study intends to achieve both theoretical and empirical objectives. The following theoretical and empirical objectives were set:

- to review literature on SCM in the public sector;
- to explore literature on e-procurement practices in the public sector;
- to analyse literature on the application of the TAM and UTAUT frameworks;
- to establish the relationship between the perceived usefulness of e-procurement systems and attitudes towards their use in the public sector in the Gauteng Province;
- to explore the relationship between the perceived ease of use of e-procurement systems and attitudes towards their use in the public sector in the Gauteng Province;
- to ascertain the relationship between the self-efficacy of e-procurement systems and attitudes towards their use in the public sector in the Gauteng Province;
- to explore the relationship between facilitating conditions of e-procurement systems and attitudes towards their use in the public sector in the Gauteng Province;
- to determine the relationship between attitude towards the use of e-procurement systems and the behavioural intention regarding their use in the public sector in the Gauteng Province; and
- to determine the relationship between the behavioural intention of e-procurement systems and actual system use in the public sector in the Gauteng Province.

The **first theoretical objective** is realised in Chapter Two, which discusses the conceptualisation and definition of public procurement, the evolution of public procurement, international procurement practices, public procurement practices in South Africa, and the challenges faced, as well as the legislative framework in place to guide public procurement in South Africa.

The **second theoretical objective** is realised in Chapter Three, where the evolution of e-procurement, its implementation and challenges associated with its use are discussed.

The **third theoretical objective** is realised in Chapter Four, which discusses the TAM and UTAUT models and the application of the model constructs to e-procurement in the public

sector in the Gauteng Province in South Africa. The eight hypotheses developed based on these models are stated and discussed in this chapter.

All the empirical objectives are realised in Chapter Six (Section 6.6, Section 6.7, and Section 6.8), in which descriptive statistics, Pearson correlations and regression analysis are performed to test the formulated hypotheses.

7.4 CONCLUSIONS BASED ON THE THEORETICAL OBJECTIVES

This section discusses conclusions drawn based on the theoretical objectives.

7.4.1 Conclusions based on the literature review on SCM in the public sector

The first theoretical objective is addressed in detail in the second chapter of the thesis. The chapter provides the historical evolution of public procurement and emphasises its multiple perspectives resulting in the lack of a universal definition. The review highlights the application of public procurement internationally, including how it is used to impact markets through supporting domestic suppliers and protect jobs. The review further discusses how in most countries in Africa, including South Africa, public procurement is used to drive the delivery of social services. The review also emphasised how public procurement is used as a policy tool to address inequality in South Africa. The legislation in place and the principles that guide public procurement to ensure good governance are also outlined.

The literature review also revealed that although public procurement has enormous potential to improve the wellbeing of citizens, there are various challenges in the public sector. It emerged that there is a general lack of knowledge, skills and capacity to effectively implement public procurement procedures and processes. Furthermore, there are many instances of non-compliance to stipulated legislation, policy and regulations. In some instances, the roles and responsibilities of different public officials are unclear. The review also revealed that lack of accountability is a major challenge because of poor consequence management. As a result, corruption and unethical practices are rife in the public sector. However, there is an awareness that remedial action needs to be taken to conserve state resources and to ensure that public procurement contributes to the improvement of livelihoods for the majority of citizens. Based on the review of literature it is concluded that there are major challenges in SCM in the public

sector and these need to be addressed to prevent continued pilferage of state resources and improve service delivery.

7.4.2 Conclusions based on the literature review on e-procurement practices in the public sector

The second theoretical objective focused on reviewing the literature on e-procurement practices in the public sector. This theoretical objective was addressed in the third chapter. The literature review in this chapter built on the discussion regarding SCM in the second chapter. The emphasis in this chapter was on e-procurement. In that regard, the review outlined the evolution of e-procurement and demonstrating how the developments in ICT influenced the development of e-procurement. The various definitions of e-procurement were highlighted with emphasis on automation as the common thread. The review examined the core characteristics of e-procurement including outlining the e-procurement process and how this has impacted SCM.

It emerged from the review that there are several factors that influence the adoption of e-procurement. These factors include leadership buy-in, a solid business case, a clear e-procurement strategy, involvement of stakeholders and the political will to support public sector procurement. Despite the awareness of these factors it also emerged that e-procurement adoption in the public sector is still low. The review sought to provide ways in which the factors affecting adoption could be addressed in a manner that could influence decision makers in the public sector.

