A CONCEPTUAL FRAMEWORK FOR THE ADOPTION AND IMPLEMENTATION OF ONLINE REVERSE AUCTIONS IN SOUTH AFRICA

by

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A CONCEPTUAL FRAMEWORK FOR THE ADOPTION AND IMPLEMENTATION OF ONLINE REVERSE AUCTIONS IN SOUTH AFRICA

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<u>Title of thesis</u>:

A CONCEPTUAL FRAMEWORK FOR THE ADOPTION AND IMPLEMENTATION OF ONLINE REVERSE AUCTIONS IN SOUTH AFRICA

<u>KEY TERMS</u>:

Online Reverse Auctions, e-Commerce adoption, Small Medium Enterprises, Supply Chain Management, Supply Chain Management, Adoption, Implementation and Usage.

DEDICATIONS

My lovely family,

What a wonderful feeling to celebrate the conclusion of my doctoral studies with my beloved husband and children (Hlelile, Mhlengi and Hlengiwe Tlhako and Chomp Philani Vilakazi) who have supported me from beginning to end. Their love, support and compassion kept me strong and focused.

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ABSTRACT

Digital technologies enable a deep rationalisation in the purchase of supplies between organisations, with positive cost-reducing spin-offs on wise e-procurements adoptions with savings of up to an 8-12% average to the purchases total. To this effect, web-based systems, online reverse auctions (ORAs) emerge as the most cost-efficient options, from the goods and services supply chain, as well as administration and governance perspective. ORAs are beginning to replace traditional paper-based manual procurement transactions and face to face negotiations effectively.

Problem and Purpose – The project undertook to explore the level of ORAs adoption and usage by local organisations. The aim was to understand and explain the status-quo, with a goal of devising a facilitative framework for improved adoptions and use of ORAs in the South African public and private business contexts.

Design/methodology/approach – The main research question How can the adoption (*including implementation and use*) of Online Reverse Auctions (ORAs) be improved among the private and public business enterprises in South Africa? To address this, a mixed methods approach was adopted, using the survey and interviews on selected 100 procurement professionals, executives, project managers and procurement specialists and practitioners.

Findings – The study has found that ORAs should be implemented in South Africa when all suppliers are empowered to participate – the basic reasons being that they would save costs, and technology advancement simplifies and standardise processes. Furthermore, the effect of perceptions on online reverse auctions on adoption, implementation and purpose of ORA and research findings provided possible ways to improve the tool to be effective in the context of developing countries like South Africa Furthermore, findings also call for improved implementation of ORAs in South Africa.

Research limitations/implications – Regulations around the procurement and SCM function in both the private and the public sector (though the private sector regulations are not as stringent and the public sector) contributed significantly on the progress and the availability of information from participants.

Originality/value –The current existing models, frameworks and online reverse auction tools are mainly supporting and designed for established, mature and developed markets. It is required that appropriate tools and processes to conduct and implement online reverse auctions are necessary. Hence the newly proposed online reverse auctions conceptual framework.

Keywords

Online Reverse Auctions, e-Commerce adoption, Small Medium Enterprises, Supply Chain Management.

Research type: Research Doctoral.

OKUCASHUNIWE

Ubuchwepheshe bedijithali buvumela ukulinganisa okujulile, ekuthengeni izinto phakathi kwezinhlangano, ngemiphumela emihle enciphisa izindleko ekutholweni kokuthengwa okuku-inthanethi okuhlakaniphile; ikakhulukazi, ekongeni okungaba khona okulinganiselwa ku-8% kuya ku-12% kwenani eliphelele lokuthenga. Njengezinhlelo ezisekelwe kusizindalwazi, ukuqhudelana kwabahlinzeki ku-inthanethi (ama-ORA) kuvela njengokunike amandla okonga imali, kokubili kusukela kuchungechunge lokuhlinzeka, imibono yokuphatha neyokubusa. Ngenxa yalesi sizathu, ama-ORA aseqalile ukufaka esikhundleni sezingxoxo zokuthengwa kwempahla ezisekelwe ephepheni lendabuko kanye nobuso nobuso emisebenzini yesimanjemanje yochungechunge lokuhlinzeka ngempahla kunqubo yokucabanga phambili yeNguqoko Yezimboni yesine (4IR) esekelwe ohlelweni lokuhlinzeka ngempahla emhlabeni wokuncintisana. Akumangalisi-ke ukuthi abamukeli balobu buchwepheshe obusha babonakala bebambe iqhaza ekuqhudelaneni nabangebona abamukeli emnothweni womhlaba wonke, nokuncintisana ngokwandayo. **Inkinga nenjongo** - Ngokusebenzisa inzuzo yokwengeza inani lezinhlelo ezizenzakalelayo ezinqubeni zokuthengwa kwempahla, umbhali wale phrojekthi wayefuna ukuqonda izinga lokwamukelwa nokusetshenziswa kwama-ORA yizinhlangano zendawo eNingizimu Afrika. Inhloso bekuwukuchaza isimo sezwe samanje. Umgomo ekugcineni kwaba ukusungula uhlaka olusizayo lokuthuthukiswa kokutholwa kanye nokusetshenziswa kwama-ORA ezimeni zamabhizinisi zikahulumeni nezizimele eNingizimu Afrika. **Ukwenza/indlela yokwenza/indlela yokusebenza** – Kule nqubo, kwaphakanyiswa umbuzo wocwaningo olandelayo: "Kungathuthukiswa kanjani ukwamukelwa (okuhlanganisa nokusebenza kanye nokusetshenziswa) kokuqhudelana kwabahlinzeki ku-inthanethi (ama-ORA) phakathi kwamabhizinisi azimele kanye namabhizinisi kahulumeni eNingizimu Afrika?" Ekufuneni izimpendulo, kwasetshenziswa izindlela ezixubile. Izinhlelo ze-ORA ziyingxenye yobuchwepheshe obusha lapho ukuhlaziya kwawo kungenziwa kangcono ngemibono yokwamukela ubuchwepheshe. Isifanekiso sokwamukela sobuchwepheshe (i-TAM) kanye nemibono ehlobene ngaleyo ndlela yasetshenziswa yomibili njengezingalizi zokuqoqo ukukhanya komqondo nokuhlaziya ophenyweni. Ngokwenqubo, inhlolovo kanye namasu okuxoxisana asetshenziswa ukuqoqa imininingwane yochwepheshe abakhethiwe abayi-100 bokuthenga, abaphathi, abaphathi bamaphrojekthi kanye nochwepheshe bokuthengwa kwempahla kanye nabasebenzi ezimbonini ezahlukahlukene zonkana zikahulumeni nezizimele. **Okutholakele** kukhomba igebe mayelana nokuqwashisa kanye nokusebenza kwezinhlaka zokwamukela nokusebenzisa ngempumelelo ama-ORA ezimbonini zikahulumeni nezizimele eNingizimu Afrika. Ukunika amandla bonke ababambiqhaza mayelana nokuqwashisa nekhono, ngakho-ke kuyaphakanyiswa kulo mbhalo wobuhlakani wokuthola iziqu. Ukuphuthuma kokuthuthukisa ubuchwepheshe be-ORA kubabambiqhaza abanenselelo yokuncintisana esimeni sezwe elisathuthuka kuyaphakanyiswa. Njengendlela yenzuzo eqenjini lephrojekthi ekuqaleni kokuthuthuka kwayo locwaningo, uhlaka oluvumayo lokusiza ukubamba iqhaza okunjalo (ukwamukelwa kanye nokusetshenziswa) kuma-ORAs ngaleyo ndlela kuhlongoziwe kokutholakele. **Imikhawulo yocwaningo/imithelela** - Imininingwane kulolu phenyo itholwe kusampula esikhundleni sesibalo sabantu esiphelele semikhakha kahulumeni nezimele, okusho ukuthi imibono ehlukile evela ezimeni eziyinqaba ihlala ingaqondakali, okunikeza ithuba lokucwaninga okwengeziwe ngesihloko. **Okwangempela/ukubaluleka** -

Izifanekiso ezikhona, izinhlaka namathuluzi kubonakala kuvumelana nezimo zezimakethe ezimisiwe, ezivuthiwe nezithuthukile. Ngakho-ke amathuluzi nezinqubo ezifanele kufanele kuthuthukiswe njengokuphuthumayo ukuze kuqhutshwe futhi kusetshenziswe ukuqhudelana kwabahlinzeki ku-inthanethi ukuze kunikezwe izixazululo ezikhona kuzo zonke izindawo zokuthuthukiswa komnotho. Kungale ndlela ephusile lapho kuphakanyiswa uhlaka lomqondo olusha oluhlongozwayo ekuqhudelaneni kwabahlinzeki ku-inthanethi kulokho okutholwe yile phrojekthi yocwaningo.

Amagama asemqoka:

- Online Reverse Auctions - **Ukuqhudelana kwabahlinzeki ku-inthanethi;**
- e-Commerce Adoption - **ukwamukelwa kwezohwebo ze-inthanethi;**
- Small and Medium Enterprises- **amabhizinisi amancane naphakathi;**
- Supply Chain Management - **Ukuphathwa kochungechunge lokuhlinzeka**

KAKARETŠO

Didirišwa tša theknolotši di nolofatša lebaka le legolo la thekišetšano ya dithoto magareng ga dikgwebo, ka dikhamphani tšeo di fokotšago ditshenyagelo ka go šomiša kgwebišano ye bohlale ya inthaneteng; kudukudu, ka dipolokelo tšeo di akanyetšwago go fihla go 8% go ya go 12% ya palomoka ya ditheko. Go swana le mananeo a inthaneteng, difantisi tša ribese tša inthaneteng (diORA) (mo barekiši ba phenkgišanela go reka go morekiši o tee) di laeditše go fokotša ditshenyagalelo, go tšwa go dikgopolo tša tshepedišo ya kabo, taolo le pušo. Ka lebaka le, diORA di thomile go šoma legatong la tsela ya tlwaelo ya ditherišano le dithekišetšano ka sebele, ka go šomiša mokgwa wa sebjalebjale wo o nago le ponelopele wo o theilwego godimo ga tshepedišo ya kabo mo nakong ya Rebolušene ya bo4 ya Intasteri (4IR) lefaseng la kgwebo la diphadišano. Ka gona ga go makatše ge bašomiši ba theknolotši ye e mpsha ba bonala ba le maemong a kaone go fetiša dikgwebo tšeo di sa šomišego mokgwa wo go kgwebišano ya lefase, le ikonoming yeo e golago ka lebelo. **Bothata le morero** – Ka go šomiša tshedimošo ya tlaleletšo ya boleng ka go šomiša mananeo a khomphutha go mekgwa ya kgwebišano, mongwadi wa protšeke ye o be a nyaka go lekola maemo le tšhomišo ya diORA ka mekgatlo ya ka Afrika Borwa. Maikemišetšo e be e le go hlaloša maemo a bjale. Tebanyo mafelelong e be e le go hlama foreimeweke ya nolofatšo ya tšhomišo le tirišo ye e kaonafaditšwego ya diORA ka maemong a dikgwebo tša setšhaba le tša phoraebete ka Afrika Borwa. **Tlhamo/mokgwa wa nyakišišo/mokgwa** – Mo go tshepedišo ye, go botšišitšwe potšišo ya nyakišišo ye e latelago: "Naa tirišo (go akaretšwa phethagatšo le tšhomišo) ya difantisi tša ribese ya inthaneteng (ORA) di ka kaonafatšwa bjang go dikgwebo tša phoraebete le tša mmušo ka Afrika Borwa?" Ka go fihlelela dikarabo, go šomišitšwe mokgwa wo o kopantšwego. Mananeo a ORA ke karolo ya mananeo a maswa gomme a ka sekasekwa ga bonolo ka go šomiša diteori tša mananeo a theknolotši. Mmotlolo wa tirišo ya theknolotši (TAM) le diteori tše di amanago le wona di šomišitšwe bjalo ka dilentshe tša kgopolo le tša tshekatsheko ya nyakišišo. Go šomišitšwe mokgwa wa nyakišišo ya tekolonyakišišo le dipoledišano go kgoboketša datha go tšwa go batšeakarolo bao ba kgethilwego ba ditsebi tše 100, bareki ba thoto, bahlankediphethiši, balaodi ba diprotšeke le ditsebi tša theko le bašomi ka diintastering tša go fapana go ralala le mafapha a mmušo le a phoraebete. **Dikutollo** di laetša tlhaelelo ya temogo le ka diforeimeweke tša phethagatšo go šomiša le go phethagatša diORA ka mafapheng a mmušo le a phoraebete ka Afrika Borwa. Go fa batšeakarolo ka moka tsebo le bokgoni, go šišintšwe ka thesising ye. Boitlhaganelo bja go kaonafatša theknolotši ya ORA go batšeakarolo bao ba hlokago bokgoni go naga ye e hlabologago go a šišinywa. Bjalo ka tsela ya go tšeakarolo go nyakišišo ya thuto e, dikutollo tša nyakišišo ye di šišinya foreimeweke ye e kgontšhago go nolofatša tšhomišo (tirišo le tšhomišo) ya diORA. **Dikiletšo/Diphihlelelo tša nyakišišo** – Datha ya nyakišišo ye e fihleletšwe ka mokgwa wa go sampola e sego ka go šomiša bašomi ba mafapha a mmušo le a phoraebete ka botlalo, se se hlaloša gore tshedimošo ya moswananoši ga se e fihlelelwe, gomme se se laetša hlokego ya dinyakišišo tše dingwe thutong ye. **Boithomelo/boleng** – Mmotlolo ye e lego gona, diforeimeweke le didirišwa di laetša di šoma gabotse go maemo ao a theilwego dikgwebong tšeo tše kgolo. Didirišwa le mekgwa ya ditshepetšo e swanetše go kaonafatšwa ka boitlhaganelo go laola le go phethagatša difantisi tša ribese tša inthaneteng go tliša ditharollo go tlhabollo ya ekonomi lefase ka bophara. Ka go realo diphihlelelo tša protšeke ya nyakišišo ye di šišinya foreimeweke ye mpsha ya difantisi tša ribese tša inthaneteng.

Mantšu a bohlokwa: Difantisi tša ribese tša inthaneteng, tirišo ya kgwebišano ya elektroniki/inthaneteng, dikgwebo tše nnyane le tšeo di golago, taolo ya tshepedišo ya kabo.

LIST OF ABBREVIATIONS

B2B   Business-to-Business

B2C   Business-to-Customer

BBB-EE   Broad Band Black Economic Empowerment

BEE   Black Economic Empowerment

CFA   Confirmatory factor analysis

CFI   Comparative fit index

CRM   Customer relationship management

DSN   Digital supply network

ED   Enterprise Development

EDI   Electronic Data Interchange

EFA   Exploratory Factor Analysis

ERA   Electronic reverse auctions

ERP   Enterprise Resource Planning

GFI   Goodness of fit index

ICT   Information and Communication Technology

IOS   Inter-Organisational Information Systems

IS   Information systems

IT   Information technology

KMO   Kaiser-Meyer-Olkin

KMV   Key Mediating Variable

KPI   Key Performance Indicators

MAA   Multi-attribute auctions

MFMA   Municipal Finance Management Act

ORAs	Online reverse auctions
PAF	Principal axis factoring
PCA	Principal Component Analysis
PFMA	Public Finance Management Act
QFD	Quality function deployment
RA	Resource-advantage
RFP	Requests for proposals
RFQ	Request for a quotation
RMSEA	Root Mean Square Error of approximation
RSA	Republic of South Africa
SA	South Africa
SBL	School of Business Leadership
SCA	Supply Chain Analysis
SCM	Supply chain management
SCOPE	Supply Chain Operations Preparedness
SD	Supplier Development
SEM	Structural Equation Model
SIS	Strategic Information Systems
SMD	Supply Market Dynamism
SME	Small and medium enterprises
SMME	Small, Micro and Medium Enterprise
SOP	Standard Operating Procedure
SPSS	Statistical Package for Social Scientists
SRM	Supplier relationship management

TCA   Transaction Cost Analysis

TCO   Total Cost of Ownership

TCPF   Total cost of procurement function

UITU   Unethical information technology use

UK   United Kingdom

UNISA   University of South Africa

USD   United States dollars

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DEFINITION OF TERMS

e-Auction

An e-auction is a well-known e-Sourcing concept. E-auctions work by putting downward pressure on the price by introducing competition into the procurement process and determine the winner – the firm to whom the contract is awarded (Engelbrecht-Wiggans and Katok, 2006). E-Auctions were popular in the early 1990s. This popularity was driven by focusing on price, and the perception of purchasing organisations and departments that invite many suppliers to bid competitively on an online auction that would reduce the price. Thus, the early e-auctions were designed as "open descending price-only events" (Elmaghraby, 2007).

However, instead of generating low costs the price-focus of e-auctions alienated suppliers, especially in industries in which suppliers could be differentiated in terms of quality, reliability, delivery times, et cetera. In addition, buyers often incurred considerably higher costs when dealing with an e-auction winner. Organisations quickly realised that the price-only focus limited the potential for growth, and the popularity of e-auctions in industry moved away from the price-focused approach.

Online Reverse Auctions

ORAs, as a process of connecting the buyers and the sellers, has been diversely defined by different thinkers, institutions and organisations. A few of these have been considered here for wider interpretation and understanding. According to The Institute for Supply Management, in the procurement context, reverse auction is "a type of e-auction that is conducted online, in real-time, between a single buying organisation and pre-qualified suppliers. Suppliers compete in presenting bids to the buyer for the supply of goods or services whose specifications for design, quantity, quality, delivery, and related terms and conditions have been clearly defined" (The Institute for Supply Management, 2003; Wyld, 2011b). In the context of procurement, a reverse auction can be defined as "a real-time online competitive bidding event where the buyer sends out a request for quotation and suppliers bid on the business, decreasing their selling prices until optimally a true market price has been reached" (Schoenherr, 2008).

These reverse auctions can formally be defined as "an online, real-time auction between a buying organisation and two or more invited suppliers, where suppliers can submit multiple bids during the time period of the auction, and where some degree of visibility exists among suppliers regarding the actions of their competitors" (Carter *et al.*, 2004). According to the Institute of Supply Management (2004), an online reverse auction is an electronic negotiation tool also known as an e-auction, sourcing event or e-sourcing. The role of the buyer and the supplier is reversed (low prices vs high bidding prices). Prices can only grow. It replaces the face-to-face negotiations through an electronic process.

There are open and closed ORAs. If the auction is limited to restricting approved suppliers, it is called a closed online reverse auction, whereas if it is open to any supplier, it is referred to as an open online reverse auction. Various stages like the preliminary preparations, conducting the auction, past auction activities and monitoring the purchase orders are the main common features of the online reverse auction process. When buyers conduct an online reverse auction, suppliers/bidders need to be given a code name. The online reverse auction is fairly new, and the bidders need an explanation as to how the whole process will proceed.

Developing Countries

In today's world, it is difficult to define the characteristics associated with countries that claim to be a developing country (Das, 2004; Ghemawat, 2003; Sevic, 2005). The classic models that have worked in describing the trends in developed and industrialised countries have proven to be ineffective in capturing the specifics of today's developing countries. Although the globalisation process started with ancient mariners, it has been greatly accelerated in the past 75 years. According to (Das, 2004), developing countries are defined by certain economic considerations such as: "globalisation that represents a process of increased international division of labour on the one hand and the growing integration of national economies through trade in goods and services, cross-border corporate investment, and capital flows on the other."

According to (Chuan Li , 2006) from the University of Iowa's Centre for International Finance Development and Research, developing countries are countries that are restructuring their economies (including Brazil, Russia, India, China and South Africa) having long market-oriented lines and offering a wealth of opportunities in trade, technology transfers, and foreign direct investment. Developing countries should show signs of a strong and growing middle-class population; observers wonder whether the term has lost some of its meaning. Initially, the phrase applied to fast-growing economies in Asia and was used in Eastern Europe after the fall of the Berlin Wall. As global interest in market-driven economies grew, investors began to identify Latin America for a number of developing countries and eventually identified countries such as Indonesia, Thailand, China, India and Russia as belonging to the group of developing countries. The terms "Low-Cost Countries (LCCS)" is another definition that describes developing countries as having low economic development, high levels of poverty, low utilisation of natural resources and a heavy dependence on industrialised nations (Nations Online Countries of the World 2014).

Buyers

The buyers perform professional purchasing, assess the quality of goods and services, deal with speed of delivery and number of potential purchases, while evaluating and negotiating for a wide variety of suppliers, services and equipment on a competitive basis in the open market (Chartered Institute of Purchasing and Supply, 2013). The buyer always adheres to procurement ethics, handles issues on ascertaining long-term framework agreements, contracts, supplier performance, and sets quality standards with suppliers and service providers.

Suppliers

"Supplier" is one term used to describe an external organisation that delivers services or goods to a buyer. Other terms in common use include vendor, service provider and contractor. In some contexts, the word 'supplier' denotes a company that supplies materials, while the word "contractor" is used for providers of services (Chartered Institute of Purchasing and Supply, 2013).

Buyers – Suppliers Relationships

Buyer-supplier relationships refer to the commercial transactions between organisations for the purchase and supply of goods or services. Although inter-organisational transactions have always been important in the purchasing and marketing practice, it is only comparatively recently that an interest in the buyer-supplier relationships has spread across a range of management disciplines, reflecting global changes in production methods and work organisation. The relationship between the buyer and the supplier can be either short-term or long-term, involving regular purchases based on established agreements. Relationships between buyers and suppliers in supply chains can range from a single transaction to complex interdependent relationships (Mentzer, 2004, p. 31). "These relationships can be positioned on a continuum or spectrum with transactional arm's-length relationships on one end of the continuum and vertical integration on the other end" (Lambert *et al.*, 2006, p. 169; Benton, 2007, p. 187; Hines, 2004, p. 187; Jacobs *et al.*, 2009, p. 368; Hallikas, Puumalainen, Vesterinen and Virolainen, 2005, pp. 74-75).

However, vertical integration implies that a single organisation owns and controls the supply chain (Hines, 2004, p. 187) including its upstream suppliers and downstream customers (Christopher, 2005, p. 17). Creating and nurturing supply chain alliances has been recognised as a competitive advantage (Ross, 1998, p. 9). The view that relationships are either transactional or alliance based (in other words, positioned only on either end of the continuum) is a great oversimplification. These relationship types merely represent opposite extremes. In practice, many business relationships fall between these two extremes (Baily *et al.*, 2008, pp. 210-211; Mentzer, 2004, p. 33; Hines, 2004, p. 187).

The relationships that fall between these extremes of transactional arm's-length relationships, and alliances are referred to as collaborative relationships or strategic partnerships. Normally, an organisation will have a wide range of relationships spanning the entire spectrum, the majority of which will not be partnerships at all but arm's-length relationships. Organisations must decide what kind of relationships to maintain with their supply chain partners (Leenders *et al.*, 2006, p. 494).

Supplier development is often in the form of monetary or non-monetary and recoverable or non-recoverable contributions initiated and implemented by organisations in favour of a beneficiary entity (Black SMME), with the specific objective of assisting or accelerating the development, sustainability, financial and operational independence of the Black SMME. This is commonly accomplished through the expansion of those beneficiaries' financial and/or operational capacity.

Supplier Performance

The term "performance monitoring" means measuring, analysing and managing a supplier's ability to comply with, and preferably exceed their contractual obligations. It can also be argued that monitoring the performance of suppliers can be an aspect of supplier appraisal when the incumbent supplier is competing for the renewal of an existing contract, b) an aspect of the management of approved supplier lists or c) an integral part of the contract management function (CIPS, 2013).

Broad-Based Black Economic Empowerment (B-BBEE)

It is a deliberate, biased, proactive integrated strategy aimed at substantially increasing the participation levels of the previously disadvantaged group of the economy across all spheres of the economy thereby, equitably developing and transferring skills for the creation of commercial wealth. Broad-Based Black Economic Empowerment (B-BBEE) aims to ensure that the economy is structured and transformed to enable the meaningful participation of the majority of its citizens and to further create capacity within the broader economic landscape at all levels through skills development, employment equity, socio-economic development, preferential procurement, enterprise development, especially small and medium enterprises, promoting the entry of Black entrepreneurs into the mainstream of economic activity, and the advancement of co-operatives. B-BBEE needs to be implemented in an effective and sustainable manner in order to unleash and harness the full potential of Black people and to foster the objectives of a pro-employment developmental growth path.

Procurement

Procurement is often interchanged with the concept of purchasing. However, there are both similarities and differences. (Van Weele,2010) defines procurement as follows: "All activities required in order to obtain the product from the supplier to its final destination.

It encompasses the purchasing function, store, traffic and transportation, incoming inspection, and quality control and assurance." From this definition, we shall understand that purchasing and procurement are not identical; purchasing is a part of the procurement process. (Van Weele ,2010) defines purchasing as: "The management of the company's external resources in such a way that the supply of all goods, services, capabilities and knowledge which are necessary for running, maintaining and managing the company's primary and support activities is secured at the most favourable conditions." Quayle et al. (2000) argue that purchasing is more concerned with commercial relationship establishment and management, whereas procurement is in addition concerned with the control aspects on physical material and service delivery after the contract has been signed, or the order has been placed.

These two terms are often used interchangeably, which makes it difficult to distinguish them purely by theoretical definitions. Therefore, in this research, we also ignore the difference between procurement and purchasing and see them as the same concept. As (Quayle *et al.*,2000) observed, in the mid-1970s, only 21% of procurement managers reported that they frequently participated in their employer's corporate planning process, but it increased to 43% by the mid-1980s. This leads to the idea that procurement has evolved its role in corporate strategy and is gradually becoming more important in corporate performance. This idea is consistent with Reck and Long (1998). They argue that the procurement function has over time become an integral part of every firm's competitive success.

1. CHAPTER ONE: ORIENTATION

1.1 INTRODUCTION

Information and Communication Technology (ICT) based systems have grown in prominence as efficiency enablers among competitive organisations, globally – in the new millennium (Ayisi Nyarko and Kozári, 2021;Mlitwa, 2011;). Increased digitalisation is eminent, with the industry 4.0 reflecting automated methods to manage supply chains and product lifecycles in the information-age, and more so in fourth revolution (4IR) (Mlitwa and Musharu, 2019). To this end, the development and usage of information-centric tools, systems and processes – mostly over cloud technologies, with Big Data analytics, the Internet of Things (IoT) and other systems – are the essence of the 4IR innovations (Mlitwa and Kachunda, 2021). Industry 4.0 in particular, is not dependent on one specific technology, but an interaction between multiple technologies (Glas and Kleemann, 2016). The equivalence of this systemic interdependence is informed by the very innovative "convergence" of technology applications (Mlitwa and Mhungu, 2019). The result has been a reduction of the conventionally larger and functionally rigid appliances, into smaller - but expanded capabilities of "interoperable" "cyber-physical systems", all in the name of systemic process enhancing "cognitive computing" of the digital age (Mlitwa snd Kachunda, 2021). As a defining feature of the 4IR, the process integrates humans, systems and machinery in improving supply chain management processes (Fatorachian and Kazemi, 2021). In this respect, a large number of transactions that would traditionally be face-to-face negotiations are now candidates for online, real-time auctions (Tayaran and Gazanfari, 2020). It is from this background that the potential of the Electronic (online) Reverse Auctions (ERAs) innovation to enhancing supply-chain management and operational processes was explored in this academic research report.

1.2 The Electronic Reverse Auctions (ERAs) Innovation

Described as a positive e-commerce innovation to improving supply-chain procurements in progressive industry 4.0 shopfloors, the electronic reverse Auction innovation is considered a game changer in terms of time and process enhancing capabilities (Tayaran and Gazanfari, 2020). When the internet capabilities of online presence is emphasized, the phenomenon is referred to as the "Online Reverse Auction" (ORA) process, tool, and system (Engin and Vetschera, 2020; Schoenherr, 2016; Schoenherr and Mabert, 2007). Evidently, the ORA process under the ERA innovation has grown in leaps and bounds – conceptually, at the dawn of the 21st century. Mostly, due to the global 4IR innovations push. The essence is the increasing demand among those seeking shorter delivery lead times and overall customer-service efficiency enhancements. This, from the developed country perspective – makes the ORAs innovation a truly lucrative enhancement to the e-commerce practice (Schoenherr, 2019). High transaction efficiency

and the standardization of business information is a major feature of e-commerce/e-auctions. For, the seller can stock up according to customer demand, avoid stockpile conditions, reduce corporate risks and reduce inventory costs and improve savings (Yumin, 2020). Indeed, advantages for the adopter and implementer are enormous. They range from reduced document processing costs (i.e.savings on the paper as most transactions are processed online, to increased economies of scale due to automation of transactions (Metha and Wang, 2020; Echeng and Usoro, 2016). In effect, most commodities can even be automatically traded on a global scale (remotely), in line with the "intelligent" online commodity transaction process (Yumin, 2020). Given the significance of efficiency enhancements, the evolved e-commerce adoption patterns highlight an element of exponential growth.

1.3   Rationale for the 4IR Automated Business Process Innovations

The Internet and its associated capabilities are advancing, continuously promoting corporate electronic business developments. Internet tools have also been used to online customer services for businesses and leisure - with no sign of slowing down any time soon (Jie, 2017). In this process, Artificial Intelligence (AI) presents firms with automated efficiencies that can significantly impact sales, both in the offline and online environments (Sousa and Rocha, 2019 Moncrief, 2017). In particular, online procurement auction (OPA) practices are expanding across the operations management (OM) research communities (Chaturvedi, *et al,* 2020; Wilson, 2020; Beil, 2019). Along this trend, a more exponential growth is anticipated to parallel similar demand from individuals, businesses, institutions of learning and religious institutions (Tarazona-Bermudez *et al.,* 2014; Dobie 2011; Williams, 2011).

Industry research anticipates a greater impact on the accounting profession and on related supply chain fields (Silva et al., 2020; Rumbens *et al.,* 2019). Mostly, due to leading efficiency-enhancing value of online Reverse Auctions (ORAs) for contemporary societies, organizations and economies (Carr-Hill 2020; Mlitwa, 2018; Castells, 2012 (Engin; Vetschera, 2020)). The e-Business, e-Collaboration and e-Procurement innovations are escalated in this adoption priority list, with an overwhelming confidence on associated efficiencies and profitability enabling qualities (Stromquist, 2019; Piotrowitz and Irani, 2010; Johnson and Whang, 2002. (Piera, Roberto, Giuseppe; Teresa, 2014)).

The 4IR innovations promise to solve cross-sectional challenges, including complex disparities in educational affordances, environmental pollution, sustainable use of natural resources, and efforts to diminish food security (Hadden 2019) – across the developed and developing economies, irrespective of their location (Ayentimi; Burgess 2019; Wood *et al.* 2018). The very automation and intelligence transaction mode greatly reduces the time required for transactions, promotes agility and further improves transaction efficiency (Yumin, 2020). Technology, however, is a social construct whose value cannot be

self-infusing (automatic) – but enabled through social and environmental adaptations to advancing developments, lest one risks being left behind (Manca, Sivakumar, and Polak, 2022; Latour, 2005). Adoptions of the automated 4IR solutions for example, are finding creative (rather than simplistic) expression in a number of business information systems, including the accounting tools. Adoption with the accounting profession being both useful and complex, due to extreme vulnerabilities associated with continuous automation and the ever-changing business models (Bowles *et al.,* 2020).

Emergent in this brief "*Online Reverse Auctions*" (ORA) adoption and implementation discourse is a paradox of significance vs complexity.

1.4 The "Significance vs Complexity" Discourse in Automated 4IR solutions

From the "significance" front, 4IR automated innovations can improve effectiveness, efficiency and the economies of scale for procurement departments, with spin-offs on "smarter sourcing" – at reduced costs whilst maximizing utilisation of new solutions (Nicoletti, 2020). Implications for adaptive entities on the core of this revolution are increased efficiencies, innovative capacity and competitiveness. Operational benefits for organisations include reduced administrative and process costs, more effective purchasing processes, shortening the order fulfilment cycle time, lowering inventory levels and the price paid for goods, greater visibility on expenditure control, and other benefits from managing suppliers ((Daniyan *et al.,* 2020).Croom 2000; Davila *et al.,* 2003). Electronic technologies consist of robust digital capabilities that link with organizational performance (Khin and Ho, 2018), hence all the attributes with positive benefits.Further efficiencies in the areas of finance, customer and business processes (Abu-elezz, Hassan, Nazeemudeen, Househ, and Abd-alrazaq, 2020). (Piotrowitz and Irani, 2010; Rajkumar, 2001), substantiate this point. To take advantage of data and the added value it can provide, technologies such as artificial intelligence and big data analytics can be used (AllalChérif *et al.,* 2021, Kache and Seuring, 2017). An important part of improving buyer-supplier relationships, and thereby procurement, is communication. A vital part of communication is information sharing, which has changed alongside technology, from paper-based to electronic communication (Handfield *et al*., 2019).

Digitalisation and implementation of technology constitutes a big part of the current innovation within procurement and can give companies a strategic vantage point (Nicoletti, 2020, Tripathi and Gupta, 2020a).

Complexity on the other end, is informed by a number of factors. At the onset is a shift in commercial civilisations – from tedious manual processes into the new automated technology enhanced business practices (Wang. 2020). The digital divide and a need to adjust to associated literacies also poses an awareness and confidence limitation to adoption and usage of the 4IR automated business process

solutions such as the ORA innovation. Equally significant are discrepancies in the interoperability of related tools and systems that feed into automating 4IR solutions (Mlitwa and Kachunda, 2021).

The global digitalisation divide between countries and across regions, based on differences in ICT access and technology development – is well-documented (Kunkel and Tyfield, 2021; Goncalves et al. 2018,) Dewan and Riggins 2005). The divide translates into the problem of uneven access to the application and use of ICT between countries, economies and populations (Mlitwa and Kachunda, 2021). That is, access to the enabling infrastructure, to the actual technology and related literacies are more reachable in first-world contexts than in underdeveloped, poorer environments (Selja *et al*, 2020). With a focus on Sub-Saharan Africa, Banga and te Velde (2018) contend that the impact of digitalization and automation on labour markets will depend on how well African countries are prepared to harness digitalization for their industrialisation processes. Currently, African countries face a significant digital divide due to lack of infrastructure, low skills levels and high capital costs that hamper automation (Asongu and Le Roux 2017). For, as long as the ICT spread in developing economies remains low, and unless the digital divide can be narrowed Unless, they would remain behind in terms of efficiency enhancing automated tools and systems, and ultimately on the global competitive economic trade continuum (Naudé, 2017).

Even where literacy and awareness are adequate, a supporting environment such as the basic power and energy security would often be an impediment to digitisation stability. The constant power disruptions and failures in South Africa, due to weak capacity of its electricity supply monopoly entity – ESKOM, would inhibit the adoption and implementation automated business process innovations such as the ORA. Limitations in terms of parallel systems to converge conventional applications with automated innovations – would further challenge implementation of automated systems in affected business environments (Nicoletti, 2020).

1.5   Rationale and Trends for the ORA innovation

In line with the evolving times, buyers are increasingly using e-procurement for purchasing activities. Respective functions include tendering, authorisation, ordering, delivery and payments, with the electronic reverse auctions (ERAs) gaining momentum on e-procurement front (Tayaran and Ghazanfari, 2020; Saprikis, 2013). In ERAs (frequently referred to as ORAs), a buyer invites suppliers with a request for quotations in real-time by submitting e-bids for a specific good or service (Hu, *et al*, 2018; Hackney *et al.,* 2007). The buyer then chooses one supplier from these potential suppliers. Despite the increasing popularity of ORAs which has resulted in a burgeoning of academic research, with various empirical explorations ORA appropriateness and usage (Yeniyurt *et al.*, 2011), yielding a mix of the positive, negative and incomplete observations (Gelderman, Semeijn and Nagel, 2017).

Sceptics cite the detrimental potential of ORAs usage, with claims that it can potentially destroy buyer-supplier relationships(Cho, Donohue, Fry ;Wooten, 2019). (Joo and Kim, 2004; Kaufmann and Carter, 2004; Mithas *et al.*, 2008; Hawkins *et al.,* 2009). By promoting distant interactions to successfully effect business auction transactions, sceptics complain that it stands to diminish (if not objectify) the buyer-supplier relationships(Teixeira, Gomes; Vale, 2021). (Pearcy *et al.*, 2007; Gattiker *et al.*, 2007; Stevens, 2007). Hence, a warning not to blindly adopt the ORA innovation with thorough assessment of appropriateness and need for every procurement situation. Indeed, mixed perspectives on appropriateness and value of ORA adoptions suggests that the innovation is yet to achieve a point of maturity, with more for researchers to still uncover (Xu and Wang, 2017; Saprikis, 2013).

Immaturity is evident in unresolved challenges emanating from the post-use of ORAs. The performance of the suppliers after winning the contract with lower margins for example, remains unclear (Aital, 2017). Similarly, mechanisms to alleviate adverse customer-suppliers relations on the quality of offerings remains mysterious, leaving into suspense quality assurance dynamics on the type of work, and the volume of the contract or the attractiveness of individual buyers (Hanák, Marović,Jajac, 2018).
To this end therefore, the adequacy of ORA adoptions and implementations across varying business environments remains an exploratory discourse. Hence, many economists are currently discussing how to achieve an optimum level of confidence in ORA optimization to the effect of stimulating economic growth. However, several studies are shifting the ORA implementation debate into business to business (B2B) relations, with emphasis on how trust in supplier quality can determine total corporate performance (Santos, Murmura and Bravi, 2019; Maian *et al*., 2016; Charki,Josserand, 2006). The debate is extended to issues vendor rating, with attempts to understand, measure and improve the quality level of the supplier's performance in this equation (Shukla *et al*., 2016). This development however, introduces complexities of rating systems to measuring supplier quality, with further questions on the impact of contested measurements under contestation, without compromising vendor selection negotiations and results (Fernandes and Vieira, 2015).

Researchers and organisations in compromised development conditions have begun to ask whether it is not enough to improve internal efficiencies whilst navigating the journey of getting the whole procurement environment to be made competitive (Vonderembese, 2019), for when this electronic tool reaches implementation maturity, could transform procurements from the old to a new paradigm in the e-purchasing regime (Muhaimin, 2019).

From this background, the rationale for the study was to identify the critical factors of ORAs usage and its effect on the buyer-supplier relationships in the context of a developing country. The goal was to

understand and explain the adoption (or lack thereof), as well as the implementation and practice of Online Reverse Auctions (ORAs) innovations in South Africa. Whilst implementations of ORAs may seem optional and standard for businesses in developed economic environments, the reality is more complex in sub-marginal economic environments Indeed, as complexities for business in challenged environments, the benefits of new technological innovations are advancing – with notable competitive benefits for the adopters – who would naturally assume a competitive edge in the global trading markets, by comparison. Hence, this chapter outlines the background of the study (sec 1.2) – including the research focus (which is the Electronic Reverse Auctions innovation in this case), together with a research problem (sec 1.3), research question/s (sec 1.4), the aim, objective/s (section 1.5) and the significance of the study (section 1.6), structure of the thesis (section 1.7), the conceptual and operational definition of terms (section 1.8 and a conclusion (in section 1.9).

1.6   Background Information

The fusion of the digital, biological and the physical worlds, in the context of new technologies such as artificial intelligence, cloud computing, robotics, 3D printing, the Internet of Things, and advanced wireless technologies, among others— is ushering economic disruptions with uncertain futures for the *marginally-developed* regions, including African countries (Ndungu and Signe, 2020). In the globalised economic context, business processes are at the forefront of these technological disruptions. For, process automations and e-commerce have become a significant enabler of efficiencies upon which a competitive advantage is forged on the local and global markets (Treiblmaier; Sillaber, 2021; Mlitwa. Raqa, 2012). E-commerce in multiple variations have grown significantly in this 4IR induced technological revolution, with almost supply-demand interactions establishing one form of an online presence, or another (*ibid.*). An increasingly sophisticating client in the electronic environment demands an electronically enhanced service, with enhanced quality and delivery speed, regardless of the distance between themselves and the seller or service provider (Y. L. Zhang, Bi, Xiao, 2017 ; Mlitwa and Tshetsha, 2012). Thus, a service provider is left with little choice but to adjust, lest they risk relinquishing that market-share to a more responsive competition (*Ibid.*).

In effect, e-commerce has grown substantially since the turn of the 21st centurury, with the global value estimated at around 29 trillion dollars as of the year 2017 – its various sales segments: commercial transactions between companies or Business to Business (B2B) - including ORAs; the activities of companies that serve end consumers with products and/or services or Business to Consumer - (B2C); and Consumer to Consumer - (C2C) (Campos Souzaa *et al*, 2021; Mlitwa and Raqa, 2012. (Nogueira, de Assis Rangel, Shimoda, 2021)). In the latter format (C2C), platforms that promote the intermediation

of the operation such as ORAs, AI, DA and many other technology innovation tools are frequently used – including the practice of online auctions. In this process, an agent announces an item for sale. Other consumers or companies make bids to auction them off, with online platforms only serving as intermediaries between auctioning parties – at a fixed fixed fee or commission (Trevathan, 2018). A combination of the platform and this electronic autioning process is known as E-auction, which is a negotiation system for internet based auctions to facilitate supplier selections (Capgemini Consulting, 2016, Jandoš, 2006). (Engin, Vetschera, 2020).

1.7   The Significance of Advanced e-Commerce Solutions, including ORAs

The significance of this system, tool and process lies in the value it offers in terms of scope, and efficiencies to the auctioning parties. Indeed, internet-based platforms have improved auctioning processes significantly, in terms of time and space efficiencies by comparison conventional manual processes (Chan et al., 2018). In the past, the first Internet shopping pages were mostly bad versions of written mail-order catalogues (Benny Ong Ming Zhe and Norhadilah Abdul Hamid, 2021). E-commerce have also widened the scope of digital business creativity, with online stores such as Amazon and Zappos diversifying their offering beyond their traditional comfort and affordable items; by extending genuinely innovative consumer goods. Mainstream businesses such as taxi companies and grocery store chains have also ridden on the bandwagon in pursuit of a strategic competitive edge. With adequate planning, digitisation is possible (Richard *et al.,* 2020), and when achieved, it can help improve business processes, allowing a creation of new opportunities and business models (Heberle *et al.,* 2017).

While digital innovations have delivered numerous benefits to society, they also result in unintentional, adverse effects—especially when these innovations result in inequity that separates those who have access to the technology (e.g., people, companies, and governments) and those who do not (Papadopoulos et al., 2020; Flyverbom *et al.,* 2019; Vial, 2019; Dewan and Riggins, 2005), (Schlichter, Nielsen, 2022). Despite decades of initiatives that have focused on eliminating this digital divide, it has persisted (Bose, 2018), with rise of artificial intelligence (AI) seeing the increase of the skills gap (Robert, Bansal, and Lütge, 2020a; Scheerder *et al.,* 2017; Bélanger and Carter, 2009). (Yang *et al.,* 2021). However, few studies have systematically and comprehensively reviewed the digital divide in relation to AI. Among interested researchers, Dwivedi *et al.* (2019) call for a more engaged debate on the societal impacts of AI – in the light of the digital divide, infrastructure development and skills gaps.

As the rational for the call is that Africa's potential workforce will be among the world's largest upsurge by 2030. Paired with the needed infrastructure and skills for innovation and technology use, the 4IR represents a massive opportunity for growth, which, unless adequately prepared for, could prove illusive

to these regional populations and economies (Ndungu's, 2018). The same argument applies to the e-Commerce as well as the ORA and the ERA innovations adoption debate in cited economies. To this end, the research topic of this projects was motivated by ORAs being amongst the tools represented under 4IR and ecommerce. The recent phenomenal growth in the use of business-to-business (B2B) ORAs by organisations on a global basis with a glaring picture on Africa lagging even though future business growth will be generated from Africa. For, despite this global trend and the perception that South Africa is technologically advanced compared to other African countries, the ORAs concept have still not been fully embraced in this economy.

Reason behind the slow adoption of this procurement negotiation tool (i.e., ORAs) is partly linked to long-term protections of buyer-supplier relationships. Sentiments cite this impediment, directly to the government negative agenda on legislation and protection on small and medium enterprises including training requirements. This is despite developments to the effect that ORAs will positively affect established relationships, impacting the empowerment of small supplier plans, especially in a developing country such as the Republic of South Africa (RSA). Despite this level of uncertainty and policy contradictions, the advantage of electronic solutions to business processes remains undisputed. Online negotiations for example, are literally done in the comfort of one`s space, connecting globally in real-time, with transparency, in the shortest space of time. The tool provides six simple steps including business rules (terms and conditions, limitations, and deal breakers) to be built into the system (Figure 1).
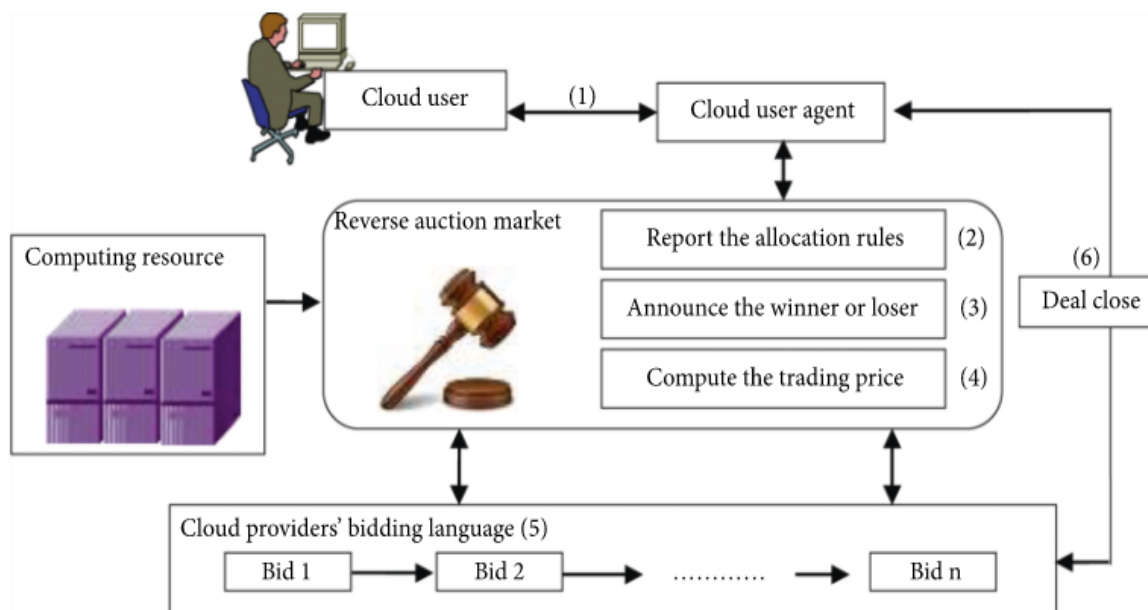
Figure 1: Hongkun Zhang and Xinmin Liu, ORA Toolbox (2021)

During the first three years of its existence, very little insight was known of the ORAs and its tool functionalities (Norris, 2000). Interested organisations, predominantly in Europe and America normally contracted to third-party application service providers (ASPs), are commercial service organisations that deliver, manage, and remotely host software applications through centrally located servers in a rental or lease arrangements (*ibid.*). While effective, this first-generation model of hiring ASPs to host ORAs proved to be expensive due to the service fees, support and maintenance costs, pushing the innovation beyond the reach of many consumers.