The review also examined the tangible and intangible benefits to SCM as a result of automation of processes through the adoption of e-procurement. One of the major benefits of e-procurement is the efficiency it brings to the SCM system. The review revealed that e-procurement provides an opportunity for reducing corruption due to automation of processes thereby limiting unethical practices. Other benefits of e-procurement include cost reduction, performance improvement, reduction of maverick purchasing and better supplier management. All these benefits were stated with the intention to provide a rationale or basis for adoption of e-procurement.

However, there are still challenges that are associated with the use of e-procurement. It emerged that the benefits of e-procurement are not always easy to measure, and the requisite IT

infrastructure and technical knowledge required to run the systems are not always available, especially in the public sector. Furthermore, public institutions often lack the appropriate procurement policies and the internal organisational culture is often not conducive for the adoption of e-procurement. It was also revealed that the cost of developing and maintaining e-procurement systems is often prohibitive and the lack of security of transactions inhibits adoption. Other challenges faced in the public sector include resistance from employees and anxiety and fear regarding change from a familiar to a new, unfamiliar system. The review also discussed how e-procurement has been adopted and is utilised in the public sector in South Africa. The National Treasury made significant investments in providing the appropriate infrastructure to support e-procurement. Despite the efforts almost half of all procurement processes in the public sector are still done manually. It is concluded from the review of literature that while e-procurement promises to address the various challenges that are currently faced with the use of paper-based procurement processes, there is still more that needs to be done in order to promote the wholesale adoption of e-procurement in the South African public sector.

7.4.3 Conclusions based on the literature review on the application of the TAM and UTAUT frameworks

The third theoretical objective focused on conducting a literature review on the application of the TAM and UTAUT frameworks. The emphasis of the review was on establishing a comprehensive understanding of these models and how they influence the adoption or rejection of technology. The review thus focused on discussing the determinants and constructs of both the TAM and UTAUT models in order to determine to what extent they can predict the uptake of new technology. The review revealed that the TAM model was initially used to understand and predict consumer adoption of new information technologies. It emerged that perceived usefulness and perceived ease of use are the main predictors of user acceptance according to the TAM. Furthermore, the review showed that behavioural intention is also critical in predicting the actual usage of a new system. Although the model was found to be useful, limitations were noted regarding the efficacy of the model. The literature indicated that the intention to use a new system did not automatically translate into actual usage. As a result of such limitations, the TAM2 was developed and included a range of other factors that moved individuals closer to actual system usage.

In the literature review, it emerged that the UTAUT model was a more robust and comprehensive technology-acceptance model. This model is based on the integration of eight earlier models thus giving it greater predictive power than the TAM. The review focused on discussing the constructs that make up the model, including factors that enhance its predictive power. It was established that the four key constructs that determine technology acceptance by individuals are: performance expectancy, effort expectancy, social influence, and facilitating conditions.

The conceptual framework for this study was then developed through the integration of the TAM and UTAUT frameworks. The emphasis of the conceptual framework was to build an arsenal of the determinants of the adoption of e-procurement technology in the public sector. The chapter also outlined and discussed the eight hypotheses that were developed and tested during the study. Based on the results from the literature review it is concluded that the TAM and UTAUT models are relevant for the testing of the eight hypotheses.

7.5 CONCLUSIONS BASED ON EMPIRICAL OBJECTIVES

This section discusses the conclusions drawn from the empirical objectives.

7.5.1 Conclusions regarding the relationship between the perceived usefulness of e-procurement systems and attitudes towards their use in the public sector in the Gauteng Province.

The first empirical objective was aimed at establishing the relationship between the perceived usefulness of e-procurement systems and attitudes towards their use in the public sector in the Gauteng Province. The Exploratory Factor Analysis (EFA) procedure for the perceived usefulness construct produced an eigenvalue and Cronbach alpha coefficient that indicated that the data collected for this construct were reliable. Similarly, the EFA procedure for the attitude construct also produced an eigenvalue and a Cronbach alpha coefficient depicting that the data collected for the construct were reliable. The descriptive statistics for perceived usefulness demonstrated a strong degree of neutrality towards the claim that e-procurement is useful in the public sector in South Africa. On that basis, the study concludes that e-procurement has not been useful to public sector employees with regards to improving their performance regarding e-procurement. The descriptive statistics results for the attitude construct are mixed and the