Like all capital investments, implementing technology for the first implementation of e-procurement tools could be costly. For example, the Deutsche Bank research established that a full transition to e-procurement could generate savings of between 50 billion and 70 billion euros (Suryani *et al.,* 2022, Alsaç, 2017; Meyer, 2011; Mishara, Konana; Barua, 2007). However, a leadership resolve would guide, to the extent of justifying the initial investment. For, the extent of e-procurement infrastructure integration between organisations has a direct impact on the savings and benefits obtained by organisations (Bellenbaum, Höckner, and Weber, 2021;Lorentz, Aminoff, Kaipia, Srai, 2021; Min, Galle, 2003) . There are always two-sides to an implementation process: good and successful implementation on the one hand, and poor implementation on the other hand. At the first instance, lack of or poor integration of e-procurement infrastructure would lower the benefits. It could also increase costs. The opposite is also true, where good integration stands to yield the positive effect, a promise which encourages the supply function in an increasing scale than before (Ahmad, Aljafari, and Venkatesh, 2019; Purchase and Dooley, 2005).

The debate creates a sense of a puzzle that invites detailed research to untangle. Hence, this study sought to investigate if the ORA/ERA e-commerce innovation does stand to positively contribute to improved sourcing practices, particularly between buyers and suppliers in South Africa. Perhaps, a synopsis at the South Africa Procurement process, and related challenges could paint a picture of significance, need and urgency to the adoption of the ORA / ERA innovations. The study focuses slightly on the African continent's perspective, with South Africa as a case study.

1.8 The Digital Online Reverse Auctions

Buyers are increasingly turning to ORAs in their negotiations with suppliers globally, with every major industry globally, resorting to the use of ORAs to save money (Tayaran and Ghazanfari, 2020; Brunelli, 2000). In effect, the annual volume of industrial purchases through ORAs reportedly amounting billions

of United States dollars (USD). The question is: How do these price competition mechanisms affect South African supplier development plans?

The results of the study conducted by (Brunelli,2000) indicate a positive trend, with beliefs that buyers will act opportunistically in open-bid auctions. Similarly in sealed-bid auctions, both current and new suppliers increase their willingness to make dedicated investments towards the buyer (Tayaran,Ghazanfari, 2020). Thus, most medium to large organisations buy some goods and services that are viable candidates for ORAs, seeing ORAs being used successfully to source indirect materials, production materials and support services among adopting entities (Tayaran and Ghazanfari, 2020; Gabbard, 2003).

Online reverse auctions (ORAs) are considered a new e-commerce approach to procurements in the supply chain (Tayaran ,Ghazanfari, 2020), due to improved time and cost efficiencies – by comparison to conventional means. In detail, the entire transaction process between e-commerce companies and customers is online, and customers only need to pay a certain amount when purchasing goods. This way, the cost of network data which are lower than the transportation cost – can save customers communication and time cost of purchasing goods. Additionally, e-commerce companies get to trade with customers directly, thereby avoiding the middlemen and its related costs. Thirdly, the use of paper is greatly reduced as most documents are processed online, thereby reducing the cost of document processing. Finally, the seller can stock up according to customer demand, thereby reduce corporate risks and reduce inventory costs (Yumin, 2020). For this reason, the value of the associated digital signature tools is also increasing, given the urgency of securing these online procurement transactions (Reddick, 2004). A digital signature is a significant element to the secure usage of the ORAs technology. For, as an electronic means of signing documents that provides sender authentication using public-key encryption, it assures auctioning stakeholders of the authenticity of ORAs transactions (Sambhara, Rai, Keil, and Kasi, 2017; Laudon and Laudon, 2001).

1.9   Definition and Implications of Online Reverse Auctions (ORAs)

Since reverse auctions are buyer-initiated transactions "*in which a buyer asks for bids from multiple sellers; the price then decreases as sellers compete for the buyer's business with the lowest bid considered the winner*" (Raffa and Esposito, 2006, pp. 46-49), they are easily defined as involving online competition by different suppliers for contracts by the buyer (Ananto, Hsieh and E R, 2022; Tassabehji *et al.*, 2006). In line with this view, Sambhara (2020) adopts (Hartley *et al's* 2006) conception of an ORA technology, describing it as an Internet-enabled facility that allows suppliers to compete dynamically by submitting multiple electronic bids synchronously, and within a certain time period (Hanak, Chadima and

Selih, 2017). The presence of bidding and pricing processes, together with the actors such as sellers on the one end, and buyers on the other, competing between them, emerge as major constructs. In brief then, ORAs are a seller-initiated tool and process – to interact between auctioning parties in respective transactions over an electronic platform. Enhanced efficiency clearly appears to be an added advantage offered by this innovation, worthy of statutory regulations in national policy circles.

In the South African context, the Electronic Communications and Transactions Act (ECTA) of 2002, builds on this context to provide for electronic transactions and communications by businesses. It further provides for the human resource development in electronic transactions, and, most importantly, encourages a secured use of e-government services. An emerging dimension herewith is an equal significance of ORAs in public or governmental transactions, as it is in the private business sector. In this process, the act further promotes the use of e-government services and electronic transactions between private and public bodies, with the ECTA (section 1) attributing *a wide definition of "e-government services"* as *"any public service provided through electronic means by any public body in the Republic",* including related business processes and e-procurements (ECTA, 2002: Sec 1).

The planning, adoption and implementation, therefore, is clearly the prerogative of the seller. With the development of network technology, more people are searching for information on the internet, which by its very nature, explains the entry point for the customer/ buyer, where internet enabled tools, systems and processes – become the meeting point. The innovation is borderless and thus, the service provider considers the number of people, as potential clients who has internet access. For, internet connectivity has become a gateway to a myriad of business process efficiency enhancing solutions in the information age. In 2013 for example, the number of Internet business transaction in the whole world reached USD2.92 billion. In today's pre- and post-COVID 19 lockdown era, people do more than just read the news and search for information on the Internet, but also conduct business transactions, with e-commerce having grown rapidly as a solution. The ranking of Jack Ma (founder and CEO of Alibaba, China's most famous e-commerce company) as the second richest man in China in 2014, illustrates this point. Not only this successful Chinese example, but there is a multitude of electronic auction products and services on platforms such as Yahoo and eBay, all across the internet. On these websites, successfully registered users can play the roles of the auctioneer, and also of a bidder, anytime – and from anywhere (Sogn-Grundvåg, Zhang, and Dreyer, 2021; Hartley *et al.*, 2006). For, online auctions allow geographically diverse buyers and sellers to exchange goods, services, and information, and to dynamically determine prices that reflect the demand and supply at a certain point of time so that efficient matching of supply and demand can be realised (Bodin et al., 2020; Chen *et al.*, 2005).

On the flip-side of the growing number of efficiency enhancing opportunities associated with networked based solutions however, stands the digital divide reality – that covertly aligns internet-dependent services – with the privileged, technology networked elite relative to connectivity deprived majority in under-developed environments. This research project was concerned with the overall adoption, implementation and use of networked solutions such as ORAs, to improve *procurement process* efficiencies for all who need its benefits, across environments. Not just a few selected cabal in privileged environments. For this purpose, a holistic framework to ORAs implementations was explored in this project.

1.10   The Procurement Process

The procurement of services and products enables buyers and suppliers to interact for a certain period while a service is being delivered. Often, during the development of customised enterprise information systems or in management consulting projects. Such interaction is likely to allow buyer-supplier relationships to exhibit themselves beyond the themes discussed in the literature on ORAs for goods (Bodin et al., 2020; Jap, 2007). Hence, buyer-supplier relationships are an essential necessity in the procurement of products and services.

To clarify the essence of ORAs in business procurement processes, issues affecting the auction design and other parameters (e.g., number of bidders) on the buyer's willingness to make idiosyncratic investments are unpacked, in greater detail in this section. Figure 1 shows the procurement process using ORAs.
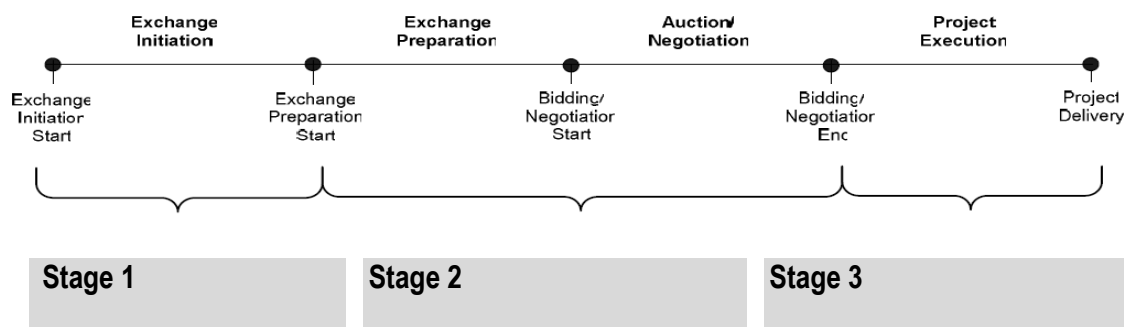
Figure 2:Tenders online Reverse Auctions Contract execution

Source: Radkevitch, 2008

Figure 2 depicts the actual procurement process, with emphasis on the essence of the initiative lead (by the exchange initiator). The Exchange preparation phase involves both the presentation and the actual bidding negotiation – which involves both parties of the bidding transaction from this point. In line with a

definition of ORA and e-Procurements in preceding passages, it emerged that ORAs are initiated by sellers. Similarly as depicted in this graphical illustration, the buyer is engaged at the exchange preparation phase - between the exchange presentation (phase 1) and the bidding process (phase 2). It becomes a dichotomous engagement process from this phase onwards, i.e. up to phase 3 and beyond. Whilst ORAs continue to advance efficiencies in developed countries such as the USA and other parts of Europe, there is no clear insight on African developments in the literature about conducted differently in Africa compared to the USA and Europe. What works or does not work in the developed worlds may not be the same in Africa. In these developing country environments, buyers have built relationships with suppliers to an extent where they can place orders verbally with suppliers, and the purchase order follows later (Zhang and Watson IV, 2020). In order for this to happen, there must be a very tight relationship between the supplier and the buyer, stretching up to the executives, end-users and project directors. This research focuses on relationships that are built in South Africa, with emerging lessons generalisable to countries with similar conditions.

1.11   Research Emphasis

Reverse auctions are the unit of emphasis in this study. Electronic reverse auctions are described as "the technology that has triggered more ethical concerns in the e-commerce arena than in any other segment of activity" (Charki *et al.*, 2011, p. 17). It is rather significant in purpose, yet mysterious in the level of uptake in underdeveloped countries, with cynics dismissing it as "coercive" in nature, due to the buyer's power to force suppliers to participate in auctions and reduce their prices during the auction (Hanak *et al.*, 2017; Hanak *et al.*, 2017; Giampietro and Emiliani, 2007; Emiliani and Stec, 2002). Indeed, some vendors may feel pressured to participate in a process where suppliers are rutted against one another to lower their prices, where all perceived benefits flow to the buying organisation. Further, some suppliers may bristle at the notion that their products or services are evaluated on a single factor price to the exclusion of other considerations effectively commoditising their market offerings (Ryu and Park, 2021; Griffiths, 2004). From this perspective, the reverse auction scenario may cause an exploitative relationship between buyers and suppliers, rather than allowing procuring organisations to collaborate with their suppliers. Yet, there is also the perspective that such tensions are inevitable with the buyer-supplier relationship having conflicting needs, goals, and expectations; and that these are evidenced both within and outside of the context of reverse auctions in several ways (Sambhara, *et al.*, 2017; Tassabehji, 2010). Understanding implementation factors would therefore, call for the unpacking of these and other influential determinants if full potential of ORAs is to be fully exploited in competitive business environments.

At the very onset, for example, suppliers with access to this innovation would face the question of whether to participate in reverse auctions or not. Increasingly, the answer to this question is that they simply have to, as greater amounts of corporate and government spending are decided through competitive bidding – as Moorhouse states, "*refusing to play is an incredibly dangerous (and expensive) approach*" (Moorhouse, 2008, p. 25), a sentiment that is equally upheld by Elsayegh, Dagli, El-Adaway, (2020). This research simultaneously recognises that ORAs are divided into three streams: (1) Price-only auctions; (2) Hybrid mechanisms, for example, auction plus post-auction bargaining or negotiation; and (3) Multi-attribute auctions. In price-only auctions, suppliers are allowed to bid on price alone.

This stream of work mainly focuses on mechanism design and characterises equilibrium bidding behaviour. Milgrom (2000b) indicated that competition is very high where there are many suppliers and where the goods are not complex. In a similar setting,(Xiao *et al*.,2018), as well as (Engelbrecht-Wiggans and Kahn 2005) found that the low-revenue equilibrium allows bidders to obtain goods at prices lower than the competitive price. Although the results of these works are applicable within the framework of simultaneous ascending-bid auctions, they can easily be applied to ORAs with similar rules. When industrial bidders are constrained by capacity, (Barbaro and Bracht, 2021; Gallien and Wein, 2005) introduced a "smart-market" mechanism that allows bidders to adjust their bids and quantities based on current allocation. Although theoretically sound, "price-only auctions" have limitations due to their emphasis on short-term success. These limitations are quickly realised by both buyers and procurement service providers(Park, Suen, and Wan, 2021; Elmaghraby, 2007; Jap, 2002).

There are various mechanisms that combine both ORAs and post-auction events (i.e., hybrid mechanisms). The purpose of such designs is to maintain the price discovery feature of auctions but alleviate the price pressure on the suppliers (Engin and Vetschera, 2019; Engelbrecht-Wiggans and Katok, 2006; Salmon and Wilson, 2005). The underlining factor and dilemma facing this research is that most of the project managers or end users are expressing negative sentiments with respect to ORAs, citing: "*It will affect relationships between buyers and suppliers including other important aspects concerning the selection process (that involves supplier development, supplier performance and legislation matters)*" (Monczka *et al.* 2011). Dwelling on the statements made about ORAs, there are no tangible facts to support the allegations. As a result, executive managers are reluctant to approve the implementation of ORAs in the ICT industry. Along the same lines, multi-attribute auctions have been gaining more attention due to their ability to enable buyers to evaluate suppliers along diverse dimensions and compare their relative strengths. This research explores the multi-attribute auctions model in-depth in respect of a particular (Sözüer and Semerciöz, 2016; Robertson Cox, 2001) supplier-buyer relationship

model. By doing so, the mentioned combination fully addresses the identified study's research question. Therefore, the multi-attribute auctions model serves as the primary theme of this thesis.

With regards to the abovementioned three online reverse auction categories, the intention of this study was to undertake an in-depth investigation of the multi-attribute stream. Does this online reverse auction stream have any impact on the buyer-supplier relationship in the context of supplier development and job creation in a developing country?

The multi-attribute online reverse auction model is evaluated in the context of the three buyer-supplier relationship models: (1) Making supplier relationship choice by Robertson Cox, (2) Buyer-Supplier relationships by Cannon and Perreault and lastly (3) the Key Mediating Variable model by Morgan and Hunt. The intention is to establish, out of the three relationships, which one is most likely to be strongly affected (positively or negatively) by the implementation of ORAs. The Cox model is assessed in-depth to identify which relationship theory is likely to be the most suitable for ORAs; and to propose a suitable framework which will ensure that all the key variables are well balanced, particularly supplier development, BBB-EE legislation and the supplier performance of conducting business in developing countries, from a South African perspective.

The increased emphasis on sourcing today across all organisations is driven by two factors. These are (1) the heightened reliance of most large organisations on contracted services and outsourcing, as well as, (2) the fact that procurement is increasingly understood to be vital to organisational success. How well procurement is executed has become a critical success factor. Procurement is now understood as "*to provide a competitive advantage by reducing the price and the transaction costs associated with the procurement of goods and services*" (Hawkins, Randall and Whitman, 2009, p. 56). The strategic nature of procurement is thus becoming more and more recognised. Indeed, across both corporate and governmental procurement departments, the function of procurement has moved from a localised, operational activity to one that is more consolidated and strategic in nature (Hawkins, Gravier and Wittmann, 2010). The principal driver in this shift has been the drive to produce per unit cost savings through better acquisition practices(Sözüer and Semerciöz, 2016; Trent and Monczka, 2003).

According to Tassabehji (2010, p. 433): "*those organisations perceiving procurement as a purely administrative function, might not be capitalising on the benefits of the new procurement technologies with the potential to improve efficiency, reduce costs and build relationships with supply chain partners*." The online procurement auctions have quickly evolved from the price-only auction design to more complicated mechanisms to improve allocation efficiency and to achieve sourcing sustainability (Cho *et al.*, 2019; Elmaghraby, 2007). Driven by the growing adoption of online procurement auctions, the

literature on ORAs is also growing. More sophisticated mechanism designs are proposed to facilitate and guide business practices (Cramton and Ausubel, 2006; Elmaghraby and Keskinocak, 2003; Vries and Vohra, 2003). Therefore, it is imperative to assess if the developing countries resonate with these trends, given all the outlined unique challenges in their environments.

1.12   RESEARCH PROBLEM

It has been firmly established in the literature that ORAs can improve a competitive advantage by improving efficient in business processes in an organisation. Despite this briefing established advantage, it remains a mystery on why the innovation is minimally adopted let alone implementation and usage in South African public and private sector.

The problem with the south African businesses is that they will miss out on a competitive advantage in the global competitive trade. Therefore, full adoption is required as an added advantage for these businesses. Electronic reverse auctions can be defined as "The sale of goods or services, where people or organisations make higher and higher bids (offers of money) for each thing, until the thing is sold to the person who will pay the most" (Cambridge Dictionary, 2019) or "A sale of property to the highest bidder" (Mirriam-Webster, 2019), over a networked electronic medium (Tayaran and Ghazanfari, 2020). These sales events are managed electronically by specialized companies (market makers) who provide an online platform where the bids take place (*ibid.*). ORAs are an electronic negotiation tool which is the opposite of the traditional negotiation process that is effectively face-to-face. Their primary objective is to cut the organisation's procurement costs and to save time. As an enabler of efficiencies, ORAs are receiving a high adoption rate among organisations developed countries that seek to maximise their competitive edge in international trading markets.

Despite the value a competitive advantage the innovation offers to procurement processes however, the level of awareness, adoption and implementation of this innovation in emerging economic environments such as South Africa remain minimal at best, and unclear at worst. The survival of a business depends on being able to effectively compete in the increasingly globalising world markets, and the danger with entities missing out on these efficiency-enhancing competencies, is a potential loss of a competitive advantage associate with adoption and exploitation of this technology. Trading stakeholders who are left behind in under-developed environments risk losing an efficiency enhancing tool to compete in the global stage. Understanding the full impact, and relevance of ORA is also important in making sense of the adoption and implementation dilemma in developing country environments. For, despite the usefulness of the ORA innovation, sceptics also complain of practical challenges, including: the potential damage of buyer-supplier relationships(Cho et al., 2019; Schoenherr and Mabert, 2011; Caniëls and Van Raaij,

2009; Hawkins *et al.*, 2009; Mithas *et al.*, 2008); suppliers' trust in buyers (Nadler and Kros, 2010) potentially being negatively influenced by technical problems, rumours or an inadequate auction format; Complexity in implementation processes - such as running ORAs without the intent of awarding business, collusion of suppliers, awarding contracts more often to incumbents, submission of abnormally low bids or delivery of lower quality products/works;

buyers running ORAs not in a fair manner, which requires clear explanation and communication of non-discriminatory auction rules and conditions to suppliers; and Whilst trying to understand the uncertain adoption and usage status in South Africa, the extent to which these factors affect uptake also requires unpacking. ORAs may have made inroads in Europe and USA but certainly not in Africa, and most certainly very little progress has been made in South Africa and other countries of the African continent. Despite the increasing popularity of ORAs which has resulted in a burgeoning of academic research (Gelderman, Semeijn and Nagel, 2017; Yeniyurt *et al.*, 2011), the scarcity of empirical studies on the appropriateness of ORAs usage in developing country environments such as South Africa – further escalate the mystery, thereby necessitating this investigation. For example, explanations of why procurement professionals decide to utilise ORAs are incomplete and under-researched.

Practical challenges cited in above passages could result into side-effects, yet there is no adequate research on how to alleviate adverse outcomes on the questionable quality of the offerings (Aital, 2017). From this dilemma, emerges the urgency for a more holistic framework that takes into consideration the type of work, and the volume of the contract or the attractiveness of individual buyers especially in developing countries. There is limited research that has primarily looked at specific problem areas such as legislation, supplier performance, supplier development and specific buyer-supplier relationships without being generic (Saprikis, 2013). Further, lack of insight on potential financial savings that can be achieved through auctions also still need further research (Hanák, Marović and Jajac, 2018). For, a lack of this tool and framework implies a knowledge gap towards a comprehensive adoption and implementation of the ORAs innovation in a developing country context such as that of South Africa. Clearly, the examination of online reverse auctions (ORAs) is still in its early stages, leaving research with much more to uncover (Saprikis, 2013).

Hence, it is important to examine how and why procurement professionals reach the conclusion that ORAs are appropriate for a particular procurement situation. A major question is: Do ORAs fit in this context as currently designed and the manner in which it is currently implemented, or do they simply not work under the challenges faced by a developing country? E-procurement and ORAs, broadly speaking, have been researched and concluded narrowly around intermediate outcomes of being better services,

cost savings, and time savings. As such, some researchers have only concluded on outcomes, namely, improvement of labour productivity, economic rationality (organisational efficiency), simplification, transparency, accountability, and GDP growth. Others have only touched on the adoption process, which largely speaks about the tools, involved. Finally, the ones that have researched buyer-supplier relationships are mainly focusing on trust, collaboration and buyer training. Therefore, this research was intended to fill this gap, focusing on the dynamic and complex challenges that are faced by developing countries such as South Africa. The study sought to identify the status of ORA adoption and implementations in South Africa. It sought to explain related causes, and ultimately, to contribute towards bridging the knowledge gap and to improve effective implementations.

1.13 RESEARCH QUESTION

1.13.1 Main Research Question

How can the adoption (*including implementation and use*) of Online Reverse Auction (ORA) be improved among the private and public business enterprises in South Africa?

The idea eventually, is to ultimately explain trends and the causal factors thereto, how can the adoption (*including implementation and use*) of Online Reverse Auction (ORA) be improved among the private and public business enterprises in South Africa?

1.13.2 Sub-questions

What is the state of ORA adoption among the private and public business enterprises in South Africa?

Why are the ORA innovations not optimally adopted in private (corporate) and public (parastatal) enterprises in South Africa?

How can the inhibiting factors be mitigated to enhance effective use of ORAs in the private and public sector in South Africa?

The review of the e-auction literature reveals that researchers have not explored in detail the effects and factors of ORAs on buyer-supplier relationships, enterprise development and supplier performance in a developing country. In practice, business executives are reluctant to adopt the multi-attribute auctions design due to uncodifiability and unobservability of non-price attributes and impersonal relationships (MingYan and Yuan, 2012; Elmaghraby, 2007; Dai, Narasimhan and Wu, 2005). This research will fill the

gaps in the literature arising from a lack of research in developing countries, using South Africa as a case study. The intention of this study is to help build a foundation for the future in the adoption of reverse auction in developing countries.

1.14   AIM AND RESEARCH OBJECTIVES

1.14.1   Aim

The *aim* of this study is to understand and explain the factors of adoption (which includes implementation and use) of Online Reverse Auction (ORA) innovations in private (corporate) and public (parastatal) enterprises in South Africa.

1.14.2   Research Objectives

The *objective* thus, is to identify causal factors so as to inform solutions to inhibited adoption, implementation and use of ORAs in the private and public sector. Unpacking these factors would ultimately inform a positive adoption of ORAs in the South African business sector. That way, the sector could improve a competitive advantage on its business processes, and ultimately, long-term sustainability in the global competitive global political economy in the fourth industrial revolution (4iR) era.The adoption of a technology according to the Technology Adoption Model (TAM) is largely dependent on the perceived ease of use (Usability) of the ORAs systems, perceived Usefulness of the ORAs systems, frameworks and processes, relationships on buyers and suppliers on using ORAs, costs implications, being informed- awareness and enabling technical conditions (i.e. technological access). (Vinkatesh and Bala, 2008; Venkatesh and Davies, 2000; Davis, 1989). It is on this basis that this study had sought to understand and explain the effect of these causal factors the adoption of ORAs in the private and public business sector in South Africa.

Objective 1

Unpacking these factors would ultimately inform a positive adoption of ORAs in the South African business sector. That way, the sector could improve a competitive advantage on its business processes, and ultimately, long-term sustainability in the global competitive global political economy in the fourth industrial revolution (4iR) era.

Objective 2

The investigation of the perceived ease of use (Usability) of the ORAs systems, perceived Usefulness of the ORAs systems, frameworks and processes, relationships on buyers and suppliers on using ORAs, costs implications, being informed- awareness and enabling technical conditions

Objective 3

It is on this basis that this study had sought to understand and explain the effect of these causal factors the adoption of ORAs in the private and public business sector in South Africa. The outcome will result in a framework to enable adoption and implementation of ORAs. The objective in the context of this study is to inform effective adoption and implementation of ORAs in a developing country environment like South Africa. The diagram (Figure 3) below outlines the fundamental variables involved throughout this research study.
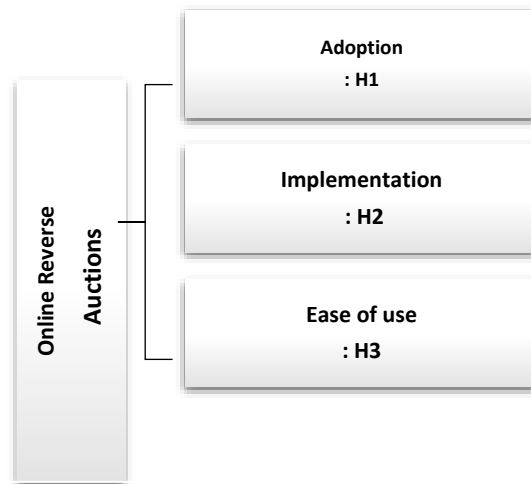
Figure 3: Online Reverse Auctions

The outcome of the study was to develop a conceptual framework for online reverse auction's adoption and its implementation in South Africa. The conceptual framework would incorporate the critical procurement objectives in respect of implementation, adoption legislation and use of ORAs, as opposed to only looking at standard and current offerings of ORAs and looking beyond just the savings. When these objectives are adequately addressed, effective adoption would be properly modelled. Although the study is limited to South Africa, it would certainly benefit other developing countries on the African continent since their procurement functions are faced with similar challenges and are expected to achieve similar outputs.

1.15   SIGNIFICANCE OF THE STUDY

According to Advanced Market Research (AMR) (2014), ORAs allow buyers to exchange information with sellers and solicit and accept bids from multiple sellers in a web-based electronic marketplace (Refer to Figure 1.3). The allure of lower prices, a broader supplier-base, faster cycle times, and a more efficient procurement process attracts buyers to reverse auctions. Online buyers often save money on purchases of goods because the nature of the reverse auction tends to force a supplier to progressively reduce its asking price. As a result, it is not surprising that suppliers may feel threatened by reverse auctions. Many long-time suppliers have trouble adjusting to online arrangements because of the personal nature of the relationships and negotiating tactics that they have formed with buyers through the years. ORAs still continue to gain acceptance. Due to the nature of the expected surge in the use of ORAs, this research

aims to increase the body of knowledge in the area of implementing ORAs in a developing country (such as South Africa), and gain insight in respect of the adoption, implementation and use of ORAs.

This contribution leads to an appropriate implementation, adoption and use of ORAs framework that will ensure that South African corporates fully adopt the tool to achieve all the benefits of ORAs, the framework will introduce a systematic process of implementing ORAs in organisations faced with the abovementioned challenges, particularly in South Africa. This contribution to the body of knowledge will form a foundation that may reasonably offer the Information Communication and Telecommunications (ICT) and the supply chain fraternity a framework and a process that will resonate with South Africa.

The study possesses an opportunity to analyse the current ORAs model and propose a framework that will resonate with ORAs in a developing country. Furthermore, the findings from this study may also increase the understanding of the implementation of business-to-business ORAs, from the auction design and industrial purchase type perspectives, as this is viewed as an effective procurement tool by both procurement and technical professionals in several ways. The positive or negative contribution of ORAs within the procurement fraternity in a developing country, like South Africa, is tested. This study offers a new dimension on an electronic procurement negotiation system that is modelled for Africa, as procurement challenges are similar across the continent. Figure 4 below reflects comparative costs information between a traditional procurement system by comparison to e-procurement (using the manual system costs as the base index (= 100), as per Warwick Business School (2015).

function	Traditional Procurement	E-procurement
Requisition Generation	65.77	29.20
Requistion Distribution	6.05	0.00
Order Generation	9.87	1.50
Order Distribution	0.87	0.00
Expediting	0.91	0.30
Goods Receipt	3.83	1.50
Invoice Processing	9.40	0.70
Material	3.31	0.00
	100.0	33.2
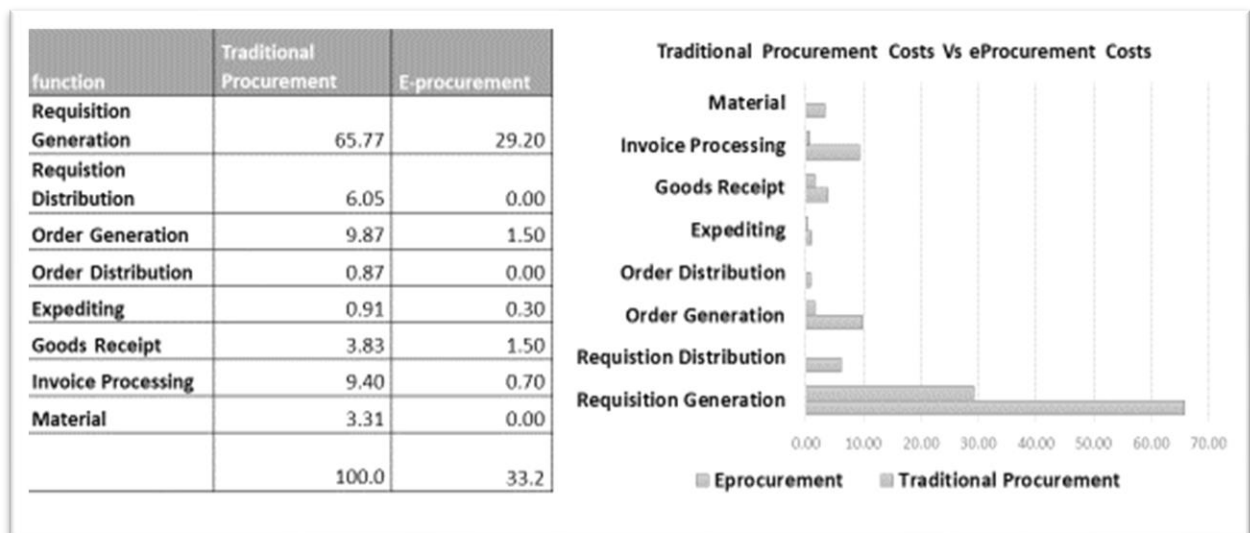
Figure 4: Traditional Procurement vs e-procurements
Source: Advanced Market Research (2014)

1.16   Research Hypotheses

A hypothesis is an informed speculation about possible relationships between variables and is deduced from a theory (Bryman, 2008). The following hypotheses were tested in this study:

Research Hypothesis 0

H00:   In South Africa, the positive perception on online reverse auctions will not result in high adoption

H01:   In South Africa, the positive perception on online reverse auctions will not result in high implementation and use

Research Hypothesis 1

H01:   In South Africa, the positive perception on online reverse auctions will result in high adoption

H11:   In South Africa, the positive perception on online reverse auctions will result in high implementation and use

Research Hypothesis 2

H02:   In South Africa, the negative perception on online reverse auctions will result in low adoption

H12:   In South Africa, the negative perception on online reverse auctions will result in low implementation and use

Table 1:Online Reverse Auction Effects on Buyer and Supplier

Buyers	Suppliers
Improved and online database	Enhance Market Visibility and Access
Elimination of Administrative costs	Publish Once and Sell to Many
Significant Cost reduction in the purchase process	Increases Sales Productivity with 24 hours and 7 days Digital Sales Agents
Reduced Errors vs Phone, fax, mail	
Reduced order cycle time	Reduces Administrative Costs and transaction costs
Real-time order status	Fast receipt of orders Increased accuracy of orders
Increased information on suppliers and buyers	Real-time order status information
Effective Monitoring	Automated Order Management
Improved Contract Compliance	Reduced time for receiving payment
Reduced prices through increased	Decreased Operating cost
Purchasing leverage and aggregation of demand	
Proper procurement planning and Lower stock costs	

Table 1:Online Reverse Auction Effects on Buyer and Supplierabove demonstrates positive effects of the ORAs but these can only be realised only when the implementation and adoption is done correctly with a sound framework, policies that backs up good governance, training of the users both the buyers and sellers. The effects when realised will certainly increase the user adoption even in South Africa notwithstanding the reality brought in by the new normal because of COVID 19. Businesses are now forced to increase the use of technology particularly e-commerce, e-sourcing off which ORAs are a tool embedded on sourcing.

1.17   STRUCTURE OF THE THESIS

Chapter One gives a broad overview of the study and outlines the background, problem statement, research question to be answered, aim and objectives, the significance of the study, research methodology used, as well as the operational definitions of terms.

Chapter Two presents the literature reviewed on buyer-supplier relationships and online reverse auctions. The literature was reviewed and analysed to identify the gaps in the body of knowledge to build the rationale for this study.

Chapter Three discusses the theories and models of Technology Acceptance and Adoption, buyer-supplier relationships and online reverse auctions.

Chapter Four maps out the research design and methodology; the research design is described, and the rationale is given for the choice of a mixed method approach which is predominantly quantitative with an element of qualitative to further support the findings. A quantitative case study design was used in this study. Data was collected from participants and respondents from three cases, that is, three different industries namely ICT, government and Utility sector.

Chapter Five presents the study results. It integrates the qualitative and quantitative results to give more comprehensive findings.

Chapter Six provides a discussion of the findings, conclusions and recommendations. It also suggests scope for further research.

1.18   DEFINITION OF TERMS

1.18.1   e-Auction

An e-auction is a well-known e-Sourcing concept. E-auctions work by putting downward pressure on the price by introducing competition into the procurement process and determine the winner – the firm to whom the contract is awarded (Engelbrecht-Wiggans and Katok, 2006). E-Auctions were popular in the early 1990s. This popularity was driven by focusing on price, and the perception of purchasing organisations and departments that invite many suppliers to bid competitively on an online auction that would reduce the price. Thus, the early e-auctions were designed as "open descending price-only events" (Elmaghraby, 2007).

However, instead of generating low costs the price-focus of e-auctions alienated suppliers, especially in industries in which suppliers could be differentiated in terms of quality, reliability, delivery times, et cetera. In addition, buyers often incurred considerably higher costs when dealing with an e-auction winner. Organisations quickly realised that the price-only focus limited the potential for growth, and the popularity of e-auctions in industry moved away from the price-focused approach.

1.18.2   Online Reverse Auctions

ORAs, as a process of connecting the buyers and the sellers, has been diversely defined by different thinkers, institutions and organisations. A few of these have been considered here for wider interpretation and understanding. According to The Institute for Supply Management, in the procurement context, reverse auction is "a type of e-auction that is conducted online, in real-time, between a single buying

organisation and pre-qualified suppliers. Suppliers compete in presenting bids to the buyer for the supply of goods or services whose specifications for design, quantity, quality, delivery, and related terms and conditions have been clearly defined"(Sambhara *et al*., 2017) (The Institute for Supply Management, 2003; Wyld, 2011b). In the context of procurement, a reverse auction can be defined as "a real-time online competitive bidding event where the buyer sends out a request for quotation and suppliers bid on the business, decreasing their selling prices until optimally a true market price has been reached" (Elsayegh et al., 2020; Schoenherr, 2008).

These reverse auctions can formally be defined as "an online, real-time auction between a buying organisation and two or more invited suppliers, where suppliers can submit multiple bids during the time period of the auction, and where some degree of visibility exists among suppliers regarding the actions of their competitors" (Sambhara et al., 2017; Carter *et al.*, 2004). According to the Institute of Supply Management (2004), an online reverse auction is an electronic negotiation tool also known as an e-auction, sourcing event or e-sourcing. The role of the buyer and the supplier is reversed (low prices vs high bidding prices). Prices can only grow. It replaces the face-to-face negotiations through an electronic process.

There are open and closed ORAs. If the auction is limited to restricting approved suppliers, it is called a closed online reverse auction, whereas if it is open to any supplier, it is referred to as an open online reverse auction. Various stages like the preliminary preparations, conducting the auction, past auction activities and monitoring the purchase orders are the main common features of the online reverse auction process. When buyers conduct an online reverse auction, suppliers/bidders need to be given a code name. The online reverse auction is fairly new, and the bidders need an explanation as to how the whole process will proceed.

1.18.3 Developing Countries

In today's world, it is difficult to define the characteristics associated with countries that claim to be a developing country(Sharma, Pandit, and Bose, 2020; Das, 2004; Ghemawat, 2003; Sevic, 2005*)*. The classic models that have worked in describing the trends in developed and industrialised countries have proven to be ineffective in capturing the specifics of today's developing countries. Although the globalisation process started with ancient mariners, it has been greatly accelerated in the past 75 years. According to(Meles, 2020; Das, 2004), developing countries are defined by certain economic considerations such as: "globalisation that represents a process of increased international division of labour on the one hand and the growing integration of national economies through trade in goods and services, cross-border corporate investment, and capital flows on the other."

According to (Chuan Li ;2006) from the University of Iowa's Centre for International Finance Development and Research, developing countries are countries that are restructuring their economies (including Brazil, Russia, India, China and South Africa) having long market-oriented lines and offering a wealth of opportunities in trade, technology transfers, and foreign direct investment. Developing countries should show signs of a strong and growing middle-class population; observers wonder whether the term has lost some of its meaning. Initially, the phrase applied to fast-growing economies in Asia and was used in Eastern Europe after the fall of the Berlin Wall. As global interest in market-driven economies grew, investors began to identify Latin America for a number of developing countries and eventually identified countries such as Indonesia, Thailand, China, India and Russia as belonging to the group of developing countries. The terms "Low-Cost Countries (LCCS)" is another definition that describes developing countries as having low economic development, high levels of poverty, low utilisation of natural resources and a heavy dependence on industrialised nations (Nations Online Countries of the World 2014).

1.18.4   Buyers

The buyers perform professional purchasing, assess the quality of goods and services, deal with speed of delivery and number of potential purchases, while evaluating and negotiating for a wide variety of suppliers, services and equipment on a competitive basis in the open market (Chartered Institute of Purchasing and Supply, 2013). The buyer always adheres to procurement ethics, handles issues on ascertaining long-term framework agreements, contracts, supplier performance, and sets quality standards with suppliers and service providers.

1.18.5   Suppliers

"Supplier" is one term used to describe an external organisation that delivers services or goods to a buyer. Other terms in common use include vendor, service provider and contractor. In some contexts, the word 'supplier' denotes a company that supplies materials, while the word "contractor" is used for providers of services (Chartered Institute of Purchasing and Supply, 2013).

1.18.6   Buyers – Suppliers Relationships

Buyer-supplier relationships refer to the commercial transactions between organisations for the purchase and supply of goods or services. Although inter-organisational transactions have always been important in the purchasing and marketing practice, it is only comparatively recently that an interest in the buyer-supplier relationships has spread across a range of management disciplines, reflecting global changes in production methods and work organisation. The relationship between the buyer and the supplier can be either short-term or long-term, involving regular purchases based on established agreements.

Relationships between buyers and suppliers in supply chains can range from a single transaction to complex interdependent relationships (Ye et al., 2021;Mentzer, 2004). These relationships can be positioned on a continuum or spectrum with transactional arm's-length relationships on one end of the continuum and vertical integration on the other end(Nabila, Er, Chen, and Chen, 2022; Jacobs *et al.*, 2009, , Benton, 2007Lambert *et al.*, 2006; Hallikas, Puumalainen, Vesterinen and Virolainen, 2005, Hines, 2004).

However, vertical integration implies that a single organisation owns and controls the supply chain(Schmitz, 2021;Hines, 2004) including its upstream suppliers and downstream customers (Wrede, Beyer, Dreyer, Wojtynek, and Steil, 2016; Christopher, 2005). Creating and nurturing supply chain alliances has been recognised as a competitive advantage(Kumar *et al.*, 2017; Ross, 1998). The view that relationships are either transactional or alliance based (in other words, positioned only on either end of the continuum) is a great oversimplification. These relationship types merely represent opposite extremes. In practice, many business relationships fall between these two extremes(Sundgren, 2022 ;Baily *et al.*, 2008, Mentzer, 2004, p. 33; Hines, 2004).

The relationships that fall between these extremes of transactional arm's-length relationships, and alliances are referred to as collaborative relationships or strategic partnerships. Normally, an organisation will have a wide range of relationships spanning the entire spectrum, the majority of which will not be partnerships at all but arm's-length relationships. Organisations must decide what kind of relationships to maintain with their supply chain partners(Liu, 2018; Leenders *et al.*, 2006).

Supplier development is often in the form of monetary or non-monetary and recoverable or non-recoverable contributions initiated and implemented by organisations in favour of a beneficiary entity (Black SMME), with the specific objective of assisting or accelerating the development, sustainability, financial and operational independence of the Black SMME. This is commonly accomplished through the expansion of those beneficiaries' financial and/or operational capacity.

1.18.7 Supplier Performance

The term "performance monitoring" means measuring, analysing and managing a supplier's ability to comply with, and preferably exceed their contractual obligations. It can also be argued that monitoring the performance of suppliers can be: a) an aspect of supplier appraisal when the incumbent supplier is competing for the renewal of an existing contract, b) an aspect of the management of approved supplier lists or c) an integral part of the contract management function (CIPS, 2013).

1.18.8 Broad-Based Black Economic Empowerment (B-BBEE)

It is a deliberate, biased, proactive integrated strategy aimed at substantially increasing the participation levels of the previously disadvantaged group of the economy across all spheres of the economy thereby, equitably developing and transferring skills for the creation of commercial wealth. Broad-Based Black Economic Empowerment (B-BBEE) aims to ensure that the economy is structured and transformed to enable the meaningful participation of the majority of its citizens and to further create capacity within the broader economic landscape at all levels through skills development, employment equity, socio-economic development, preferential procurement, enterprise development, especially small and medium enterprises, promoting the entry of Black entrepreneurs into the mainstream of economic activity, and the advancement of co-operatives. B-BBEE needs to be implemented in an effective and sustainable manner in order to unleash and harness the full potential of Black people and to foster the objectives of a pro-employment developmental growth path.

1.18.9 Procurement

Procurement is often interchanged with the concept of purchasing. However, there are both similarities and differences. Van Weele (2010) defines procurement as follows: "All activities required in order to obtain the product from the supplier to its final destination.

It encompasses the purchasing function, store, traffic and transportation, incoming inspection, and quality control and assurance." From this definition, we shall understand that purchasing and procurement are not identical; purchasing is a part of the procurement process. Van Weele (2010) defines purchasing as: "The management of the company's external resources in such a way that the supply of all goods, services, capabilities and knowledge which are necessary for running, maintaining and managing the company's primary and support activities is secured at the most favourable conditions." (Stek and Schiele, 2021;Quayle *et al.*,2000) argue that purchasing is more concerned with commercial relationship establishment and management, whereas procurement is in addition concerned with the control aspects on physical material and service delivery after the contract has been signed, or the order has been placed.

These two terms are often used interchangeably, which makes it difficult to distinguish them purely by theoretical definitions. Therefore, in this research, we also ignore the difference between procurement and purchasing and see them as the same concept. As (Copur, Harman, Turgut, and Eker, 2020; Quayle *et al,* 2000) observed, in the mid-1970s, only 21% of procurement managers reported that they frequently participated in their employer's corporate planning process, but it increased to 43% by the mid-1980s. This leads to the idea that procurement has evolved its role in corporate strategy and is gradually becoming more important in corporate performance. This idea is consistent with(Utama, Santoso,

Hendrawan, and Dania, 2022; Reck and Long 1998). They argue that the procurement function has over time become an integral part of every firm's competitive success.

1.19   CONCLUSION

This chapter has provided a clear background of the study in relation to online reverse auction its implementation, adoption and use, followed by the focus of the study and articulation of the problem statement and the research question. The use of internet-supported supply chain and procurement is a fundamental component of e-business in modern organisations. The primary objective of ORAs is to cut the organisation's procurement costs, improve efficiencies, improve processes, provide organisations with competitive edge to compete globally and to increase their revenue. However, despite the prevailing global trend of phenomenal growth of the use of ORAs by organisations, developing countries have not yet fully embraced the concept in business structures, the adoption uptake and use is still a concern.

ORAs are faced with challenges, including the potential damage of buyer-supplier relationships, suppliers' trust in buyers, bad ORAs process practices, etc. There is an assumption that ORAs will adversely affect the established relationships, and negatively impacting the supplier development plans, especially in a developing country such as the Republic of South Africa (RSA).

The growing importance and the increasing pressure to utilise ORAs in modern organisations has resulted in a growing necessity of academic research, however there are few empirical studies that have explored the appropriateness of ORAs usage; and issues such as explanations of why procurement organisations decide to implement ORAs. What hampered the widespread adoption of ORAs was the various myths that circulated regarding this type of negotiation. While some of these myths were substantiated based on experiences of supply management professionals, these myths became true due to a lack of understanding or knowledge of how to approach the auction Ray, et al. (2011). One of the biggest criticisms of online reverse auctions has been that they are only about price.

Certainly, in most instances this is the case. However, if a buying organisation wants this to not be true, there are certain mechanisms that can be implemented to take away the emphasis from the price component. As such, non-price components can be considered by an extensive pre-qualification of suppliers, allowing only those suppliers to participate in the auction event that meet determined threshold levels on a number of dimensions, such as quality, relationship potential, delivery, performance, and so on. Related to the perception that ORAs are only about price is the notion that quality provided by suppliers will be compromised and deteriorate. In South Africa, it is of critical importance that this research investigated the effect of ORAs on buyer-supplier relationships

underpinned by the current South African economic environment on supplier development and job creation.

This study therefore was an attempt to assess the extent to which ORAs affect buyer-supplier relationships and subsequently develop a framework to facilitate and improve the procurement process during the adoption and implementing of ORAs. Given the complexities and the surrounding procurement practices in Africa as a developing continent, this research project is thought to add value to the field of supply chain management, procurement management and related areas at a theoretical and methodological levels.

The following chapters in the study will strive to answer the posed research question through a well-designed research process, including the study framework or a clear plan of action (informed by the conceptual framework), methodology and the final findings that will inform the need for future research.

2. CHAPTER TWO: LITERATURE REVIEW

2.1 INTRODUCTION

Internet-based solutions emerge prominently in the introductory chapter – with e-ecommerce, e-procurements and online reverse auction solutions standing out in this discourse. Sentiments are that many forward-thinking entities are turning to online reverse auction solutions to enhance competitive efficiencies in their e-commerce and e-procurements business processes. A contradiction in terms however, emerges in this discourse. In particular, the adoption of this new innovation appears to be skewed towards well-established entities in socially, technologically, and economically advanced environments, then is the case in underdeveloped contexts where the innovation stands to make a notable difference. This chapter provides an overview of previous research on knowledge sharing and intranets, with a discourse on opportunities, controversies, challenges and related networked solutions including e-commerce, e-procurements and ultimately, the online reverse auctions (ORAs) innovation/s. It builds on the background in chapter one, pointing to the extra-ordinary value-add potential of networked solutions to the enhancement of almost all business processes.

The introductory chapter links supporting technological environments, technological literacies, financial status of entities – directly with the capacity to adopt, implement and exploit new technologies. The emerging verdict points to an adoption-divide between entities on the core (*entities in well-developed environments*), and those on the periphery (*those in technologically and economically underdeveloped environments*). There is a clear discrepancy in terms of the essence of online reverse auctions advantages on the one hand, and limited adoption by emerging businesses in developing countries such as South Africa on the other. To this effect, this chapter links the introductory background to the purpose of the study, thereby linking a discussion to the emergent gap in the literature – with a theoretical discourse and a chosen methodology in subsequent chapters.

Indeed, the chapter highlights relevant literature to contextualize the topic broadly, assessing developments and gaps, thereby sharing trends and the role of ORAs in this unique enquiry. The scope of the work presented in this area is further outlined, with emergent insight informing a taxonomy of incentives for knowledge sharing models, frameworks, journals and official reports recommended later in the document – to guide data collection requirements, and data collection tools for this research. In this process, inadequacies of the existing published research on the specific role of the ORAs is nakedly exposed – for all to see, yielding a clear direction towards a broad approach for the research described in this thesis.

To this end, the chapter opens with an overview of online reverse auctions (ORAs) innovation, within the context of supply chain management. A broader discussion of auctions is discussed, followed by relevance of technology and the ORA innovation on e-commerce and procurement processes. Subsequently, a research gap is highlighted preceding the conclusive remarks. Other topics are covered in the literature to ensure that a broader understanding and enablers to solve the dilemma are fully captured. Since the adoption happens to be our main element for the thesis the explorations and its insights are sought in the next section.

2.1.1 Global Status of Online Reverse Auctions (ORAs) Adoption

The introductory chapter clearly outlines trends of adoption growth among small, medium, and conglomerate entities globally, with evidence placing the innovation at a global market capitalization value in excess of $6.6 billion as of 2019 (Technavio, 2020). Further research estimates an even faster growth rate in excess of 400%, placing the global ORAs market size above a $28 billion threshold by 2024 (*ibid.*). At the very worst, ORAs are estimated to register no less that a Compound Annual Growth Rate of nearly 7.2% at the barest minimum during the forecast period (Technavio, 2020; S-Horn. *et al.*, 2018). An emergent picture is that of essence and growth in adoption of the new innovation, with the e-Auction industry set to expand rapidly in the near future (Chen, *et al.,* 2017). For, just as internet-based solutions continue to revolutionize modern mercantile processes, ORAs have become a standard mechanism for retailers and consumers across businesses, suggesting that it is not about to slow-down in strengthening electronic commerce and related e-procurement processes (S-Horn. *et al.*, 2018). According to (Chen, *et al.,* 2017) the internet-based information-sharing efficiency of this innovation enhances its market trading functions and processes (including the effective execution of auctions at relatively reduced costs), making a strong case for accelerated growth in its adoption in the foreseeable future.

Whilst the trend and estimates are true for entities in the developed world, the same cannot be guaranteed when it comes to organisations in underdeveloped context – with multiple inhibiting factors. An enabling environment in terms of technology infrastructure development tops the list of enablers, or a key inhibitor in case of a development gap (Rawwash *et al.*, 2020). Issues literacy, awareness, and ultimately, financial affordability – complete the set of intervening factors. A continuous set of observations go as far as to link the adoption and use of e-procurement and ORAs, positively to organisations with adequate financial resources (Rawwash *et al.*, 2020, Hassan, 2013; Davison and Khalifa, 2006). This way, financial capabilities or lack of – could both be an enabler or an inhibitor of e-procurement systems (ORAs) usage – even when the technology infrastructure allows. Another factor that has been known to contribute to innovation use is the information system committees. When managers recognise the advantages of IT,

they tend to exert a strong influence on the IT acceptance of firm members (Daoud *et al.*, 2020; Marei and Iskandar, 2019). Conversely, where managers are unsupportive of IT usage, IT acceptance fails to produce positive outcomes (Ifinedo, 2011). From the later observation, it is logically arguable that when the basic infrastructure, awareness and basic technological literacies are reasonable, top management is a change factor in the usage of this, and other IT innovations (Wan *et al.*, 2012). Structurally, ORAs are a sourcing process in which multiple sellers vie for the demand request from a single buyer (Sambhara, Rai, Keil, and Kasi, 2017; Monczka *et al.*, 2011; Engelbrecht-Wiggans and Katok, 2006; Chen-Ritzo *et al.*, 2005).

Given the background of contradicting enablers and inhibitors however, researchers and practitioners tend to hold divergent opinions on the universality of ORA solutions (Hawkins, *et al.*, 2014; Monczka *et al.*, 2011; Sanders, 2011). Divergence emerges on two key positions, with the first being a support of ORAs based on its cost efficiency characteristics when it comes to process costs. Arguments are that it saves buyers substantial procurement related costs or time (Liu, Zhu, and Hu, 2016; Giampietro and Emiliani, 2007; Talluri and Ragatz, 2004;). A dissenting voice however, posits that ORAs are primarily price-oriented. They may hurt sellers' profitability, going as far as to degrade the seller-buyer relationship (Wilkerson, Romanenko, and Barton, 2021;Kumar and Chang, 2007; Pearcy *et al.*, 2007). Disagreements have much to do with the perceived appropriateness of using ORAs for the for different procurement projects across divergent contexts (Kumar and Maher, 2008). Underlying factors considered include a number of sellers at any given point, together with the administrative costs for participating in the ORAs (Engin and Vetschera, 202;Yeniyurt *et al.*, 2011; Engelbrecht-Wiggans *et al.*, 2007; Anton and Yao, 1989). The competitors also risk attitudes, and whether the buyer would split the demand quantity among multiple sellers – thereby reducing the competitive power of the seller in favour of the buyer in the ORAs bidding process(Wilkerson et al., 2021;Yeniyurt *et al.*, 2011; Hawkins *et al.*, 2010; Klotz and Chatterjee, 1995). Whilst these points may seem purely argumentative among researchers, the reality changes when it comes to the small trader in a technologically, economically and financially underdeveloped context – where even the smallest factor to a business process decision could be a matter of life and death to one's survival, let alone competitiveness and growth. Changing from the old traditional and manual ways of conduction business may not come easy for other users. In order to direct the study with rigor the comparison and cross referencing of the old/manual and new/digital approaches is required in this study hence the next section`s discussion.

2.2   Traditional Auctions Vs ORAs

General Auctions - Auction methods have been extensively used in private, commercial and in government procurement processes globally – in enterprise procurement and other resource allocation, as a traditional trade mechanism, since antiquity (Schottmüller, Boone, 2016). Loyalty to the method is linked to its effectiveness on trading goods and services, extending to multi-attribute auction modes in which the auctioneer and the bidder negotiate on multiple attributes, such as quality, delivery time, service level, and price. The multi-attribute auction variate in particular, also known as multi-attribute reverse auction, has grown in prominence in procurement bidding processes (Ming Yan ;Yuan, 2012). Compared with single-attribute price auction, the multi-attribute reverse auction attaches importance to a negotiation process between the buyer and the supplier, expanding the bidding space of the supplier who exploits his/her competitive advantage. Obviously, the buyer can only proceed where the price remains within his/ her means – meaning a win-win situation between the buyer and the supplier(Grabara, 2021;Teich, Wallenius, *et al.,* 2004). However, having to consider several parameters such as quality, delivery time, price and so on, the multi-attribute reverse auction is more complex in practice. Particularly, if the determination of the price mechanism is only dependent on a single-attribute auction mechanism, then the non-price attributes such as quality cannot always be guaranteed, with a multi-attribute auction mechanism always increasing the complexity of the auction process, even further.

Online Reverse Auctions - Indeed, a broader understanding of the ORA process would play a significant role in the adoption of implementation decision for a business – across developed and under-developed contexts. Comparatively, in a traditional auction, sellers offer one or more items for sale while potential buyers compete for purchasing an item of common interest. ORAs on the other hand, are a downward bidding event in which suppliers submit successively lower prices bids within a fixed timeframe (Schoenherr and Mabert, 2011). For example, multiple suppliers are vying for a single buyer, so that the supplier with the lowest offer wins the auction (Tarazona-Bermudez *et al.,* 2014). In other words, it is pre-qualified suppliers who can directly compete against each other online in real-time (Engin and Vetschera, 2020;Beall *et al.,* 2003). So, access to participate is in a sense pre-qualified – as opposed toa free "walk-in process" that most would prefer. The advantage for buyers is imminent, for they can announce requirements and select suppliers from the lowest bidders (Barbaro and Bracht, 2021b;Mithas *et al.,* 2008). That way, ORAs can substitute traditional, asynchronous, paper-based or email-based requests for proposals and face-to-face negotiations(Sambhara et al., 2017;Hawkins *et al.,* 2009), something which requires clear, complete and comprehensive specifications of the product or service (Tarazona-Bermudez *et al.,* 2014). Every aspect of change need to positively contribute to the cause. Why the need to transform from traditional to modern if there are not positive benefits, ORAs need to stand the test of

time to justify the need to accelerate their implementation and use. Advantages must outweigh disadvantages, that view will be tackled in the next topic.

2.2.1 A Comparative Advantage of ORAs

As the reverse auctions run via an online software platform, they are at times also referred as 'Online Auctions', 'Online Reverse Auctions' or 'ORAs'. It is reported that ORAs are not applicable to all purchasing categories. They tend to work particularly well when the ability to specify the products is high, i.e., when the product has clearly defined attributes that suppliers can translate into unambiguous specifications. By comparison to traditional auction bidding processes, ORAs boasts a lower level of complexity, as the tools enable easy comparison of the offerings of competing vendors (MingYan and Yuan, 2012;Smith, 2009; Losch and Lambert, 2007). Particularly, as buyers and sellers are trying to make the most of being competitive through 'product heterogeneity'. Overall, procurement research has shown that if a material or service can be properly specified, it can be successfully procured through competitive bidding. The magnitude of the purchase transaction, market conditions and infrastructure play an equally significant role in the format, process and outcome of a bid transactions over ORA platforms (Pereira *et al.*, 2011). Here, bulk materials and stock commercial goods or technical services appear to be more suitable for ORAs (Saprikis, 2013) because they can be easily specified, with negligible switching costs(Mora Cortez and Johnston, 2020;Smart and Harrison, 2003). For this reason, ORAs are widely adopted to reduce the cost of materials (Wilkerson *et al.,* 2021;Pearcy and Giunipero, 2006), in the sense that they reverse the roles of buyers and suppliers, with the buyer's main objective being to drive purchase prices down (Kros *et al.*, 2011).

The relative amount of savings that can be achieved in ORAs are notable, varying from 3% to 40% as reported by Pawar et al. (2017). Such a large range of relative savings reflects e.g., the type of buying situation (for straight rebuys with repeated ORAs use, the amount of savings is considerably lower than for ORAs supported new buys) or different supply and demand conditions on particular markets (Schoenherr and Mabert, 2011).

ORAs sourcing has had continued use, with the soaring number of business-to-business (B2B) continue to see ORAs exceeding interest and growth expectations for service providers and buyers alike (Aloini *et al.*, 2012; Kros *et al.*, 2011; Hawkins *et al.*, 2010). In this process, trends confirm a cost significant transaction-savings advantage of ORAs for the auctioning stakeholders in their short life-span (Aloini *et al.*, 2012; Schoenherr and Mabert, 2011). This section has reasonably demonstrated positivity of ORAs and professionally the study will also have to look at literature in terms of implementation, if the tool has

potential to perform wonders for corporates is it implemented as expected and if not what are the obstacles preventing full use and implementation.

2.3 Online Reverse Auction Supply-Chain Implementations

A meaningful discussion of ORA implementations within the supply chain process requires an equal understanding of the supply chain process, as it does of the ORA innovation (in preceding sections). A supply chain process entails the flow (sourcing in the provision sense and acquisition in the buying sense) of materials between the customer and the provider of goods or service (Stanton, 2018). Materials (goods and services) flow downstream through value added steps that create the final product which the customer buys (*ibid.*). A means of payment – usually the currency (money) flows upstream from the customer, through the supply chain to the producer and supplier of the final product. When a supply chain is upscaled to involve multiple partners, it becomes complex to comprehend and operate through. For example, there could be standardisation shortfalls in the auction process, across companies and regions in the implementation phase, with a potential for failure-prone errors. Hence, the innovation of the supply chain management tools and system to simplify.

Within this logic, the Council of Supply Chain Management Professionals (2019) defines supply chain management process as encompassing the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. In this evolution, the supply chain process is structured to coordinate people, tools and systems of creating value for a company and customer (Stanton, 2018). Importantly, it also includes a coordination of processes, facilitating collaborations with channel partners, including suppliers, intermediaries, third party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies (Shil and Mouhoub, 2014). This way, it enables the internal work being seamlessly coordinated with the outside world, by simplifying the complex link to deliver demanded value.

It is from this background that the ORA solution is received within the supply chain circles - as a combination of process, tools and system. Obviously, with underlying dependencies on various aspects like organisational structure, managerial decisions, and assumptions for specific requirements (Muylle and Standaert, 2016; Hawkins and Gravier, 2014; Ray *et al.*, 2013Shil, *et al.*, 2013). Despite the revolutionary capacity however, ORAs are yet to realise their full potential (Shil and Mouhoub, 2014; Shil, *et al.*, 2013). Albeit, with some limitations reflecting across varying supply characteristics –ranging from supplier relationships, contractual power, business impact, supply/ market complexity, leverage opportunities and to all other constraints (Davide, *et al.*, 2012).

Since ORAs are still evolving, a comprehensive analysis of its implementation would require a completely dedicated research project – beyond the focus of this study. Every project undergoes a series of implementation stages and one of the elements to be tested for the safety of organisations' data, confidential information for both the buyers and the sellers is paramount. The adoption and implementation can be stopped due to security issues posed by the new tool including the use of ORAs. During implementation and post the tool need to present strong ethical functionalities, where users will be prevented to manipulate the system and there must be processes and policies built within and outside the system to prevent unethical conduct amongst the users.

2.4 The Ethical Philosophy of ORA Implementations

Like all multi-stakeholder processes, ORA equally requires integrity and ethical conduct among participating stakeholders in order to remain reliable and effective. It starts with careful preparation of the event (auction strategy) including equal treatment of all participants, including effective and non-deceptive communication (Losch and Lambert, 2007). Obviously, different bidders may want to adopt various approaches to influencing the bidding process, and in all respects, such processes need to remain within control, without infringing on the fundamentals of ethics and integrity among all stakeholders (Guowe, 2015). The rules of online bidding should thus, be cognisant of various process, with full anticipation of possible challenges, so as to pre-empt the necessary ethical guidelines. In this respect, (Barbaro and Bracht, 2021b;Elmaghraby,2007) defines various auction formats, and unpacks issues related to constructing or bundling of lots, sequencing the lots, types of feedback to be provided to bidders during the auction and the type of bid format to use. In this process, emerges a critique against reverse auctions – as not being able directly assignable to the mechanism. Rather, it is because of the impact that competitive bidding has on suppliers (to be able to lower prices by a major buyer at discretionary times (Xiao et al., 2018;Wheaton, 2010). So, suppliers have no option other than to participate in the ORAs as greater amounts of corporate and governmental spending are shifted to be decided through competitive bidding. At the end, a desire to secure the most appropriate bid could supersede most rules and decisions, and the very least – the system should guarantee both the seller and the supplier that a relevant stakeholder would meet their end of the bargain.

According to (Charki *et al*. 2011), ethical issues related to ORAs use and how they can be used in the future are critical, warning against rumours in the propagation of stories about unethical. In the same light, (Pawar, *et al*.,2017) offers a comprehensive list of unethical behaviours in ORAs on both buyers' (e.g., ambiguous or shifting auction rules, phantom bidding) and suppliers' side (e.g., collusion or unrealistically low bids). In public procurement, for bids appearing to be abnormally low contracting

authority shall request in writing details of the constituent elements of the tender which it considers relevant before it may reject them (Directive 2004/18/EC of the European Parliament and of the Council of 31 March 2004 on the Coordination of Procedures for the Award of Public Works Contracts, Public Supply Contracts and Public Service Contracts, Article 55). Providing explanations for abnormally low bids enables the elimination of bids that might be subject of the winner's course phenomenon (Fehrenbach and Herrando, 2021;Soudry 2004).

The reasons why contractors suffer from the winner's course include inaccurate estimates of project cost or strong competition within the market (Ahmed *et al.*, 2016). In this account, (Al-aaidroos, Jailani, and Mukhtar,2019;Emiliani 2005) states that avoiding ethical misconduct, e.g., with support of codes of conduct for ORAs, will lead to reducing supplier's doubts and an increased level of trust. If the ORAs contribute to higher transparency of the purchasing process, all auctions' rules and conditions need to be provided and clearly explained to suppliers. While information technology use has provided huge economic and social benefits, these advantages have been tainted by unethical information technology use (UITU). Research suggests that UITU causes harm (Chatterjee *et al.*, 2012) and leads to losses for business and society (Leonard and Cronan, 2001), not to mention challenges for managers (Bush *et al.*, 2010). This calls for the IS community to find a solution and explains why the topic of ethics has such importance for the Strategic Information Systems (SIS) literature, as acknowledged by senior information systems (IS) scholars (Gable, 2020; Walsham, 2010;Desouza *et al.*, 2006;). Notwithstanding this importance, our knowledge on the way to address UTIU remains limited. Accordingly, IS and ethics scholars have called for a clearer understanding of how to address UITU (Çelen and Seferoğlu, 2013; Stylianou *et al.*, 2013; Chatterjee *et al.*, 2012;Bush *et al.*, 2010;). One of the solutions envisaged is an intervention in the form of codes of conduct (Lewoc *et al.*, 2013;Oz, 1992).

However, there is evidence that management – or third party-implemented codes of conduct – is inefficient in regulating UITU (Çelen and Seferoğlu, 2013; Healy and Iles, 2002;Harrington, 1996). For the success and sustainability of ORAs the unethical perceptions need to be made known to both the buyers and suppliers in order to be avoided at all cost, therefore this section looks into the specifics of the potential unethical conduct in the implementation process of ORAs.

As the use of ORAs can also be viewed as controversial (Charki *et al.* 2011), its potential adoption and implementation should be considerate of the industry-specific features, both positive and negative. For many contractors opposing reverse auctions believe that they should be allowed to submit bids based on their distinctive capabilities and unique resources (Dráb, Štofa, and Delina, 2020;Horlen *et al.*, 2005).

Counter arguments against this claim point to a question of equitable access to the system and process among stakeholders with uneven resources – which is an ethical question. Here, stakeholders with different financial capacities are exposed to fierce and open price competition with financially stronger rivals. Another aspect of the controversy is varying scopes of works/projects that are suitable for ORAs in terms of the ability to specify the subject of purchase (Hanak, 2018). The relationship between buyers and sellers in public procurement in projects is complex, and there are various issues that can be seen as both positive and negative. Therefore, we address these issues of ORAs in procurement through possible saving as the main benefit of such auctions. The effects on the sellers i.e., suppliers' competition, pros and cons of using ORAs, as well as possible risks that could occur during bidding are equally important ethical considerations.

2.5   Risks, Pros and Cons – the Balancing Act of ORA Implementations

There are pros and cons are associated with ORAs. On the positive end, time and cost savings as well as the enhanced transparency of the purchasing process (Hanak and Selih 2017) are generally considered the main benefits. On the opposite end, unwillingness of suppliers to participate, harm of Business-to-business (B2B) relationships, acquisition costs as well as IT requirements and skills, e.g., e-readiness, are the most often mentioned barriers for implementing ORAs (Mora Cortez and Johnston 2019; Hanak and Selih 2017). (Cortez and Johnston 2019) even argue that failed ORAs often results in the termination of a long-term buyer-supplier relationship. To not get the impression that ORAs contributes just to the buyers, some benefits for suppliers should also be mentioned. These benefits can be summed up in time savings, equal conditions to getting into the business (crucial in countries with a higher level of corruption) and discovering the real market price for items being purchased (Standaert *et al.* 2015; Hawkins *et al.* 2014).

Certainly, ORAs should not be treated as being just a margin squeezing tool. For, the supplier selection can be based on multi-criteria decision-making when taking into consideration other non-price criteria (Hawkins *et al.* 2010) such as delivery time, the experience of suppliers, etc. This issue is also highlighted by (Cheng ,2011), who argues that ORAs success depends on the awareness of the buyer's preferences. In support of this suggestion, (Sambhara *et al.* 2017) highlights risks associated with ORAs that managers need to be aware of and must address. In particular, the pre-auction risks which emerge as gravely concerning for buyers (e.g., identifying the products or services to be procured through the ORAs or identifying qualified suppliers), while during and post-auction risks are of greater concern to suppliers (e.g., aggressive bidding or to not adhere to the buyer's specifications).

Another risk associated with ORAs is the suitability of product/service/work to be purchased. In the first place, they refer to the requirement to clearly state commodity specifications. For this reason, (Hanak, Chadima, and Selih, 2017;Standing *et al.* 2013) recommend to apply ORAs for the purchase of standardized (or low risk) products, (Pawar *et al.* 2017) concretize this condition as for products with common specifications and little complexity. Contrary to these two references, scientific evidence points to successful implementations of ORAs, even on the originally complex purchases (such as projects). From practice, a large project of Šance dam reconstruction can be mentioned, which had 40% gross savings achieved as a result of ORAs competitive bidding (Proebiz, 2015). In every business, activity there are certain risks associated, unless the risks are correctly identified, mitigated and monitored, they have a huge potential to undermine the success of the plan at hand. ORAs are not any different, therefore this section zoomed into conditions associated with ORAs potential and known risks.

Although ORAs hold much promise, numerous risks still exist. (Smeltzer and Carr, 2003) are the only researchers who conducted a comprehensive study to research the risks and promises of ORAs; other researchers just expressed opinions or personal experiences, so most of this section is based on (Smeltzer and Carr's 2003) paper titled "Electronic ORAs: Promises, Risk and Conditions for Success." Most academic journals and business press articles agree that the negative effect on the buyer-supplier relationship is the biggest concern related to using ORAs (Yuan, 2012;Altman, 2003; Sehwail; Ingalls, 2003; Smeltzer ;Carr, 2003; Emiliani and Stec, 2001; Jap, 2000). The buying organisations are afraid that using ORAs will destroy their relationships with the suppliers. Many organisations have spent decades building strategic alliance partnerships based on trust and loyalty with their suppliers.

This fear is especially pronounced when the buyer, and the supplier have had a long working history. With the announcement that an online reverse auction will be used, the buyer is possibly indicating that the supplier is no longer meeting the expectations of the buying company (Sambhara, 2020;Smeltzer and Carr, 2003). Other risks include suppliers not participating in the auction. In theory, only two competitor organisations are required for an auction. However, economic game theory indicates that when only two competitors exist, they are not inclined to participate in either a reverse or forward auction. Another risk according to (Feng et al., 2021;Smeltzer and Carr 2003) is that the sellers may get caught up in what may be termed "the race." Bidders may get so caught up in the emotion of the race or competition that they offer unreasonably low prices. Suppliers are not the only party that might be affected by the risks of ORAs. Buyers might be so blinded by all the promises of ORAs that they do not anticipate the hidden costs, those associated with changing and approving suppliers, travelling to monitor new suppliers,

additional manpower to move products from one supplier to the other, technical assistance and the fees of the market maker.

To maximise the potential of ORAs and avoid the risks associated with ORAs, several considerations must be given to the specification of the product or service being auctioned. Smeltzer and Carr (2003) presented four general guidelines to avoid failure risks when implementing ORAs event: the buyer must clearly state the commodity specifications, the purchase lots must be large enough to encourage suppliers to bid, the appropriate supply market conditions must exist, and the correct organisational infrastructure must exist for the buying organisation. (Jap, 2002) presented several factors at play when minimising the risks associated with ORAs: auctioning products or services in which the purchase price constitutes the largest component of the product or service value, auctioning products or services that are commoditised, and ensuring the availability of enough capacity on the supply side. If the buying company is expected to save on the product or service price, the ORAs should be conducted when there is extra capacity on the supply side(Engin and Vetschera, 2019;Jap, 2002).

A synopsis of ORA implementations in the literation highlights a combination of advantages, shortfalls, ethical factor, risks and opportunities. Meaning, in summation – that successful implementation of ORAs remains a deliberate balancing act for the system, the tools, and for the stakeholders engaged in the process.

2.6   Adoption and implementation of online reverse auction in South Africa

According to (Charki; 2011) online reverse auction refers to the inverse process of auction that is undertaken online. The authors posit that by inverse, it means that the auction process does not follow the traditional way in which the buyers bid up the price in order to win a bid or buy goods. In this case it is the buyers that bids down the price in order to attract the buyers and this is usually common in the tender issue process. Another researcher (Dulmin and Mininno 2012) also pointed out that online reverse auction is the inverse of the entire process of auction and it is done on online platforms using several types of software's. They further alluded that in a normal auction it is the seller that puts forward the goods that they want to sell and the buyers' bids or compete against each other in order to get the product. On the other hand, in online reverse auction, the roles of the buyers and the sellers are reversed. Here, it was alluded that it is the sellers that compete against each other through lowering their selling price and improving the quality of the products in order to get the buyers.

(Toktas-Palut *et al*.,2014) stated that online reverse auction refers to a type of negotiation process that is adopted in Strategic Sourcing and it is exactly the opposite of a forward auction. For instance, E-bay

auctions are forward auctions that are instigated by the Seller in which the Buyer bids the price up. However, in an online reverse auction, the roles of the buyer and of the seller are reversed; the auction is initiated by the Buyer and the Supplier bids in real time driving the price down. It was further pointed out that it is a type of competitive bidding that is conducted on reverse auction websites, which is suitable when the only point being negotiated between the Buyer and the Supplier is price.

In the normal or traditional auctions bidding occurs in terms of higher prices which means the highest bidder of one who offers the highest price obtains the goods. However, on the other side, online reverse auction entails the bidding occurring in terms of lower prices which means that the seller who offers the lowest possible price gets the buyers (Losch and Lambert, 2007). Online reverse auctions are common in business and they come in form of aspects such as procurement auctions of the government or private companies. Implementation of the ORAs is highly dependent on the success of the adoption and ease of use of the system.

2.7   Implementation of Online Reverse Auctions

Researchers (Hanak and Šelih, 2017) have pointed out that the implementation of online reverse auctions in businesses have been fostered by the advanced technological advancement in the world which has led to lowering cost of adopting Information technology (IT) and information communication technology tools (ICT). According to (Smart, 2010) as a result of a continuous fall in the costs of ICT and IT tools, companies in a number of sectors are increasing adopting contemporary e-procurement tools. According to (Standing *et al* 2013) there are a number of e-commerce technology option that are available in the business world in the current times which includes online reverse auction (ORA) whereby the sellers bid for the prices at which they are willing to sell their goods and services, as opposed to a regular auction where buyers place bids. The author further pointed out that these tools are implemented in different ways and can be applied to the majority of industrial sectors. The buyers' point of view states that there are two things that are needed in order to achieve efficient implementation of online reverse auction which are: The ability to precisely describe the product in demand and to define and quantify the selection criteria (Hanak and Šelih, 2017). It is also stated that if the product cannot be described at the time of purchase, alternative procurement routes, such as Competitive Dialogue should be used.

Further, according to (Zung *et al.*,2014) the implementation of Online Reverse Auction is an innovation that may be particularly important for institutions that need to purchase various products and services on a daily basis. Most construction contracting companies operate in this way. Nevertheless, these companies are often conservative in their business attitudes and consequently they implement the contemporary IT technology at a slow pace (Bygballe and Ingemansson, 2014). It is therefore possible

that the implementation of ORA in construction companies is faced with challenges that are not encountered in other industrial sectors. Implementation of any system in within the strength of its infrastructure, software, support and upgrades. The system or the technology employed for the implementation must be three possible stages (1) Full service, (2) self-service, and a (3) hybrid of the two and these describe the amount of administrative and technical support provided by a reverse auction host. Technology is key to the success of the ORAs, and it is worth looking at in depth.

2.8   Online Reverse Auction Technology

(Korytarova and Pospisilova 2015) stated that the technology that is behind reverse auctions plays a key role in helping companies and other forms of organization to collect bids and manage them. The two authors further postulated that the primary benefit of technology use in the auction system is that it is time saving, it also saves resources and allows for an easier award process. It was also pointed that with the use of technology in the auction system, what used to take months is now taking weeks or a few days. Information technology and ICT have been pointed out as the key technologies in ORA as they eradicate information asymmetry and therefore allows the bidders and buyers to have information pertaining the sale as well as communicating effectively during the auction process (Hanak and Šelih, 2017).

According to (Zung *et al* 2014) firstly, it is of great significant to have knowledge on the fact that reverse auctions are normally hosted on another server other than that of the company. The researchers went on to allude that there are three levels of the software: Full service, self-service, and a hybrid of the two and these describe the amount of administrative and technical support provided by a reverse auction host. More so, it was also stated that in a proper and effective reverse auction, there is no need to deal with unqualified suppliers, therefore, all bidders should be pre-qualified. This should be done via a Request for Information (RFI) which is a great tool where information about the potential contract is sent to potential suppliers. They should have responded with what they can supply and why they're qualified (Zung *et al,* 2014)**.** In order to realise the benefits of the ORAs the technology need to be on point to assist with realisation of benefits. Understanding the potential benefits upfront is critical and that will provide clear requirements for the architecture of the tool to configure the tool align to the desired outcomes and benefits.

2.9   Benefits of Adopting Online Reverse Auctions

A number of researches and literature has been put forth with regards to the advantages or the benefits of ORA mainly in the context of the buyers but some of the advantages also apply to the sellers. The major advantage has come in recent times in which the world was and still experiencing an increase in

the mortality rate as a result of the coronavirus pandemic. As a result, national lockdown has been put in place, people are not allowed to gather in numbers and some premises were closed temporarily to control the spread of the deadly virus therefore online meetings and auctions have been increasing adopted as they prevent the spread of the COVID-19 pandemic (Moore, 2021).

According to (Aloini *et al* 2012) unlike a general auction where the buyer has to select only among the sellers who are offering a bid, in ORA the buyer can put up his own demand for a bid. It was further stated that the buyer also gets to select among the various sellers of the product in terms of competitive prices and quality. On the other hand, (William and Hardy 2007) postulated that ORA opens up a vast sea of opportunities for the sellers in terms of entry into new sectors of the economy and expanding business with the existing buyers. The researcher postulated that ORA is different from a general auction and the seller does not have to limit themselves to a single product that he wishes to sell and attract buyers of only that product. Instead, the seller can look for the various demands being made by buyers in different sectors and decide to enter or explore any such area of demand through an efficient competition. A buyer who has already had an experience with a seller is likely to choose that very seller in the bid. This helps the seller to expand his horizon of business with one buyer and build a strong business relationship.

It was also pointed out that ORA leads to transparency in the procurement process of firms. According to (Pearcy, *et al* 2007) in order to conduct an effective reverse auction, it is imperative to have clear and concise participation instructions as well as detailed specifications of the product/service you are looking to procure. Ensure that all participating suppliers have the same information and are aligned on the procurement requirement. Since all this information is stored and disseminated via an online platform to all participating suppliers, there is consistency in communication. Another researcher, (Smart, 2010) further pointed that ORA enhances efficiency as the adoption of online e-Sourcing software greatly reduces the prep time as well as the execution time of a successful reverse auction.

(Mouhoub and Ghavamifar 2016) also raised the same point and postulated that ORA adoption has been met with mixed feelings in terms of perceived usefulness of the process. The researchers pointed out that the increase adoption of IT and ICT technology by vast population of the globe has made it easy for a number of people to quickly understand ORA platforms thus making it easy for them to use. However, there are other individuals or groups that still find some of the ORA platforms to be complex and hard to use or understand thereby they shun away from such platforms (Mouhoub and Ghavamifar, 2016). There is very thick line between benefits and the usefulness of the system. If the two are not complementing each other, therefore the tool or system can be perceived to be non-value add and not quite required by the corporates. The usefulness of ORAs in the eyes of the users need to be crystal clear and glaring to

everyone especially to the decision makers the ones who are responsible for the approval, funding and accounting for systems implementations in the corporates.

2.10   Usefulness of Online Reverse Auction

According to (Tarazona-Bermudez *et al*, 2014) ORAs has been effective in helping the buying firms to cut costs in the procurement process. The group of authors alluded that with the adoption of ORAs, buyers to not need to invest much financial resources in look for the products that they want in terms of the quantity, quality and price rather it is the sellers that comes to them at a lower or at no costs. Another researcher (Tassabehji, 2010) had earlier pointed out that ORAs have been key in the buying firms as it helps the companies to buy good quality products at a lower price after the sellers out performs themselves and this is key in lowering the costs for the buyers which also enhances their profitability.

ORAs have also been effective in helping improve the quality of goods and services that are being offered by production companies across the globe (Ubeda, Alsua, and Carrasco, 2015). It was pointed out that as the sellers seeks to attract buyers through outperforming their competitors, this is achieved through attaining a competitive advantage which comes through the production and offering of good quality products and services. The bargaining power of buyers in the ORA process has been a key factor that has driven a continuous improvement in the quality of goods and services that are produced and offered in the market by production companies or sellers (Wang, Liu and Lu, 2013). Therefore, the perceived use of ORAs in relations to the technology acceptance model also supports the importance of usefulness of the system and the quality outcome offered by the system. The ease of use will attract participates to be eager to use the tool and they can also advocate for the system to other potential users. Since the literature has confirmed the usefulness, the need and the benefits if the ORAs it is imperative that these areas are carefully looked at to increase adoption.

2.10.1   Perceived ease of use

According to the technology acceptance model (TAM) theory, perceived ease of use refers to the simplicity that makes the technology easy to use (Davies, 1989). This means that for a technology to be well adopted to, it has to be user friendly and the users should not incur difficulties in using it. ORA as a technology driven process is also assessed with regards to its perceived ease of use. (Tayaran and Ghazanfari, 2020) postulated that the perceived ease of use of ORA differ from one software to the other and from one buyer to the other. The researcher alluded that some of the ORA platforms such as corporate websites are easy to understand and use therefore encouraging buyers and sellers to interact

effectively and conduct business. On the other hand, some of the platforms are complex thereby demotivating buyers to look for products on them.

2.10.2 Usage of online reverse auction in SA

In South Africa, the usage of online reverse auction has been on the rise since the beginning of COVID 19, but the rise is not good enough considering the quantum of businesses still to adopt the tool and the need to receive greater attention from a number of stakeholders in big corporates. The need to achieve transparency in the government and public sector spending has led to the slight adoption of ORAs and this has been evidenced in the procurement process of public schools, hospitals and ministries amongst others (Coetzee, 2019), though a lot still to be done. The government has been pointed out as the major user of online reverse auctions in South Africa mainly through the procurement process in its spheres or department such as the central, provincial and local government (Masango, 2019). It was also noted that the government has also been adopting ORAs in purchasing required materials in schools and hospitals across South Africa (Ngobese, 2018), this is a positive development and need to be accelerated to other areas to make a significant impact.

The private sector in South Africa has also been participating in ORAs in order to cut the costs associated with looking for raw materials, ORAs have also been adopted in the private sector mainly by corporates in a bid to enhance sound corporate governance practices through the transparency in purchasing that comes through ORAs thus eradicating fraud in the procurement process (Naidoo, 2020), in comparison with other countries especially China, India even some of the East African countries South Africa still have a long way to go. Further, it was also pointed out that the private sector in South Africa also provides goods and services to the government and other corporates as raw materials or inputs therefore this has led to a slight increase in the adoption of ORAs in the country (Naidoo, 2020), so there is hope that the ORAs use will drastically improve. the slight adoption may be a result of many contributors including adoption costs including how suppliers are positioning themselves when it comes to pricing their gods and services. A combination of costs implications how are they effecting participants.

2.10.3 Costs implications of Online Reverse Auctions

Just like any other aspects of this world, ORAs also comes with a number of costs and drawbacks to both the suppliers and the buyers. (Aloini *et al* 2012) stated that one of the major drawbacks for a seller in an online reverse auction is that they do not get to choose the price for his product. Often, in order to win the bid, he may end up lowering the prices significantly. This may lead them to incur loss in the contract. More so, (Pearcy, *et al* 2007) further postulated that in order to lower prices, the sellers may have to

ignore several costs incurred by them in terms cost of service of contract that include delivering the product and invoicing. This may lead to acceleration in the loss.

On the other side it is also postulated that a reverse auction only deals with lowering of prices. It does not give information on other costs involved in a contract. This may lead a buyer to choose a seller who offers an apparently low price but who provides poor quality product, high cost of delivery or poor customer services. This can affect the buyer's business considerably at a later stage (Aloini *et al*, 2012). Additionally, as the bids do not provide a clear picture of the dealings with the seller, the bid may lead the buyer to choosing a seller with whom the cost of monitoring and managing the project becomes high (Pearcy, *et al,* 2007). The users of the ORAs must develop the trust on the credentials of the system, if the trust is questionable and wabbly it is easy for the parties especially the suppliers to suspect that they are taken for granted by the buyers. Depending on the position, prominence and the power possessed by the suppliers, the buyers may equally feel been manipulated by the suppliers through collusion on the suppliers' side to freeze prices or simply refusing to participate. Therefore, relationships must be natured by making sure the system`s functionality is well understood and its security. Costs are well defined and the transparency of the selected supplier must be well visible and convincing to other participants.

2.10.4 Relationship on buyers and suppliers using online reverse auction

ORA has enhanced the need to have strong and close relationship between the buyers and the suppliers with the latter being the instigator of the relationship. According to (Peng and Calvi, 2012) Online reverse auction focuses on buyer's preferences and ignores seller's preferences. In other words, sellers often do not have the opportunity to improve their bids in an auction, while buyers have multiple alternatives from different sellers to optimize their purchases. This also means that the customers or the buyers cannot be loyal to one seller as they have low switching costs and can therefore turn to a new supplier of goods at any time (Cheng, 2012).

Many firms have moved towards closer ties with a smaller supply base, but the literature suggests that in many instances partnerships or long-term relationships are not appropriate. The assumed or predicted benefits for both parties have not always materialised and there is evidence the firms continue in the old adversarial mode when it comes to discussions about price (Burnes and New, 1997). A number of authors (Roberts and Mackay, 1998) have suggested that a portfolio approach is necessary within a firm's procurement strategy, not least to take advantage of the fluctuating supply conditions which apply in different market sectors.

A study that was conducted by (Tayaran and Ghazanfari, 2020) concluded that reverse auctions have the potential to be used in both the collaborative and competitive relationship as a means of tendering contracts. Firms who have established long-term relationships with key suppliers still require to check on market prices from time to time, or to invite new or alternative sources of supply to bid, particularly in areas of continuous technological development. This is generally done through a competitive tender. A majority of both buyers and suppliers interviewed in other research projects believed that the auction is an efficient method for conducting tenders which can save time, cost and resources. From this perspective, the buyer could consider using the reverse auction as a process improvement tool. Online auctions may simply prove to be a more efficient way of conducting business, even if price reductions are not the main objective. The effect of ORAs on buyer -supplier relationships can be devastating to the business if it is negative, therefore there has to be extra care taken on how the adoption and the implementation is done. The issues of ethics come into play, all parties involved nee to be ethical and trustworthy. The manipulation of the system and decisions made in contradiction with the outcome of the system can cause a lot of damage. It will be easy to blame the system based on human carelessness and hidden agendas. The experience of the users needs to be consistent and be a wonderful experience and interaction to ensure continuous usage and trust.

2.10.5 Buyer-Supplier Relationships and the Effect of ORAs

The buyer supplier relationship involves two parties that relate with each other through transactions that involve exchange of goods and services for money (Butt, 2019). Effective buyer supplier relationship is associated with benefits including quality dependability, information sharing, cost control and reliability of services (Aloysius;Blessley, Mir, Zacharia, 2018). A conducive buyer-supplier relationship is credited with a potential to integrate stakeholders in the chain with manufacturing; warehouses and stores to the effect of limiting expenses whilst fulfilling administration level necessities (Yoo, Rhim and Park, 2019). Emergent from increased competition, are improved procurement practices through enhanced buyer supplier relationships. The extent to which firms compete is based on supplier quality, but sources of supplier competition link their buyer operations in the supply chain partners, distributors and retailers (Najib, Kartini, Sari and Suryana 2017). In Public organizations, buyer-supplier relationships influence their performance which, in turn influences short-term demand, and customer expectation refocused. Additionally, buyer supplier relationships have enhanced strategic role of the relationship in decision making regarding (Awan, 2019; Yang, Jiang and Xie 2019) indicated that one of the vital preconditions for long-term firm survival is the achievement of its productivity and that productivity is achieved through aggressive supply relationship that is able to involve both internal and external stakeholders. In this

process, ORAs help to maximize the value for money to all public organizations and state organs (Omolo and Akinyi, 2019).

Indeed, procurement processes include the planning, processing, inventory and asset management, as well as disposal activities and contract management. A process which limits uncertainties on procurement and or even on assets disposal processes, thereby enabling public organizations strategic plans to achieve their strategic goals and costs reduction strategies (Maradze, 2019). The opportunities exist with procurement functions to improve performance in strategic ways (Munyede and Mapuva, 2020). Operational advantages of a successful ORA include accuracy, clarity and open communication between the buyer and the suppliers (Hanák, 2018). According to Standing, (Hanák 2018; Love, Gengatharen, 2013;), with ORAs, buyers must know that the e-auctions may harm buyer-supplier relationships especially in a limited supplier base (Ray, Jenamani and Mohapatra, 2011). Although, initially, there is initial cost reduction, the adoption of ORAs has been irregular because while some companies have used them successfully and expanded their use, others have either encountered resistance or have shunned them due to the long-term damage that ORAs can have on buyer-supplier relationships (Shambara et al., 2017, p. 1114). There may be a positive impact on the trust between the supplier and the buyer when there is transparency and objectivity of the process of the ORAs; otherwise, the trust in auction can be negatively influenced by technical problems, rumours or an inadequate auction format. Therefore, it is important that buyers run an ORAs in a fair manner, which requires clear explanation and communication of non-discriminatory auction rules and conditions to suppliers. Care should be taken to set the auction to make sure that there is bid visibility, considering the number of tendered items and the options for decreasing bids or the way the bids are evaluated, that is, the choice of evaluation criteria and their weights.

In ORAs, unethical behaviour by both buyers and suppliers can exist; for example: buyers may invite unqualified suppliers and simply exert price pressure on qualified suppliers; holding auctions for price discovery only without the intent of awarding the business; providing incomplete or incorrect demand specifications; allowing certain suppliers to rebid after the closing date; frequently repeating the ORAs to the point of supplier bankruptcy; threatening the supplier to end the relationship in the absence of bids; and purposefully cancelling the deal after the auction as buyer expectations are not met. The buying organisations can use ambiguous or shifting auction rules (Barbaro and Bracht, 2021b; Tassabehji *et al.,* 2006;Emiliani, 2005;), changing contract terms and conditions between RFQ and awarding the contract(Dagli, and El-Adaway, Elsayegh,2020) and strong supported by (Tassabehji *et al.,* 2006; Emiliani, 2005), phantom bidding (Barbaro and Bracht, 2021b; Tassabehji et al., 2006 Emiliani, 2005;

Jap, 2002;), driving down unit prices with no intention of switching supply sources (Emiliani, 2005), (Nikookar, Varsei, and Wieland, 2021) allowing unqualified suppliers to bid (Barbaro and Bracht, 2021b;Tassabehji *et al*., 2006; Emiliani, 2005), showing the bidders' identities (Emiliani, 2005), forcing suppliers to honour unreasonably low prices (Engin and Vetschera, 2020; Tassabehji *et al.,* 2006;Emiliani, 2005;) and limiting or falsifying information provided to bidders (Nikookar et al., 2021;Tassabehji *et al.,* 2006;Emiliani, 2005). Such behaviours can cause serious concerns among suppliers (Bygballe, 2017b; Tassabehji *et al*., 2006;Emiliani, 2005;) and may have a negative impact on business relationships(Wadell and Åberg, 2021; Emiliani, 2007;Emiliani and Stec, 2005, 2004; Giampietro and; Jap, 2003), causing suppliers to be highly suspicious of buyers' behaviour (Jap, 2003, 2007), distrustful and less committed to their relationships with the buyers (Wadell and Åberg, 2021; Tassabehji *et a*l., 2006;Emiliani and Stec, 2005, 2004; Jap, 2003). Careful preparation of the event, equal treatment to all participants and effective communication are key successful factors; and not honouring the deal by deliberately reducing quality of the offering without informing the buyer or by adding extra fees after the auction should be avoided. Objective sourcing process and transparency can improve the state of ethics and fairness; and third-party handling of the auction process normally creates more confidence within suppliers (because when the buyer is not involved in the event process, ORAs tend to be more ethical).

On the side of the supplier, unethical behaviours include collusion or illegal arrangements between suppliers to not bid, selectively bid, or keep the price high, tenaciously hurting competitors by making unrealistically low price bids without the intention of being awarded the business, unrealistically low bids, changing product specifications after winning the deal, recouping profit by charging for change orders, not bidding, participating simply to gain market intelligence, failing to perform or deliver the product or service as promised, and cutting corners on safety aspects to support drops in margins. According to (Bulutay, Hales, Julius, and Tasch, 2021;Emiliani and Stec,2005), behaviours like these may be in revenge for the suspected opportunistic stance of the buyers (Jap, 2003). Suppliers may also fail to respect the recommended codes of conduct.

According to (Engin and Vetschera, 2020; Jap 2003), ORAs require the buying organisation to walk a "delicate balancing act" to be able to preserve the buyer-supplier relationship in a positive manner, for ORAs may be coercive and involve the use of unethical practices, opaque contract awarding processes and changing item specifications after the auction (Hanak et al., 2017;Giamietro and Emiliani, 2007). There are buyers who merely use ORAs simply to survey market prices and make qualified suppliers to unfairly compete against unqualified lower-cost suppliers (Engin and Vetschera, 2020;Amelinckx *et al.*,

2008). Such tensions are inevitable when the respective parties in the buyer-supplier relationship have conflicting needs, goals, and expectations (Tassabehji, 2010). Furthermore, relationships are even more fragile when it comes to SMEs, both public and private institutions in south Africa need to embrace the growth of SMEs to overcome the high problem of unemployment. IT systems that are introduced need to embrace the SME concept and have a positive effect on their business growth and sustainability.