conclusion reached is that public sector employees have a poor attitude toward e-procurement. This suggests that they are not certain about the benefits of e-procurement and how it can improve their work. The results of the Pearson's correlation test show that there is a moderate positive and significant correlation between perceived usefulness and attitude toward the use of e-procurement. The results of the regression analysis show that perceived usefulness exerted a significant positive influence on attitude towards the use of e-procurement systems. Based on these analyses, this study concludes that perceived usefulness is a strong predictor of attitudes towards the use of e-procurement systems in the public sector in South Africa. This means that if public sector employees perceive e-procurement systems to be useful in their work, they will shift their attitude towards using these systems. Thus, the attitudes towards the use of e-procurement systems by public sector employees are shaped by their perceptions regarding the usefulness of these systems. Positive perceptions about the usefulness of e-procurement systems will yield positive attitudes and negative perceptions will cause negative attitudes towards the use of e-procurement systems.

7.5.2 Conclusions regarding the relationship between the perceived ease of use of e-procurement systems and attitudes towards their use in the public sector in the Gauteng Province

The Pearson's correlation test results indicated that perceived ease of use was not a strong predictor variable in influencing the attitudes of public sector employees to use e-procurement systems. This result was also confirmed by the regression analysis results that indicated that perceived ease of use has a positive but insignificant impact on attitude towards use. Collectively, the results showed that even if public sector employees could be convinced of the perceived ease of use of e-procurement systems, their attitudes would only improve marginally. Therefore, it is concluded that perceived ease of use of e-procurement systems is not enough to influence the attitudes of public sector employees towards using such systems. This conclusion is in contrast with various studies that have depicted perceived ease of use as a strong predictor in influencing attitudes of public sector employees to use e-procurement systems. However, the conclusion that perceived ease of use has no significant impact on attitudes towards use of e-procurement systems is plausible in this study, given that there are various generic technologies that are generally easy to use. Therefore, any additional simplification of the e-procurement systems will not result in a significant change in attitudes towards use.

7.5.3 Conclusions regarding the relationship between self-efficacy and attitudes towards the use of e-procurement systems in the public sector in the Gauteng Province

The Pearson's correlation test results show a weak but positive and significant relationship between self-efficacy and attitude towards the use of e-procurement in the public sector in South Africa. However, the regression analysis results indicate that there was a positive and significant relationship between self-efficacy and attitude towards use. Considering that regression analysis has more predictive power than the Pearson's correlation coefficient test, this study concludes that as self-efficacy of public sector employees using e-procurement increases, their attitudes towards the use of such systems also increases significantly. When public sector employees develop a positive and firm belief and confidence in their ability to use e-procurement systems, they will continue to use these systems. This conclusion is consistent with a range of other studies conducted in the public sector elsewhere in Africa.

7.5.4 Conclusions regarding the relationship between facilitating conditions of e-procurement systems and attitudes towards their use in the public sector in the Gauteng Province

The Pearson's correlation test results show there is a weak but positive and significant correlation between facilitating conditions and attitude towards use of e-procurement by public sector employees in South Africa. Based on the results, it can be concluded that if public sector employees perceive their departments as having adequate infrastructure and technical resources to support e-procurement, their attitudes towards using e-procurement systems will also improve, albeit marginally. However, the results of the regression analysis showed that there is a significant relationship between facilitating conditions and attitude towards use of technology. The study concludes that if public sector employees perceive their departments as being adequately prepared to host and support e-procurement systems and users, their attitudes towards use will improve significantly. Conversely, should their perceptions regarding facilitating conditions be negative, the attitudes towards the use of e-procurement will deteriorate.

7.5.5 Conclusions regarding personal competence and attitude towards use of e-procurement systems in the public sector in the Gauteng Province

The Pearson's correlation test results show that there is small but positive and significant correlation between personal competence and attitude of public sector employees towards the use of e-procurement. Based on this result, the perception among the public sector employees is that if their competency increases their attitude towards the use of e-procurement will also increase relatively. However, the results of the regression analysis indicate that personal competence is a significant predictor of attitude towards use of e-procurement in the public sector in South Africa. This study concludes that as public sector employees become more competent in the use of e-procurement, their attitude towards use will increase strongly. As such, more competent users are likely to have a more positive attitude towards the use of e-procurement than less competent users. Several other studies globally have depicted personal competency as a strong predictor in influencing the attitudes of e-procurement users.