2.10.6 E-procurement Adoption in Small and Medium Businesses in Developing Countries

In a study done by (Shemi,2012) to examine the factors that impact web business adoption by SMEs in the developing country setting of Botswana, it was found that: "the effect of the nearby business environment has had a direction of the way of Internet business selection in the picked SMEs, particularly the low correspondence of foundations that are planned to support online business, and the double part of the government in empowering and making an empowering domain and meanwhile going about as a business accomplice to the SMEs." Embracing e-procurement has not been simple for SMEs around the world, mostly because of continuous changes in the field of information systems and the moving needs of nearby and overall business by and large. Considering the high unemployment rate in South Africa, SMEs are expected to stimulate the economy and create jobs, therefore they also need to find digital ways to invest, operate and sustain their businesses. The next section deals with e-procurement in the context of SMEs.

2.10.7 SMME Performance and e-Procurement

In the past decade (2009–2019), integrating suppliers and implementation of e-procurement systems has grown interest in major firms. The empirical investigation of the impact of e-procurement (e-design and e-negotiation) on SME supplier integration has received little attention (Pooe; Mahlangu 2017:23; Thoben and Seifert 2014). Small and medium enterprises constantly face the problem of on-time delivery (Zhao, Feng and Wang 2015). Through integration with suppliers, SMEs can share order and inventory information with suppliers. Furthermore, supplier integration, which includes proper communication, sharing information and working together with suppliers, can reduce upstream complexity (Zhao *et al.*, 2015). The benefits of supplier integration are that it enhances responsiveness, flexibility and time-saving. Supplier integration also plays a role in reducing transaction costs through the reduction of uncertainties and reducing of production costs (Flynn *et al.* 2010). Therefore, supplier integration has a positive impact on operational performance (Yu *et al.* 2014). In supplier integration, opportunistic behaviours are greatly reduced under shared visions and cooperative goals (Espino-Rodríguez ;Taha, 2022;Prajogo, Oke and Olhanger 2015:102; Wong, Tjosvold and Yu 2005). These challenges inhibit collaboration among supply chain partners and consequently affect SME performance. Lack of appropriate technology has been cited

as an impediment to SME collaboration, innovation and growth. Therefore, the most persistent challenge to greater supplier integration is lack of adequate information systems. Insufficient information system support is a barrier because collaboration is essentially information-based. Therefore, in the current climate of global supply chain competition, supplier integration is regarded as a prerequisite for winning performance (Njagi and Ogutu 2014). Collaboration of suppliers, sufficient information and mutual respect are the foundation of building strong and strategic relationships between buyers and suppliers.

2.10.8 Buyer-Supplier Relationships and Strategic Importance

Starting in the mid-1980s, many organisations moved away from transactional governance structures towards cooperative relationships(Ambrozini and Martinelli, 2017; Kalwani and Narayandas, 1995). Some of the typical characteristics of cooperative buyer-supplier relationships are, a sincere commitment on the part of both parties, use of a single source or small supply base, joint problem solving, integration of systems and social networks (Sundgren, 2022; Burger, Kessler, and Arlinghaus, 2021; Paulraj and Chen,2005;Day, 2000;Landeros and Monczka, 1989) added, "an extended relationship period is a crucial characteristic of (cooperative) supply chain relationships." A conceptual paper by (Daly and Nath, 2005) suggests that ORAs and long-term buyer-supplier relationships are not necessarily mutually exclusive concepts (Daly and Nath, 2005) noted that whether the auction is designed in a manner that conveys that price is not the driving factor in supplier selection, the buyer is not behaving opportunistically, and the supplier's long-term investment will be mutually beneficial; long-term relationships can be developed/maintained. (Engin and Vetschera, 2020;Antonnette *et al.*, 2002) stated that ORAs providers learnt two major lessons using the technology. This study makes a huge emphasis on relationships simply because systems adoption, implementation and ultimately the use are mostly dependent on human beings, therefore making sure all stakeholders are aligned and supportive it is priority in this study. Implementors need to be appraise on the governance, adoption legitimate process and the overall reasons why they should consider the tool. Drawing literature from the three mentioned critical aspects will assist the study to identify opportunities for improvement and ultimately a sound and acceptable framework model.

2.10.9 Relationships, adoption and governance structure

Supply chain relationships may become an important source of competitive advantage since their ties potentially allow the firm's superior value creation vis-a-vis a competitor (Miguel *et al.*, 2014). This is premised on the integration with suppliers and customers in the form of operational cooperation (For example, joint responsibility, shared planning), information exchange or cross-functional orientation (Tsanos *et al.*, 2014). Few studies approach this from the perspective of integration with customers and

with suppliers at the same time. Studies have shown that the development of the relationship between buyers and suppliers results in inventory reduction and improvements in terms of buyer satisfaction, costs, time (Vos, Van der Lelij, Schiele, and Praas, 2021; Mentzer *et al.*, 2001;Bechtel and Jayaram, 1997; Cooper *et al.*, 1997;) and increasing in the launch of new products (Melander and Lakemond, 2014).

Gligor and Holcom (2013) reported an increase in trust and commitment levels of both suppliers and customers, increase in customer's loyalty levels, improve operational, and market performance when collaborative relationships are present. (Daugherty, 2011), considering results of other studies, reports that information sharing improves financial performance, that collaboration with partners provides increased internal collaboration and improves services, while collaboration impacts the suppliers' innovativeness and financial results. (Brito *et al.*2014) concluded that the cooperation/collaboration with suppliers mainly affects profitability, while with the customer cooperation/collaboration affects growth. First, the value of the auction is strongly affected by the quality of the work that takes place before and after the auction. Second, the online reverse auction process is used to implement the "offer" or primary phase of the auction process.

However, the relationship established with the awarded supplier is independent of the execution tool used (for e.g., sealed bids or ORAs). When organisations use traditional (paper-based) methods for supplier selection, the buying firm can develop a long-term, cooperative relationship with the supplier after it has been selected. Alternatively, the buying firm can tender out business each time the purchase occasion arises. It makes sense that buying organisations can use electronic ORAs to ultimately develop two very different forms of governance structures, which are: (1) Bid-and-buy, where the electronic ORAs process is used to award business to the selected supplier on a transaction-oriented/arm's-length basis; and (2) Buying organisations identify suppliers as candidates for a more relational governance structure, and the electronic ORAs process is used to select a supplier with which to develop this cooperative relationship.

2.10.10 Adoption Process

Thus, empirical studies sought to verify the relation between the adoption of process integration, collaboration, information sharing, and firm performance (Sunmola, Burgess, and Tan, 2021;Son *et al.*, 2015; Chen *et al.*, 2004; Min and Mentzer, 2004). This approach goes beyond arm's-length relationship and formal contracts: organisations should be involved in deep relationships, sharing investment, knowledge and information, as a way to improve products and processes (Lazzarini *et al.*, 2008).
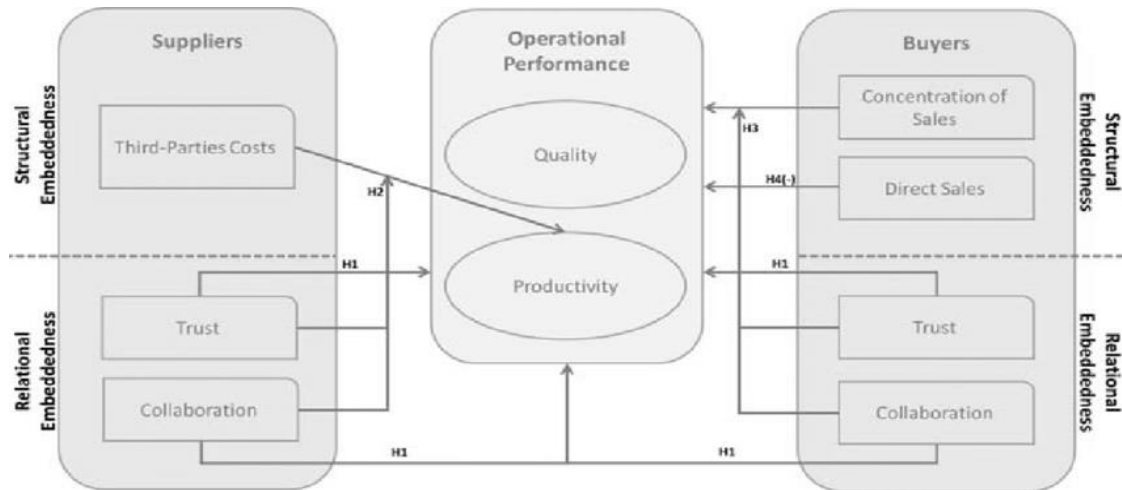
Figure 5: Relational and Structural embeddedness on operational performance
Source: Duarte and Martins, 2017

Organisations tend to develop these relationships carefully since such collaborative activities require time, effort, resources and risk-taking, therefore, when studying supply chain relationships, understanding these ties and organisations' embeddedness is relevant. Two basic types of embeddedness are present in network studies: structural and relational (Zukin; Dimaggio, 1990) Figure 5 Relational embeddedness reveals the cohesion in the network and highlights the shape of the firm's immediate ties and access to valuable information, such as the role of trust and cooperation in the governance mechanism. Structural embeddedness reveals a positional perspective and goes beyond immediate ties, emphasising how the structural position of the firm in the network allows it to have access to valuable information(Haugland, Ness, and Aarstad, 2021;Gulati, 1998).

Studies have shown that the development of the relationship between buyers and suppliers results in inventory reduction and improvements in terms of buyer satisfaction, costs, time (Jääskeläinen, 2021; Mentzer *et al.,* 2001;Bechtel and Jayaram, 1997; Cooper *et al.*, 1997;) and an increase in the launch of new products (Melander and Lakemond, 2014) in the market. (Gligor and Holcom, 2013) reported an increase in trust and commitment levels of both suppliers and customers, increase in customer's loyalty levels and improve operational and market performance when collaborative relationships are present. (Daugherty, 2011), considering results of other studies, reports that information sharing improves financial performance, that collaboration with partners provides increased internal collaboration and improves services, while collaboration impacts the suppliers' innovativeness and financial results. (Brito *et al.,*2014) concluded that the cooperation/collaboration with suppliers mainly affects profitability, while with customers cooperation/collaboration affects growth. Thus, empirical studies sought to verify the

relation between the adoption of process integration, collaboration, information sharing, and firm performance (Son *et al.*, 2015). The next section will dwell into the e-Sourcing and procurement auctions exploring the two concepts in depth.

2.10.11 E-Sourcing and Procurement Auctions

One of the main objectives for organisations deploying e-procurement initiatives is to reduce transaction costs (Ishak and Said, 2015; O'Leary, 2002;Croom, 2000). For instance, managers at Covisint estimated that the cost of processing an order could be cut from USD 150 to USD 15 using Covisint online marketplace (Meredith, 2001). The benefits result from reduced paper transactions, shorter order cycle times and subsequent inventory reduction, and the instantaneous transmission of purchase order-related information, in addition to the enhanced opportunities for the buyer-supplier relationship through the establishment of a web of business-to-business communication networks. The supply management and e-procurement literature are rich with estimates of the benefits of e-procurement. The key proposition of e-procurement is one of cost optimisation. Any reduction in the cost of purchased goods, both direct material and indirect material, often goes straight to the bottom line (Utama, Santoso, Hendrawan, and Dania, 2022;Verespej, 2002). To achieve the same improvement on ORAs by increasing revenue or reducing overheads would require significantly more effort.

The e-procurement effects model shown in Figure 6 outlines the main causal variables in implementation, which impact on e-procurement performance. Naturally, the model is a relatively simple schematic at this stage but serves to provide insight into the dynamics of the process through which we have seen e-procurement drive change. Considering how e-procurement implementation influences governance structures, evidence was found of reduced search costs leading to increased supply availability, and hence greater leverage in negotiation. Furthermore, an increased level of communication drives knowledge sharing between customers and suppliers. Therefore, rather than see a move towards increased market-based relationships (Bellenbaum, Höckner, and Weber, 2021;Barratt and Rosdahl, 2002), it was found that e-procurement tends to reinforce existing hierarchical relationships between organisations(Suryani *et al.,* 2022; Brousseau, 1990).
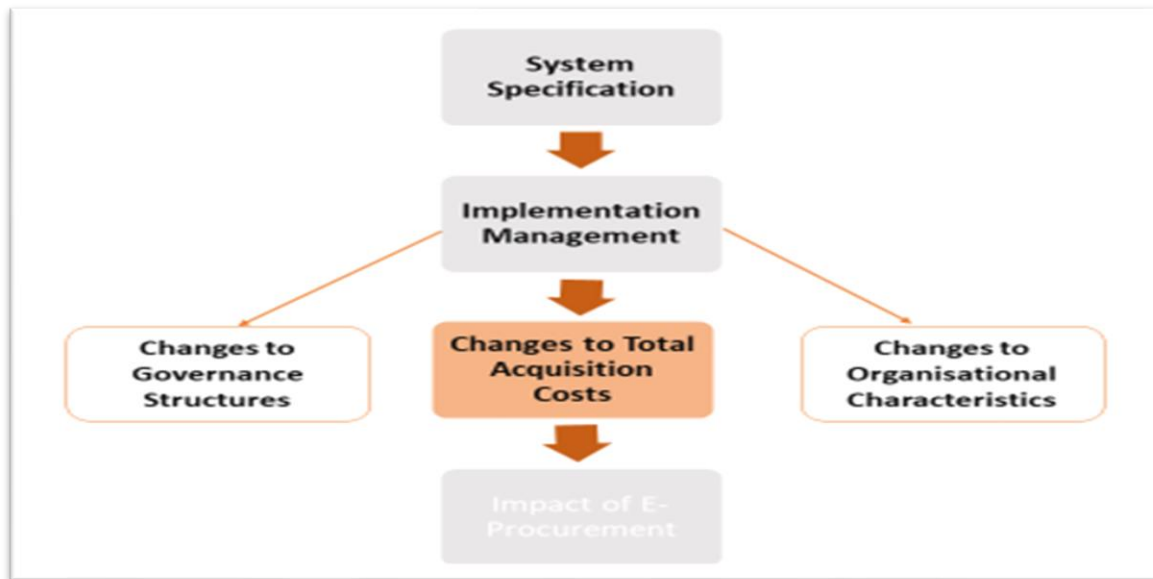
Figure 6:Eprocurement Effect Model

Source: Croom and Brandon-Jone (2007)

The potential for savings to be made from e-procurement is beyond dispute(Suryani *et al.,* 2022; Eakin, 2003). The benefits of electronic procurement have received a lot of attention in the business press and among scholars from procurement and supply management (Grimani, Gavine, and Moncur, 2020; Sehwail and Ingalls, 2003; Moser, 2002; Essig and Arnold, 2001;Blodget and McCabe, 2000; Detourn, 2000). The incentive to reduce purchase prices through aggregate buying was what initially caught most buyers' attention. Online marketplaces help buyers reduce maverick spending since every item is pre-negotiated and catalogued; and expensive emergency buying by individuals within large organisations is significantly reduced (Hayashi and Ohsawa, 2020; Barratt and Rosdahl, 2002;Croom, 2000).Online marketplace buyer benefits also include better information management through access to more suppliers, exchanging real-time information with a single point of access to ensure consistent workflow, reducing processing errors, and reducing information technology complexity by reducing the numbers of electronic connections established with suppliers (Syuhada and Gambett, 2013;Sehwail and Ingalls, 2003).

The marketplace also improves the procurement process by reducing the amount of paperwork required for purchase orders and by linking the various decision-making employees with each other electronically(Barros, Cortez and Carvalho, 2021;Detourn, 2000). Buyers are not the only benefactors of online marketplaces. Suppliers' benefits include lower transaction costs through simplified order processing, reduced errors and buyer discovery. Market discovery, which allows access to new buyers, is considered by most authors to be the main driver for suppliers joining marketplaces. Other benefits include back-office facilitation through the possibilities of remote inventory management, standardisation

of specification, easier liquidation of excess inventory using the marketplace, time-saving through reducing the bidding cycle time and the time to integrate with customers(Ssewamala *et al.,* 2018;Sehwail and Ingalls, 2003).

In 2000, Forrester's research interviewed 55 procurement and sales executives of organisations involved in B2B online marketplace ventures to uncover their motivation to join online marketplaces. Buyers focused on cost savings and improved processes as their main motivation, whereas sellers' main motivation as shown in Figure 7 was expanding their market share (Favior *et al.,* 2000).
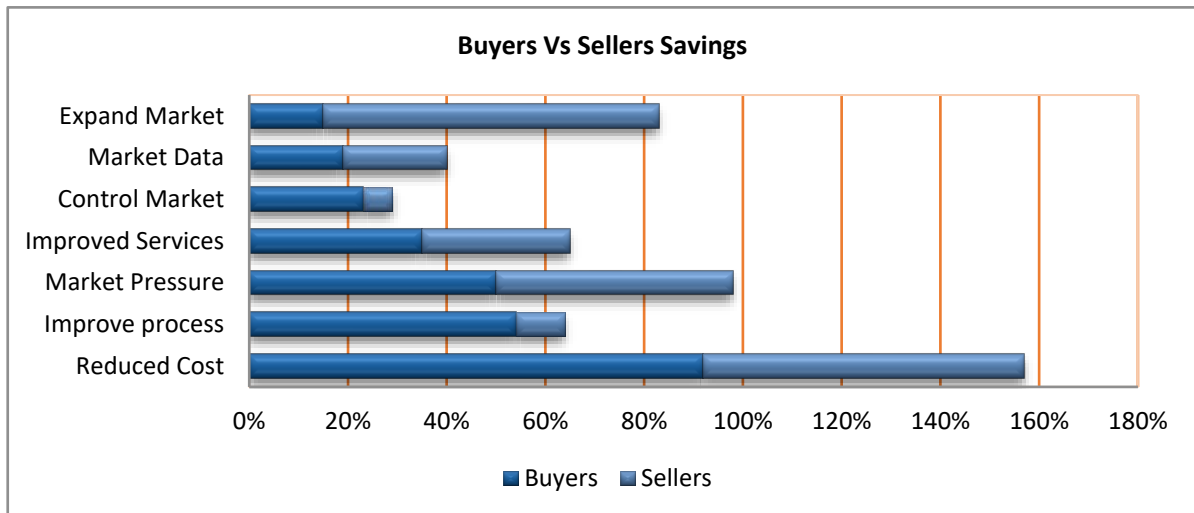
Figure 7:Buyer vs Sellers Savings

Source: Procurement Insight Report, (2018)

Money saved is not the only benefit to reverse auctions. Sourcing professionals can manage more spend and more events due to the efficiency of running an auction, which can often be concluded in under an hour. This frees up category managers to focus on strategic sourcing and analysis, ultimately leading to better business outcomes. By carefully planning a reverse auction, educating all parties involved, and executing it by using technology properly equipped for the job, enterprises can attain significant cost savings without forfeiting quality or deteriorating supplier relations. They can also enjoy savings that exceed 20% (Figure 8).

Chart title: Types of Services ORA Savings %
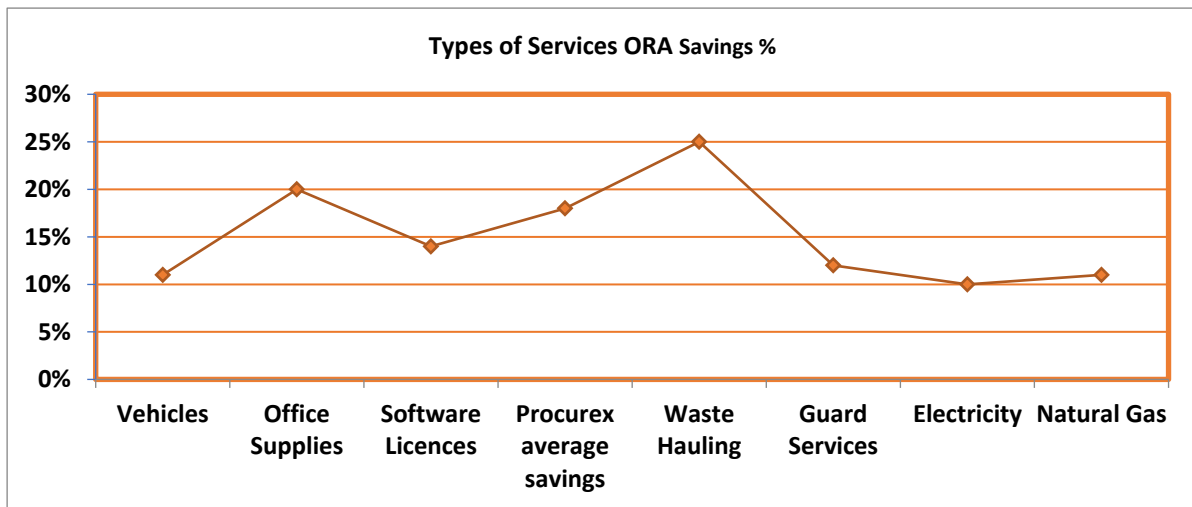
Figure 8: Main Motivations for using Online Marketplaces

Source: Favior, et al (2000)

Some studies used the technology acceptance model or theory of planned behaviour to understand the adoption of the new technology in the public sector setting (Aboelmaged, 2010; Wahid, 2010; Davis, 1989). Understanding the challenges and limitations of e-procurement/e-auction implementation, particularly in the government sector is important due to the complexities of government policies and bureaucracy. Without such understanding, governments may not be able to achieve the desired impacts of the e-procurement/e-auction system. Perhaps there will be a need for a framework that could assist in understanding the complexities and challenges of e-procurement/e-auction implementation in developing countries that could assist in system planning and implementation in the future. In order to understand these challenges, the study touched on a modified idea of (Croom and Brandon-Jones, 2007), with related literature in system specification and implementation management, and it may be obligatory to rework on their modified framework.

Implementation management means the process of e-procurement/e-auction system delivery to the users (Ambrozini,Martinelli, 2017;Croom;Brandon-Jones, 2007). explained that the rollout strategy of the e-procurement/e-auction system can either be an informal "evolutionary" protocol or a formal "project board" protocol. However, because of insufficient data, their discussions are limited to benefits accrued from both "evolutionary" and "project board" protocols. Another important challenge in implementation management is IT skills (Kassim and Hussin;2010; Heeks, 2006; 2003 and Liao *et al.* 2003) showed the difficulties faced by suppliers due to the tedious procedures and a lack of IT skills to perform e-procurement/e-auction transactions. Therefore, this study proposes the need to understand the challenges of the rollout strategy and management of e-procurement/e-auction/e-auction implementation.

For e-procurement/e-auction implementation, based on these challenges, the government needs to plan and develop appropriate strategies to gain from the impacts of an e-procurement/e-auction system, particularly the changes to total adoption costs, changes to traditional ways of conducting business, changes to enterprise development strategies and cultural differences. South African is one big and semi matured markets in the African continent and piloting the project through South Africa will forge a clear path for other African regions to follow suit which is in the best interest of the study. Due to time constrains and to give focus on the study the study only looks at South Africa.

2.10.12 e-Procurement in South Africa

e-Procurement, also known as electronic procurement or supplier exchange, is the purchase and sale of supplies, equipment, works and services through a web interface or other networked systems (United Nations, Asian Development Bank, and Korea South 2020). The technology is designed to centralise and automate interactions between an organisation, customers, and other value chain partners to improve speed and efficiency of procurement practices. It boasts a suite of innovative features – all designed to bolster the efficiency, effectiveness, and total cost of procurement (*ibid.*). Explained differently, the act of integrating, managing, automating, optimizing, and empowering of the procurement process of an organization through equipment, technology, electronics and web-based application is defined to as e-procurement (Animah *et al.*, 2018).

Historically, eProcurement was first used by IBM in the year 2000, when the company launched its Replenishment Management System and Method, created by Mexican engineer Daniel Delfín, who was then the procurement director at IBM's largest production plant, and Alberto Wario, an IT programmer (Arturo *et al.*, 2018). IBM's complicated procurement procedure was intended to address its 1,6 billion dollars annual output value for the plant in Guadalajará, Mexico, the world's largest laptop manufacturing facility. The plant production rose to 3.6 billion dollars (EU, 2020), three years after implementation, which led to the firm employing the system in Germany and then selling the plant via licensing to other enterprises world-wide. Governments worldwide spend an estimated US$ 10 trillion on public contracting. It is a major part of any economy- up to 30 percent in developing countries. According to the World Bank, public procurement accounts for nearly 15 percent of GDP per capita in sub-Sahara Africa (SSA) (Djankov *et al*, 2016). Contracting is an essential al step in delivering goods and services that people care about: quality education, quality health care, safe roads and clean drinking water. Public procurement is a controversial subject in both developed and developing countries due to various reasons.

African countries are generally not as advanced as developing countries as far as the adoption and use of e-procurement is concerned, and the reasons behind this slow progress include slowness in ensuring the establishment of basic and adequate capacity, inadequate information and technology infrastructure, inability of these countries to provide mass Internet access and a fixed administrative culture that does not easily adapt to global technological advancement (Anthony 2018; Thomas *et al.* 2007). As much as global governments in the last two decades have pursued modernisation of procurement systems, some still face challenges in the implementation of e-procurement, and South Africa is no exception. It is noteworthy that the introduction of e-procurement in the South African government was to ensure that there is good governance and good spending of limited public funds.

The government aimed at delivering goods and services in the most efficient manner and strives to save as much public funds as possible in order to avail more resources to citizens (Public, 2018; Gulwa 2017). As a developmental state, the South African government has to ensure that all suppliers, especially the previously disadvantaged class of people, do business with government in an accessible manner, and digitisation of the procurement system will make it easy for even small businesses to access economic opportunities. An e procurement system that is open and accessible offers clear procurement guidelines and facilitates the easy submission of documents, whilst at the same time minimising a cumbersome handling of documents (hard copies) and the duplication thereof, and in turn assists in the empowering of small businesses. It was important for the South African government to introduce e-procurement because the old traditional system was plagued by a lack of accountability, and therefore e-procurement was envisaged to promote transparency and faster turnaround time (Gulwa , 2017).

Organisations that have effectively implemented e-procurement systems and processes have also improved efficiencies in these key business processes, ensuring that goods are obtained at a lower price, thereby reducing administrative costs and that of the goods (Nawi *et al.* 2017). E-procurement also reduces the time of transfer of money between computer-generated accounts, and therefore the time of delivery becomes shortened and costs are significantly reduced. For example, an automated transaction process speeds up the completion of buying of goods and services (Nawi *et al.* 2017; Liu, and Ekram;Tran, Huang, 2011). Notably, improved operational efficiency further helps to reduce corruption, whilst improving the turnaround time. Advantages of using electronic procurement tools, systems and processes are numerous, albeit, not without some challenges. For example, the introduction of new software may create an unexpected culture shock precisely because digital transformation may not necessarily be an easy thing to adapt to by employees who are supposed to acquaint themselves with and use the new software. Some may perceive it as a threat to their jobs and therefore may be reluctant

to abandon the traditional way of doing things (Purchase Control 2019). Extensive training , collaboration and partnerships in the quest to grow the use of the tool is required. The approach on how to launch ORAs in the public sector may require a different approach from launching in the private sector. Suppliers are fundamental in this process, without their participation corporates will not realise their investment made and to reap the benefits that other developed countries are enjoying.

2.10.13 Partnerships and training of stakeholders

 In order for a government to be successful in e-procurement, it has to consider a long-term partnership with the private sector and learn from the advancement and best practices of the sector in electronic bid management. It therefore becomes important that the private sector is committed to assist government because without its commitment, the government's e-procurement may fail. Therefore, it is essential that both sectors (public and private) work together so as to share information and understand the global changes taking place in order to adapt (Gulwa, 2017).

Again, for e-procurement to yield the desired procurement results in an organisation, it is imperative for all stakeholders, particularly suppliers, to be extensively trained in the use of web-based procurement. Hence, developing a positive attitude towards the use of technology is paramount (Anthony 2018). More importantly, staff members need to be educated as far as technology goes in order for e-procurement to succeed. As stated by (Gulwa, 2017:1), 'skilled procurement personnel are crucial to a well-functioning e-Procurement system, requiring government to recruit skilled procurement staff and continually train them (classroom training, on-the-job training and mentorship)'. The training should include all stakeholders involved from internal to external users, decision makers and owners.

In order for any organisation to have a competitive advantage, it is important to ensure that information and knowledge are adequately shared with every stakeholder. In the case where an organisation needs to introduce and implement e-Procurement, both internal customers and suppliers need to be well informed about the developments because disseminating necessary information is one of the pillars of a successful e-procurement system. If information is not fully shared, suppliers will not be able to access the most important data, therefore negatively affecting proper procurement planning, making it difficult to effectively make decisions related to procurement, and this will hamper suppliers' preparation to deliver the necessary goods and services (Ilhan and Rahim 2013). Lastly the system needs to be accessible, therefore good infrastructure is key. Connectivity, availability of power supply given the current power cuts in South Africa. Reliable infrastructure for the success of the adoption must be on the radar.

2.10.14 Good infrastructure

Although training of stakeholders is necessary, the top management needs to ensure that the training is complemented by the appropriate infrastructure (Anthony,2018). While establishing an infrastructure, it should be in mind that the infrastructure specifically addresses the existing business challenge. In other words, the relevant infrastructure becomes key in enabling 'proper document management' and also 'keep[ing] track of the standards needed in contracts to ensure consistency' (Gulwa,2017). This therefore means that the technology introduced should promote communication that is open between government agencies and bidders so as to minimise the confusion and misunderstanding that may arise during the tender process, as that may derail the delivery of services to citizens. Reliable infrastructure will safeguard data input and ensuring proper audit trial.

2.10.15 Accurate data for good decision-making

According to (Hamzah *et al.*,2018), data capturing is a method used to put information either from a document or any other source into an electric format, and it has become an important part of successful organisations. Capturing and keeping accurate procurement data is a major component of an e-procurement system because it determines the success of an organisation. Data that are accurately captured can be of good assistance to the planning of senior management in order to determine and achieve organisational strategic goals. Accurate data are utilised to provide an organisation with meaningful insights to enable senior management to improve the day-to-day decision-making. Therefore, accurate and efficient data capturing is of utmost importance (Cross 2017; Cotton 2014). Accurate capturing of information is intertwined with governance requirements in South Africa which is legislated in South Africa.

2.10.16 Legislation on e-Procurement in South Africa

The South African government has made some strides in improving the enablers of smooth e-procurement. As stated by Section 217 of the Constitution of the Republic of South Africa, 1996 (hereafter referred to as 'the Constitution'), there is a standard set by government when it comes to procurement of services and goods. The set standards state that the national, provincial and local spheres of government and any other relevant institution identified in the national legislation have to procure goods and services in a 'fair, equitable, transparent, competitive and cost-effective' manner (Anthony,2018). Although the Constitution does not define fairness, equity, transparency, competitiveness and cost-effectiveness, the International Comparative Legal Guides (2019) mentions that South African courts have provided clarity on what these terms mean. 'Fairness' and 'equity' refer to dissemination of information to all bidders in a non-discriminatory manner and the adjudication of bids being done without bias. 'Transparency' then

would mean that the procurement process must promote openness, ensuring that reasons are provided as to why a tender was awarded to a certain bidder over the other, and officials need to account for their actions of awarding the tenders. 'Competitiveness' and 'cost-effectiveness' imply that the procurement process needs to achieve value for money. The South African government has made some strides in improving the above-mentioned enablers of smooth e-procurement. As stated by Section 217 of the Constitution of the Republic of South Africa, 1996 (hereafter referred to as 'the Constitution'), there is a standard set by government when it comes to procurement of services and goods. The set standards state that the national, provincial and local spheres of government and any other relevant institution identified in the national legislation must procure goods and services in a 'fair, equitable, transparent, competitive and cost-effective' manner (Anthony,2018). Although the Constitution does not define fairness, equity, transparency, competitiveness and cost-effectiveness, the International Comparative Legal Guides (2019) mentions that South African courts have provided clarity on what these terms mean. 'Fairness' and 'equity' refer to dissemination of information to all bidders in a non-discriminatory manner and the adjudication of bids being done without bias. 'Transparency' then would mean that the procurement process must promote openness, ensuring that reasons are provided as to why a tender was awarded to a certain bidder over the other, and officials need to account for their actions of awarding the tenders. 'Competitiveness' and 'cost-effectiveness' imply that the procurement process needs to achieve value for money.

Contractors may therefore be treated differently in view of South Africa's past discriminatory practices (Anthony,2018). In practising equality in the entire procurement process, the socio-economic conditions of previously marginalised individuals need to be taken into consideration as stated in Section 9 of the Constitution. More importantly, the government needs to ensure that the process saves time and is cost-effective. This means that administrative costs need to be minimised, indirectly advocating for less paper usage and more use of e procurement. The Online Communications and Transactions Act 25 of 2002 (ECTA) has provisions for government to conduct its business electronically with small, medium and micro-enterprises (SMMEs), and sections 27 and 28 encourage the use of e-governance services to, amongst other things, develop human resources and electronically transact with other entities that do business with government. Section 6(a) further provides that the government should have an e-strategy that indicates the nature of Internet programs that will 'expose' disadvantaged communities to Internet usage (Anthony, 2018).

It therefore implies that the ECTA advocates for e-procurement. One legislation that mentions e-procurement is the Preferential Procurement Policy Framework Act (PPPFA) with its regulations addressing preferential procurement and how policies that have to do with procurement need to be

implemented. This piece of legislation, together with the Public Finance Management Act no. 1 of 1999 (PFMA) at the national and provincial levels, and Local Government: Municipal Finance Management Act no. 56 of 2003 (MFMA) at the local government level, emphasises the prudent use of public funds, therefore generally implying cost-saving processes to be implemented in all spheres of government (Anthony ,2018).the risks associated with ORAs need to be legislated and sufficiently covered in corporates policies , knowing the risks upfront will save a lot of organisations from entering into litigations with their vendors.

2.10.17 The Status of e-Auctions

Despite the growth of online platforms and ORAs being one of the participants, there are still serious risks and disadvantages associated with ORAs around the globe. The disadvantages are listed below:

- Possibility of fraud. Auction items are in many cases unique, used, or antique. Because buyers cannot see the item, they may get a defective product. Buyers can also commit fraud. Thus, the fraud rate in e-auctions is very high. (For specific fraud techniques and how to prevent them, see the discussion later in the appendix.)
- Limited participation. Some auctions are by invitation only, whereas others are open to dealers only.
- Security. Some of the C2C auctions conducted on the Internet are not secure, which scares away many potential clients. On the other hand, some B2B auctions are conducted on highly secure private lines.
- Software. The "complete" or "off-the-shelf" software solutions can support the dynamic commerce functionality required for optimizing pricing strategies are still very limited. Dynamic commerce "best practices" that can be easily customized to the unique requirements of a company / industry are still being defined and will continue to evolve as new business processes emerge online. (*Table 2).

Table 2: Category Characteristics of Reverse Auction

Category Characteristics	Reverse Auction	Sealed Bid	RFI	RFP
Commercially attractive	High	High	Medium	Low
Definable requirements	High	High	Medium	Low
Competitive supplier base	High	Medium	Medium	Low
Savings opportunities	High	Medium	Medium	Low
Inherent risk	Low	Medium	Medium	High

High = blue, Medium = red, Low = green

Source: Gill and Ruytenbeek (2012)

Research institutions have estimated that 1.4 billion people will be using digital devices over mobile networks by 2004, and by 2003 the number of mobile commerce users is expected to surpass the number of fixed e-commerce users worldwide (Tolstoy, Rovira, and Vu, 202; Delichte, 2001). Mobile phones and other wireless devices will be the primary way for people to access the Internet, resulting in large-volume m-commerce. In response, auctions are implementing m-commerce applications. Aberdeen Group (2000) showed that market makers leveraging auction exchange models are reaching liquidity more rapidly than those utilising only catalogue-order-based trading environments. However, businesses are still struggling to understand how to truly implement dynamic pricing models to augment existing business practices. Despite all challenges faced by online reverse auctions, they are growing rapidly and provide a large and growing source of consumers (Yuan, 2012; Suh and Han, 2003; Hahn, 2001;) worldwide. Ultimately the use of ORAs dependent on its current state.

2.10.18 The use of Online Reverse Auctions (ORAs) advantages and controversies

The review of the e-auction literature reveals that researchers have not explored the factors that affect the decision to adopt e-auctions by supply management organisations. However, several studies have explored the adoption of the broader concepts of e-commerce, e-procurement and e-marketplaces. E-auctions are generally encompassed in each of these broader concepts. The factors influencing the decision to adopt Internet-based information systems was explored by (Soliman and Janz 2004) using data gathered from a survey of US members of the Council for Logistics Management. Using factor analysis, they identified seven factors that were perceived to be barriers to adoption. Using data from a survey of 168 US organisations, (Davila *et al.* 2003) categorised organisations as either aggressive or conservative e-procurement adopters and then compared organisational characteristics of each. (Joo and Kim 2004) compared adopters and non-adopters of e-marketplaces and found that adopters were larger and faced more external pressure to adopt e-marketplaces than the non-adopters faced. (Grewal *et al.* 2001) explored the factors that affect the level of participation in an e-marketplace and found that the desire to increase efficiency and information technology (IT) capabilities is related to higher levels of active participation. In a case study of Chinese organisations who were non-adopters of an e-marketplace, (Hsiao,2003) examined the impact of technical and cultural distrust of adoption and found that both sources of distrust must be adequately addressed for a successful adoption.

The use of ORAs as a procurement tool has been discussed very controversially. While in normal auctions the buyers keep offering a higher price to buy the product, on the other hand, ORAs, are designed so that sellers keep offering a lower selling price to get the contract with the buyer. This situation is only applicable when the buyer has enough power, and several suppliers are willing to compete for the

business. Additionally, the buyer must find a way to qualify the supplier with a system that determines the quality of the supplier and the requirements of the buyer, such as the request for a quotation (RFQ) (Tolstoy *et al.,* 2021;Teich *et al.,* 2006) to compare the bids. Only if all the sellers meet the minimum requirements, the process and the product appear to be useful. Linking benefits, advantages, and the overall impact whether good or bad will pave a well-articulated study outcome.

2.10.19 Online Reverse Auctions benefits, and overall impact

In ORAs, the savings on the cost per unit are usually impressive for the buyer. Many suppliers condemn the use of ORAs citing that they squeeze their margins and destroy long-term relationships with their customers. According to (Hannon, 2003), some advantages are unchallenged; ORAs make the bidding process much faster in comparison to the old days when this type of bidding process was conducted via mail. Now, the use of real-time auction software enables the participants to complete the process within hours including the award of the resulting contract. Secondly, the business is open to more organisations, thus offering suppliers the chance to win new contracts and new customers. This argument is like the general argument of e-commerce that it provides new suppliers and businesses for the company. This is also true in the case of ORAs when the auction is announced clearly enough by the buyer to attract organisations, which usually did not take part in the normal bidding process.

Other advantages for the supplier can include lower marketing and sales costs, faster reaction times and improved feedback on the offer. (Emiliani,2000) stated that another advantage is greater information for the buyer; even if the company is not willing to bid aggressively, the information about the market price and the bidding behaviour of competitors has value for the company. This can be used as an indicator of the competitiveness of the operations and the offered price. The use of ORAs is spreading due to the advent of cheaper and easier software packages that enable even small organisations to start ORAs. (Hannon, 2003) studies have shown that 35% of the organisations with more than USD 100 million to spend use ORAs tools. Gartner Group has reported that the use of software reached USD 20 billion in 2012 and USD 13 billion in 2007.

The research suggested other ORAs benefits, i.e., cycle time reductions, quality improvement, a broader supply base (Yeniyurt *et al.,* 2011), faster information transmission, and increased competition (Kros *et al.,* 2011). Suppliers may benefit too from ORAs. The participation in ORAs could provide suppliers with specific benefits, such as new distribution channels, a wider customer database, new means to increase sales, to reduce excess inventory, and reduce the cost of products for sale (Tarazona-Bermudez *et al.,* 2014). However, ORAs have negative aspects. Firstly, research suggests overstated savings due to price reduction focus and not total supply chain costs focus. Secondly, ORAs potentially damage buyer-

supplier relationships (Burger, Stief, Dantan, Etienne, and Siadat, 2021; Schoenherr and Mabert, 2011; Caniëls and Van Raaij, 2009;), and challenge suppliers' trust in buyers (Nadler and Kros, 2010). Thirdly, ORAs constitute a potentially coercive use of buyer market power (Vos, Lelij, Schiele, and Praas, 2021;Giampietro and Emiliani, 2007).

Buyer-supplier tensions exist, especially since suppliers think ORAs only benefit buyers (Yuan, 2012; Tassabehji *et al.*, 2006; Emiliani, 2004;). ORAs competition may induce suppliers to substantially lower their bids, which ultimately results in a buying organisation that benefits at the expense and profitability of the 'winning' supplier (Yeniyurt *et al.*, 2011). However, sound empirical research explaining perceived appropriateness is lacking, and few studies empirically examined the determinant factors of ORAs use (Tassabehji, 2010; Mithas *et al.*, 2008;). A supplier that invests in an asset specificity element such as technical labour skills while possessing business acumen and understanding of the ORAs contemplating buyer's requirements will likely be tempted to participate in the ORAs. Buyers will appreciate the willingness to make relationship investments of suppliers participating in ORAs.

2.10.20 Conditions for Successful Online Reverse Auctions

The ORAs have created distrust as the incumbent suppliers witness the opportunistic behaviour of the buyer. The damaged relationships can lead suppliers to take retaliatory actions in the future. However, the long-term effects could reduce competitiveness as ORAs hamper capability building (Wilkerson, Romanenko, and Barton; 2022;Emiliani and Stec, 2002) and reduce the amount of capital available for suppliers (Vetschera, 2020;Hartley *et al.*, 2004) to reinvest in their business. Nevertheless, ORAs have the potential to be used in both the collaborative and competitive relationships as a means of tendering contracts, and they can produce benefits for both sides, particularly in terms of the process improvements. The conditions for successful ORAs are discussed in this section, and they can prevent potential damage of relationships between buyers and suppliers. The goal of (Wagner and Schwab's, 2004) study was to determine the procurement management-related conditions that influence the success of ORAs. According to them, conditions can be classified in a well-specified manner, however, demand is important in ORAs in order to ensure that all participating suppliers correctly understand the scope of the demand and are able to place suitable bids during the ORAs. (Stek and Schiele, 2021; and Carter *et al.* 2004; Beall *et al.* 2003) called this condition "specific ability." These are:

Auction volume: From a supplier's perspective, higher auction volumes are more appealing than lower volumes (Wynstra, Suurmond, and Nullmeier, 2019;Beall *et al.*, 2003). If suppliers are awarded larger volumes, they are able to produce larger lot sizes. Larger lot sizes are associated with lower transaction

costs and economies of scale. From a buyer's perspective, a large enough volume warrants the investment of conducting ORAs (Vetschera, 2020;Sashi and O'Leary, 2002). Expense of switching suppliers: For example, these are search costs for finding new potential suppliers, negotiation costs for closing contracts, expenses for setting up new business relationships, and costs for adapting the production processes occur (Bygballe, 2017a; Hackett and Srinivasan, 1998;Heide and Weiss, 1995;). Number of participating suppliers: The competition among a larger number of suppliers is supposed to be stronger. Competitive pressure may force some suppliers to provide a better offer. Competition among participating suppliers: If competition among suppliers within an industry is strong, suppliers are more willing to grant concessions, for e.g., in terms of price (Ruchuan, Xiong, and Bao, 2021;Porter, 1979). Power of the buyer: The larger the buying power of the firm on a specific market, the more pressure can be put on suppliers to provide competitive offers (Ruchuan *et al.*, 2021;Porter, 1979). According to (Arbin and Hultman ;2003), ORAs are suitable when "the buyer dominates the relationship."

Complexity of the negotiation package: How the specified products and services are combined into a negotiation package has an impact on the savings that can be realised through ORAs. (Bichler, 2000) empirically analysed multiple attribute\ auctions and found that the utility scores achieved by the buyer are higher than those of the corresponding single-attribute auctions. Time to auction: Authors assume a positive relationship between the time organisations spent for preparing the auction (i.e., until the auction takes place) and the auction's success. There is also the issue of tangled reverse e-auction application. Organisations complain about the lack of a simple and clear reverse e-auction application method. Using the quality function deployment (QFD) method can be a possible solution to solve this difficulty. QFD is a useful approach to help managers choose (traditional negotiation or auctioning) when they should use an e-procurement tool to buy a product or service. The successful use of the ORAs irrespective of the conditions at hand is to closely concentrate on challenges and risks and mitigate them accordingly. Trust is built through healthy communication, transparent processes and ethics.

2.11   Challenges Posed by ORAs on Buyer-Supplier Relationships

ORAs are a means of making the procurement process more effective and efficient, but they can be accompanied by challenges and risks, which procurement managers need to be aware of and mitigate in order to realize the benefits (Sambhara, Rai, Keil and Kasi, 2017). These challenges concern the auction process governance, organisational contingency, buyer–supplier relationship, and agency and transaction cost. Purchasing management is one of the basic processes that have impact on the success of organisations, and which is considered a tool that can bring about competitive advantage to them. ORAs are used in various economic sectors, but their suitability and efficiency depend on the specifics

of the environment in which they are applied. Accuracy, clarity and open communication between the buyer and the suppliers are the basic prerequisites for the success of the ORAs (Hanák, 2018).

ORAs may harm the business relationship between the supplier and the buyer; and according to (Sambhara, Rai, Keil and Kasi 2017; Ray, Jenamani and Mohapatra 2011), this effect is severe especially in a limited supplier base. Challenges involve bad ORAs process practices such as running ORAs without the intent of awarding business, collusion of suppliers, awarding contracts more often to incumbents, submission of abnormally low bids or delivery of lower quality products/works. Trust between the buyer and supplier can be negatively influenced by technical problems, rumours or an inadequate auction format; and when buyers run ORAs not in a fair manner, which requires clear explanation and communication of non-discriminatory auction rules and conditions to suppliers. Other challenges include not achieving project targets, incompleteness and inaccuracy of project documentation, billing additional costs, the use of multi-criteria evaluation with regard to the expected life-cycle costs of the structure, and ORAs procedure effectively reducing the customer's total cost of ownership.

Deviations from ethical norms can cause an impediment to the suppliers and the buyers. The one-sided focus on price savings and unethical behaviour (Pawar *et al.,* 2017) (such as buying organization inviting unqualified suppliers to the ORAs to exert price pressure on qualified suppliers, holding auctions for price discovery only - without the intent of awarding the business, providing incomplete or incorrect demand specifications, allowing certain suppliers to rebid after the closing date, frequently repeating the ORAs to the point of supplier bankruptcy, threatening the supplier to end the relationship in the absence of bids, and purposefully cancelling the deal after the auction as buyer expectations are not met) by buyers also exist. On the side of suppliers,, unethical behaviour includes illegal arrangements between suppliers to not bid, selectively bid, keeping the price high, tenaciously hurting competitors by making unrealistically low price bids without the intention of being awarded the business, and not honouring the deal by deliberately reducing quality of the offering without informing the buyer or by adding extra fees after the auction, which can prevent the buying organisation from achieving the expected benefits and advantages for example of cost reduction and time saving (Barbaro and Bracht, 2021a; Martinelli and Marchi, 2007; Beall *et al.,* 2003;).

On the side of suppliers*,* ambiguous or shifting auction rules, changing contract terms and conditions between RFQ and awarding the contract, phantom bidding, suppliers failing to respect the recommended codes of conduct, collusion, unrealistically low bids, etcetera, are not uncommon. Apart from the possibility of ORAs being coercive, involving unethical practices, opaque contract awarding processes

and changing item specifications after the auction, and buyer-supplier relationship having conflicting needs, goals, and expectations; there is also buyer resistance, and a reluctance to change from the buyer's side, both at the pilot phase and sporadic phase (Peng and Calvi, 2012). Competitive bidding is a subject that many procurement managers still try to avoid for a variety of reasons (Peng and Calvi, 2012).

According to (Peng and Calvi,2012), there are six different reasons for this reluctance, namely:

- Most of the buyers are pushed or pressurized to use ORAs by top management sometimes without knowing much about it. In this case, the tool may sometimes be badly used.
- From the old working method, adopting the new ORAs process is a big challenge for the buyers, hence, they are reluctant to make an effort to adopt the new process.
- Some buyers are too certain about their negotiation ability, but the tool gives them a crash course in humility. Sometimes they feel that the tool questions their negotiation ability and their past performance.
- During the initial phase, the tool may not be convenient as there may not be enough options that meet the negotiation needs. The internet connection may also fail and the bugs in the tool may cause problems for the negotiation online.
- In some cases, one cannot exclude possibilities that some buyers have professional deviation as they favour certain suppliers according to their own interests, the transparency of ORAs process makes it impossible for their favouritism.
- The law or regulations may restrict the application field of ORAs.

In the construction sector in particular, there are causes of ORAs controversy because many contractors oppose reverse auctions and believe that they should be allowed to submit bids based on their distinctive capabilities and unique resources. Hence, instead of having just the only one opportunity to submit their best prices (sealed bids), they are exposed to fierce and open price competition. There is also another aspect of the controversy of the question of what types of construction works/projects are suitable for OEA in terms of the ability to specify the subject of purchase sufficiently (Hanak 2018).

Abnormally low bids (ALBs) (Ahmed *et al.,* 2016; Soudry, 2004) is another big challenge. These are caused by for example, using inaccurate estimates of project cost or strong competition within the market. An ALB can be defined as a deviation from the client's cost estimate or as a deviation from the average bid. In this regard, (Emiliani, 2005) advised that in order to avoid ethical misconduct, the support of codes of conduct for ORAs, will lead to reducing suppliers' doubts and an increased level of trust. If the ORAs

contributes to higher transparency of the purchasing process, all auctions rules and conditions need to be provided and clearly explained to suppliers. Awarding the contract to suppliers who submitted ALB is risky because the buyer may face cost and time overruns, a lower-quality delivery, or the inability of the supplier to complete the work during the delivery phase of the project. However, pre-determining the amount of work to be done accurately is the main problem when estimating the bid price (Marovic *et al*. 2018). (Hanak ,2018) stated that taking into consideration specific features of the construction industry, suitability is also dependent on to what extent the subject of purchase is an intellectual property.

The relation between financial savings achieved as ORAs benefit and quality of structures is crucial for construction projects. In this regard, (Huang *et al*. 2016) highlighted the contradiction between price and quality attributes and argued that they should be balanced by the buyer. Negative price-quality effects have been reported by (Pillai and Malkani 2014); the authors reported the use of cheaper and less experienced staff on the construction site as a result of ORAs cost savings. (Hatipkarasulu and Gill, 2004) also argued that awarding the contract to a bidder that submitted ABLs may end up abandoning the project even before the competition. Great care should therefore be taken when selecting capable suppliers.

In this regard, (Wang, 2015) suggested establishing the quality pre-set intervals and setting the default payment mechanism to punish the low-quality suppliers (Jung 2016). According to Lo and (Yan, 2009), generally, the submission of ABL and suppliers' opportunistic behaviour are frequently detected in all competitive bidding systems instigating the reduction of bid prices, especially in ORAs (Hanak *et al*., 2018; Ballesteros-Pérez *et al*., 2016). The problem with a contract being awarded to ABL, is that there is a high probability that the winning supplier will apply some compensation strategy such as cutting corners to reduce the costs or compensation from claims to increase the payments from the buyer. There are usually a claims recovery strategy applied if uncertainties are detected in the project documentation or if there are expectations for potential changes in the design (Yan, 2015; Mohamed *et al.* 2011).

There may also be unwillingness of suppliers to take part in the ORAs. For example, according to (Scholtenhuis *et al.* 2011), most construction project teams do not use available IT support, and generally, the construction industry is slow in IT adoption compared to other industries despite various initiatives within Industry 4.0 such as BIM or 3D printing (Maskuriy *et al.* 2019). Because of the low adoption rate, (Wamuziri, 2009) stated that most suppliers view ORAs as an unethical practice (Nicholis,2018). When compared to traditional bidding, ORAs tenders suffer from lower participation of bidders (Hanak, 2016). In general, the drivers and barriers for e-procurement adoption include resistance to change, missing upper management support or lack of technical expertise (Eadie *et al*., 2010).

There is a divergence in the perception of transparency; from a buyer's view, transparency of ORAs supported purchasing process is considered more positively than by suppliers (Hanak and Selih ,2017). For buyers, enhanced transparency is perceived almost with the same significance as savings potential when considering ORAs adoption in construction (Hanak et al. 2018). (Le´sniak *et al*. 2018 and Tkac *et al*. 2016) asserted that financial conditions, construction conditions, type of works, past experience with similar projects, or short term for proposal preparation belong to the major criteria (Marovic *et al.*, 2014) in the decision-making about submitting a bid for a specific tender.

Wamuziri and Abu-Shaaban (2005) emphasized that the primary objective of using ORAs in construction procurement is not merely to lower the contract price, but instead to obtain the best value. The best value, according to them, is achievable if other criteria are taken into consideration along with the price. In such a case, the lowest-price bidder is not automatically the winner of the tender (Hanak and Selih 2017; Ballesteros-Pérez *et al*. 2016). In the construction sector, the use of ORAs is seen as controversial due to ethical reasons, unsuitability of some products for auction, potential inadequate quality of delivery and submission of abnormally low bids by suppliers, etc. Inexperienced purchasing personnel and incorrect management decisions regarding the use of ORAs may cause significant losses, challenges and problems during the performance of public works contracts as well as afterwards when buildings and facilities are in operation. In general, basic conditions such as the subject of the purchase to be clearly specified, the quantity demanded to be sufficiently attractive, to have a sufficient supply base on the market, suppliers' willingness and preparedness to participate in ORAs, and the assumptions regarding potential price decrement in ORAs being reasonable should be met to handle ORAs appropriately. Businesses are forced to find a way to embrace technology. In the last two years after the breakout of the COVID 19 pandemic the world has survived through technology from personal essential services to big business requirements, therefore business to business marketplace as the umbrella of the online trading complements the ORAs in a spectacular way. There is no turning back on this journey the main requirement is to embrace, gain more understanding, refine, and perfect the tools.
Businesses who are not and have not embraced technology some have perished, and the surviving ones are barely making it.

2.11.1 Online reverse auctions in the context of B-to-B marketplaces

According to (Chepkemoi, 2014) illustrated the e-procurement processes and concluded that existing procurement functions need to be "electrified" end-to-end in order to support the entire e-procurement framework. The functions include requisition and order management, real-time tracking and receiving of goods, online order fulfilment, automatic billing, invoicing and payment, and also the workflow

management, commerce transactions, reporting and analysis tools. Online reverse auctions "now represent 15 - 20% of the total volume of B-to-B transactions worldwide." And the markets involved can be considerable, such as an operation organized by the British National Health System, which was concluded for an amount of 1.8 billion euros" (Brunat, 2017). The first suppliers who participated in Online reverse auctions were motivated and enthusiastic. Quickly, some of them realized the weakness of their logistics which could not follow. Indeed, by participating in these auctions, the costs of storage, transport and delivery have become exceedingly high according to them. For the past twenty years, many studies have dealt with Online reverse auctions in the context of B-to-B marketplaces (Carli, 2017; Brisset, 2011; Hannon, 2003; Beam and Segev, 1998). These studies have clearly shown the benefits of these auctions.

The following advantages can be distinguished:
- They generate indisputable savings (especially for the buyer);
- They encourage collaborative relationships.
- They drastically reduce the error rate associated with communication;
- They make transactions more transparent (especially opened reverse auctions);
- They allow greater openness of the panel of suppliers.
- They allow an indisputable saving of time for some types of products.

Indeed, as mentioned by Franck LE TENDRE, Managing Director of Synertrade France: "Almost all products can be purchased by online reverse auctions, then the gain effect will vary. On large series products, reverse auctions are quite effective but not on the service sector. If, for example, the labour part is important in the finished product, the auctions will have little effect" (David, 2017). However, it is commonly accepted that, especially with regard to non-strategic (non- production) purchases, if the buyer finds a similar product at a lower price from another supplier, even if their relationship has lasted for several years, he cannot hesitate to change it in favour of this new supplier. Therefore, online reverse auctions can present an extremely worrying threat to suppliers who can react accordingly (decline in service, faulty delivery, lower quality, etc.).

In addition to this threat, which can "poison" the relationship between buyer and supplier, saving time and money is sometimes disputed by some academic research. Some claim that the relationship between the buyer and the suppliers deteriorates using reverse auctions. "This process destroys everything related to the know-how of buyers and sellers. Reverse auctions are a deadly system", declared Jean-Claude VOLOT, president of the national joint fund (AGFPN), during a conference at the CCI of Côte d ́Or in France (Brunat, 2017).

2.11.2 Transactional or long-term relationships on ORAs

According to (Daly and Nath, 2005), there are two types of relationships between a buyer and a seller in the context of ORAs. One is the transactional exchange that is adversarial or at least arm's-length in nature. Here, both the buyer and the suppliers compete for a fixed pie of benefits. Contracts are short-term, there is no guarantee of repeat business after the contract period, and the supplier is selected only based on comparative price. The other type is the relational exchange, where the buyer and the suppliers actively create pie-expanding opportunities together (Jap, 2003).

In this case, the suppliers are selected not only based on price but a multi-attribute selection criterion like quality, reliability and congruency with business goals. Suppliers make long-term investments to meet the requirements of the buyers with substantial expectations beyond the initial contract period. (Radkevitch *et al.*,2009) conducted an exploratory investigation of empirical configurations of buyer-supplier exchange relationships at an online marketplace for IT services and the accompanying use of ORAs. They used buyers' portfolios of supplier relationships as a unit of analysis and employed a clustering technique to develop a taxonomy of relationship portfolios. They identified four types of relations, as reported in Figure 1.2, "Clusters of buyers' portfolios of supplier relationships," in (Radkevitch *et al.*,2009). South Africa has unique problems regarding the implementation of "first-world" technologies such as e-procurement.

The following are typical problems (Louw, 2011):

- Limited and monopolised supply base. Online communities are most successful when they involve a large number of participants. South Africa has a relatively small supply base per commodity group, and this is usually controlled by a few large participants. This reduces the possible impact of an online solution such as e-procurement.

- Limited bandwidth. Bandwidth is a precious commodity in South Africa. 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. Also, these smaller players tend to be unsophisticated with very few having online access and being e-procurement ready.

- e-Procurement technology and affordability are advanced and costly to South African organisations. Usually, only large corporations with large expenditure on indirect purchases such as Maintenance, Repair and Operations (MRO) consider such systems. This results in a very

small percentage of potential "e-procurement purchases" being made online. Also, implementation is usually not integrated with suppliers' systems, and the advantages of a totally integrated solution are seldom realised.

2.11.3　E-Procurement Public Spin-offs – Convenience vs Overspending

E-commerce is helpful in terms of process enhancement, but also threatens saving habits as encourages higher consumption rate. The EHI Retail Institute (2019) argues that instant shopping – a sub phenomenon of e-commerce – will increase consumption via automated and simplified ordering through virtual assistants, digitized one click payment and 24-hour availability (Lange and Santarius, 2018). There is also less awareness for the amount of money spent (Deutschland and Verbindungsstelle2018). Some authors suggest that the gained time from more efficient shopping is used for even more shopping. This "time rebound effect" may also take a toll on the social sustainability, rendering life more stressful. (Pahlevan Sharif and Yeoh, 2018) highlight the problem of compulsive online shopping. (Majamaa *et al*. 2019) observe an increase in financial hardship and debt among consumers. Online purchases do not require face-to-face human interaction, thus creating psychological distance which makes it less likely that people are aware of the socio-ecological impact of their shopping behaviour. Therefore, sustainability is likely not a deciding factor in their purchasing decisions (Lange and Santarius, 2018).

E-commerce is prone to monopolization which leads to several risks. A first risk is that small and medium sized enterprises and local commerce are disadvantaged (Lange and Santarius, 2018). A second risk is that ICT and digital MNEs use public infrastructures without proper contribution to state funds (Lange and Santarius, 2018). Google, for instance, generated 22.6 billion Euros in Europe, the Middle East and Africa but paid only 47.8 million Euros in taxes in 2016 (The Guardian, 2016). A third risk relates to inequality. Digitalization may further enlarge inequality by a shift of wage income to capital income. In the digital age, it may become more profitable to own software, programs and robots than to offer jobs on the market (Lange and Santarius, 2018).

The problems listed above give some explanation why South Africa has had a slower than average (compared to other countries) adoption rate of e-procurement solutions. To overcome the problems stated, a staggered implementation process has to be looked at. Organisations should start with automating part of the process, such as using online auctions to negotiate some of their commodities' contracts or implementing procurement cards. According to (Hur *et al.*,2006), the costs of e-auction implementation are directly related to the choice of e-auction administration configuration, which is determined by the organisation's internal e-auction competence for conducting e-auctions. They identified three different configurations for e-auction administration:

- Full-service: inexperienced buyers who plan to hold only a few e-auctions can turn to full-service providers to administer for them.

- Self-service: organisations, which gain experience with e-auctions, tend to move them in-house. In self-service auctions, buyers are responsible for conducting all aspects, including market analysis, supplier identification, preparation of the request for bids, supplier training and running bidding events.

- When an organisation has a relatively large auction volume but lacks e-auction skills and market knowledge, they can employ both self-service and full-service. The firm can use the third-party service provider for its software and/or for very specific bid-related tasks, such as training suppliers and running the bid event. (Grabara, 2021;Arnold *et al.* (2005) studied the impacts of ORAs on the total costs of the procurement function (TCPF). They analysed these impacts on three levels, namely, the process step, the transaction, and the tool integration level.

- A considerable outcome of their study is that permanent use of online reverse e-auction involves TCPF reduction, "the integration of the ORAs-tool and its impact on the TCPF" (Bellenbaum *et al.*, 2021;Arnold *et al.*, 2005).

Organisations will encounter lower costs using ORAs in comparison to traditional purchases, and the decrease in costs will be proportional to the effective auctioning number. For instance, inviting the suboptimal suppliers to the event can result in increased activity-based costs, lower price reductions and higher switching costs. On the other hand, there are impacts, which are not reflected in the net savings of one specific auction but do still affect the procurement related costs. For instance, inviting the wrong suppliers may lead to lost trust, impeding further cooperation.

These types of impacts manifest themselves in an increase of TCPF. The effects on other company departments generated by ORAs can also be interpreted as a change of TCPF. For example, a shorter procurement process may bring about time advantages on the sales side, which is a positive contribution to the organisations value (improved cash flow) and thus a productivity increase in the procurement function. Annexure A refers to these issues as positive and negative impacts on TCPF.

2.11.4 Adoption of ecommerce by different regions

Adoption of e-tendering system in Sweden was related to transactional benefits, in that it was accredited with simplifying transactional processes (Abdullahi, Ibrahim, Ibrahim and Bala, 2019). E-payment systems in particular, supports the general process of tendering as from raising of requisition to payment online. Processing of tendering activities electronically has resulted to saving of time, enhanced

effectiveness and efficiency as a result of electronic enabled relationship with the suppliers, removal of trivial activities, correctness of data, and improved supplier performance (Mbaka and Namada, 2019). The performance of the entity procuring is enhanced by the adoption of an effective public e-tendering likewise at the national level in the United States.

In Egypt, electronic procurement is an ever-growing means of conducting business in many industries, around the world and is projected to reach $ 3trillion in transaction this year, up from $75 billion in 2002 (Mutangili, 2014). The benefits of e-procurement optimization are, increased efficiency, improved transparency, enhanced risk management, higher levels of integrity, greater and better access to government procurement for small and medium size enterprises, corruption avoidance and cost reductions as compared to traditional manual procurement (Chen, Bretschneider, Stritch, Darnall and Hsueh, 2021). While there are various forms of e-Procurement that concentrate on one or many stages of the procurement process such as e-Tendering, e-Marketplace, eAuction/Reverse Auction, and e-Catalogue/Purchasing, e-Procurement can be viewed more broadly as an end-to-end solution that integrates and streamlines many procurement processes throughout the organization (Nyangaresi, 2016). In Kenya the shift from manual to E-Tendering was launched in 2018 in a bid enhance transparency and credibility in the management of public finances and tendering process through the Integrated Financial Management Information System (Hazarika and Jena, 2017). Procurement of goods and services constitute about 50 percent of the government's annual budget and the E-procurement platform 1 will save substantial financial resources and help in instilling confidence among taxpayers that they are getting value for their money. The system will strengthen the government-supplier relationship by providing easy access to information and documentation, simplify the bidding process and ensure cost saving for the Government and taxpayers (Biwott, 2015).

Although public procurement is perceived as a primary function of government, and although governmental entities, policymakers, and public procurement professionals have paid a great deal of attention to procurement improvements or reforms, public procurement has been a neglected area of academic education and research (Basheka, 2020). In County Government of Turkana there is still mismanagement of the County funds, the theft cases, odd procedural ways of managing funds, buying un-budged equipment and lack of a clear plan on the use of the public funds (Eweet, 2020).

2.12   E-commerce as a booster for the local economy

E-procurement is one of the largest drivers of change in any industry. E-commerce, mass customization, personalization of products and prosumption are also opportunities for capitalization by local businesses and can boost local economy for three main reasons. First, the improvements in the logistics of deliveries

can make local production more efficiently accessible (Bevh, 2018; Lange and Santarius, 2018). Second, digitalization can increase efficiency in the production and allocation of goods. Small-batch production offers an opportunity to SMEs and a renaissance to previously more economically successful sectors (e.g., the textile sector) (Bevh, 2018). Efficiency gains through precision framing could also play out in urban and regional food production. Moreover, digital platforms may help in organizing sales more efficiently. Farms can post online which products they have to offer and interested consumers can reserve them ahead of time. The suppliers can then deliver the product to an agreed point of sale where the consumers pick up their purchase. Similarly, subscription models to Communities can be boosted through digitalization, which may help reach a larger number of potential customers. Third, blockchain technology supports direct trade for example by creating a decentralized booking system.

2.12.1 Components of e-Procurement e-Informing

This process rather precedes the purchase. E-informing does not take part directly in the purchase process. It collects and distributes information from and to domestic and foreign parties using the Internet technology (Humboldt State University, 2020). The extent to which important and private data is transmitted to the supply chain partner therefore provides a better efficiency and high level of supply chain performance. The sharing of information also takes into account the quality of information. This covers information exchanged accurately, promptly, sufficiency and credibility (European Bank for Reconstruction and Development, 2020). This process occurs especially in Enterprise Resource Planning (ERP).

e-Tendering

e-tendering is intended to strengthen the process of awards for the acquisition of small, but highvalue, specialized works, products or services (UN, Asian Development Bank, and Korea South 2017).

e-Auctioning

E-auction is the process of conducting an auction to sell assets, natural resources or other goods through online competitive bidding. Compared to physical auction, electronic auction provides complete transparency and enables more parties to take part (Chepkwony, Joel and Charles Lagat, 2021). It provides powerful reporting and measurement: Company can see all the data about the tender instantly and perform analysis by reporting.

e-Purchasing

Unlike e-Tendering, e-commerce is used to acquire low value and large volume products and services. The purchase process for such goods and services is simplified online. Catalogues are one of the most significant components of this form of buying. Key components of this system are frequently complicated, thus development of the system is often necessary. The procedure begins with the online published products by the suppliers and continues with the electronic selection, ordering, receipt and payment by the buyer (Tieto, 2019).

2.12.2 Reverse Auctions, Supplier Performance and Development

In the online negotiation process, suppliers are influenced by the proposed bids of their competitors; and in the process of winning the tender, each supplier lowers the bid and tends to win the business with thin margin. ORAs is a way of working that changes the behaviour not only of buyers but also of suppliers. Since the products and services purchased constitute a large portion of the cost of goods sold, buyers may put ongoing pressure on suppliers; and suppliers are often forced to accept this pressure to continue to win tenders or receive orders. This, however, can be detrimental to their logistics performance. Despite the growing interest in multi-criteria reverse auctions and the advantages they suggest, suppliers must receive training and support, which are a mandatory condition to successfully conduct and benefit reverse auctions. This would also help them to develop.

In the past, with the traditional purchasing practices, organisations focused on supplier selection and comparing bids but now the need for a more strategic approach is emphasized. Suppliers must be evaluated to obtain the necessary information that is used in strategic decisions related to supplier selection and supplier development. This also plays a role in supply risk management. The approach highlights the need for complex evaluation processes and shifts attention to supplier management and supplier development in the creation of long-term competitive advantage and managing risk.

Strategically, purchasing relies on a broader toolset for evaluating suppliers, ensuring good performance and reducing the likelihood of non-performance. This evaluation process involves undertaking a set of activities that include pre-qualification and post-qualification, alongside supplier selection, to ensure the availability of information about the performance and capabilities of suppliers. Hence, the importance of the pre- and post-qualification phases is increasing because these phases are used to provide input for supplier management activities, including supplier development, making purchasing more of a strategic task.

2.13   THE RESEARCH GAP

There is a new global trend in the business environment of e-Procurement, which is helping organisations to enhance the competitive advantage of organisations. This is mostly happening in the developed world. In most of the developing countries the adoption of e-procurement and most importantly that of the procurement negotiation tool, ORAs, is still slow. The reason for this is partly, the existing protected long-term buyer-supplier relationships, which are affected by governments' agendas on supplier development, legislation and BBB-EE requirements (in this case South Africa). In the developing countries, this concept has not been fully embraced for the assumption is that ORAs will adversely affect the established relationships, and negatively impact the supplier development plans. According to (Mishara, Konana and Barua (2007), the Internet-supported procurement is a fundamental component of e-business in modern organisations, that carries the potential to significantly increase the buyers' and sellers' benefits for example, generating savings of between 50 billion and 70 billion euros (Meyer, 2011). Though the primary objective of ORAs is to cut the organisation's procurement costs and to save time, they are however, faced with serious challenges which include:

- the potential damage of buyer-supplier relationships (Madzimure, Mafini, and Dhurup, 2020) .
- suppliers' trust in buyers (Nadler and Kros, 2010) potentially being negatively influenced by technical problems, rumours or an inadequate auction format.
- bad ORAs process practices such as running ORAs without the intent of awarding business, collusion of suppliers, awarding contracts more often to incumbents, submission of abnormally low bids or delivery of lower quality products/works; and
- buyers running ORAs not in a fair manner, which requires clear explanation and communication of non-discriminatory auction rules and conditions to suppliers.

Research has been done in the area of e-commerce, purposely to come up with solutions to these challenges. However, according to the extensive literature review done by the researcher, the research has mostly concluded narrowly around intermediate outcomes, namely, cost savings and time savings. (Saprikis,2013) stated that limited research has been done to primarily look at specific problem areas such as legislation, supplier performance, and specific buyer-supplier relationships. To make matters worse, this has been generic. Hence, still not enough research has been done, for example, to explore the appropriateness of ORAs usage (Gelderman, Semeijn and Nagel, 2017; Yeniyurt *et al.*, 2011).
 to explain why procurement professionals decide to utilise ORAs, to discover the performance of the suppliers after winning the contract (Aital, 2017), to examine how and why procurement professionals reach the conclusion that ORAs are appropriate for a particular procurement situation; focusing on the mechanisms that can be used to alleviate adverse outcomes of the quality of the relationship with

suppliers and about the quality of the offering (Aital, 2017), and to create a more complex model taking into consideration additional aspects, such as the type of work, and the volume of the contract or the attractiveness of individual buyers. In addition, according to (Hanák, Marović and Jajac, 2018), the assessment of financial savings potential that can be achieved through auctions also still needs further research.

It is not even known whether ORAs fit in the context as currently designed and the manner in which they are currently implemented. To the researcher's knowledge, there is also no framework that can govern online reverse auctions in a developing country effectively. It was noted that the existing frameworks (Diola, 2015; Riccardo Dulmin and Valeria Mininno, 2012; Jap, 2007) are not fully addressing the challenges faced in developing countries like South Africa. All this implies that the examination of ORAs is considered to still be in its early stages, leaving research with much more to uncover (Saprikis, 2013).

This study therefore was done as an attempt to fill this gap, focusing on the dynamic and complex challenges that are faced by developing countries by answering the following fundamental questions:

2.14   Research Question

How can the adoption (*including implementation and use*) of Online Reverse Auction (ORA) be improved among the private and public business enterprises in South Africa?

Sub-questions

- What is the state of ORA adoption among the private and public business enterprises in South Africa?

- Why is the ORA innovations not optimally adopted in private (corporate) and public (parastatal) enterprises in South Africa?

- How can the inhibiting factors be mitigated to enhance effective use of ORAs in the private and public sector in South Africa?

The study investigated if the tool of ORAs positively contributes and improves sourcing practices, particularly between buyers and suppliers in South Africa.

It was critically important that this research investigated the effect of ORAs on buyer-supplier relationships underpinned by the current South African economic environment on supplier development and job creation. The study was intended to determine the root causes that lead to slow adoption of ORAs and scepticisms about its effectiveness in organisations in a developing country, using South Africa as a case.

Findings on the third question pointing to the essence of a revised enabling framework as the main contribution.

2.15 CONCLUSION

The purpose of this review was to understand trends in composition studies and see how ORAs have evolved and how other factors influence and affect the use and implementation of ORAs. It is clear from the research reviewed that ORAs are significant, relevant and not overly complicated, considering the human element on relationships, which can be negatively affected by perception on risks, doubts and mere understanding on how different ORAs work and their impact. SMEs are posing their own dynamic sensitivity, which cannot be ignored for the benefit and sustainability of ORAs in the SCM fraternity. This field of inquiry is important as it has the potential to disrupt the entire SCM.

Furthermore, the literature review has revealed many pieces of information about Reverse Auctions and in particular, the Buyer-Supplier Relationship. Elements from the review have been combined to create a proposal model for online reverse auction implementation based on the motivation of reducing purchase prices and developing/maintaining a collaborative relationship with the suppliers. As there are rapid advances in information technology and ORAs, the literature review needs to be updated constantly to capture the latest breakthroughs and uses of ORAs. Advancement in information technologies appears to be one of the main drivers for these innovations. Lower costs of computing and communication have changed the structure and the operation of the electronic reverse auction to become economically feasible. The next chapter discusses the models to test the hypotheses. Recent and current literature has been a challenge to source, and in some topics, it does not exist, or at least, I could not find it.

The review of the literature has laid a foundation in the identification of the gap that exists on ORAs in developing countries. The literature is extremely limited and hard to find. Recent scholarly literature is not easily accessible; rather there are many informal and general writings of information on online tools, which are based on trend, assumptions and observations that are not empirically tested and proven. The main problem that was investigated by this study, as mentioned above, was the fact that using ORAs instead of more traditional negotiations may have a negative impact on the buyer-supplier relationship as it may lead to supplier suspicions of buyer opportunism (Jap, 2007) and less supplier commitment to the relationship (Tassabehji *et al.*, 2006). Online auctions cause the speed of information to be rapid, with instant communication and feedback, and a significant reduction in negotiation time and preparation. Instead of protracted negotiations through the phone, fax and email over weeks and months; but most importantly, with online auctions, there is no direct, face-to-face communication between buyers and

sellers like in traditional auctions. In this study, the   extent to which Online Reverse Auctioning affects buyer-supplier relationships in South African organisations was investigated.

This review highlights a need for a customised framework for ORAs in South Africa. The research methodology and findings assisted with the content, form and the shape of how the framework should look like. By achieving this, the study immensely contributes to the body of knowledge, particularly in this era of technology and the fourth industrialisation and technology disruption. The next chapter presents the theoretical framework.

3. CHAPTER THREE: THEORETICAL FRAMEWORK

3.1 INTRODUCTION

This chapter presents theories and models that are relevant to ORAs. It draws on these theories and models to assess the theoretical rigor in the discipline, a link between theory and practice, as well as the adequacy of existing frameworks to a practically facilitate ORA adoptions, implementations and use in the developing country business contexts. Indeed, existing theories offer a useful conceptual context on the vocabulary of the study. They further offer analytical lenses through which a project investigation was framed, albeit, with an apparent gap in terms of an enabling framework to facilitate ORA adoptions in the South African context. Consequently, an alternative framework was devised as a solution, and therefore, the main contribution of this study.

The chapter is structured into 5 sub-sections – starting with this introductory portion in section 3.1. After the introduction, section 3.2 discusses the ORAs model, section 3.3 presents the technology and acceptance models, 3.4 elaborates on the supplier-buyer relationship theoretical models, section 3.5 provides the existing conceptual models, and section 3.6 outlines a proposed conceptual framework for ORAs, followed by a conclusion of the chapter in section 3.7.

3.2 Existing Theories and Models on ORA Adoptions

This section discusses models that inform conceptions, vocabulary and frameworks of ORAs, both from the technology adoptions and the strategic business perspectives.

3.2.1 The ORA Models

During the adoption of a technology tool there are many factors influencing the acceptance thereof including the perceptions around risks that may strongly influence the user (Featherman and Pavlou, 2003). Therefore, the adoption decision may not only be based on considerations for the usefulness of the technology, but also on a risk-benefit analysis of a technology by users. For example, users may perceive security technology associated with ORAs, in relation to its performance embedded risks (Yang *et al.,* 2017; Featherman and Pavlou, 2003).

Furthermore, a better understanding and usage benefits about the interrelationships among the analysts of various theories not only contribute to technology acceptance but also provides users guidance when introducing innovations (Hasan *et al.,* 2018, 2017). Emergent in preceding chapters are inadequate adoption and use of ORAs in South African Public and Private sector – with unclear causes, despite an overwhelming appreciation of this innovation in the literature. The slow adoption of the ORAs in South

Africa need to be addressed as a matter of urgency if the South African public and private business entities are to reap its innovative benefits.

A comprehensive understanding about the various influencing factors of implementing or adopting a technology innovation tool is very critical for the success and sustainability thereof. These are the following factors/facilitators of ORAs adoption and implementation:

- Usability of the ORAs systems
- Usefulness of the ORAs systems
- Perceived ease of use
- Frameworks and processes
- Relationships on buyers and suppliers on using ORAs
- Costs implications
- Being informed- awareness
- Enabling technical conditions
- Usage of ORAs

Appropriate tools, frameworks and models are often adopted to help give a holistic outlook across key considerations for effective ORA adoptions. To this effect, the following facilitative theories, models and frameworks on ORA adoptions are engaged in the following sections of this chapter:

3.2.2 Technology Acceptance Models (TAM2 and TAM3)

The most widely recognized theoretical tool to view, understand and analyse adoption of technology systems in recent research is the Technology Acceptance Model (TAM) as proposed by Davie, et al (1989). TAM offers an analytical lens and a holistic outlook into motivations (or lack of), and thus guidance on how to accept, introduce and adopt technology innovations by individuals, organisations and institutions, more successfully (Hasan et al., 2017) as outlined in Figure 9.
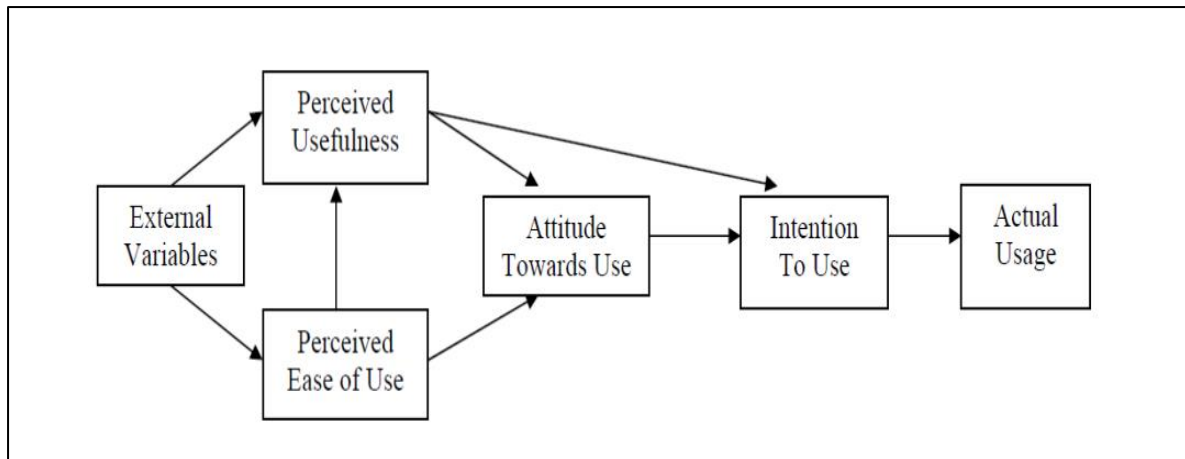
Figure 9:Technology Acceptance Model

Source: Adapted from Davis et al. (1989)

The goal of (Davis' 1989) Technology Acceptance Model (TAM) was to explain the general determinants of computer acceptance that lead to explaining users' behaviour across a broad range of end-user computing technologies and user populations. The basic TAM model offered four specific assumptions on the acceptance and use of a technology, such as ORAs. Firstly, that that perceptions on usefulness of a technology, framed as Perceived Usefulness (PU), Perceived Ease of Use (PEU), an Attitude to Use (ATU), and an Intention to Use (ITU). This is outlined in a graphical illustration in Figure 9.Though "it is difficult to disentangle direct effects of subjective norm on behavioural intention from indirect effects via attitude" (Davis, 1989 p. 986), it can be hypothesized from this theory that negative perceptions on these assumptions would not yield Actual Usage (AU). Similarly, positive perceptions should, however, lead to the acceptance and the Actual Usage (AU) of a technology. Given a confirmation of the essence of the ORA technology in the literature review chapter (Chapter 2), a positive hypothesis can be deduced to associate positive perceptions with an apparent need for its use.

From this logic, the first set of hypothesis was framed on the arguments that:

- Negative perceptions on usefulness (- PU), together with negative perceptions on usability (ease of use) of a technology (- PEU), leading to a negative Attitude to Use (- ATU), a negative Intention to Use (-ITU) would emerge, which would in turn, inhibit adoption and usage of an ORA technology [-PU; -PEU; -ATU/ -ITU] = inhibited adoption and none-usage[-AU].

- Positive perceptions on usefulness (+PU), together with positive perceptions on usability (ease of use) of a technology (+PEU), supported by a positive Attitude to Use (+ATU), a positive Intention to Use (+ITU) would emerge, which would in turn, yield (results into) the Actual Usage (AU) of an ORA technology [+PU; +PEU; +ATU/ +ITU] = Adoption and Actual Usage[+AU].

The two assumptions are reflected in the opening hypothesis of the study, the Hypothesis 0.

Research Hypothesis 0

H00:   In South Africa, the positive perception on online reverse auctions will not result in high adoption

H01:   In South Africa, the positive perception on online reverse auctions will not result in high implementation and use.

The same set of opening hypotheses offered insight towards the contextual questions of the study.

It may be a positive perception that would facilitate acceptance, or in case of a negative perception there will be no acceptance, let alone usage. However, continued use is also dependent other factors outside of the technology itself, such as electricity (in the case of South Africa), or literacy levels of those who should use it. The cost of a technology could be another variable that could inform acceptance or non-acceptance, despite a positive perception on usefulness. Even where there are positive perceptions on technology usefulness, or supporting external conditions, persons or organizations would still be wary of accepting and to use a technology if it is perceived to be counter-intuitive (not easy) to use. This is referred to as perceive ease of use. Despite all these considerations, an individual or organization will still need to satisfy themselves that there is a need, a purpose and an intention to use a certain technology – without which there would be no reason for acceptance or use of a technology, or the actual usage (Davies, et al, 1989).

TAM as a model offered a useful lens in this project, from which slow uptake of the ORA technology can be viewed and analyzed. It also offered practical concepts that could be used to understand the phenomenon of technology uptakes and use, thus guiding a development of questions and related explanations in this study. Though useful in this conceptual and analytical respect, TAM could not go far enough to allow the administrative, policy, and financial as well as deeper issues of development that transcend beyond a mere perceptual discourse. For this reason, it became necessary to explore other theoretical frameworks for increased analytical insight. To this effect, the revised versions of TAM, including the Theory of Reasoned Action (Davies, et al, 1990) together with TAM 2 (Venkatesh & Davies, 2000) were explored for additional insight in Figure 10 and Figure 11.

3.2.3 The Technology Acceptance and Adoption Models

3.2.3.1 Technology Acceptance Model (TAM) and Technology of Reasoned Action (TRA)

Theory of reasoned action (TRA)

Figure 10 looks in depth on what motivates people to take certain action and which behaviour intentionally drives a person to take certain action that will lead to a specific outcome, in this case leading to adoption and usage of technology. Believes, people tend to evaluate a specific subject based on their believes and experiences and that influences their cause of action, therefore it is imperative that the research process puts all the theoretical understanding of behaviour, believes, experiences and attitudes as influencers in adopting technology.
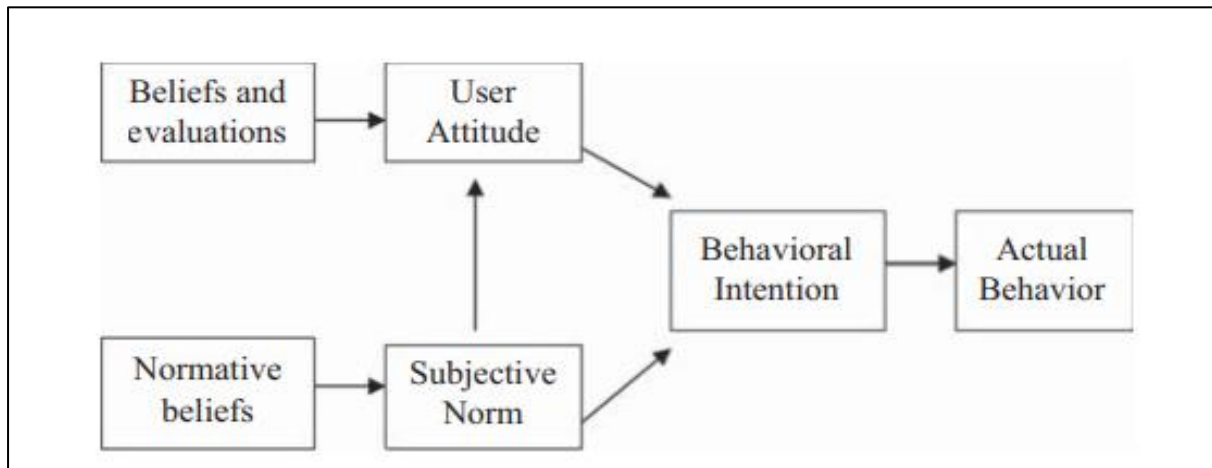
Figure 10: Theory of Reasoned Action

Source: Adapted from (Davis et al.1989)

Normative believes extends to subjective norms as soon as there is subjectivity in the process. It becomes a challenge to pin down the actual reason why people behave in a certain way. Individual intentional and actual behaviours are in the center of system adoptions and usage subjective norms have a direct impact on attitude, depending on the norm of a user the attitude could negatively influence adoption and can easily extend to other users and eventually the whole system implementation can collapse. Many organisations have introduced digital tools, and some have not progressed far especially when influential people`s attitudes were negative and never accepted the implementation. Digital tools need to be enhanced to stand the test of time on their own merit with very limited or absence of human behaviour deciding on their success or failure. Hence the need for a refreshed and upgraded framework to realise the future state on systems` adoption and usage. However, the TRA model was further critiqued

on the basis of gaps in articulating and expressing the holistic factors to explaining system adoption hence, leading to the revisions as outlined in TAM2.

In this respect, Venkatesh and Davis (2000) proposed improvements to TAM, resulting into the TAM 2 adaptation as shown in (Figure 11). Drawing on this framework, there is a positive corelation between adoption and use of a technology, and perceptions of users on system usefulness at three (3) points in time: pre-implementation, post-implementation and postimplementation. TAM2 theorizes that users' mental assessment of the match between important goals at work and the consequences of performing job tasks using the system serves as a basis for forming perceptions regarding the usefulness of the system (Venkatesh and Davis, 2000). The results revealed that TAM 2 performed well in both voluntary and mandatory environment. Below are the two revised models from the original TAM, Venkatesh and Bala, (2008) combined TAM2 (Figure 11) expands the theories and look further than just an individual behaviour, beliefs and norms, to the external factors which are directly linked to the technology itself, such as the relevance of technology in the job that one does, its benefits and quality output. Technology must be easy to use otherwise users will avoid using it and must bring tangible and practical benefits for adoption to be more acceptable and attractive to the users. Outcome and value add of the technology must be validated and proven.
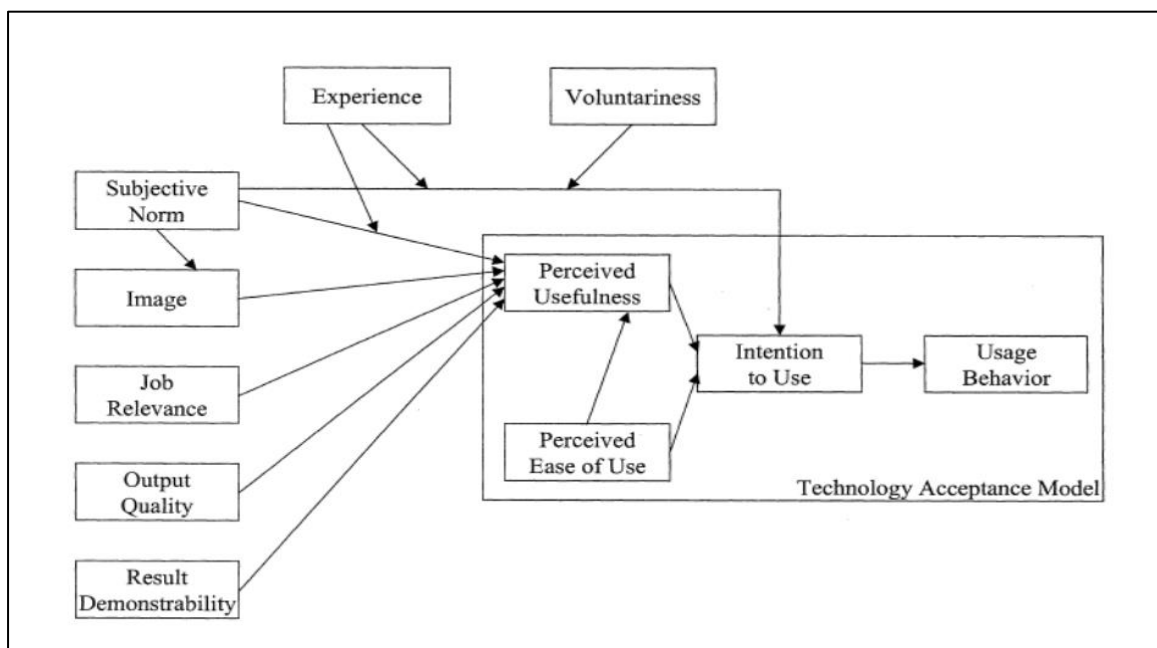
Figure 11:Technology Acceptance Model (TAM2)

Source: Adapted from (Davis *et a*l.1989, Venkatesh and Davis, 2000)

4IR technology systems are in the rise and competition is high and users must find it useful and acceptable to acquire certain tools for their organisations, failure by the system to demonstrate all the

features expected adoption will be negatively affected and literature supports states that as a fact. Introducing a tool that will not improve current processes and driving efficiencies would threaten the quality of processes and outcomes. Looking at the SAP (procure to pay) system for example, it had to be reconfigured to reduce specifications due to its initial complexities, to help improve response time for users to post transactions as compared to the old legacy systems. Users were always in training and very little understanding was achieved from long, complicated, and expensive and loss of productivity by organisations. Due to high implementation costs, organisations had to pay more to simplify the system. Not all systems will survive and sustain longevity therefore reviews are required on what is required to increase adoption and usage of digital tools and potential ORAs in South Africa. A further improved model was introduced in 2000 (Figure 12) TAM3.