7.5.6 Conclusions regarding external assistance and attitude towards use of e-procurement systems in the public sector in the Gauteng Province

The Pearson's correlation test results show that there is small positive and significant correlation between external assistance and public sector employees' attitudes towards the use of e-procurement in South Africa. This result implies that when public sector employees receive more and more external assistance, their attitudes towards use of e-procurement will also increase. Conversely, when external assistance decreases, the attitude towards use of e-procurement will also decrease. The regression analysis results indicate that there is a statistically significant relationship between external assistance and attitude towards use. This result is also corroborated by other similar studies elsewhere. It is concluded in this study that the provision of external assistance has a significant impact on the attitudes of public sector employees and can influence them to make use of e-procurement.

7.5.7 Conclusions regarding the attitude towards use and behavioural intention to use e-procurement systems in the public sector in the Gauteng Province

The Pearson's correlation test results show that there is a moderate positive and significant correlation between the attitude of public sector employees towards use of e-procurement and their behavioural intention. This result indicates that a positive change in attitude towards the use of e-procurement will result in a moderate change in behavioural intention of the public sector employees. However, the regression analysis results indicate that the attitude towards

use is a strong predictor of the behavioural intention to use e-procurement systems in the public sector. This implies that as the attitude of public sector employees towards the use of e-procurement systems positively improves, their behavioural intention to use these e-procurement systems increases significantly. Conversely, a decrease in the attitude of public sector employees' attitude towards use of e-procurement will cause a decrease in their behavioural intention. Based on this result, the study concludes that the attitude of users is an important factor in determining their behavioural intention to use e-procurement systems. This conclusion is also corroborated by other studies globally.

7.5.8 Conclusions regarding behavioural intention and actual use of e-procurement systems in the public sector in the Gauteng Province

The Pearson's correlation test results show that there is a strong positive and significant correlation between behavioural intention and actual use of e-procurement by public sector employees. The regression analysis results also indicate that behavioural intention is a significant predictor of actual use of e-procurement systems. The result implies that as the expression of behavioural intention to use e-procurement systems increases among public sector employees, it results in a significant increase in the actual use of e-procurement systems in the public sector in the Gauteng Province. However, when the expression of behavioural intention decreases, a strong decrease in the actual use of e-procurement will ensue. This result is corroborated by other studies that found behavioural intention to be a strong predictor of actual use of new technology.

7.6 RECOMMENDATIONS

The conclusions reached in this chapter demonstrate that both the theoretical and empirical objectives have been met. Only one of the eight proposed hypotheses (H2) could not be supported by the available evidence, resulting in the acceptance of the alternative hypothesis. This section provides a set of recommendations for each proposed relationship between constructs in order to provide the public sector in the Gauteng Province with actionable suggestions for the improvement of e-procurement adoption and use.

7.6.1 Recommendations regarding the relationship between the perceived usefulness of e-procurement systems and attitudes towards their use in the public sector in the Gauteng Province

It has been established that the perceived usefulness of e-procurement systems strongly influences the attitudes of users towards their use. Given that the attitudes towards use are shaped by the perceived usefulness of e-procurement systems, it is recommended that the current and future e-procurement systems in the public sector in the Gauteng Province should respond to the needs of the users. Thus, the following recommendations are made for the public sector in the Gauteng Province:

- Conduct a needs assessment of SCM practitioners with specific focus on e-procurement to determine the specific and relevant requirements and needs of current users of the e-procurement systems.
- Based on the needs assessments, the public sector in the Gauteng Province should commission the design of e-procurement systems that are customised to these identified needs and requirements.
- Avoid the use of generic e-procurement systems as they may not be as useful in addressing user needs.

In line with the results of the study, it is likely that when e-procurement systems are designed in response to the uses identified by the practitioners, the attitudes towards use will improve. Providing customised e-procurement systems will demonstrate both utility and relevance to users, further promoting more positive attitudes towards use of these systems.

7.6.2 Recommendations regarding the relationship between the self-efficacy of e-procurement systems and attitudes towards their use in the public sector in the Gauteng Province

The results establish that self-efficacy is a strong predictor of attitudes towards the use of e-procurement systems in the public sector in the Gauteng Province. Therefore, when individuals have a positive sense of self and they have the confidence and belief that they can use the e-

procurement systems, their attitude towards their use will significantly improve. Therefore, the following recommendations are made:

- The public sector in the Gauteng Province should provide personal development programmes for employees to complement their technical and cognitive attributes. These programmes should be focused on providing public sector employees with social and emotional skills designed to raise their personal awareness, confidence and morale.
- Networking platforms should be established to encourage public sector employees to interact with other professionals in e-procurement. This is intended to encourage them to share experiences and knowledge with other professionals thereby heightening their own sense of belief in their own abilities.
- Within the public sector SCM system, employees should be encouraged to have periodic professional meetings or workshops to discuss, share experiences and knowledge. It is hoped that the more they interact with other professionals and share their experiences they will incrementally increase their self-efficacy.