TAM3 by (Venkatesh and Davis, 2000) is using the four different types including the individual differences, system characteristics, social influence, and facilitating conditions which are determinants of perceived usefulness and perceived ease of use. Perceptual determinants of technology acceptance, adoption and use outlined in TAM (Figure 9) and the Theory of Reasoned Action (
Figure **10**): the PU, PEU, ATU, ITU and ultimately, AU, are further moderated in the TAM3 research model, by the following determinant: computer anxiety, behavioral intention and experiences. The TAM3 research model was tested in real-world settings of IT implementations (Figure 12).
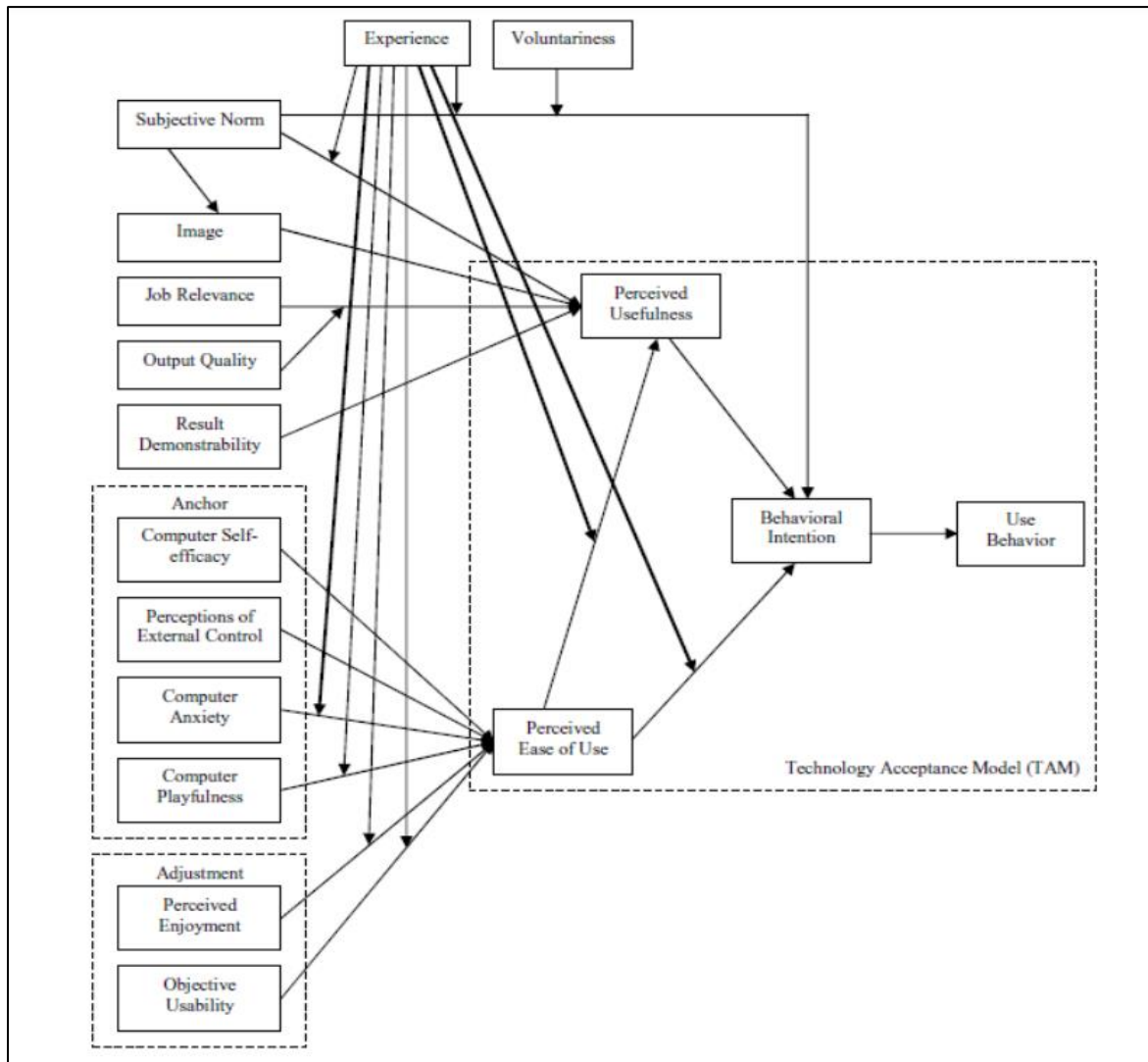
Figure 12: Technology Acceptance Model (TAM3)

Source: Adapted from (Davis et al.1989, Venkatesh and Bala, 2008)

TAM3 with its improvements that broad in broader and expanded influencers and factors than the previous TAM multiple models. It had packaged the model into categories where there are anchors and adjustments which influences the reception of ease of use. anxieties are a threat in adoption and external factors which may be beyond users control and they need to be managed. Enjoyment and playfulness are put in the mix, users must enjoy using technology with less complexities, financially reasonable, less disruptions on connectivity and glitches. These are useful factors that will shape the study to concentrate on things that matter and will add value in the ICT community. System adoption must be a pull not a push approach, users must volunteer and be willing to use the technology rather than be forces and threatened to adopt systems. Experience of one user will extend to other users be it good or bad hence first user experience must be amazing and appealing for future use and embrace.

The common theme in all the above-mentioned TAM models have provided a clear and in-depth understanding of the major contributors in adoption and usage of digital tools. The models have expanded the views and knowledge of the researcher to enable unpacking and the application of the challenges faced in South Africa. Generally, the important silent points where captured:

- What are external variables associated with the adoption, perceived ease of use especially with unique challenges facing South Africa on expensive internet data with limited spectrum or the unavailability of the internet because of constant power failures.

- Intention to use may stop suppliers form participating with uninformed perceptions that the buyers are trying to squeeze to much savings from them and the manipulation of the system to favour specific supplier(s). what is driving the negative attitude not to adopt the tool to eventually boost the high actual use of the tool.

- Are people finding the system too complicated to use, intimidating, moreover are people aware of the existence of the system or what are the unfounded theories about the system that prevents businesses from adopting this efficient technology that will eventually promote agility and positive benefits on pricing/savings and governance.

Theoretical moderations of the TAM assumptions as reflected in TAM 3 (Figure 12) suggests that perceptions alone seem inadequate to offer a holistic account of technology acceptance mediators. To this effect, TAM3 acknowledges the role of (i) Experience, (ii) Subjective Norms, (iii) Image, (iv) Job Relevance, and a relationship with (v) Output Quality as measured through (vi) Demonstrated Results. Literature foundations in Chapter two suggests that experiences together with subjective norms, as well as the essence to work requirements (job relevance) inform positive perceptions on the ORA technology in the private and public sector. Though this observation falls short in explaining continued adoption limitations of ORA in the public and private sector in South Africa, it helps to offer analytical insight into the project inquiry. Hence, from these additional considerations an added layer of Hypothesis 1 and Hypothesis 2 were devised:

Research Hypothesis 1

H01:   In South Africa, the positive perception on online reverse auctions will result in high adoption

H11:   In South Africa, the positive perception on online reverse auctions will result in high implementation and use

Research Hypothesis 2

H02:   In South Africa, the negative perception on online reverse auctions will result in low adoption

H12:   In South Africa, the negative perception on online reverse auctions will result in low implementation and use

In the context of this study however, the current models only offer a general insight into the perceptual factors, without a full account on the minute determinants of these factors of adoption and use of ORAs. Though offering a useful analytical lens (and a conceptual basis) to the study, the following limitations are apparent in the TAM models:

- The models have largely concentrated on the users' experience, behaviour and perception with no evidence incorporating other business-related factors
- Internal and external users explicit driving factors on adoption and usage.
- There are no clear tools that will assist users to adopt technology at an accelerated pace.

From the technology usefulness perspective of TAM (Figure 12), both the subjective norm, experience and output quality are flagged as essential in technology acceptance and use. Perceptions of control (be it seen as enabling or inhibiting) are also cited with the same level of significance in this theory. In the ORA technology context the role of relevant stakeholders in the ORA engagement stands out, with the role of users (producers, buyers, sellers and distributers) emerging as an important component. Technology adoption in the supply chain environment for example, may require the buyer (seller, employing organisation) and the supplier (the selling organisation) to both have the same vision and intentions in driving efficiencies through process improvement and digitalization if a common adoption position is to be synchronized. One party cannot succeed without the other. Nevertheless, other scholars (Legris, Ingham and Collerette 2003) considered the models to be useful but must be integrated into other broader and advanced frameworks which would include variables related to both human and social change processes, and to the adoption of the innovation model" (Legris, Ingham and Collerette 2003).

Prior to proposing a new framework, a detailed understanding of the buyer and supplier connectedness would help expand assumptions of the TAM models. Hence, the buyer supplier phenomenon is unpacked for deeper insights into moderating factors of each perceptual moderator in sections 3.3 and 3.4.

Whilst Davis, *et al.,*(1989) defined users' perceived ease of use as "the extent to which the potential user believes the system or technology would be free of effort" Davis *et al.,* p.985). In support of this observation, Abramson also found the perceived ease of use of a technology to significantly influence

attitudes toward use of the Business Intelligence systems in an m-learning environment (Dawson and Stevens, 2015). An overview of the buyer-supplier relationship models seeks to explore the impact of the attributes of ORAs on buyer-supplier relationships in South Africa.

3.2.4 Online Reverse Auction Attributes

Drawing from the diagram in Figure 13 below, constructing ORAs attributes for both sellers and suppliers. This is a very powerful system that has a two-way communication between the buyer and seller in real time. It demonstrates strong transparency process, audit trail, recording of the process without any human intervention, compliance with contract terms and conditions, eligibility, loading of catalogue. The list is long and extremely impressive. Assumptions were also made that it is a straightforward and easy to use system, it will be difficult to manipulate especially by the buyers, the security features are adequate and not easy to be a victim of cybercrime. The setup process and costs are low since it is a cloud-based system and can be easily accessible from the internet as long as the supplier registers with the associated corporate.
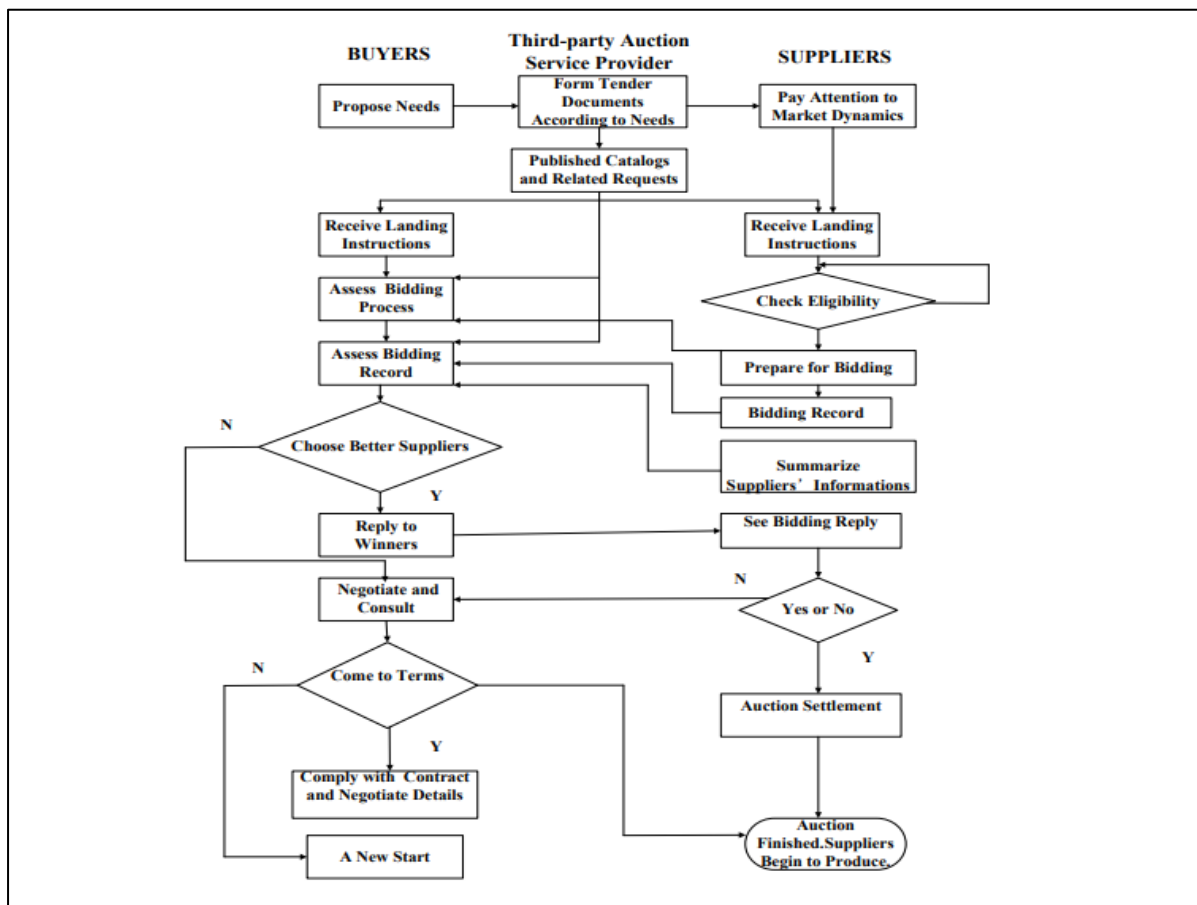
Figure 13: Processes of multi-attribute Reverse Auctions
Source: MingYana, Yurong Yuan (2011)

3.2.5   The Online Reverse Auctions Model

Outlined in Figure 14 are Online Reverse Auctions (ORAs), buyer-supplier relationships and information on behaviour including the framework as underpinning concepts of this research. The ORAs model examines the relationship between supplier-buyer collaboration, adaptation, trust, commitment and relationship continuity. A number of authors however, argue that online reverse auction tends to focus on buyer's preferences, and ignores seller's preferences (Tayaran and Ghazanfari, 2020). In other words, sellers often do not have the opportunity to improve their bids in an auction, while buyers have multiple alternatives from different sellers to optimize their purchases. As shown in the model, the relationship between supplier-buyer collaboration and relationship continuity is mediated by adoption, implementation and Use (Haung and Haung, 2019; Morgan and Hunt, 1994; Han and Wilson, 1993; Heide and John, 1992).
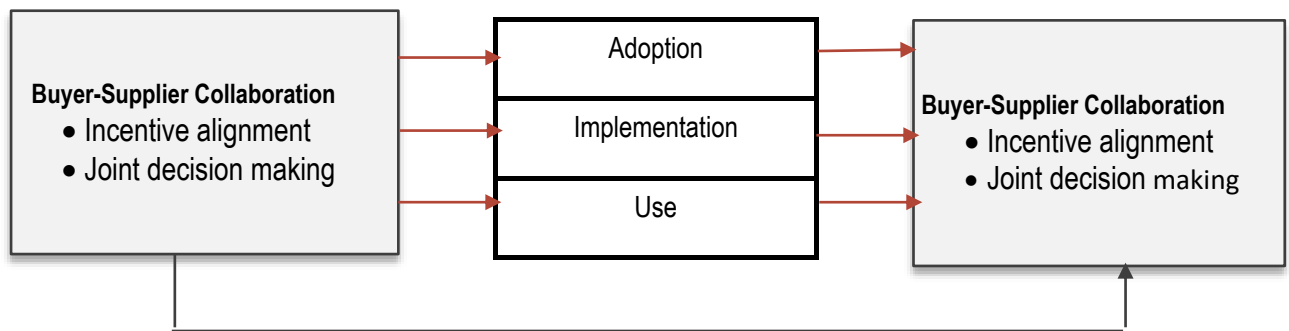
Figure 14: ORAs Model and Buyer-Supplier Relationships

Source: Modified from the works of Cortezand and Johnston (2019); Tatić, Džafić, Haračić, and Haračić (2019); Sousa, C.M.P. and Bradley (2008); Goran (2005); Simatupang and Sridharan (2005) Kaynak (2003);Walter and Ritter (2003); Cousins (2002);Gilliland and Bello (2002); Ellram and Edis (1996); Ramsay (1996);;) and Heide and John (1992)

In line with this model, most private organisations collaborate with their suppliers to ensure relationship continuity through customer satisfaction, supplier retention, future expectations and intentions and relationship loyalty by sharing information, making decisions jointly and aligning incentives. Collaborative innovation is necessary to explore and implement circular economy strategies (Brown, Bocken and Balkenende, 2020). The way buyer-supplier collaboration is formed, whether formal or informal, will prescribe the appropriate level of adaptation, trust and commitment to deploy, which may enhance relationship continuity (Martins, Machado, Queiroz, and Telles, 2020; Pan, Trentesaux, Ballot and Huang 2019; Simatupang and Sridharan 2003; Wilson, 1995). suggest that the requirements for effective collaboration are mutual objectives, integrated policies, joint decision-making, information sharing, sharing of benefits and losses. Furthermore, (Walter and Ritter ;2003) Pham, Nguyen, (Mcdonald and Tran-Kieu 2019) believe that collaboration in adoption, joint implementation and use of the system increase satisfaction for the buyer, building loyalty, and improve supplier retention through repeated

purchases. The decision by customers to re-purchase from the same service provider depends on their past experiences (Corrada, Flecha and Lopez, 2020; Wathne *et al.*, 2001); their perceptions of value from previous service encounters (Ma, and Wang, 2021; Bolton *et al.*, 2000) and expectations of the future business relationship and improvements of benefits will result in more satisfied customers with greater loyalty and an enhanced competitive position (Othman, Khatab,, Esmaeel, Mustafa, and Sadq, 2020; Kaynak, 2003).

When a customer is satisfied with a supplier, this also means that they know that the supplier can deliver what is expected, and thus the perceived risk associated with choosing a familiar supplier (who fulfils expectations) is less than the perceived risk associated with choosing an unfamiliar supplier, or a familiar supplier who has not met expectations in previous experiences. Several studies and theories have established the relationship between buyer-supplier collaboration, trust, commitment, adoption and relationship continuity. It should be noted that most of the established relationships between these variables have been focused on developed countries. According to (Ariffin, Mohan, T and Goh 2018; Mugarura 2008). a study attempting to establish these relationships in less developed countries is necessary for logical and universal conclusions, as well as their application. Having established the ORAs model in relation to the core adoption and acceptance models of technology holistically it is also important to observe and discuss the supplier-buyer relationship. Hence the next topic discussing the relationships models in-depth.

3.3   SUPPLIER – BUYER RELATIONSHIP THEORETICAL MODELS

This section explores three existing supplier relationship management models, which were used to solve the dilemma of complex supplier-buyer relationships, especially when using reverse auctions. The models are:

   I.   Generic Supplier Relationship Management Types Robertson Cox
   II.   Buyer-Seller Relationships Cannon and Perreault's model
   III.   The Key Mediating Variable (KMV) model, Morgan and Hunt

The three supplier relationship models assisted in assessing the implementation of ORAs in the context of a developing country, and how this affects prominent factors such as enterprise development, job creation and cultural dynamics. The study, therefore, could create a view on whether ORAs can be successfully implemented in these countries given the mentioned challenges and government priorities. The study concluded with a proposed suitable framework for a developing country (on the African continent).

The purpose of the models is to explore different existing relationships models, which resonates with this study since the core of the study is based on buyer-supplier relationships. The main issue is how ORAs affect buyer-supplier relationships (positively or negatively), therefore when using ORAs one has to use the tool in conjunction with the best relationships model to achieve the best results and to protect fragile relationships between buyers and suppliers (Son, Kim, Hur and Subramanian, 2021). In this section, the study, firstly, looked at (Robertson Cox's, 2001) model, followed by (Cannon and Perreault,1999) model and finally, concluding with the Key Mediating Variable (KMV) model which was later modified. These models are in line with the study objectives in relation to buyer-supplier relationships (Hammerschmidt, Wetzel, and Arnold, 2018).

3.3.1   Making Supplier Relationship Choices (Robertson Cox Model)

The Robertson Cox model sets out the generic relationship types that can be found in business markets. It does not tell managers what type of relationship to adopt. With particular reference to circumstances, they face. To do this, the manager needs to consider a number of questions. Managers need to ask the following questions: First, what are the likely benefits of collaboration? Second, what will be the cost of the collaborative activities to the firm? Third, what is the probability of the collaborative activity being successfully executed? Fourth, what is the power relationship with the supplier?

Lastly, how will this impact the supplier in collaborating with the buyer, and if it will affect the way in which the surplus value created will be divided (Chicksand and Rehme, 2018; Cox *et al.*, 2003; Watson *et al.*, 2003). Having considered some factors, the procurement manager will be able to assess (when deciding) whether it is desirable or possible to enter a collaborative relationship with a supplier allowing the entity to know which of the two parties is likely to dominate the exchange (Bandara, Leckie, Lobo and Hewege, 2017). In order to understand supplier relationship management and to identify the types of relationships that can be found in business markets, it is necessary to view relationships as consisting of two main dimensions. These dimensions are the way the two parties work together and the way in which the surplus value that is created in the relationship is shared between the two parties. According to (Iung, Ivanov ,Panetto, Wang and Weichhart 2019; Cox 2001) working methods can be considered as consisting of a choice to be made between a collaborative way of working and an arm's-length way of working. By an arm's-length way of working, we mean that the two parties engage in very little contact during the relationship, beyond the exchange of the basic commercial information (i.e., what is to be supplied, at what price, by what date, et cetera), that needs to be exchanged for a transaction to take place. Such a level of interaction will often be highly appropriate when the transaction involves the supply of basic "off-the-shelf" goods and services (Florio, Giffoni, Giunta and Sirtori, 2018).

A collaborative way of working is where the level of interaction is higher, and the relationship involves the creation of additional surplus value through some form of innovation or waste reduction (Donner, Gohier and de Vries, 2020). Supply relationships, therefore, fall somewhere on a continuum between arm's-length and collaborative. Clearly, the more a buyer and a supplier engage in the categories of activities, the closer towards the collaborative end of the continuum the relationship is. This then constitutes the first of the two main supplier relationship dimensions (Amoako-Gyampah, Boakye, Adaku and Famiyeh, 2019). The second dimension of a supplier relationship is the division of surplus value. This dimension can be explained with reference to basic economics. As was mentioned earlier, the term "surplus value" refers to the difference in the transaction between the supplier's costs and the buyer's utility function. A supplier is not expected to go into business if there is no prospect of making a profit. Therefore, included in its costs is a reasonable profit margin, something economists refer to as "normal profits." (Thomas, 2020).

The buyer's utility function, meanwhile, is determined by the extent to which it values the product. If the product in question is priced beyond its utility, then it will exit the market.

The importance of these two points is that they allow the transaction to aim for a certain terrain. That terrain is referred to as the surplus value. Having identified the concept of surplus value, the factors behind how it is shared between the two parties is explained in this section. The major factor is buyer-supplier power (Mabrouk, 2020; Cox *et al.*, 2003; Cox *et al.*, 2002; Cox *et al.,* 2000). By combining insights provided by sociology, industrial and institutional economics, it has been shown that buyer-supplier relationships can be characterised by one of four generic power positions (Matopoulos, Didonet, Tsanasidis and Fearne, 2019). These are buyer dominance, supplier dominance, buyer-supplier independence and buyer-supplier interdependence. How the surplus value is shared is related to which of these four power positions pertains. Where the buyer is dominant, the buyer takes all the surplus value. This is also the case where there is a situation of independence (Chicksand and Rehme, 2018). The reason why the buyer can take all the surplus value is that in both situations, there is a competitive market. In a situation of interdependence (i.e., both parties are highly reliant on each other), the surplus value is shared, as the two parties are both able to negotiate from a position of relative strength (Zanoni, 2019). Finally, where the relationship is characterised by supplier dominance, the supplier takes a majority either of the surplus value or all of it. If the supplier is unable to price discriminately, it may well be that an individual buyer's utility function is still more than the price being charged by the supplier (Baraiya, Das, Jakhar, Kumar, Mangla Xu and, 2021).

All the situations described above relate to an arm's-length relationship, and the surplus value that is created by the supplier is a standard offering. However, the division of surplus value can be modelled when the relationship between the buyer and supplier is collaborative in nature.In economic terms, the reason why a buyer and a supplier enter into a collaborative relationship is to either reduce the supplier's costs or increase the buyer's utility (Steward, Narus, Roehm and Ritz, 2019). For example, a buyer and a supplier could decide to undertake an exercise of process activity mapping. Having mapped out the process, they may decide that there is a considerable waste in the process that can easily be eradicated. This action will reduce the supplier's costs and increase the amount of surplus value (Hosseini, Morshedlou, Ivanov, Sarder, Barker and Al Khaled, 2019). Alternatively, a process activity mapping exercise could motivate an adaptation to the configuration of the supplier's product. Thus, helping to simplify production process, cost-effectively. If this was the case, this innovation would increase the buyer's utility function for the product.

If this increase in the buyer's utility was greater than the increase in the supplier's costs, caused by the adaptation, then there will also be an increase in the amount of surplus value. However, even if there has been a collaboration between the two parties that has led to an increase in the amount of surplus value, there is still the question of how that surplus value is divided. The fact that the two parties have collaborated does not change the fact that the buyer-supplier power relation will determine how that increased surplus value is divided. Having discussed the main dimensions of supplier relationships, the generic relationship types model is illustrated in Table 3 of business markets (Marx, 2020; Goodwin and Punzo, 2019; Cox et al., 2000; Cox, 1999;).

Table 3: Generic Supplier Relationship Management Types

Buyer-Skewed - Adversarial - Arm's-Length	**Buyer-Skewed** - Adversarial - Collaboration
Non-Adversarial - Collaboration - Supplier-Skewed	**Non-Adversarial** - Collaboration
Supplier-Skewed - Adversarial - Arm's-Length	**Supplier-Skewed** - Non-Adversarial - Collaboration
Product Quality - Product performance - Reliability - Consistency	**Service Support** - Product-related service - Customer information - Outsourcing of activities
Delivery - On time delivery - Delivery flexibility - Accuracy of delivery	**Supplier Know-how** - Knowledge of supply market - Improvement of existing products - Development of new products

Source: Robertson Cox, 2001

These generic types of relationships come from the three possible divisions of surplus value and the two different ways of working.

3.3.1.1 Making Supplier Relationship Choices

It needs to be recognised that all that the Cox model does is to set out the generic relationship types. Researchers have identified a movement away from transactional relationships to partnerships, depending on input and procedures (Kanyoma, Agbola and Oloruntoba, 2018; Power, 2005; Lambert and Cooper, 2000) to make different outputs of the relationship as below. Scholars refer to this as 'relationship magnitude', i.e., "the degree or extent of closeness or strength of the relationship between organizations" (Prasanna and Haavisto, 2018, Daugherty, 2011, p. 18). Refer to Table 4.

Table 4: Comparing 'arm's length' and partnership relationship

Characteristics of arm's-length	Characteristics of Long -Term Collaboration
1. Short-term	1. Long-term relationship
2. Decision made on price	2. Decision made on value
3. Many suppliers	3. Few selected suppliers
4. Limited communication	4. Open communication
5. Little coordination of work processes	5. Integration of work processes
6. Information is proprietary	6. Information is shared
7. Conflicting goals	7. Shared goals
8. Behaving opportunistically	8. Mutual trust exists
9. Acting only in own interest	9. Acting for mutual benefits
10. Win-lose orientation	10. Win-win orientation

Source: Adapted from Wittenborn, A. K., Liu, T., Ridenour, Lachmar, Mitchell and Seedall, 2019;Allen, Allen and Lange, 2018; Daugherty, 2011; Power, 2005; Cox, 2004;Cox et al, 2003; Humphreys et al, 2001; Harland, 1996).

Working together/jointly (i.e. Cooperation, Coordination, and Collaboration) "to bring resources into a required relationship to achieve operations in harmony with the strategies/objectives of the parties involved, thus resulting in mutual benefits" (Bandara, Leckie, Lobo and Hewege, 2017). Inhibiting factors around technological, process integration and cooperation issues need to be considered when trying to increase productivity and respond to customer demands (Horvath and Szabo, 2019). Cooperation, therefore, includes the exchange of small amounts of information with fewer suppliers (Cavalcante, Frazzon, Forcellini and Ivanov, 2019; Harland, 1996) and long-term contracts. (Alshurideh, Alsharari and Al Kurdi 2019; Waters 2009) classified cooperation into customer relationship management (CRM) and supplier relationship management (SRM), both having the same principles.

3.3.2   Buyer-Seller Relationships Cannon and Perreault's Model

(Cannon and Perreault 1999) Figure 15 have theories and empirical research across several disciplines; they managed to specify six underlying key connectors that characterise the way buyers and sellers relate and conduct relationships (Aykol and Leonidou, 2018). Recent study by (Dwivedi, Miles, Oczkowski, Weerawadena and Wilkie,2020) purports that, engagement reflect how organizational buyers and sellers conduct relational exchange. Furthermore, their model specifies antecedent markets, purchase

situations, and shows that they affect relationships. The model also shows how customer satisfaction and evaluations of supplier performance vary across different types of relationships.
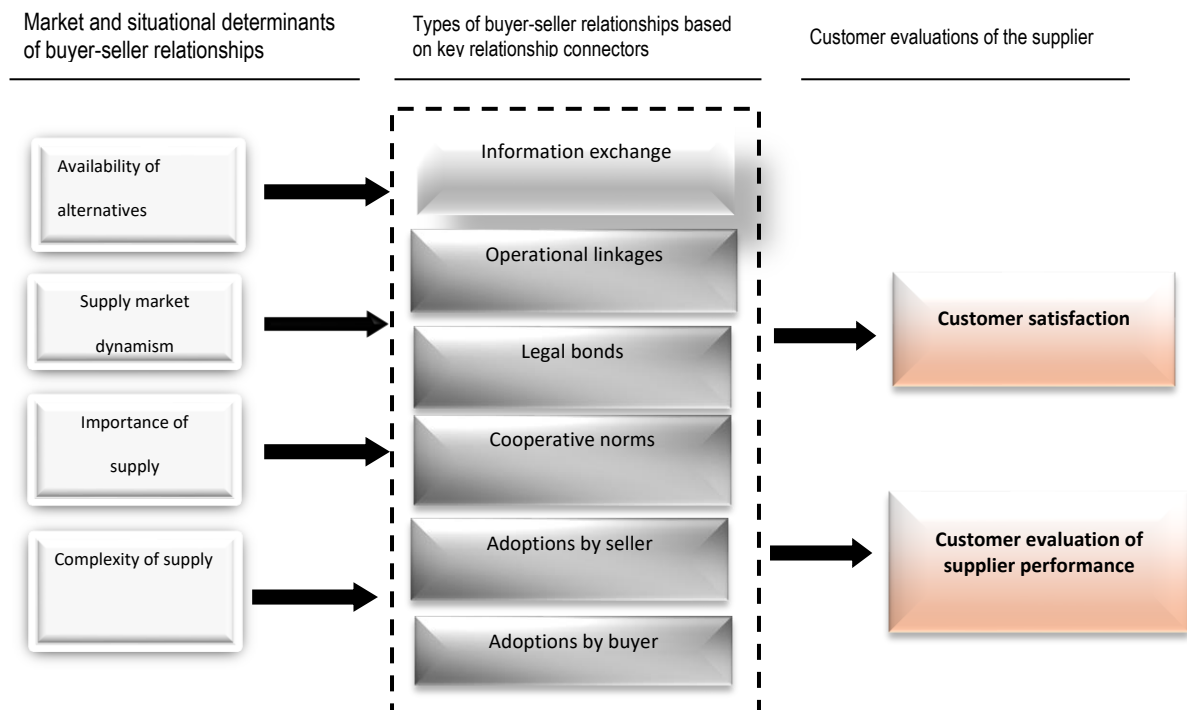
Figure 15:Buyer -Seller Relationship Cannon and Perreault`s Model

Source: Recent study by Dwivedi, Miles, Oczkowski, Weerawadena and Wilkie, (2020), Cannon and Perreault (1999)

3.3.3   Market and Situational Antecedents

(Handfield, 2019; Cannon and Perreault 1999). identified four markets and situational factors reflecting key conditions in which buyer-seller relationships form:

- Availability of alternatives;
- Significant supply market dynamism;
- Importance of a supply focus;
- Strong complexity of supply.

3.3.3.1   Availability of Alternatives

Availability of alternatives to manage tensions and further negatively affecting relations are very vital for organisations to attain both value creation and value-appropriation benefits (Ritala, 2012, Gnyawali and Park, 2011). Coopetition is beneficial, the coexistence of cooperation and competition tends to enhance relationships between partners (Ritala, 2012, Tidström, 2014, Tidström et al., 2018) and strain relationships. (Crick, 2020, Crick and Crick, 2021), adds that dependencies and opportunism as key tensions that often occur in coopetition (Lado et al., 1997, Peng and Bourne, 2009, Tidström, 2014, Raza-Ullah et al., 2014, Huo et al., 2019). Therefore, the prospective relationship between coopetition and interdependence (Bengtsson and Kock, 2000, Luo, 2005, Peng et al., 2012, Raza-Ullah et al., 2014, Fredrich et al., 2019). can take advantage of opportunism, strategic alliance arrangements that are considered as breading grounds for opportunism given that partners may have different sets of goals, the alliance's inherent temporalities, and the incentives that such arrangements offer for mutual benefits.

3.3.3.2   Supply Market Dynamism (SMD)

The SMD characterises the degree of variability of changes in a firm's supply market. Such changes may be short-term variations or long-term shifts and may be due to factors such as rapidly changing technology, frequent price changes or fluctuations in product availability. Significant supply market dynamism can create uncertainty and risks for a buying organisation. In such an environment, closer interaction with a particular supplier may create opportunities to learn about and manage future developments. This could, however, create switching costs making it difficult to change quickly to a superior alternative (Hogevold, Svensson and Lombard, 2021).

In this kind of market, a good relationship built on trust is very important (Handfield, 2019; Cannon and Perreault, 1999):

- The availability of alternatives is the degree to which a buying firm has alternative sources of supply to meet a need. When many suppliers compete to sell comparable services, the market becomes a source of information on prices and quality. However, few suppliers or non-comparable goods may increase the information given to the seller. Thus, not having readily available alternative sources of supply may be a source of uncertainty and dependence for a buying firm (Hogevold, Svensson and Lombard, 2021, Anna, Svensson, Carl, Nilsson, Maria and Ohlsson, 2004).

- Importance of supply describes the buying firm's apprehension of the financial and strategic significance of a particular supply. Focus is on the impact of the purchase of the buying firm's

objectives (Khan and Qianli, 2017, Cannon and Perreault, 1999). It is important to decide whether a product is profitable or not.

- Supply market dynamism: characterises the degree of variability of changes in a firm's supply market. Such changes may be short-term variations or long-term shifts and may be due to factors such as rapidly changing technology, frequent price changes or fluctuations in product availability. Significant supply market dynamism can create uncertainty and risk for a buying organisation. In such an environment, closer interaction with a particular supplier may create opportunities to learn about and manage future developments. This could create switching costs, making it difficult to change quickly to a superior alternative. In this kind of market, a good relationship built on trust is very important.

- Complex supply: needs make it more difficult for a buying firm to evaluate purchase choices in advance or even be certain about a supplier's performance after the purchase. In essence, greater complexity of supply increases the purchase decision, ambiguity, and risk. Thus, when supply needs are complex, a buying organisation is likely to seek a relationship form that helps reduce ambiguity and risk (Khan,and Qianli, 2017, Cannon and Perreault, 1999).

3.3.3.3 The Key Mediating Variable Model (KMV)

The KMV model or its component relationships have been cited extensively in marketing and supply chain literature to explain the important aspects of the long-term buyer-supplier (or other types of marketing) relationships and as the basis for similarly modelled relationships. Other studies like (Khan and Fatma,2017; Morgan and Hunt 1994), presented trust and commitment as crucial in influencing relationship outcomes (Mofokeng and Chinomona, 2019; Han, Huang and Macbeth, 2018; Friman *et al.*, 2002; Chaudhori and Holbrook, 2001; Hewett and Bearden, 2001; Garbarino and Johnson, 1999; Geyskens, Steenkamp and Kumar, 1999; Jap, 1999;Moore and Cunningham, 1999; Siguaw, Simpson and Baker, 1998; Doney and Cannon, 1997; Smith and Barclay, 1997; Mohr, Fisher and Nevin, 1996; Holm *et al.,* 1996). In addition, several studies have also included one or more of the sources and outcomes as constructs of interest in these models, including acquiescence and cooperation (Garrett and Weingast, 2019; Hewett and Bearden, 2001); shared values (McAfee, Glassman and Honeycutt 2002) and relationship termination cost, benefits, and communication (Friman *et al.*, 2002).

The model has also demonstrated to be a useful means of exploring relationships between organisations. The model includes such key relational constructs as trust, commitment, cooperation, communication, shared values and uncertainty, which have been studied extensively in supply chain and marketing literature. However, at present no comprehensive test of buyer-supplier relationships has used the KMV

model as the basis for analysis. In addition, no multi-industry study has applied the KMV model to investigate its usefulness in other industries.

The Key Mediating Variable (KMV) model developed by (Morgan and Hunt 1994) Figure 16 presents trust and commitment as indispensable to successful business-to-business relationships (Anwar, Yusoff, Dali, Shukor and Nazri, 2021; Khan and Fatma, 2017). In addition, trust and commitment are presented as the keys to understanding how important conditions and behaviours, shared values, communication, relationship termination costs, relationship benefits, and opportunistic behaviour affect the parties' trust and commitment in marketing relationships and decreases uncertainty, relevant to effectiveness and satisfaction. This prominence derives from similar centrality in the social/relational exchange theory literature, as both form the bases for repeated exchanges. For some of the constructs, parallel concepts are also treated even were not coextensive with Morgan and Hunt's conceptualisations.
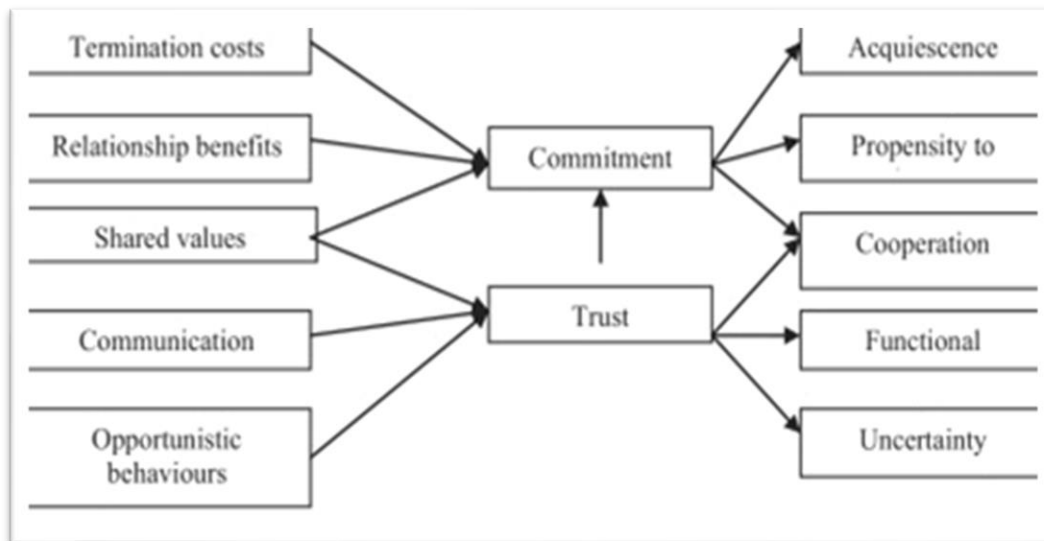
Figure 16: Key Mediating Variable Model of Relationship Marketing

Source: Morgan and Hunt, (1994), p. 22

3.3.3.4   Sources of commitment and trust

The KMV model proposes relationship termination costs and relationship benefits as sources of commitment; communication and opportunistic behaviour as sources of trust; and shared values as a source of both trust and commitment (Khan and Fatma, 2017; Morgan and Hunt, 1994). These five sources are necessary conditions to produce (or, in the case of opportunistic behaviour, to reduce) trust and commitment. While the literature concerning trust and commitment is relatively extensive, the literature relating to their precursors in the KMV model varies in scale and scope. Many of the antecedent constructs in the KMV model have been conceptualised slightly differently in the marketing literature (Khan and Fatma, 2017, Williamson, 1985).

3.3.3.5   Relationship benefits

Organisations that provide comparatively higher benefits will not only be more highly sought after as potential collaborators, but also their partners will, in turn, be more highly committed after a relationship is initiated. A relationship of benefits according to (Thibaut and Kelly 1959) as later adapted by Rather (2017) is reflected in an "evaluation of outcomes" given a "comparison level" (CL), translated into "the lowest level of outcomes a member will accept in the light of available alternative opportunities" (Jap and Haruvy, 2008). Such alternatives may include other relationships or no relationship at all. Therefore, relationship benefits are theorised in (Khan and Fatma, 2017; Morgan and Hunt 1994; Anderson and Narus, 1990) as a relative construct seen in comparison with relationship alternatives.In addition, there is an investment in the relationship at the commitment phase. In the supply chain literature, shared values have also been empirically modelled (Anwar, Yusoff, Dali, Shukor and Nazri, 2021; Parsons, 2002) and theoretically proposed (Queiroz, Fosso, Wamba, De Bourmont and Telles, 2021; McAfee, Glassman and Honeycutt, 2002) as directly affecting inter-firm relationship quality.

In 2002, (Friman *et al.*,2002) revisited the KMV relationship mode (Figure 16) and found that although there is little doubt that communication increases trust and commitment, nevertheless, trust also highly influences the quality of communication (i.e. its relevance, timeliness and reliability); this type of open communication affects the level of trust in a positive way by minimising the level of opportunistic behaviour (Khan and Qianli, 2017; Kwon and Suh, 2005 Morgan and Hunt, 1994;). in their study of the nature of benefits, and the factors which facilitate, successful supply chain partnerships between suppliers and retailers in the United Kingdom (UK), classify these model elements into intangibles and tangibles.

Communication and information exchange as a tangible facilitator co-ordinate the interaction between functional areas. Tangible benefits from data, information and knowledge sharing (Figure 17) across

organisations as a technology to communication, knowledge sharing and information exchange (Grant and Preston, 2019). Information availability also improves external relationships within supply chains. The basic argument of their study is that partnership success will be derived by increasing levels of information sharing and moving from operational and financial information to strategic information, in order to support a business relationship (Zhao, Zuo and Blackhurst, 2019; Kwon and Suh, 2005; Barratt, 2004; Filho *et al.*, 2003;).
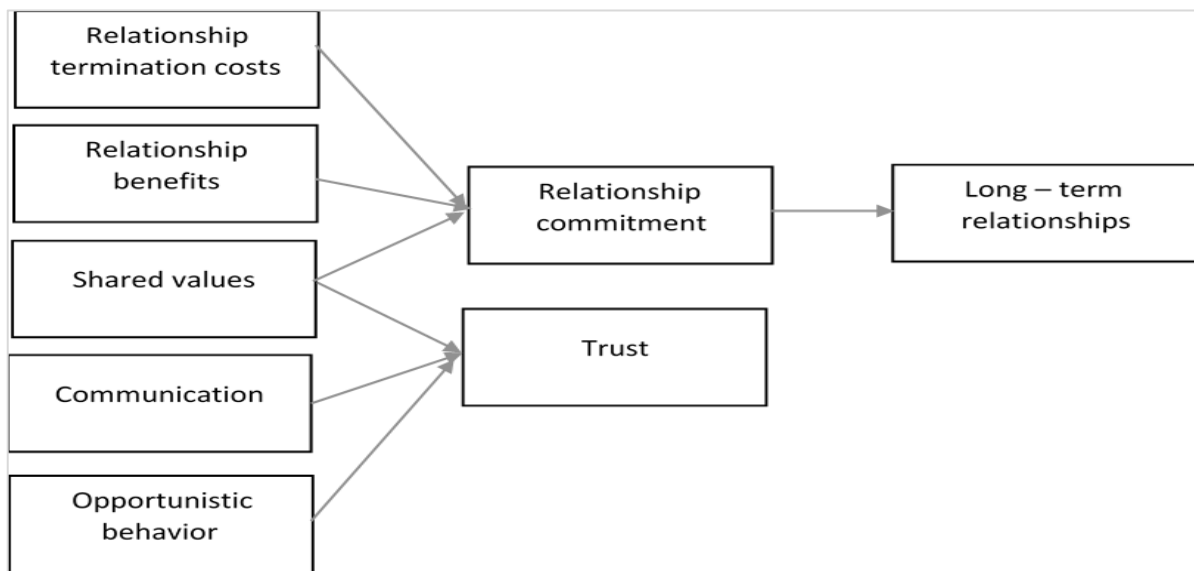
Figure 17: Relationship Benefits

Source: Rather, 2017; Friman *et al.*, (2002, p. 404)

To reach a competitive position in the marketplace, individual organisations are moving from transaction models (at arm's-length) to partnership models. While arm's-length Vertical Integration Internal Integration Supplier Horizontal Integration organisation 1 and 2 Customer Vertical Integration 31 is a transactional relationship where both buyer and supplier act independently for their own self-interest. Partnership is a relationship where both parties are acting together for their mutual benefit. Researchers have suggested characteristics that distinguish between the two extremes (Dubey, Gunasekaran, Childe, Wamba, Roubaud, and Foropon, 2021; Grant and Preston 2019; Daugherty, 2011;Power, 2005; Cox, 2004; Cox *et al.*, 2003; Humphreys *et al.*, 2001; Harland, 1996) which has been the approach is this study as well to get a balanced view and a sound conclusion. In general, the transactional model is a pure market model based on a purely transactional basis. Cost is a critical part of the evaluation equation. As it depends on cost, the buyer deals with many suppliers in order to ensure the lowest cost for each purchase action.

Due to the large number of suppliers and the interest in cost only, there is little communication between exchange parties, and even less sharing of information as each party is looking after his own interest to succeed over the other party. Partnership is a win-win situation and depends on both the skills of the people involved and the performance to pay back the initial cost. Value is more important than the cost; therefore, it depends on few suppliers, which enhances the level of communication and the level of information sharing, to achieve their mutual interest.

3.4   Reflection on the Three Models

The three models discussed above reflect the different types of relationships that exist and used by many organisations globally. There are many relationship models available in the market, but for the sake of the relevancy of the study, the above three were selected. They are relevant because they resonate with the objectives of the study, and the review of the literature revealed challenges and concerns on buyer-supplier relationships. Therefore, based on the models discussed, it was found that the KMV model proposed by (Khan and Fatma 2017; Morgan and Hunt1994) is the most comprehensive model for relationship development because it simultaneously employs three of the most common antecedents of trust (i.e., shared values, communication and opportunistic behaviours). Since its introduction in 1994, the KMV model has been widely used in many studies such as those by (Alzoubi and Yanamandra 2020; Li *et al.* 2006; MacMillan *et al.* 2005; Bowen and Shoemaker 2003; Cote and Latham 2003; Friman *et al.;*2002, Zineldin and Jonsson 2000)

The model has already shown promise when used by Anwar, (Yusoff, Dali, Shukor and Nazri 2021; and Bowen and Shoemaker 2003) in a procurement setting, although it is accepted that in many cases, the relationship between buyers and suppliers can be a genuine corporate relationship. Unlike Bove and Johnson's model, it allows for the development of relationships in the global stage and where multiple relationships exist. It is centred around trust and commitment, which are encouraging and acceptable in a mature environment whereas the ORAs in South Africa are still on shaky ground and require stability in terms of trust and commitment among the buyers and suppliers. The (Cannon and Perreault , 1999) model according to (Hammerschmidt, Wetzel, and Arnold, 2018) shows how customer satisfaction and evaluations of supplier performance vary across different types of relationships, customer satisfaction and evaluations of supplier performance vary across different types of relationships. The model in my view looks at the short-term situations without elaborating on the long-term and collaboration point of view. The ORAs according to the literature have failed due to a short-term focus, and because they take a narrow view on relationships (Hammerschmidt, Wetzel, and Arnold, 2018). However, the Robertson Cox model took a broader view on different types of relationships where a buyer or an organisation is

afforded a choice between a collaborative way of working and an arm's-length way of working; therefore, creating flexibility and possibilities and a favourable environment for organisations to integrate any framework, any model and any digital tool, including reverse auctions which may cause confusion and partiality by certain organisations.

3.4.1   Existing Conceptual Models

The existing conceptual frameworks (Maditati, Munim, Schramm and Kummer, 2018; Diola, 2015; Parente *et al.,* 2004 and Aloini 2007 and Jap, 2007) ORAs models considered in this report to justify and support the criticality and the relevance of proposing a new conceptual framework to close the gap in literature as far as the reverse auctions and buyer-supplier relationships are concerned in South Africa. The first model was a study conducted by (Maditati, Munim, Schramm and Kummer 2018; Diola 2015) on the Philippine Government procurement if restructuring from a manual/paper-based sealed-bid system to an e-procurement portal can reduce administrative cost and purchasing prices by adopting e-procurement with e-tender offering, e-tender notice, e-tender advertisement, and e-bidding. The study findings confirmed that e-procurement system with e-tender information, e-tendering, e-bidding, have a positive relationship with procurement cycle time, cost savings, and competitive bid price. Subsequently, the conceptual framework was developed (as shown in Figure 18). Judging from the study of the literature it is explicit and confirmed over different research studies that current ORAs existing framework(s) are largely limited to price, savings and the bottom line of the costs, without considering other contributing factors such as supplier development, supplier performance and procurement legislations particularly in a developing country like South Africa.
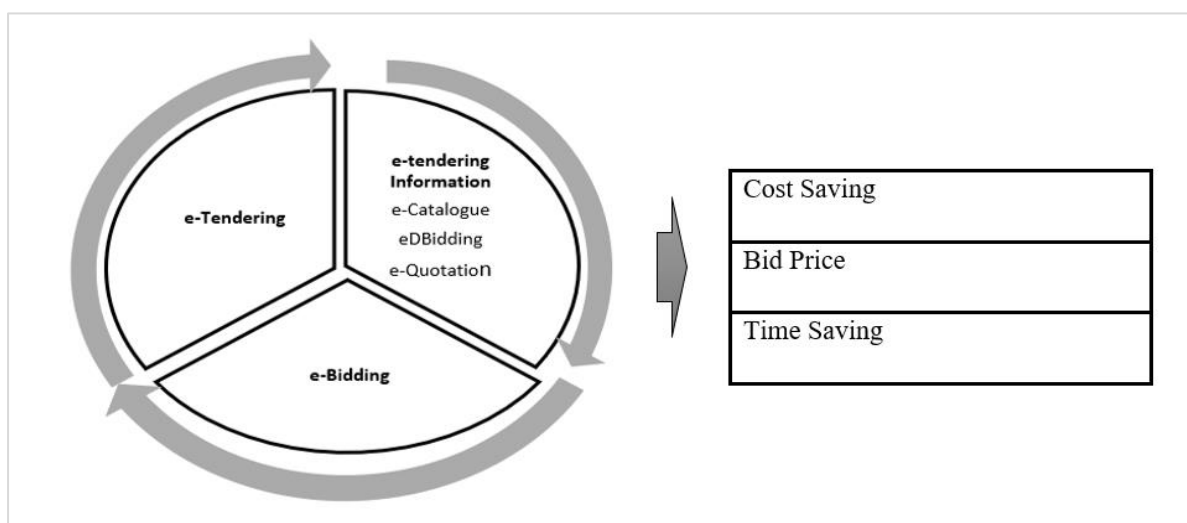
Figure 18: ORAS Conceptual Framework

Source: Diola 2015

The framework contributed in the broader automation of the public sector procurement with an intention to improvement processes, reduces transaction costs, improves inter-organisational coordination within the supply chain, improves relationships with business partners and offers competitive sourcing opportunities for the buyer organisations. In an alternative conceptual framework by (Chibani, Delorme, Dolgui and Pierreval 2018; Aloini 2007; Parente *et al.*2004), the critical success factors impacting on "price" and "process" performance in business-to-business (B2B) e-reverse auctions design in Italy highlights the following points:

- Total savings achieved by the e-RA adoption.
- Price savings is computed as historic price – lowest bid.
- Price and process performance are achieved through aligned market context, sound buyer/supplier relationships amongst other things.

Switching costs are all costs due to the changing of supply sources such as the buyer's resource deployment for supplier qualification, personnel training and other similar costs. Auction costs are fees eventually paid to the e-auction service company or linked to the auction process setting. Process cost savings are due to the increased productivity of the purchasing process. Similarly, the study (and its finding) was limited to costs, price and fees, though the main focus was on things like supplier/buyer characteristics, relationships, auction parameters, et cetera but it was in context, and the goal was to achieve improved pricing and processes.
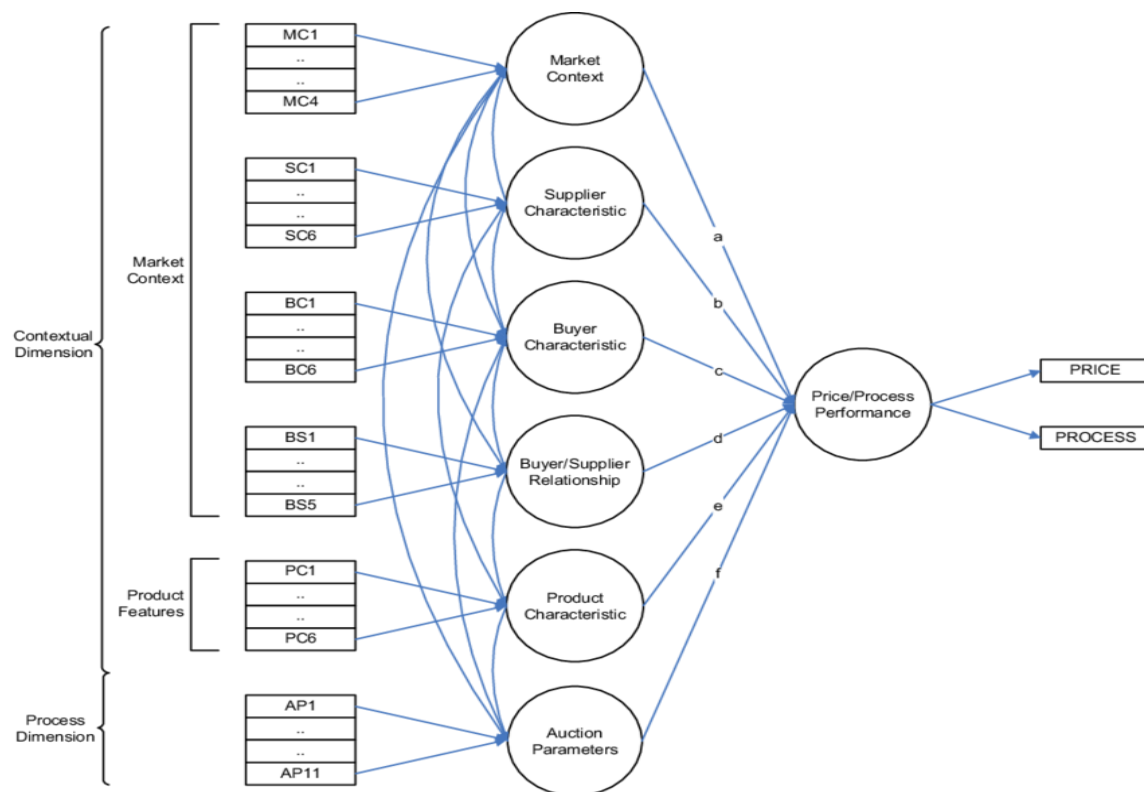
Figure 19: Alternative ORAs Concenptual Framewrok
Source: Parente et al. (2004) and Aloini (2007

The alternative ORAs framework (Figure 19) was formulated based on objectives for competitive prices, pricing and savings as outlined in embedded propositions below:

- The effects of the product category, the auction type, the number of bidders, and the economic crisis should decrease in the procurement prices with respect to the minimum of the initial submitted bids.
- The product categories are classified according to their impact on the decrease observed in procurement prices.
- The group purchasing programmes yield a greater decrease in the procurement prices achieved at the end of an auction compared to buying individually.
- The differences among the decreases achieved when different contract types are used.
- The e-auction platform yields more reduction in procurement prices.

The currently experienced conceptual frameworks discussed in this study are highly concentrated on cost savings, pricing the reduction of the bottom line. Other critical attributes especially on selecting a specific and suitable supplier they are not considers. The main issues aimed to solve the puzzle in this research such as development, supplier performance and procurement legislations particularly in a developing country like South Africa are not present and not considered in the current frameworks hence the requirement to explore a possibility to form a new and suitable framework.

The third Conceptual Framework designed by Jap 2007 is the perspective of an individual supplier (not an online event) that is participating in an online reverse auction with one specific buyer. Pawar, Behl and Aital (2017) corroborates that, a reverse auction can be defined as "a real-time online competitive bidding event. The auction design characteristics vary systematically across the auctions. An overview of the conceptual model is provided in Figure 20.

The general intuition is that the supplier's relationship with the buyer is affected by two attributes of the online reverse auction event:

(1) the design and format of the auction and
(2) the price dynamics in the auction. The former is controllable by the buyer, and the latter is not.

Then, the specific auction design aspects and event dynamics are described, and predictions relating these to the overall supplier/buyer relationship satisfaction.
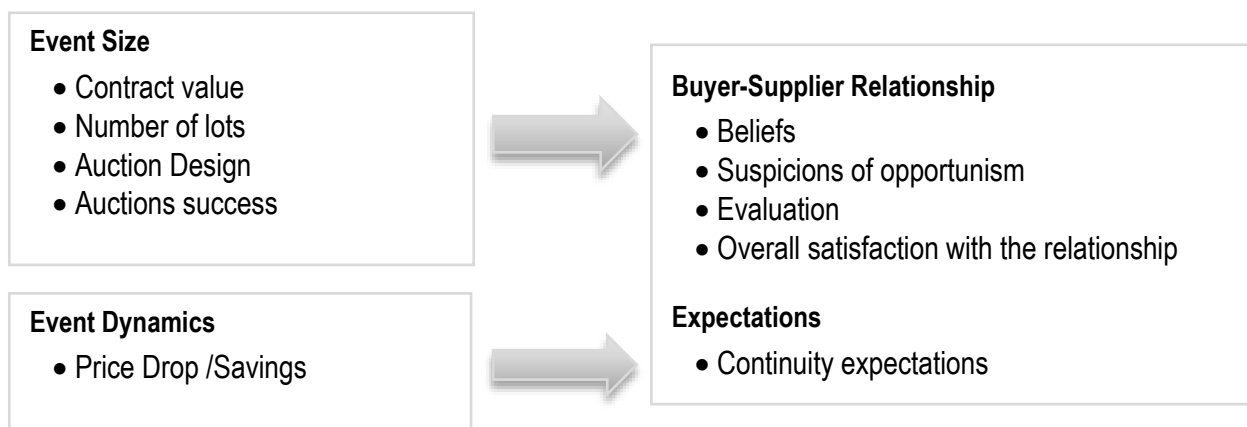
Figure 20: Conceptual Framework: ORA Design on Buyer–Supplier Relationships

Source: Pawar, Behl and Aital 2017; Sandy D. Jap 2007;

Online Reverse Auctions Research that considers how auctions affect or are affected by, the organisational contexts or the participants are emerging. Although sociologists have not developed a large literature on auctions, they have examined repeated auctions involving the same people, finding that people involved in repeated auctions tend to behave in ways consistent with social behaviour theories rather than economic theories. The impact of auctions on productivity and cycle time considers the design factors associated with auctions success, which they defined as the perceived price savings from the online auction compared with face-to-face negotiations. Some research shows that more successful auction events also tend to have a higher number of bidders, larger procurement contracts, and some use a partial price visibility format. (Pawar, Behl and Aital,2017) study and the model confirmed that technology is the way to go in this day and age judging from the review of the literature but the approach in which technology in this case the ORAs are to be adopted was a concern, especially around the potential damage on buyer-supplier relationships. The above identified and existing frameworks as they are, they are not fully addressing the challenges faced in South Africa hence the need for a study as initiated (Alzoubi and Yanamandra, 2020).

3.5   CONCEPTUAL FRAMEWORK FOR ONLINE REVERSE AUCTIONS

By definition, a conceptual framework is a consistent and comprehensive theoretical framework emerging from an inductive integration of previous literature, theories, and other pertinent information. It is usually the basis for reframing the research questions and formulating hypotheses or making informal tentative predictions about the possible outcome of a study (Maatman, 2021; Tashakkori and Teddlie, 2003). According to (Molthan-Hill, Worsfold, Nagy, Leal Filho and Mifsud ,2019; Shields and Hassan, 2006), a

conceptual framework is used in research to outline possible courses of action or to present a preferred approach to an idea or thought. It can also act as a map to provide coherence for an empirical inquiry. The proposed conceptual framework for this study is in three parts as follows. The first part details an ORAs theoretical framework on technology adoption and acceptance models, which further explores the online reverse auction model. Another part of the conceptual framework provides an overview model, which will further evaluate the impact of ORAs on buyer-supplier relationships in relation to trust, commitment, long term relationships, contracts, and reliability. Lastly, the existing supplier relationship management models were explored to solve the dilemma of complex supplier-buyer relationships, especially when using reverse auctions. To reiterate, the models are:

- Technology adoption and acceptance models
- The online reverse auction model
- Generic Supplier Relationship Management Types Robertson Cox
- Buyer-Seller Relationships Cannon and Perreault's model
- The Key Mediating Variable (KMV) model, Morgan and Hunt

The below conceptual framework emerged from theoretical discourse, to evaluate the impact of ORAs on buyer-supplier relationships and for creating an electronic process that would be equally beneficial to all stakeholders, therefore the framework will facilitate the adoption, implementation and full use of the system. Given the apparent degree of ORAs in relation to the supplier-buyer relationships, relative impact of two relational antecedents characteristics are derived from an understanding of procurement relationship management. These are characteristics of buyer-supplier relationships in the context of the existing and explored models. Figure 21 is informed by the two constructs of ORAs and buyer-supplier relationships. It indicates the extent to which they act as antecedents for various relational consequences and the quality of the relationship between a buyer and a supplier. This conceptual model is derived from the existing and evaluated models in this study. It is theoretically based and would be confirmed or proved otherwise by the findings from the field study.

Buyer-supplier relationships	Trust Long-term contracts with the suppliers, collaboration
Technology Adoption	In policy, accepted by all, acquired, there're manuals, there're is training, Innovation, uptake, system acceptance
ORA Implementation	Physical/human system use, change processes, e-Learning, changeover to digital, innovation.
ORA Usage	Frequently used, easy maintenance, capability, capacity, availability, tracking, monitoring, upgrades

Usefulness of the ORAs

Efficient, Agile, cost efficient, improves decision-making, smart process, Synchronous transactions

Full ORA Adoption

Figure 21: ORAs and Buyer-Supplier Relationships Model

The buyer-supplier relationships are characterised by commitment, which usually involves great personal interactions that provide opportunities for mutual trust to emerge (Gao *et al*., 2005). Hence, the following general hypotheses (as outlined in Chapter 1) were proposed to be tested:

Research Hypothesis 0

H00:   In South Africa, the positive perception on online reverse auctions will not result in high adoption

H01:   In South Africa, the positive perception on online reverse auctions will not result in high implementation and use

Research Hypothesis 1

H01:   In South Africa, the positive perception on online reverse auctions will result in high adoption

H11:   In South Africa, the positive perception on online reverse auctions will result in high implementation and use

Research Hypothesis 2

H02:   In South Africa, the negative perception on online reverse auctions will result in low adoption

H12:   In South Africa, the negative perception on online reverse auctions will result in low implementation and use

Research Question

How can the adoption (*including implementation and use*) of Online Reverse Auction (ORA) be improved among the private and public business enterprises in South Africa?

- What is the state of ORA adoption among the private and public business enterprises in South Africa?

- Why is the ORA innovations not optimally adopted in private (corporate) and public (parastatal) enterprises in South Africa?

- How can the inhibiting factors be mitigated to enhance effective use of ORAs in the private and public sector in South Africa?

3.6   CONCLUSION

Chapter Three has discussed and assessed three models related to ORAs with an aim to select the most suitable model to be tested in this study. This chapter examined the TAM models, relationships between supplier-buyer collaborations, and information on behaviour and discussed the theories, models and frameworks that are related to the issues concerning ORAs. Firstly, the original TAM model developed by (Davis *et al.* 1989) was used as a primary framework in this study was followed by the integration of the two models TAM and TRA, thereafter a TAM 3 blended with suitable human and social construct from Technology of reasoned action (TRA).

The subjective norms enable this study to broadly investigate other potential factors to be impacted such as three existing supplier relationship management models are used to solve the dilemma of complex supplier-buyer relationships, adoption, implementation, usage of the tool.

The models are: Generic Supplier Relationship Management Types (Robertson Cox Model); Buyer-Seller Relationships Cannon and Perreault's model; and the Key Mediating Variable (KMV) model, Morgan, and Hunt. The models also assist in assessing the implementation of ORAs in the context of a developing country, and how this affects prominent factors such as enterprise development, legislation, and supplier performance. Of these models, the KMV has been identified as the most suitable model in the context of this research. This model would demonstrate the traits of the best practices when it comes to buyer-supplier relationships, trust and commitment in relation to ORAs.

The Key Mediating Variable Model (KMV) or its component relationships have been cited extensively to explain important aspects of the long-term buyer-supplier relationships and as the basis for similarly modelled relationships. Though not exhaustive to offer a complete solution to the challenge of limited uptakes, adoptions and implementations in the South African public and private sector contexts, the model is also a useful means of exploring relationships between organisations. This model includes such

key relational constructs as trust, commitment, cooperation, communication, shared values and uncertainty, which have been studied extensively in supply chain and marketing literature.

According to Robertson Cox, working methods can be considered as consisting of a choice between a collaborative way of working and an arm's-length way of working, where the level of interaction is higher, and the supply relationship involves the creation of additional surplus value through some form of innovation or waste reduction. The Buyer-Seller Relationships Cannon and Perreault's Model specifies antecedent markets, purchase situations, and shows that they affect relationships. It also shows how customer satisfaction and evaluations of supplier performance vary across different types of relationships.

Finally, though a greater insight was gained on the analysis of existing models and frameworks relevant to the adoptions of ORAs, none of the individual models, theories and frameworks were adequate to offer a comprehensive tool to facilitate improved ORA adoptions and effective implementations. Hence, an alternative conceptual framework for online reverse auctions was proposed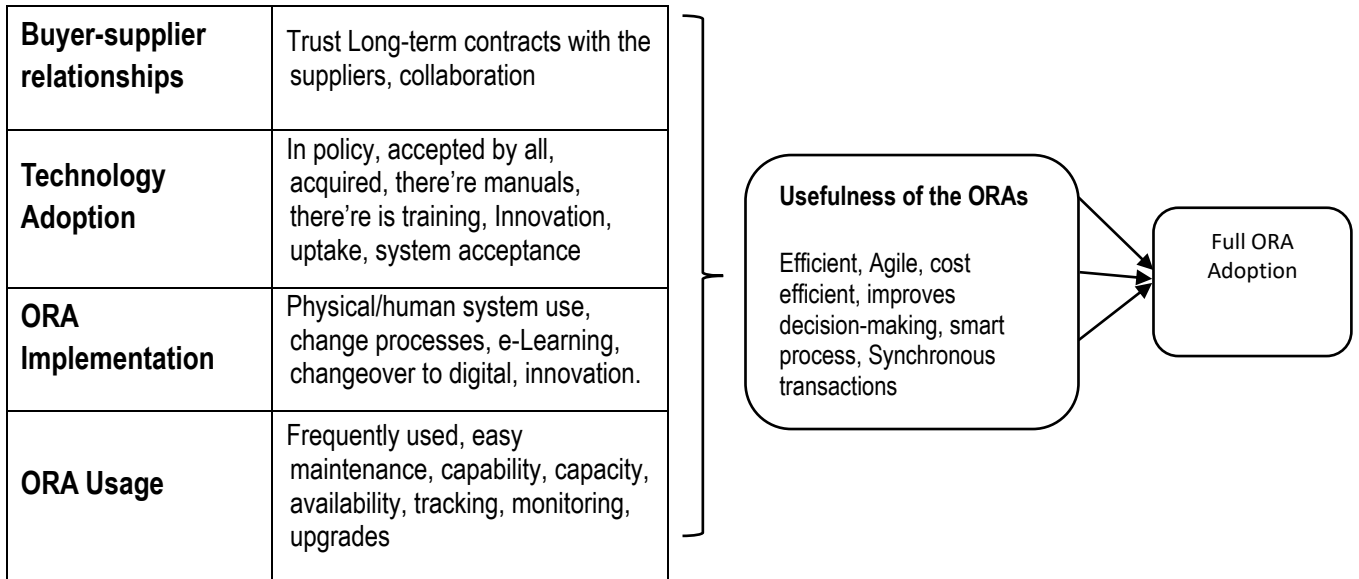. This conceptual framework is a consistent and comprehensive theoretical framework emerging from an inductive integration of previous literature, theories, and other pertinent information. This framework was the basis for reframing the research questions and formulating hypotheses or making informal tentative predictions about the possible outcome of a study. The proposed conceptual framework is in three parts, namely, the part which details an ORAs theoretical framework on buyer-supplier relationships and information behaviour, which explores which information is being exchanged from the two parties looking at a suitable conceptual map for investigating human information behaviour; the part of the conceptual framework which provides an overview model, which would further evaluate the impact of ORAs on buyer-supplier relationships in relation to all stakeholders involved; and the last part which would explore the three existing supplier relationship management models, which were used to solve the dilemma of complex supplier-buyer relationships, when using reverse auction. The next chapter discusses the research design and methodology used in this study.

4. CHAPTER FOUR : RESEARCH DESIGN AND METHODOLOGY

4.1 INTRODUCTION

Following an outline of theoretical underpinning in chapter 3, this chapter presents the research design and methodologies applied in this study.

The chapter describes the various stages of the research, which includes the selection of participants, the data collection process and the process of data analysis. According to Brink *et al.* (2006), this phase of research involves activities with a strong conceptual element. The activities include thinking, rethinking, theorizing, making decisions, and reviewing ideas.

After the introduction, the research philosophy is outlined in section 4.2. This is followed by a research design in section 4.3. A research methodology is then presented in section 4.4, together with an outline of a research population and sample in section 4.5. The process of data collection and data analysis are the presented in sections 4.6 and 4.7, followed by a discussion of validity and reliability in section 4.8, ethical considerations in 4.9, limitations of the study in section 4.10, and a conclusion in section 4.11.

4.2 RESEARCH PHILOSOPHY

The various paths to data collection techniques and analysis procedures can be depicted by using a research "onion" (Figure 22). At the very center of the onion is an exact way of collecting the data to answer research questions. This center however, is reached by peeling away important layers, including data collection methods, research philosophy, research approach, research strategies and time horizons (Melnikovas, 2018; Saunders, 2009). On the philosophy of research, the study adopted a hybrid approach the extends from positivist foundations, to embrace non-positivist assumptions as a mixed methods extension. The reason for the hybrid approach is that the answer to the research question had to be obtained by using quantitative data, collected with survey questionnaires and mathematical statistics on the one hand. Then, non-positivism or constructivist assumptions were embraced qualitative explanatory data, where subjective meanings of peoples' living experiences. Mixed methodology also helped to validate and make the study more comprehensive. Qualitative data came with its in-depth information, whereas quantitative data added objectivity to it.
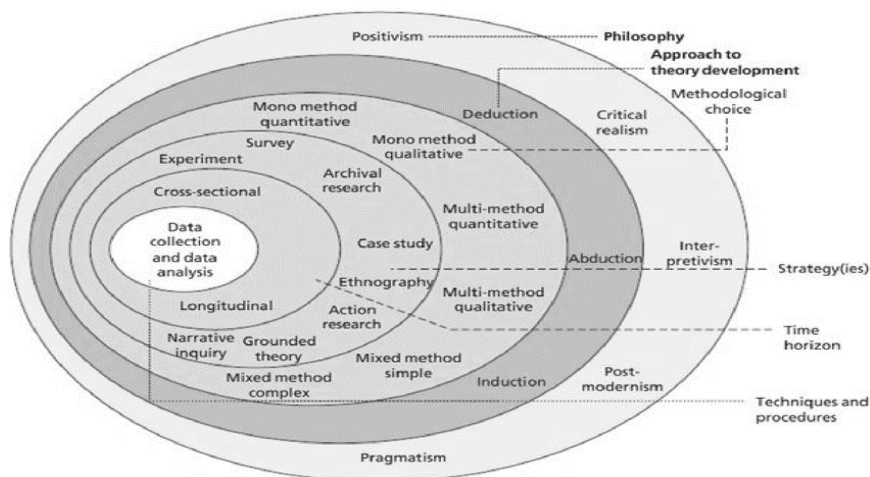
Figure 22:The Research Onion

Source: Saunders *et al.* (2016)

4.2.1   Positivism Philosophy

Positivism philosophy is based upon a highly structured methodology to enable generalization and quantifiable observations and evaluate the results with the help of statistical methods. Positivism philosophy is commonly used in natural science, and it is a critical and objective base method. Based on this research approach, quantitative research is mostly characterized by the examination of relationships between variables, which are measured numerically and analyzed by using a range of mathematical and statistical techniques, which are associated with survey research strategies (Melnikovas, 2018; Saunders *et al.*, 2012). With the help of positivism philosophy, the study could collect all the facts and figures that were associated with the research issue through general sources. We use the deductive approach to interpret the data.

4.2.2   Non-Positivism Philosophy

This is a naturalistic approach that seeks to understand phenomena in context-specific settings – such as real-world settings where the study does not attempt to manipulate the phenomenon or independent variables of interest (Shava and Nkengbeza, 2019; Patton, 2001). Unlike quantitative researchers, qualitative researchers seek illumination, understanding and extrapolation to similar situations (Jiang, Wade, Fiesler and Brubaker, 2021; Hoepfi, 1997). Interviews and observations are dominant in the naturalist (interpretive) paradigm and supplementary in the positivist paradigm. Interpretivism involves the subjective explanation of data to yield results, which turn out to be a weakness of the qualitative research.

According to (Saunders, Lewis and Thornhill, 2007) as well as (Kumatongo and Muzata, 2021) research interpretivism provides a holistic understanding of numerous variables within the context of what is being investigated. Interpretivism, therefore, helped the study to investigate the phenomenon from a variety of sources (i.e., triangulation) instead of only giving a detached presentation of statistical data using the positivism approach. With this approach, the study used the inductive approach to interpret the data.

4.3   RESEARCH DESIGN

A predominantly quantitative multiple case study design was used in this study. The design is thus predominantly quantitative, making use to a lesser extent of qualitative methods such as the interview with the limited group. Three cases (i.e., sectors) were used in this study. The cases or sectors were the government sector, private sector and Information and Communication Technology (ICT)/Financial sector. The study focused on these three sectors to make comparisons and build a conceptual framework to adopt and implement online reverse auctions in South Africa.

The case study was a detailed investigation of individuals, especially professionals in the field of supply chain management, project management and senior management. The focus was not on generalisation but on understanding the particulars of a sector in its complexity. In this type of case study, normally, contemporary complex phenomena are studied in their natural settings where the boundary between the phenomenon and context is not clear. As mentioned above, the study population is mainly used to answer questions of why and how things happen the way they do (Goldberg and Warburton, 2021; Yeong, Ismail, Ismail and Hamzah, 2018; Cooper and Schindler, 2008, Yin, 2003; Creswell, 2002;). A survey is a quick way of obtaining information. Quantitative surveys use questionnaires to collect data. Surveys can be used to find out respondents' opinions, behaviours and attitudes (Goldberg and Warburton, 2021; Saunders, Lewis and Thornhill, 2007). The size and representativeness of the sample are crucial, and time and cost factors must be considered.

4,3,1   Justification of the Adoption of the Case Study Design

For rare or uncommon cases, single case studies would be appropriate; but for a common case, multiple case studies are more appropriate than single case studies, where cases are selected not on the sampling logic but replication logic (Eisenhardt, 2021; Guetterman and Fetters, 2018; Powell, Proctor, Glisson, *et. al*., 2013).

The researcher selected similar cases for replication and predicted that the processes and outcomes discovered in each case would also be similar. In this case, the researcher had to collect rich or detailed evidence, which was achieved by using triangulation with in-depth interviews, observation and documents and archives. Interviews were supplemented and complemented with semi-structured and structured interviews like it is done in surveys with closed-ended questions or focused interviews. Documents and archives corroborated information. However, the researcher was aware of their shortcomings. Written documents may appear objective and truthful when this is not true (Padilla, Netto, and Da Silva, 2020; Blumberg, Cooper and Schindler, 2008). Analysing data for a case study for example

tends to be more opinion based than statistical methods. The usual idea is to try and collate your data into a manageable form and construct a narrative around it.

Normally, case studies are used to investigate complex issues or objects, and detailed contextual analysis of a limited number of events or conditions and their relationships is emphasized. (Shiddike and Rahman, 2020; Yin,1984) defines the case study research method as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used.

The method is however criticised in that a study of a small number of cases cannot offer grounds for establishing reliability or generality of findings, and that the intense exposure to the case(s) might bias the findings. The type of case study that was used was the one for theory building research (intended to develop a framework) and practice-oriented research, of which purpose was to contribute knowledge by identifying and describing not yet known variables (Guetterman and Fetters, 2018; Powell, Proctor, Glisson, *et. al.,* 2013;). (De Souza, 2019) urges that case studies are particularly useful in examining the 'how' and 'why' aspects of real-life phenomena, which cannot be manipulated by the researcher. The extent of the how and why questions inherent in the case study serves to strengthen it as an approach that would yield meaningful results. The weaknesses of case studies are risk of losing focus, generalisability of results and subjectivity of data. Generally, the case study approach has been criticised for being 'soft' with many uncontrolled variables, for being ambiguous in design and inherently biased (Quandt, Boberg, Schatto-Eckrodt, and Frischlich, 2020; Mouton and Marais, 1990). A key strength of the case study method involves using multiple sources and techniques in the data gathering process. Literature review assisted to refine the questions.

The primary reasons for choosing a case study as the research methodology for this thesis were based on the research questions which were in the form of "what," "why" and "how." These questions invited answers that were explanatory in nature. For example, the first research question asked: How do ORAs affect buyer-supplier relationships, and supplier performance and development in South African organisations? The case study approach is more adequate than statistical methods for exploring situations involving multiple respondents (Alam, 2020; Cooper and Schindler, 2008; Yin, 2003; Creswell, 2002; Baba, 1988). It enables consensus building across respondents or the discovery of the reasons behind a lack of consensus. In summary, the benefits of the case study approach arise from the possibility of the study collecting data in close proximity to the real-life situation. That is, the interaction between the study and the key individuals is direct and based on dialogue, instead of being mediated only by a survey questionnaire. Telephonic interviews and some face-to-face interviews were employed in this study. Due

to time constraints and the potential participants being scattered over a large distance, the survey questionnaire was also used to collect quantitative data.

4.3.2 Research Problem

Despite enormous advantages that ORA technology offers to business process enhancement, for an improved competitive advantage in the business sector, adoption of these technologies remain minimal in the South African private and public Sectors. South Africa is part of a competitive global economy, with where organisations in these economies take full advantage of process enhancing technologies to improve their competitive advantage. Whilst the technology appears to be understood in South Africa, this is not supplemented by an equivalent level of uptake, implementation and use of the ORA technology. The problem is that reasons for minimal adoption of this useful technology tools remains unclear.

Unless limited adoption, implementation and use of the ORA technology by South African organizations can be understood, it would remain hard to discover remedial efforts. This in turn, would imply a lost opportunity, as South African organizations will not benefit from a competitive advantage enhancing benefits offered by the ORAs technology.

4.3.3 Aim

The _aim_ of this study is to understand and explain the factors of adoption (which includes implementation and use) of Online Reverse Auction (ORA) innovations in the various segments of the private (corporate) and public (parastatal) enterprises in South Africa.

4.3.4 Objectives

The _objective_ thus, is to identify causal factors so as to inform solutions to inhibited adoption, implementation and use of ORAs in the private and public sector. Unpacking these factors would ultimately inform a positive adoption of ORAs in the South African business sector. That way, the sector could improve a competitive advantage on its business processes, and ultimately, long-term sustainability in the global competitive global political economy in the fourth industrial revolution (4iR) era. The adoption of a technology according to the Technology Adoption Model (TAM) is largely dependent on the perceived ease of use (Usability) of the ORAs systems, perceived Usefulness of the ORAs systems, frameworks and processes, relationships on buyers and suppliers on using ORAs, costs implications, being informed- awareness and enabling technical conditions (i.e. technological access). (Vinkatesh and Bala, 2008; Venkatesh and Davies, 2000; Davis, 1989). It is on this basis

that this study had sought to understand and explain the effect of these causal factors the adoption of ORAs in the private and public business sector in South Africa.

Objective 1

Unpacking these factors would ultimately inform a positive adoption of ORAs in the South African business sector. That way, the sector could improve a competitive advantage on its business processes, and ultimately, long-term sustainability in the global competitive global political economy in the fourth industrial revolution (4iR) era.

Objective 2

The investigation of the perceived ease of use (Usability) of the ORAs systems, perceived Usefulness of the ORAs systems, frameworks and processes, relationships on buyers and suppliers on using ORAs, costs implications, being informed- awareness and enabling technical conditions.

Objective 3

It is on this basis that this study had sought to understand and explain the effect of these causal factors the adoption of ORAs in the private and public business sector in South Africa. The outcome will result in a framework to enable adoption and implementation of ORAs.

4.3.5 Research Question

How can the adoption (*including implementation and use*) of Online Reverse Auction (ORA) be improved among the private and public business enterprises in South Africa?

Sub-questions

- What is the state of ORA adoption among the private and public business enterprises in South Africa?
- Why are the ORA innovations not optimally adopted in private (corporate) and public (parastatal) enterprises in South Africa?
- How can the inhibiting factors be mitigated to enhance effective use of ORAs in the private and public sector in South Africa?

4.3.6   Research Hypotheses

The process of quantitative research starts off with a theory after which a hypothesis is deduced from the theory. A hypothesis is an informed speculation about possible relationships between variables and is deduced from a theory (Cucina and Nester, 2022; Bryman, 2008). The structural equation modelling (SEM) was used for testing and estimating professional relations using statistical data and qualitative assumptions. This approach signifies that a broadly deductive approach to the relationship between theory and research is taken.

Building on literature review and the Technology Acceptance Models (TAM) theories in chapters 2 and 3, a series of hypotheses were developed to test the dynamics of ORA technology acceptance and use in South African public and private sectors. The following hypotheses were tested in this study:

Research Hypothesis 0

H_{00}:   In South Africa, the positive perception on online reverse auctions will not result in high adoption

H_{01}:   In South Africa, the positive perception on online reverse auctions will not result in high implementation and use

Research Hypothesis 1

H_{01}:   In South Africa, the positive perception on online reverse auctions will result in high adoption

H_{11}:   In South Africa, the positive perception on online reverse auctions will result in high implementation and use

Research Hypothesis 2

H_{02}:   In South Africa, the negative perception on online reverse auctions will result in low adoption

H_{12}:   In South Africa, the negative perception on online reverse auctions will result in low implementation and use

4.4   RESEARCH METHODOLOGY

The predominantly quantitative (which is QUANT-qual) approach was employed in this study (DeCuir-Gunby and Schutz, 2018; Creswell and Clark, 2011; Johnson and Onwuegbuzie, 2004). A small amount of qualitative data was collected to help with the explanation or the interpretation of the quantitative data and relationships found, by answering questions of why and how things are happening the way they do. A mixed method encompassed such concepts as a paradigm, quantitative and qualitative techniques as outlined in (Figure 23).
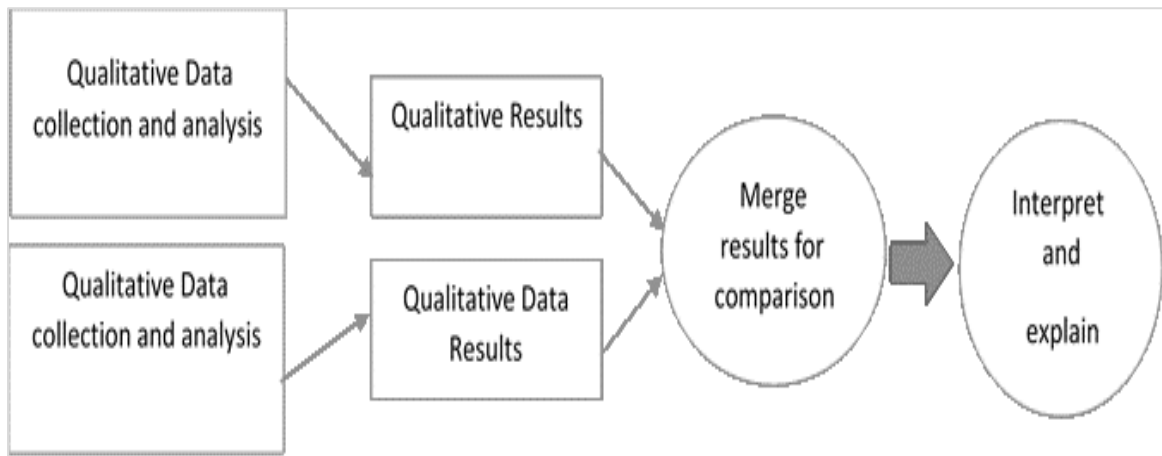
Figure 23: Mixed Methods

Source: Creswell, J.W. (2013). Steps in Conducting a Scholarly Mixed Methods Study

The most desirable method of a predominantly quantitative approach is explained and descriptive research identified as the best method for the purposes of this study. Mixed methodology is normally used to blend different approaches allowing the study to design research questions within the context and parameters of the study (Han and Ellis, 2019; Bernard, 2014; Johnson and Onwuegbuzie, 2004). It also assists to address broader questions providing a more expansive and creative approach to research (Johnson and Onwuegbuzie, 2004). In this study however, the qualitative component was included, albeit minimally, mostly to explain quantitative accounts on research questions. Hence, the dominance of quantitative data and the underlying analysis.

4.4.1 Reasons for Using the Predominantly Quantitative Methods Approach

The decision to use a particular research approach depends on the research problem or question, the variables and the phenomenon being investigated (Guetterman and Fetters, 2018; Creswell, 2015a; Creswell, 2015b; Powell, Proctor, Glisson, *et. al.*, 2013; Creswell and Plano 2011;). For comprehensive studies, like the present study, it was better to use the quantitative approach but with qualitative methods approach on a small scale, a situation where the quantitative method helped to test hypotheses and to make the study more objective and the qualitative method helped to give a complete understanding or in-depth information on the phenomenon being studied in all its dimensions.

The qualitative data helped to give explanations to the results of the hypotheses testing by answering questions *why* and *how*. For such a complex study, which had more than one research question, the researcher had to use this type of approach. According to (Lee,1999) as well as (Jiron and Carrasco, 2020) within a single study multiple qualitative and quantitative techniques that involve complementary

data-gathering activities can be applied that compensate for the weaknesses of individual tactics – for the data becomes more comprehensive and quite informative. The type of mixed methodology used in the study was concurrent where both types of methodology (qualitative and quantitative methods) were applied simultaneously. The reason for using applying the two methodologies simultaneously was also to be able to triangulate the study and address the validity issue (Guetterman and Fetters, 2018; Creswell, 2015a; Creswell, 2015b; Powell, Proctor, Glisson, *et. al.*, 2013; Creswell and Plano 2011).

This study involved social experiences and realities which are multidimensional in nature, so if the studied phenomenon was viewed along only a single dimension, the researcher could not have had a complete picture of what was going on in the sectors that were used. Qualitative empirical research tends to expose the complexity of real-life experiences but the use of mixed methods and a multidimensional approach allowed the researcher to frame questions which precisely focused on how different dimensions and scales of social existence were related. Using this type of approach increased confidence in the findings by providing more evidence while offsetting possible shortcomings from using only one approach (Frias and Popovich, 2020; Helles, Ørmen, Jensen, Lai, Menchen-Trevino, Taneja and Brunus,2018; Caruth, 2013; Creswell and Plano Clark, 2011; Hoover and Krishnamurti, 2010; Albert, Trochelman, Meyer and Nutter, 2009; Tashakkori and Creswell, 2008; Bryman, 2004) and answering questions, "what", "why" and "how".

4.4.2   Definition of Variables

Variable in research simply refers to a person, place, thing, or phenomenon that you are trying to measure in some way. The best way to understand the difference between a dependent and independent variable is that the meaning of each is implied by what the words tell us about the variable you are using (Babbie, 2021; Thousand Oaks, 2010). For example, a dependent variable would vary, depending on how it is affected by the independent variable/s. Dependent and independent variables for this project are outlined in Table 5

4.4.3   Independent Variable

An independent variable is the one that is stable (unaffected by) - but affects other variables you are trying to measure. It refers to the condition of an experiment that is systematically manipulated by the investigator (Babbie and Mouton, 2001). It is a presumed cause (Thousand Oaks, 2010). This study investigates the factors of adoption, implementation and use of Online Reverse Auction (ORA) innovations in private (corporate) and public (parastatal) enterprises in South Africa. In this context, independent variables would be the factors that affect (or even fluctuates) the adoption,

implementation, and usage of the ORAs among the corporate and parastatals in South Africa. Simply because it is not influenced, but influences other variables in the study (Babbie, 2021; Babbie and Mouton, 2001).

4.4.4   Dependent Variable

The variable that depends on other factors that are measured. These variables are expected to change because of an experimental manipulation of the independent variable or variables. It is the presumed effect (Thousand Oaks, CA: SAGE, 2010: pp 348-349) or trigger of a variation in the observed phenomenon (Mlitwa, 2018). Variables are outlined in Table 5.

Table 5: Operationalization of Variables

Variables		
Independent Variable		**Dependent Variable**
• Perceived Ease of use (Usability) of the ORAs systems • Perceived Usefulness of the ORAs systems • Frameworks and processes • Relationships on buyers and suppliers on using ORAs • Costs implications • Being informed- awareness • Enabling technical conditions (i.e. technological access) • Intention to use	------------▶ ------------▶ ------------▶	• Adoption • Implementation • Use/ Usage

Variable	Definition	Attributes
Perceived usefulness	Perceived Usefulness is defined as the potential user's subjective likelihood that the use of a certain system (e.g: single platform e-Payment System) will improve his/her action. The degree to which a person believes that using a particular system would be free of effort (Davis, 1989).	Efficient, Agile, cost efficient, improves decision-making, smart process, Synchronous transactions
Perceived Ease of Use	Perceived Ease of Use refers to the degree to which the potential user expects the target system to be effortless (Davis, 1989).	Easy to use, Practical, intuitive, interoperable with existing systems, convenience, time-efficient
Complexity	"The degree to which an innovation is perceived as relatively difficult to understand and use." (Thompson *et al.* 1991)	Terms confusing, too technical, lengthy process, not intuitive , lack simplicity, confusing, contradictory
System use	System use is defined as the frequency, duration, and intensity of an employee's interactions with a particular system (Venkatesh et al. 2003).	Frequently used, easy maintenance, capability, capacity, availability, tracking, monitoring, upgrades
Facilitating conditions	Facilitating conditions is defined as the "degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (Venkatesh et al. 2003, p. 453).	Infrastructure, policies, manuals, enabling frameworks, connectivity, availability, support plans, reliability, accuracy,
Technology adoption	Carr (1999) has defined technology adoption as the 'stage of selecting a technology for use by an individual or an organization'. With rapid strides being made in technology innovations in every conceivable domain, the issues related to technology adoption have gained increasing prominence in recent times. Refers to "the stage in which a technology is selected for use by an individual or an organization" (Carr, 1999). while the term diffusion refers to "the stage in which the technology spreads to general use and application" (Rogers, 2003).	In policy, accepted by all, acquired, there're manuals, there're is training, Innovation, uptake, system acceptance
Implementation	Systems implementation is the process of defining how the information system should be built (i.e., physical system design), ensuring that the information system is operational and used, ensuring that the information system meets quality standard (i.e., quality assurance). Radut Brualla 2020.	Physical/human system use, change processes, e-Learning, change over to digital, innovation,

Subjective Norms	"Influence of people in one's social environment on his behavioural intentions; the beliefs of people, weighted by the importance one attributes to each of their opinions that will influence one's behavioural intention" Ajzen, 1991	Opinions, external factors, behaviours, way of thinking, stereotypes, inability to change,
Behavioural intention	"Function of both attitudes toward an intention and subjective norms toward that behaviour which has been found to predict actual behaviour" Ajzen, 1991	Action, application, taking stance, influence, subjectivity, objectivity, intention to use, intention not to use, motivation, approval, disapproval
Attitudes	"Sum of beliefs about a particular behaviour weighted by evaluations of these beliefs" Thompson et al. (1991)	Dislike,like, fearing, suspicion, irritation, negativity, positivity, eagerness , trust, distrust
Social Factors	"Individual's internalization of the reference group's subjective culture, and specific interpersonal agreements that the individual has made with others, in specific social situations." Thompson et al. (1991).	Affordability, educational ability, understanding, size of organisation, socialisation and beliefs, habits, inability to change, traditional ways, comfort with technology, disposable income, connectivity, energy supply, educational level , preferences
Social Influence	Social influence is defined as the degree to which an individual perceives that important other believe he or she should use the new system. Venkatesh *et al.* (2003)	Informational, normative, conformity, compliance and obedience, approachability, thoughts, feelings, obey social rules, positive or negative behaviour, social rules, conform with others

4.4.5 Unit of Analysis/ Subject of Investigation

To clarify observation from the unit of analysis is that technologies are adopted by organisations which are mostly revenue driven just like the ICT and the financial and banking industry. The public sector requires transformation as well to realise the social responsibilities and to sustain the state-owned enterprises especially in South Africa. The unit of analysis was at the level of determining on how can the adoption (*including implementation and use*) of Online Reverse Auction (ORA) be improved among the private and public business enterprises in South Africa? The research looked at three sectors in South Africa, ICT, public sector on state owned enterprises and Utility sector. At an individual/professional level. Each sector was divided into three categories (procurement professionals and Technical Professionals) for the survey.

Initially, the study was going to examine certain specific organisations, formal request letters to conduct a study were sent to these organisations at senior top management. Unfortunately, all three organisations declined to participate. Therefore, the study took a different approach and approached individuals identified from the same targeted organisations at individual capacity. Commitment usually involves numerous personal interactions that provide opportunities for mutual trust to emerge (Kerr and Coviello, 2020; Gao *et al.*, 2005). So, the unit of analysis was sector based.

4.4.6 Online Reverse Auctions as A Technology

ORA is a technology tool, an innovation system, a platform to facilitate an electronic procurement process to conduct reverse auction to buy goods and services from various seller as depicted in Table 6. There are several systems in the market adopted by different businesses, though the most popular one is the ERP system procure to pay and others including the Reverse auction modules fall under the below mentioned brands in the markets targeting the same customers.

4.4.7 Enterprise resource planning (ERP)

ERP refers to a type of software that businesses use to manage day-to-day organisational activities such as accounting, procurement, project management, risk management and compliance, as well as the supply chain operations Okungbowa, 2015).