7.6.3 Recommendations regarding the relationship between facilitating conditions of e-procurement systems and attitudes towards their use in the public sector in the Gauteng Province

In the e-procurement space, facilitating conditions include technical infrastructure required for the system to function effectively and organisational commitment and support to ensure users are able to do their work. Therefore, in order to ensure that public sector employees have positive attitudes towards the use of e-procurement systems, the relevant authorities must ensure that all technical requirements for the smooth functioning of e-procurement systems are in place. Thus, the following recommendations are made:

- Provide appropriate online platforms with technical integrity to host e-procurement systems.
- Provide uninterrupted access to internet to avoid unnecessary downtime and a lapse in communication, especially when dealing with an integrated system that includes external stakeholders.

- Guarantee continued system use or quick recovery by ensuring that there are IT practitioners available to attend to any unexpected system problems or routine maintenance to minimise disruption to SCM practitioners.
- Ensure that there are IT professionals available to orient users to any new or upgrades regarding e-procurement systems.
- Make contingency plans to provide back-up power in view of the current load-shedding which could potentially affect the functioning of e-procurement systems.

When SCM practitioners are aware of such technical infrastructure, availability and readiness of internal support staff, their attitudes towards the use of e-procurement systems are most likely to be significantly positive.

7.6.4 Recommendations regarding personal competence and attitude towards use of e-procurement systems in the public sector in the Gauteng Province

The study established that public sector employees with high levels of competence have a more positive attitude towards the use of e-procurement systems. Therefore, the following recommendations are made:

- Provide training on the technical aspects of e-procurement (not the use thereof) to transfer skills and knowledge to boost personal competence of users.
- Human Resources departments in the public sector should support career development of public sector SCM practitioners through encouraging them to engage in further education in their area of specialisation.
- Provide coaching and mentorship in order to support public sector employees in their work performance.

The acquisition of additional skills and knowledge will certainly impact on the individual competence of users. These interventions can improve the individual competence of users thereby promoting positive attitudes towards the use of e-procurement systems.

7.6.5 Recommendations regarding external assistance and attitude towards use of e-procurement systems in the public sector in the Gauteng Province

The public sector suffers from lack of capacity and skills in certain areas that impede service delivery. In this study, the availability of external assistance has a significant impact on the attitude towards use of e-procurement systems in the public sector in the Gauteng Province. Therefore, the following recommendations are made:

- Outsource technical services for which there are technical skills or capacity to support SCM practitioners on specific issues including e-procurement.
- Screen service providers to ensure that external assistance is provided by competent and reliable entities.
- Avoid bureaucratic procedures to ensure quick and easy access to external assistance by employees in the event that they require such.

As concluded in the study, such guarantees of access to external assistance will ensure that users have more positive attitudes towards the use of e-procurement systems.

7.6.6 Recommendations regarding the attitude towards use and behavioural intention to use e-procurement systems in the public sector in the Gauteng Province

The attitude of users of e-procurement systems in the public sector in the Gauteng Province has a significant impact on their behavioural intentions to use these systems. It is therefore important to ensure that employees have the correct attitude towards use. The following recommendations are made in that regard:

- Senior leadership and managers in SCM in the public sector should formulate and implement strategies to engender positive attitudes among e-procurement system users and promote migration from manual to automated systems.
- E-procurement marketing and awareness campaigns should be designed and conducted to promote the adoption and use of e-procurement systems in the public sector.
- Senior leadership and managers in SCM should provide clarity on the rationale, processes and benefits of using e-procurement systems in order to dispel any myths,

fear or anxiety and positively influence practitioner attitudes to shift from manual and paper-based processes to e-procurement.

- The transition to e-procurement should be structured and implemented methodically to ensure that no negative attitudes towards the use of e-procurement creep in.

The current user attitudes could be as a result of various factors including social influences. Therefore, these recommendations are meant to influence the attitude of users to shift towards behavioural expressions that positively embody the use of e-procurement systems.

7.6.7 Recommendations regarding behavioural intentions and actual use of e-procurement systems in the public sector in the Gauteng Province

The behavioural intentions among current and potential users are a strong predictor of actual usage of e-procurement systems in the public sector in the Gauteng Province. The following recommendations are made to ensure behavioural intention remains positive:

- Senior leadership and managers in SCM should periodically engage with current and potential users of e-procurement systems in order to keep abreast of their behavioural intention and ensure continued use of e-procurement.
- The public sector should demonstrate to users of the e-procurement system the broader and overall impact and benefits, such as cost savings and improved service delivery to encourage current users to keep using the system. This big picture view could encourage users to maintain positive behavioural intention inclined towards continued usage of these systems.
- Senior leadership and managers in SCM should encourage behavioural shifts through continued advocacy for e-procurement and showcasing its beneficial attributes over manual and paper-based processes.
- Change management experts should be engaged to assist with the transition from manual to automated systems and allay any anxieties that may influence behavioural intention.
- Leadership in SCM also needs to model the desired behaviour in order to positively influence users.

Although SCM policies can be made to be mandatory, the advocacy for e-procurement systems should be strategic and avoid punitive approaches in dealing with those who might initially resist the systems.

7.7 CONTRIBUTION OF THE STUDY

This study makes a significant contribution to the academic body of knowledge in e-procurement in the public sector. The literature review conducted on SCM and e-procurement adds some useful insights for academics and researchers. The theoretical framework fusing the TAM and UTAUT models also provides useful insights for other researchers and adds valuable knowledge on the factors that might contribute to the adoption of e-procurement in the South African public sector.

Beyond the academic and research fraternity, the study also makes significant contributions to SCM professionals in the public sector. The study reiterates the challenges faced in SCM in the public sector and then demonstrates how the adoption of e-procurement could improve the system, while improving service delivery and reducing inequality in the country. By indicating the factors either promoting or impeding the adoption of e-procurement in the public sector, the study provides senior leadership and other decision makers in SCM with suggestions on how to facilitate more rapid adoption and circumvent the influence of irrelevant factors. The study further demonstrates to SCM professionals that adoption of e-procurement is likely to advance their careers as they are then required to acquire additional and new skill sets in order to manage the new technology.

7.8 LIMITATIONS OF THE STUDY

This study provides useful insights that could influence the successful implementation of e-procurement practices in the South African public sector. While every effort has been made to ensure that the study results are valid and credible in order to draw practical conclusions and make pragmatic recommendations, there are still some challenges that were faced in that regard. The first limitation for this study is the sample size. The study results are based on a sample size of 263 respondents. Similar studies have been conducted with sample sizes in excess of 500 respondents. However, although this may be a limitation comparatively speaking, the sample size remains statistically significant. The second limitation is that the study relied

on one method of data collection, namely, quantitative. Furthermore, the questionnaires were self-completion meaning that the researcher could not confirm or verify the accuracy of the responses. The researcher faced time constraints and as such could not conduct face-to-face interviews with each respondent. However, the study could have benefited from qualitative interviews which would have enabled probing and verification of responses.

7.9 SUGGESTIONS FOR FURTHER RESEARCH

The study results indicate that there are several opportunities for further study in order to add to the discourse on SCM in general and e-procurement in particular. Firstly, the study was conducted only in the Gauteng Province thereby suggesting that future studies could focus on a national level to understand the adoption of e-procurement at a deeper level. Secondly, the study was conducted in various departments in the public sector. Future studies could delineate specific entities to ensure the gathering of information and conclusions on e-procurement adoption could be attributed to specific public institutions such as SOEs, municipalities and government departments. Future studies on e-procurement in the public sector could also consider utilising a mixed method approach. This study relied on a literature review and quantitative methodology to gather data. Utilising qualitative approaches through interviews could enrich the study and bring other perspectives that could shed more light on the adoption of e-procurement in the public sector.

7.10 CONCLUSION

The results of this study provide statistical evidence that there is a relationship between the following constructs: perceived usefulness, self-efficacy, facilitating conditions, external assistance, and attitude towards use. The results also provide statistical evidence that attitude and behavioural intention are important factors influencing actual usage of e-procurement systems in the public sector in the Gauteng Province. However, contrary to the results of other studies, the results of this study show that perceived ease of use has no impact on the attitude towards use of e-procurement systems in the public sector in the Gauteng Province. The literature review conducted in this study further revealed that the bulk of SCM processes and procedures in the public sector in South Africa are still being conducted manually with large amounts of paperwork, thus making the system vulnerable to fraud and corruption. The

adoption of e-procurement is strongly viewed as a solution to the pilferage of state resources through automation and tracking of processes with limited human interference.

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APPENDIX 1

SURVEY QUESTIONNAIRE



Faculty of Management Sciences

Research conducted by

Ms Gloria Mothibi

Cell: 0722447715

Work: 016 950 7636

Email: gloriam1@vut.ac.za

Dear Respondent,

You are requested to participate in an academic research study conducted by Gloria Mothibi, a PhD candidate from the Department of Logistics at the Vaal University of Technology. The purpose of the study is to gather information on implementation of e-procurement practices in the public sector. You have been chosen to participate in the study based on your experience of working in the public sector. I therefore believe that you will provide relevant information.

Please note the following:

1. This study will provide an anonymous survey. Your name will not appear on the questionnaire and the answers you give will be treated as strictly confidential. You cannot be identified in person based on the answers you give.
2. Your participation in this study is very important to us. You may, however, choose not to participate and you may also stop participating at any time without any negative consequences.
3. Please answer the questions in the attached questionnaire as completely and honestly as possible. This should not take more than 20 minutes of your time.

4. The results of the study will be used for academic purposes only and may be published in an academic journal. We will provide you with a summary of our findings on request.
5. Please contact my supervisors, Prof Chendedzai Mafini, chendedzaim@vut.ac.za or Prof Dhurup, email royd@vut.ac.za if you have any questions or comments regarding the study.

SECTION A: DEMOGRAPHIC INFORMATION

This section has questions that focus on your background information. Please indicate your answer by crossing (X) in the appropriate block or by filling in your answer.

A1	Your gender	Mae	Female
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A2	Your Age Group	25 years & below	26-33 years	34-41 years	42-49 years	50 years and above
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A3	Race	African	White	Coloured	Indian	Other - specify
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A4	Highest Qualification	Matric	Certificate	Diploma/Honours	Masters and higher
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A5	Experience in the industry/years in the organisation	Less than 1 year	1-2 year/s	3-5 years	6-9 years	10 years and above
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A6	Your net monthly income	Less than 10000	Between 10000 and 15 000	Between 15 001 and 20 000	Between 20 001 and 25 000	Above 25 000
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A7	Type of employment	Permanent	Part time
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A8	Position in the organisation	Procurement/buying	Transportation	Customer/client services	Warehousing	Management	Others
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A9	Division	Reception	Finance	Human resources	Procurement	Security	Customer relations	Others
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A10	Which department do you work for?	
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A11	Province	Gauteng	North-West	Free State	Limpopo	Mpumalanga	KZN	Western Cape
		Northern Cape	Eastern Cape					

Section B: E-procurement practices

We would like to find out a little more about your perceptions of e-procurement in the Public Sector. Please indicate the extent to which you agree or disagree by placing an (X) on the corresponding number between 1 (Strongly disagree) and 5 (Strongly agree). A rating of 3 points towards a moderate acceptance of the statement. The e-procurement practices consist of seven constructs under consideration: perceived usefulness, perceived ease of use, self-efficacy, facilitating conditions, attitude towards use of e-procurement, behavioural intention and actual system use

Perceived usefulness

Item number	Item description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
PUI	Using e-procurement technology would enable me to accomplish my tasks more quickly	1	2	3	4	5
PU2	Using e-procurement technology would make it easier for me to carry out my tasks	1	2	3	4	5
PU3	The e-procurement system has improved my quality of work	1	2	3	4	5
PU4	The e-procurement system has improved my productivity	1	2	3	4	5
PU5	The e-procurement system gives me greater control over my job	1	2	3	4	5
PU6	The e-procurement system enhances my effectiveness on the job	1	2	3	4	5

Perceived ease of use

Item number	Item description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
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PEOU1	My interaction with the e-procurement system has been clear	1	2	3	4	5
PEOU2	My interaction with the e-procurement system has been understandable					
PEOU3	Overall, the e-procurement system is easy to use	1	2	3	4	5
PEOU4	Learning to operate the e-procurement system was easy for me	1	2	3	4	5
PEOU5	I rarely become confused when I use the e-procurement system	1	2	3	4	5
PEOU6	I rarely make errors when using the e-procurement system	1	2	3	4	5
PEOU7	I am rarely frustrated when using the e-procurement system	1	2	3	4	5

Self-efficacy

Item code	Item description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
SE1	I could use e-procurement systems if someone showed me how to do it first.	1	2	3	4	5
SE2	I could use e-procurement systems if someone else had helped me get started	1	2	3	4	5
SE3	I could use e-procurement systems if I had used similar packages before this one to do the same job	1	2	3	4	5
SE4	I could use e-procurement systems if I had a lot of time to complete the job for which the software was provided	1	2	3	4	5

SE5	I could use e-procurement systems by myself without someone else to help me	1	2	3	4	5
SE6	I could use e-procurement systems if I had never used a package like it before	1	2	3	4	5
SE7	I could use e-procurement systems if there was no one around to tell me what to do as I go	1	2	3	4	5
SE8	I could use e-procurement systems if I had only the software manuals for reference	1	2	3	4	5
SE9	I could use e-procurement systems if I had just the built-in help facility for assistance	1	2	3	4	5
SE10	I could use e-procurement systems if I had seen someone else using it before trying it myself	1	2	3	4	5

Facilitating conditions

Item code	Item description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
FC1	I have the resources necessary to use the e-procurement system	1	2	3	4	5
FC2	I have the necessary knowledge to use the e-procurement system	1	2	3	4	5
FC3	The e-procurement system is compatible with other systems I use	1	2	3	4	5
FC4	A specific person (or group) is available for assistance with system difficulties	1	2	3	4	5
FC5	Management supports the use of the e-procurement system	1	2	3	4	5

Attitude towards use of e-procurement

Item code	Item description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
AT1	I feel that the e-procurement system is beneficial to the public sector	1	2	3	4	5
AT2	I feel that the e-procurement system is valuable in addressing procurement challenges in the public sector	1	2	3	4	5
AT3	I believe that the e-procurement system will improve the efficiency of my work	1	2	3	4	5
AT4	Using the e-procurement system makes me feel good about my job	1	2	3	4	5
AT5	Using the e-procurement system makes me feel positive	1	2	3	4	5
AT6	I feel that the use of the e-procurement system increases my expertise	1	2	3	4	5
AT7	I will encourage other practitioners to use the e-procurement system	1	2	3	4	5

Behavioural intention

Item code	Item description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
BI 1	I intend to use e-procurement facilities in the public sector in the near future	1	2	3	4	5
BI 2	I predict that I will use e-procurement facilities in the public sector in the near future	1	2	3	4	5
BI 3	I plan to use e-procurement facilities in the public sector in the future	1	2	3	4	5
BI 4	I intend to acquire the necessary knowledge in order to effectively use the e-procurement system in the near future	1	2	3	4	5
BI 5	I plan to support efforts to popularise the use of e-procurement systems in the public sector in the near future	1	2	3	4	5
BI 6	I commit to help others to understand and use the e-procurement system	1	2	3	4	5
BI 7	I plan to work with others to continuously improve the e-procurement system	1	2	3	4	5

Actual system use

Code	Item description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
AU1	I am using the e-procurement system much more than I originally expected	1	2	3	4	5
AU2	I use the reports or output provided by the e-procurement system	1	2	3	4	5
AU3	I encourage the end users of the reports or outputs provided by the e-procurement system to use them	1	2	3	4	5
AU4	I keep studying the e-procurement system so that I can fully utilise its capacity	1	2	3	4	5
AU5	I look for more efficient ways to use the e-procurement system	1	2	3	4	5
AU6	The more I use the e-procurement system the more my competence increases	1	2	3	4	5

Thank you for taking time to complete this. Your views are appreciated.

APPENDIX 2

CERTIFICATION OF LANGUAGE EDITING

Dr. Andrea Garnett
English language editing services
SATI membership number: 1001674
Tel: 083 662 1728
E-mail: andreagarnett@yahoo.com

6 July 2020

To whom it may concern

This is to confirm that I, the undersigned, have English-language edited the completed research of Ms Gloria Mothibi for the PhD degree in Business Administration and the thesis titled: *A framework for the implementation of e-procurement practices in the South African public sector*. The responsibility of implementing the recommended language changes rests with the author of the thesis.

Yours truly,

A handwritten signature in black ink, appearing to read 'A. Garnett' with a stylized flourish at the end.

Andrea Garnett