Table 6: Systems of ORA

System	Attributes / modules
Pipety system	• Engage with vendors, customers, and colleagues, get approvals, and integrate with your financial tools like ERPs and spreadsheets. • Procure to Pay. End to end procurement and finance process. • Reverse Auctions and e-Procurement processes
SAGE System	• Financial, procurement and logistics processes. • Procure to pay for small businesses
Oracle ERP	• Engage with vendors, customers and colleagues, get approvals, and integrate with your financial tools like ERPs and spreadsheets. • Procure to Pay. End to end procurement and finance process. • Reverse Auctions and e-Procurement processes
SAP ERP	• Engage with vendors, customers and colleagues, get approvals, and integrate with your financial tools like ERPs and spreadsheets. • Procure to Pay. End to end procurement and finance process. • Reverse Auctions and e-Procurement processes

4.5   POPULATION AND SAMPLE

To test the hypothesis empirically, a survey in the form of a written questionnaire was conducted on procurement professionals and the technical professional both categories at different levels from specialist to senior executive level. These professionals and suppliers are professionally involved in an e-business setting. The government sector, utility sector and Information and Communication Technology (ICT) industries were the selected cases for this research. This allowed the study to obtain a certain amount of variance in the constructs and improve the generalisability of the findings, yet also control for the occurrence of industry effects. Furthermore, these industries have a relatively high level of sourcing from overseas (Magdalena and Suhatman, 2020; Homburg *et al.,* 2002), which is an important consideration as the survey aimed to elicit a broad variety of ORAs within the sample in terms of international sourcing. The sampling frames (i.e., lists of all potential participant/respondents) of two different departments, namely, the procurement department and the technical departments were obtained, with the help of senior procurement managers of these departments. The two procurement managers sent and collected the questionnaires from the respondents.

4.5.1   Sampling Frame

There are terms associated with sampling: population, sample, sampling frame, eligibility criteria, inclusion criteria, exclusion criteria, representativeness, sampling designs, sampling bias, sampling error, power analysis, effect-size, and attrition. Types of sampling include convenience, accidental, snowball,

quota sample, purposive sampling, simple random sampling and cluster sampling. The parts of the sampling process and terms used by researchers sometimes overlap. This section explains the sampling strategy/approach taken in this research (Figure 24).
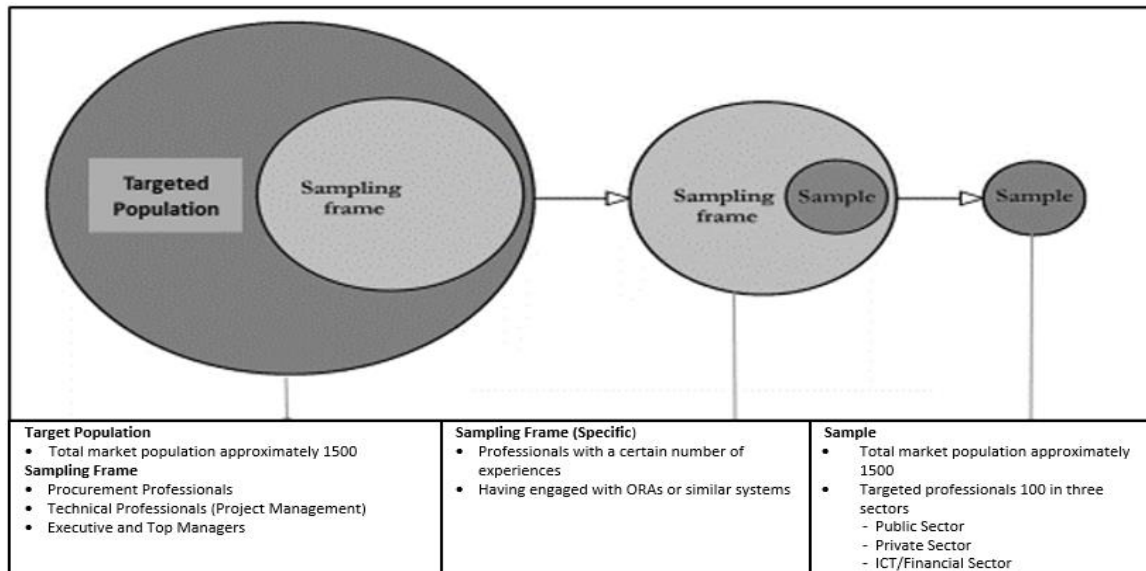
Figure 24: The conceptual relationship - population, sampling frame and sample

Source: Adapted from Ames, Glenton and Lewin (2019); Montelo andSutton (2006), and Dewi (2007)

4.5.1   Identify the target population

The study targeted three industries, namely, the public sector, Private Information and Communication Technology (ICT) sector. For the public sector, procurement, technical (project managers), and executives' information is in the public domain.

The entire population was estimated based on previous and present knowledge in the literature and through discussions with the internal employees in these sectors. The total size of the target population was estimated to be in the thousands (procurement total employees were over 800, project managers were also over 660 and executives and top management were not more than 40). Out of the numbers mentioned questions were asked from internal and trusted individuals who confirmed the estimated numbers of specialists with three or more years' experience in their procurement environments, and the number of experienced project managers (who had engaged in ORAs). Furthermore, the management category was looked at. It was found that there could be approximately over 2800 individuals who met the defined criterion, but to be safe, 1500 qualifying individuals were decided on, as a workable number to draw the sample from.

4.5.2 Selecting a sampling frame

The actual names of potential participants/respondents were not obtained, but only the number of individuals targeted within a department (i.e., sampling frame) was known. The sampling frames or sampling populations were based on functions, sector and different categories within the targeted environments. A target population of size 1500 was used in the study (Figure 25). A random stratified sample was selected from the three sectors (cases), using "sector" and department (i.e., procurement and technical department) as stratifying variables.

4.5.3 Sample

Of the estimated 1500 professionals within the target population, 100 professionals were ultimately selected to participate in this study. All the 100 selected respondents were approached, and they became part of the study. In general, larger samples are better, but they also require more resources; and because the uptake of ORAs is still limited in South Africa, the sample size of 100 was adequate and large enough for the researcher to conduct a decent study. The stratified sampling method was used to select the 100 respondents, using "sector" and "department" as the stratifying variables. The sectors were Private Sector, ICT/Financial and public sector and the departments from which the participants came from were procurement and technical departments.

4.5.4 Sample for collecting qualitative data

On a small scale, a small sample was selected from the target population to collect qualitative data to complement the quantitative data. The sampling was done through a non-probability (non-random), a combination of quota and snowball sampling. In this study, quotas were based on the qualities created such as, number of years of experience, having used ORAs or similar tools before, and the nature of the job function in terms of dealing with suppliers. The population was segmented into mutually exclusive sub-groups, just as in stratified sampling. Snowball sampling was used, because the researcher did not know where the potential participants would be found or lived. This type of sampling was found to be easy to use and was an economical procedure.

The linear snowball sampling method was utilised in which the study recruited a single participant from each sector, who in turn recruited the second participant, and the second nominee recruited the third participant, and so on and so forth. Two external interviewers interviewed the participants online and in their comfortable spaces, at their preferred time. These were used to avoid a bias to be created in the data since the researcher had a relationship with some of the participants. The interviewers were well qualified and professional interviewers. An interview took about 35 minutes each session. The researcher

was aware of the biases that could be brought about by this sampling method or about a potential to generate biased samples because participants who had a great number of social connections could provide the study with a higher proportion of participants or respondents who had characteristics similar to theirs. This risk was monitored and avoided at all cost.

This sampling technique was appropriate since the organisations, in their own capacity, declined to participate and the individuals had to volunteer to participate in their own individual capacity. The study took a secluded approach without breaking any ethical requirements. Additionally, a procurement environment can be a sensitive area for many organisations and individuals; hence, a private approach was the best sampling strategy for the study.

4.6   DATA COLLECTION

There are various procedures for collecting data, including tests, questionnaires, interviews, classroom observations, diaries, journals, et cetera. Quite often, quantitative designs use tests and closed-ended questionnaires to gather, analyse and interpret the data. However, the qualitative methods mostly make use of interviews, diaries, journals, classroom observations and open-ended questionnaires to obtain, analyse and interpret the data. On the other hand, mixed method approaches usually use closed-ended questionnaires (numerical data), interviews and classroom observations (text data) to collect information. To triangulate the data, the study obtained information through different procedures to heighten the dependability and trustworthiness of the data and their interpretation.

4.6.1   Data Collection Instruments

In line with the sampling process in section 4.5.2 (above), the research instruments or data collection instruments were: (1) Semi-structured questionnaires (for quantitative methods), (2) Interview schedule (for the qualitative methods), and (3) focus group discussions – drawn-up and distributed to the 100 research participants identified – with a 43% response rate (as detailed under the findings section in chapters 5 and 6).

4.6.1.1 Questionnaire

Questionnaires usually form an integral part of opinion related surveys, and the formulation of the questions and the structure of the questionnaire are critical to the success of the survey (Cooper and Schindler, 2011, p. 334). In quantitative surveys, questionnaires are possibly the most widely used primary data collection method (Cooper and Schindler, 2011, p. 414). Questionnaires are generally easier to analyse and offer the potential for transforming the data into quantifiable results. A hybrid format of

questionnaires was developed, to allow the quantitative type of questions, together with qualitative provisions for elaborative descriptions and explanations.

4.6.1.2 Reasons for the choice of the research instrument

The reasons for the choice of the questionnaire were: volume (emailed questionnaires could be sent to a large number of respondents in the target population simultaneously, and each could complete the questionnaire in their own time); cost (because of the geographical distribution and the size of the target population, it could be very expensive to use other data collection methods such as interviews); bias (respondents were not influenced by the presence or the opinion of the researcher); and analysis (information from quantitative questionnaires was easier to analyse).

4.6.1.3 Questionnaire design

All the steps for ensuring that the questionnaire design complied with the guidelines of an effective questionnaire were followed. For example., a formulation of the research question and research objectives, developing a profile of the respondents by including questions about gender, age group, occupation, studying the existing literature to find questions that may be relevant to this study) (Bodas and Peleg, 2020; Creswell, 2012, p. 375). Although there are advantages and disadvantages of self-administered electronic questionnaires as a research instrument, it was a preferred method for this research, since the study was highly structured with only closed-ended questions. 'Closed-ended' questions that circumscribe the respondents' range of responses to questions are better suited to questionnaires, as they readily lend themselves to coding and to quantitative analysis (Miksza and Elpus, 2018; Cooper and Schindler, 2011, p. 419). Closed-ended questions provide the following advantages (Wernicke and Talmy, 2018; Neuman, 2000, p. 345): they are quicker and easier for respondents to answer; it is easier to compare different respondents' answers; replication is easier; and there are fewer irrelevant and potentially confusing answers to questions. The study focused on predetermined questions that were not sensitive. In addition, all respondents were literate and had access to a computer.

The first set of questions in the questionnaire were background questions. The questions sought to provide the respondent's profile. The second set of questions (section B) consisted of four sections that used a 5-point Likert scale type of questions (with 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree and 5 = strongly agree) to measure variables, which were constructs. Hence, each item in this opinion related section was measured on an ordinal Likert-type scale with five categories. Likert scales are normally used to measure constructs, which are made of concepts and unlike concepts, we cannot measure them directly – we normally use a set of questions or statements to measure them. Hence,

constructs are built by combining the simpler concepts (Liu, Wang, Huang, Chen, Chen and Lai, 2018; Cooper and Schindler, 1998) and must be measured by means of multiple indicators.

By summing up the responses of these items (related to the same issue), the study created a more continuous type of variable. Variables like these (continuous) lend themselves to more sophisticated and multivariate statistical analysis techniques. The nature of the data and the relationship between the method and the research objectives were considered when selecting the right statistical methods for this study.

4.6.1.4 Choice of the measurement scale

The Likert scale was used in this research, due to the following advantages (Cunningham, Regan, Horberry, Weeratunga and Dixit, 2019; Neuman, 2000) simplicity and ease of use for respondents; more comprehensive multiple indicator measurement is possible when several items are combined; a wide range of constructs can be measured, which was the case in the study; factor analysis can be used with the Likert scale questions or items; and it allows the study to use several statistical techniques. The disadvantages of the Likert scale are (Mollaioli, Sansone, Ciocca, Limoncin, Colonnello, Di Lorenzo and Jannini, 2021; Neuman, 2000): different combinations of several scale items can result in the same overall score or value; and the response set is a potential drawback in terms of the validity of the results.

The questionnaire consisted of the following four key concepts or variables of the model. In the questionnaire, section A being quantitative and B Qualitative. The valid, reliable construct scores, which are created from ordinal Likert scale questions can be used as continuous variables (Chalmers, 2018; Creswell, 2012). (Sung and Wu 2018 and Hofstee, (2006) stated that, in order to turn data into information, it must be statistically analysed. The nature of the data and the relationship between the method and the research objectives were considered when the statistical methods for this study were selected. To reiterate, in this questionnaire, an item was regarded as an ordinal variable such that when one would add the answers to the five questions one would get a variable that is close to being a continuous variable, which was what was needed to do correlation analysis, factor analysis and Structural Equation Modelling pertinent to this study.

Overall, the questionnaire layout is a very important issue for questionnaire design. The questions for this study were a bit long, simple and to the point; questions and were designed to facilitate computer analysis; questions gave clear instructions and questions did not have prestige bias (Brand, Heap, Morgan and Mesoudi 2020; Eiselen, Uys and Potgieter, 2005). In addition, the questions avoided double negatives; emotive language; accommodated all possible answers; were phrased neutrally and did not make assumptions. The response alternatives were mutually exclusive.

4.6.1.5 Questionnaire administration

The senior managers in the procurement departement and the technical department in the sectors that were used, who helped to obtain the potential respondents in the target population for the researcher also helped her to administer the questionnaires, by forwarding their email addresses to the facilitator. The researcher emailed the questionnaires to the respondents, who resent them back to her after having filled them.

4.6.2 Pilot study

Before administering the questionnaire to sampling units in the study, the study tested the questionnaire on a small number of procurement practitioners and on the technical professionals from the target population; but these subjects were not interviewed again in the main survey. This was done to assess whether questions were unambiguously phrased and understood in the same way by all. The respondents in this pilot study gave feedback to the researcher on how they found the questions posed to them. The analysis of the pilot survey revealed flaws and suggested improvements to the questionnaire, which were corrected leading to the final questionnaires upon which the findings of this are based

The factors relating to the structure of the questionnaire as suggested by (Lewycka and Clark 2020;) such as the use of a covering letter, using an attractive design and logically ordering the questions, were considered. A covering letter containing the purpose of the questionnaire was attached to the questionnaire. It also included the name of the researcher, name of the institution, letter of ethical approval by the institution, the approximate time that was required to complete the questionnaire, information on how to complete the questionnaire and how to submit it. It assured the respondent that the information provided would be strictly confidential and advised the respondents that they were free to withdraw from the participation in the study at any time without any negative consequence. The questionnaire had an opening section that clearly and concisely explained the basic aim of the study, research ethics and the importance of the participant's involvement in the study. The questionnaire is shown in Annexure A.

4.6.2.1 Interview Schedule and qualitative data

An interview schedule (Refer to Annexure A). After getting the contact details of the potential participants from the procurement and technical departments (with the help of senior managers from these departments), two external interviewers (with no conflict of interest) contacted them and made appointments for the interviews. Quota and snowball sampling were used to find and locate the potential

participants. Then, purposive sampling was used to select three potential key informants, from each group, depending on: skill level, a minimum of three years of experience, area of experience, and having participated in reverse auctions, to be interviewed. The study went on adding extra qualifying participants to be interviewed until such a time that any additional participant gave the same information (i.e., saturation point), at which point the interviewer stopped. A minimum of three participants from each group was used.

The ultimate sub-sample size for each group was determined by the saturation point principle. This is a situation where you go on sampling, that is, adding a participant until you reach a point such that any additional participant does not add any new insight or knowledge, and then you stop. An attempt was made to maximise the response rate by following up with telephone calls (Check and Schutt, 201; Krosnick and Presser, 2010; 2). All participants were given confidentiality and anonymity guarantees, and the promise of non-attribution of responses. They were given a friendly reminder after approximately two weeks to engage and answer or were thanked for participating if they had already responded. To ensure correct invitations and reminders, the draft versions of the invitation and reminder were evaluated for readability and comprehensibility by the procurement and technical professionals as well. The interview schedule discussed in sub-section 4.6.1.2 was used to collect the data from 18 participants.

4.7   DATA ANALYSIS

4.7.1   Quantitative Data Analysis

4.7.1.1 Descriptive analysis

The questionnaire discussed in sub-section 4.5.1.1 was used to collect data from 100 respondents. Data were captured using the Excel spreadsheet, which was later imported into the SPSS spreadsheet. Hence, the statistical analysis was done using the SPSS software, involving descriptive statistical analyses. Descriptive analysis included calculations of mean scores, standard deviations, frequencies and percentages, as well as demographic representation of data that is histograms and pie charts.

Correlational analysis, as well as normality tests were done. After the preliminary descriptive statistical analysis (including dealing with missing data, multicollinearity and outlier detection) was done, estimation of the parameters in the regression models and factor analysis were applied, and then a structural equation model was fitted.

4.7.1.2 Factor Analysis and Structural Equation Modelling (SEM)

In this study, factor analysis was done to derive the main dimensions of the constructs that were investigated in this study. The assessment of the model fit (diagnostic statics and goodness of fit statistics) was done by using the commonly used measures of fit, such as chi-square test and Root Mean

Square Error of approximation (RMSEA). Good models are considered to have a RMSEA of .05 or less and models whose RMSEA is .1 or more have a poor fit. Pearson correlation coefficient was used to investigate the strength and direction of linear relationships. Exploratory Factor Analysis (EFA) was used to explore the factor structure, or dimensionality of a construct and CFA was used to confirm its uni-dimensionality. EFA was also used to reduce the dimensions of the items or questions related to the same issue or the items or questions within a given construct into meaningful scales (Henry, Shorter, Charkoudian, Heemstra, Le and Corwin, 2022; Suhr, 2004). Confirmatory Factor Analysis (CFA) was used to determine the ability of a predefined factor model to fit an observed set of data. In this study, CFA allowed the study to test the hypothesis that a relationship between observed variables and their underlying latent constructs, that is, factors, exists (Bandalos and Finney, 2018; Suhr, 2004).

4.7.2   Structural Equation Model (SEM)

SEM is commonly thought of as a hybrid between some form of regression and some form of factor

analysis. SEM was used to test the hypothesised patterns of directional and non-directional relationships among a set of observed (measured) and unobserved (latent) variables. The two goals in SEM are: 1) to understand the patterns of correlation/covariance among a set of variables and 2) to explain as much of their variance as possible with the model specified (Hair, Howard and Nitzl, 2020; Hox and Bechger, 2001). Path diagrams summarize SEMs. The path coefficient, which is derived from regression analysis, was used to measure the variability accounted for by the regression. The research hypotheses were tested using Structural Equation Model (Confirmatory Factor Analysis) to develop the framework (Armstrong, 2019; Creswell, 2012). The formal process utilised, and the outcome thereof are elaborated in chapter five.

4.7.3   The technique used to analyze the Qualitative Qata

Statistical methods were used to analyze the qualitative data. Data was categorized and the categories were coded, resulting in frequency counts. Coding helped to ease the interpretation of the qualitative data. The criticism of the coding method, however, is that coding seeks to transform qualitative data into quantitative data, thereby reducing the detail (i.e., its variety, richness and individual character). However, careful definition of the codes and linking them to the underlying data helped to address this concern. Once the data was coded, it turned into numerical data and then statistical methods were applied for further analysis.

4.7.4 Content analysis

Quantitative content analysis was done to analyse the official documents. In content analysis, patterns are identified and interpreted. According to Liamputtong (2013:246) in enumerative content analysis, or what refers to as traditional quantitative content analysis, mainly the analyst transforms qualitative data into a quantitative form. The technique tends to overlook the latent or covert elements of messages or text, as its focus is mainly on the obvious elements that can be counted (Morelock and Sullivan, 2021; Curtis and Curtis, 2011). Also, once data is categorized, and coded frequency distribution can be created on which statistical methods can then be carried out. In this study, data was categorized, coded and frequency distribution were created.

4.8 VALIDITY AND RELIABILITY

Triangulation was used to address internal validity; it minimized possible biases from participants. A measure is said to be valid if it accurately reflects the concept it is intended to measure (Landers, Armstrong, Collmus, Mujcic and Blaik, 2021; Bryman, 2012). Pearson correlation coefficient was used to quantify convergent and divergent or discriminant validity of the measure. A coefficient of 0.3 - 0.4 was used as a benchmark to assess the validity of the data collection tool (Berthelsen, Westerlund, Bergström and Burr, 2020; Cappelleri *et al.*, 2004). Content validity was assessed by experts for the clarity comprehensiveness and redundancy of the measurement tool. Also, face validity; concurrent validity; predictive validity; construct or measurement validity were considered. Cronbach alpha coefficient (alpha value) was used to measure the reliability or internal consistency of an underlying factor (Shrestha, 2021; Field, 2005). A low alpha value (< 0.7) suggested that the underlying factor is not reliable. Should a single item increase the reliability of the factor, it is common practice to omit it from the factor as a means of increasing the alpha value of the factor (Hayes and Coutts, 2020; Hair, Anderson, Tatham and Black, 1995).

4.9 ETHICAL CONSIDERATIONS

Participation in this research survey questionnaire was voluntary; and permission to utilize data collected was obtained from the participants in writing. The data collected was utilized only for the purpose of the research and was not to be shared with unauthorized individuals. A website was created to administer the survey questionnaire, which contained the consent information, research purpose, procedures, benefits to participants, and assurance of anonymity, access to consent forms, instructions and the survey instrument. The study undertook to keep all the data collected confidential and made available all data collected to all participants who chose to receive the results of the study. Full ethical clearance was obtained from the University of South Africa (UNISA). In order to protect the privacy and anonymity of the

potential participants, the invitation email was sent by using Outlook's blind carbon copy feature. Therefore, the recipients were unable to determine who else received a similar email. The University of South Africa's ethical standards and procedures were maintained through reliability and validity checks of the research.

4.10 LIMITATIONS OF THE STUDY

The research population was limited particularly in South Africa, and the bureaucracy of the procurement function discouraged some of the identified population elements from participating. Very few empirical studies exist in developing countries as far as ORAs are concerned. This implies that the amount of data that could be collected on the issues that were investigated in this study was limited.

4.11 CONCLUSION

This chapter has presented the research design and methods this study used. The hypotheses formed a fundamental part of the study that informed the research design to assist the study to navigate through the theoretical and practicality of finding the appropriate outcome of the study. Detailed information on the testing process and the outcome is discussed in chapter five. The research framework design incorporated all the relevant stages of the process and adopted a quantitative multiple case study approach.

Ultimately the study concluded that a predominantly quantitative methodology was the most suitable to systematically collect, analyze and summarize the findings of the study, to design a conceptual framework for the implementation of reverse auction in the best possible way that will not drastically harm supplier-buyer relationships. A questionnaire was used to collect data from 100 respondents. Then, 43 participants were interviewed for detailed qualitative explanations to quantitative data. Thereby, securing explanations to quantitative results by answering questions, on why and how things happen the way they do. This also helped to address issues of validity. The data analysis involved descriptive statistical analyses including correlational analysis. Inferential data analysis included factor analysis and structural equation modelling (SEM), which was used to test the hypotheses. The path coefficients, which are derived from regression analysis, were used to measure the variability accounted for by the regression; and the research utilized the t-test to test the regression coefficients for statistical significance. The next chapter will feed from the contribution of this critical chapter.

5. CHAPTER FIVE: DATA ANALYSIS

5.1 INTRODUCTION

It emerges in the literature review chapter that Online Reverse Auction (ORA) technology systems offer competitive advantage enhancing benefits through improved supplier-buyer exchange transactions for adopting business organizations. Literature in the background chapter (Chapter 1), and in Chapter 2 also suggests a fair level of awareness of this advantage both in the South African business management circles, and across academia. As outlined in Chapters 1, 2 and 4 however, the level of adoption and implementation of these technologies in the South African corporate environment is paradoxically low a best, and non-existent at worst, with no clear insight on the causes to the status quo. The problem therefore – is that South African entities are missing out on the efficiency enhancing advantages associated with the use of this technology, placing them at a competitive disadvantage by comparison to adopting entities in more competitive global environments. The main question raised by the researcher thus, was "How can the adoption (*including implementation and usage*) of the ORA technology be improved among the private (corporate) and the public service sectors in South Africa".

The aim of this study, thus, was to understand explanations to a limited adoption of the highly appraised ORA technology systems, with a quest for a solution as the main objective. A mixed method approach was adopted to investigate answers to this major question of the study.

Drawing the research design and methodology outlined in Chapter 4, presents the results of the study. A self-administered questionnaire was used to collect quantitative data. Good responses were obtained from the respondents. Chapter five consists of four sections. After the introduction (section 5.1), section 5.2 outlines the process of enquiry, together with a presentation of results of the quantitative data analysis, section 5.3 the results of the inferential data analysis of the quantitative data, section 5.4 the results of the qualitative data analysis, section 5.5 integrates the quantitative and qualitative results, and section 5.6 concludes the chapter. In order to analyze the collected data, we should convert them into valuable information by using statistical tests. Indeed, in any research, data analysis constitutes one of the most important parts. It is of great significance in studying the accuracy of hypothesizes.

5.2 THE RESEARCH PROCESS

Building on a research sample outlined in Chapter 4, the researcher drew on the theoretical framework in Chapter 3 to formulate a questionnaire to investigate the level of ORA (i) Awareness, (ii) Perceptions of its usefulness, (iii) *Perceptions of its relevance to organizational functions*, (iv) *Perceptions on usability* (and ease of use), as well as the (v) *Actual usage*, (vi) *Purposes for which it is used*, and finally, (v)

Explanations to usage or non-usage patterns – among the sampled participants. Whilst the questionnaire was designed with predominantly quantitative questions, explanatory extensions were added to allow a greater insight into the findings. This was distributed to a selected sample of 100 participants that were spread across decision makers, managers and practitioners of the (i) procurement units, and (ii) technology strategists and (iii) technicians – in selected public and private entities as per the sampling process (Section 4.7.2, in Chapter 4).

Given the hybrid nature of the questionnaire (*supplementing Quantitative Questions with Qualitative explanatory probes*), this chapter is drawn up in two parts: (i) descriptive and (ii) inferential statistics. In the descriptive part, the demography of statistical sample is tackled, followed by inferential analysis on the following issues:

1. Kaiser-Meyer-Olkin and Bartlett's test to measure the adequacy of the sampling to use for exploratory factor analysis (EFA).

2. Exploratory factor analysis for deleting the questions with little factor load and communalities (for more preparation to do the confirmatory factor analysis).

3. Study and test the research hypotheses using Structural Equation Model (Confirmatory Factor Analysis) to develop the framework.

A total of 100 hybrid questionnaires, comprising of 32 research questions - consisting of 17 Quantitative questions, and 15 Qualitative questions. Quantitative questions were based on (i) awareness of ORAs, perceptions on (ii) relevance, (iii) usefulness and benefits, (iv) usage status, the (v) cost factor, and (vi) reasons for usage or non-usage of the ORA technology. Qualitative questions on the other hand, were designed for descriptive and explanatory insight into quantitative information.

Using the SPSS 23 software package as a quantitative analytical tool, instructions for answering the questions were effective, and the respondents responded correctly to them.

5.2.1 Overall Results: Summary

In the following table, we drew on the theoretical framework (Table 5) to paint a first-glance, pre-analysis summary of quantitative findings. Seven (7) themes were drawn on the TAM theory as a lens: (i) Awareness of ORAs, (ii) Perceived usefulness, (iii) Perceived ease of use, (iv) perceptions on Security, (v) perceptions on relevance, (vi) perception on interoperability, and (vii) actual usage of ORA by the respondent. Table 7 however, offers a basic status of awareness, and overall perceptions of managers and users on the essence of ORA technology.

At first glance, the pre-analysis summary gives a positive impression about the acceptance of ORA technology among the respondents. This picture further mystify the problem of limited to inadequate adoptions of the ORA technology in selected sectors.

Nevertheless, the pre-analysis summary in Table 7 precedes a presentation and discussion of quantitative finds in section 5.2.2. To this end, one can only look forward to the analysis section, as well as to the qualitative explanations, to better understand the emergent quantitative information.

Table 7: Summary of Findings

Theme	Responses	Frequency by Category						References
		Career Status	Private Sector		Public Sector		Combined	
ORA Awareness	Learnt from: (i) vocational & professional experiences; (ii) Also from compony presentations. One respondent was not sure of this technology.	Technical	5 (Y)	0 (N)	0 (Y)	0 (N)	5 (Y); 0 (N)	(311Q0:1); (322Q0:1); (324Q0:1); (325Q:1); (328Q0:1)
		Managerial	2 (Y)	1 (N)	27 (Y)	0 (N)	29 (Y); 1 (N)	(300Q0:1); (312Q0:1 to 316Q0:1); (317Q0:1to 318Q:1); (323Q0:1 to 327Q0;1)
Perceived Usefulness of ORA	ORAs improve speed & accuracy of transactions. It makes you reach wider audiences, synchronously. Improves service, whilst containing cost of transaction.	Technical	5 (Y)	0 (N)	0 (Y)	0 (N)	5 (Y); 0 (N)	(300Q1:5); (311Q1:5); (311Q2:1-3)
		Managerial	4 (Y)	1 (N)	28 (Y)	0 (N)	32 (Y); 1 (N)	(312Q1:5 to 316Q:5); (317Q1:5 to 318Q1:5); (323Q1:5 to 327Q1;5)
Relevance to entity needs	Most respondents appraised ORA of being relevant to what they do. Only respondent was not aware of this technology, and could only guess that it should be useful.	Technical	5 (Y)	0 (N)	0 (N)	0(N)	5 (Y); 0 (N)	(311Q1:3); (311Q2:1-3); (322Q2:1-3); (324Q2:1-3); (325Q2:1-3); (328Q2:1-3)
		Managerial	4 (Y)	1 (N)	28 (Y)	0 (N)	32 (Y); 1 (N)	(300Q2:1-3); (312Q2:1-3 to 316Q2:1-3); (317Q::1-3 to 318Q2:1-3); (323Q2:1-3 to 327Q2:1:3)
Actual usage by entity	All, but 1 of the 43 respondents had one form of an ORA system or another, being used in their organization. Differences only emerged in terms of purposes, and motivations for such uses.	Technical	5 (Y)	0 (N)	0 (N)	0(N)	5 (Y); 0 (N)	(311Q1:4); (311Q1:9); (311Q1: 12); (322Q2:1-3); (324Q1:4); (325Q1:4); (328Q1:4)
		Managerial	4 (Y)	1 (N)	28 (Y)	0 (N)	32 (Y); 1 (N)	(300Q1:4); (312Q1:4 to 316Q1:4); (317Q1:43 to 318Q1:4); (323Q1:4 to 327Q1: 4)
Ease of use	All, but 1 of the 43 respondents found ORAs to be easy to use	Technical	5 (Y)	0(N)	0 (N)	0(N)	5 (Y); 0 (N)	(311Q1:10); (311Q1:10); (322Q1:10); (324Q1:10); (325Q1:10); (328Q1:10)
		Managerial	4 (Y)	1 (N)	28 (Y)	0 (N)	32 (Y); 1 (N)	(300Q1:10); (312Q2:1-3 to 316Q1:10); (317Q1:10 to 318Q1:10); (323Q1:10 to 327Q1:10)
Interoperability	ORAs, including ERP systems are in synch with other systems between buyers and suppliers. 2 of the respondents cited interoperability as a motivating factor for using ORAs.	Technical	5 (Y)	0 (N)	0 (N)	0(N)	5 (Y); 0 (N)	(311Q1:7); (311Q2:2-3); (322Q1:7); (322Q2:2-3); (324Q2:2-3); (324 Q1:7); (352 Q1:7) (325Q2:2); (328Q1:7); (328 Q2:2)
		Managerial	4 (Y)	1 (N)	28 (Y)	0 (N)	32 (Y); 1 (N)	(300 Q1:7); (300Q2:2); (312Q1:7); (312Q2:2 to 316Q2:2); (317Q1:7 to 318Q1:7); 317Q2:2 to 318Q2:2 (323Q1:7 to 327Q1:10); (318Q1:7 to 323Q2:2)

Perception on Security	Cybercrime and fraud remain a concern. 2 respondents cited security issues as a deterrent against adoption	Technical	5 (Y)	0 (N)	0 (N)	0(N)	5 (Y); 0 (N)	((311Q2:1-3); (322Q2:1-3); (324Q2: 1-3); (325Q2: 1-3); (328Q2: 1-3)
		Managerial	4 (Y)	1 (N)	28 (Y)	0 (N)	32 (Y); 1 (N)	(300Q2:1-3); (312Q2:1-3 to 316Q2:1-3); (317Q2:1-3 to 318Q2: 1-3); (323Q2:1-3 to 327Q2: 1-3)
Cost Effectiveness	Most respondents linked ORAs with operational cost savings	Technical	5 (Y)	0 (N)	0 (N)	0(N)	5 (Y); 0 (N)	((311Q2:1-3); (322Q2:1-3); (324Q2: 1-3); (325Q2: 1-3); (328Q2: 1-3)
		Managerial	4 (Y)	1 (N)	28 (Y)	0 (N)	32 (Y); 1 (N)	(300Q2:1-3); (312Q2:1-3 to 316Q2:1-3); (317Q2:1-3 to 318Q2: 1-3); (323Q2:1-3 to 327Q2: 1-3)
Want - to use it?	All, but 2 of the 43 respondents reflected preference for ORAs by comparison to manual alternatives	Technical	5 (Y)	0 (N)	0 (N)	0(N)	5 (Y); 0 (N)	(311Q1:1-5); (322Q1:1-5); (324Q1:1-5); (325Q1:1-5); (328Q1:1-5)
		Managerial	4 (Y)	1 (N)	28 (Y)	0 (N)	32 (Y); 1 (N)	(300Q1:1-5); (312Q1:1-5 to 316Q12:1-5); (317Q1::1-5 to 318Q1:1-5); (323Q1:1-5 to 327Q1:1-5)

5.2.2   Results of the Quantitative Analysis

This section discusses the background characteristics of the respondents. These are industry or sector and function or discipline in which the respondents work.

Out of the total population of 1500, a sample of 100 was selected using the snowball sampling technique, with a 43% response rate after data collection.

5.2.2.1 Industry representation

The industries which were used in three cases of this study were Public Sector (Governance), Private Sector, ICT &, Financial or Banking Sector. Figure 25 indicate that most of the respondents (58.1%) represented the Public Sector, followed by the utility Sector (18.6%) then ICT Sector (16.3%) and lastly Other Sectors (included is the financial sector) had a representation of 7%. (Figure 25)
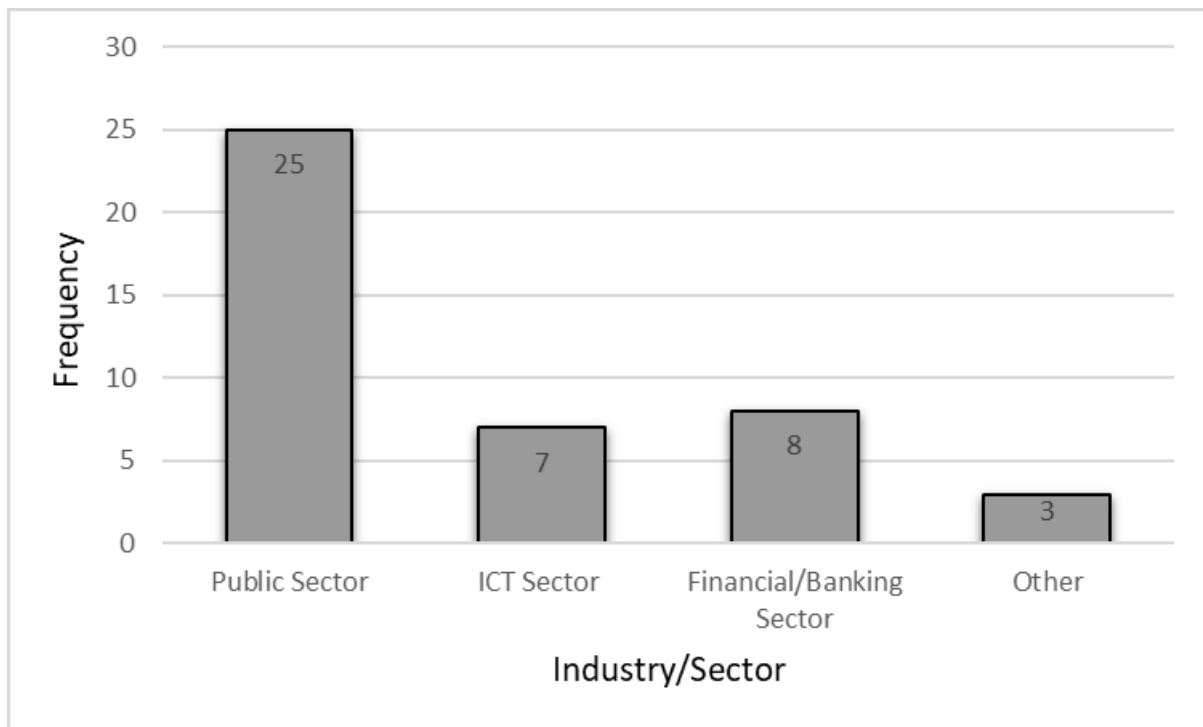
Figure 25:Sector Representation

5.2.2.2 Function or Discipline

The results in (Figure 26) indicate that most of the respondents were in the supply chain management department (44.2%). 25.6% were in the management discipline, 18.6% were in the technical/ I.T environment and 11.6% were in other departments.

This shows a fair representation from each sector and department which provides a rich in-depth information and responses from the respondents.
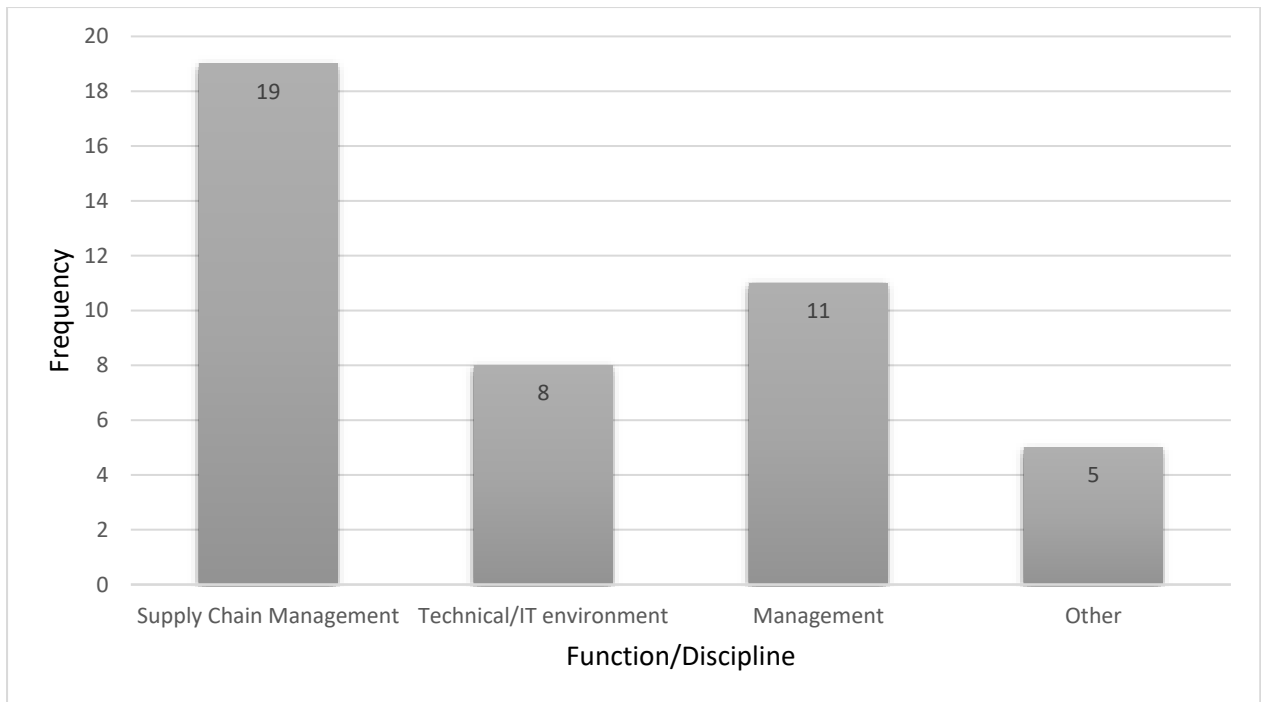
Figure 26:Function or discipline

5.3 Normality Tests

According to the results of the normality tests shown below, Kolmogorov-Smirnov and Shapiro-Wilk tests indicate that the distributions of all the dimensions were not normal since, for example, according to the Shapiro-Wilk normality test (which is a better test than the Kolmogorov-Smirnov test), for Adoption of ORAs, prob. = 0.011 (< 0.05) and for the others, the probabilities are less than 0.01, which is the level of significance. When the probabilities are greater than the cut-off point (that is, 0.1, 0.05 or 0.01), a variable would be assumed to follow the normal distribution according to the relevant statistical theory. The null hypothesis that the distribution is normal was rejected at the 1% level of significance for all the variables.

Table 8:Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Adoption_ORAs	.213	43	.000	.889	43	.011
Implementation_ORAs	.170	43	.003	.888	43	.001
Motivation_ORAs	.180	43	.001	.882	43	.000

a. Lilliefors Significance Correction

The diagrammatical representations (that is, histogram, normal Q-Q plot and Box-Whisker diagram) of the distributions also indicate that the distributions were not normal. For example, the histogram for Motivation or purpose of using ORAs is skewed to the left. Factor analysis and Structural Equation Modelling (SEM) however, tend to be insensitive to normality according to researchers.

(Figure 27, Figure 28 and Figure 29) illustrates this more clearly. The diagrams indicate that the distributions of the variables, namely, adoption of ORAs, Implementation and use of ORAs and motivation or purpose of using ORAs are not normally distributed.

5.4 Adoption of ORAs
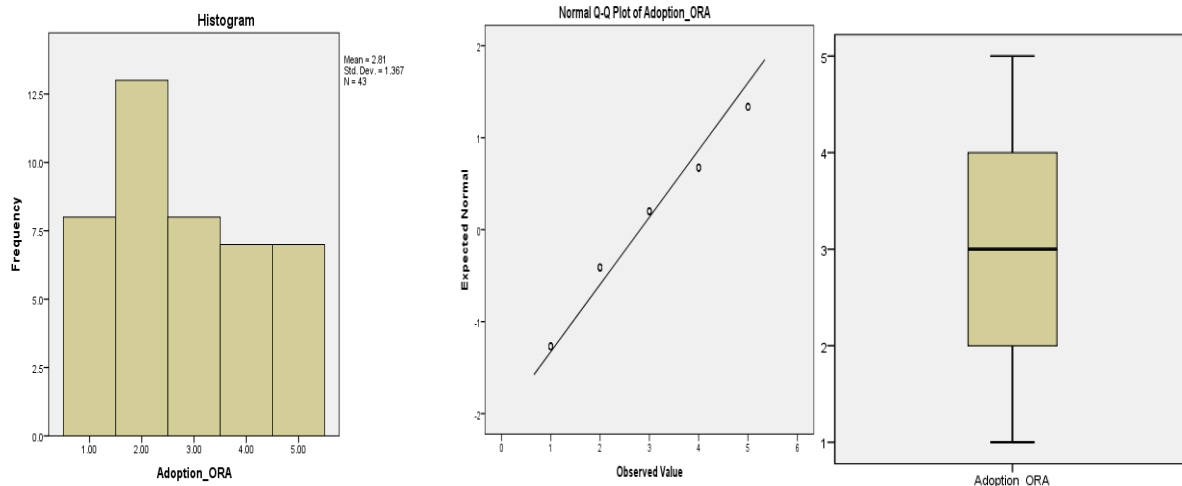
Figure 27:Adoption of ORAs

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5.5   Implementation and use of ORAs
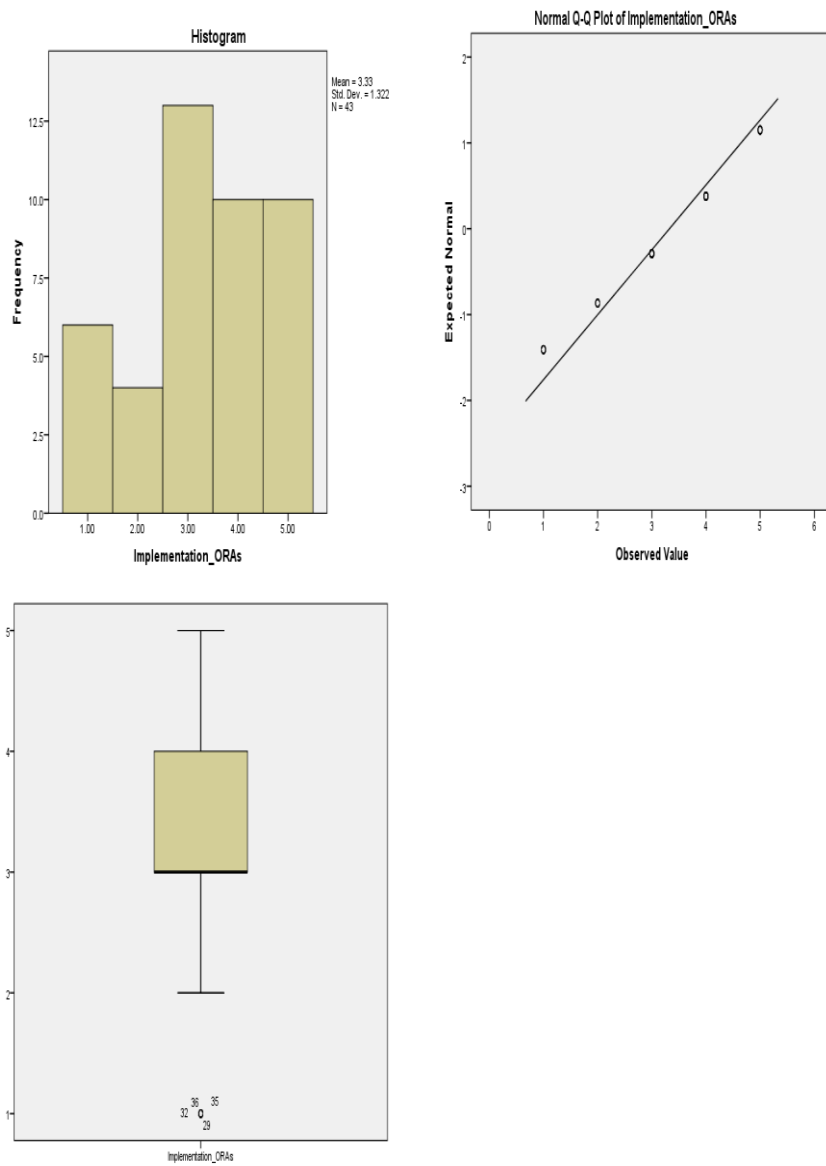
Figure 28:Implementation and use of ORAs

5.6 Motivation or purpose of using ORAs
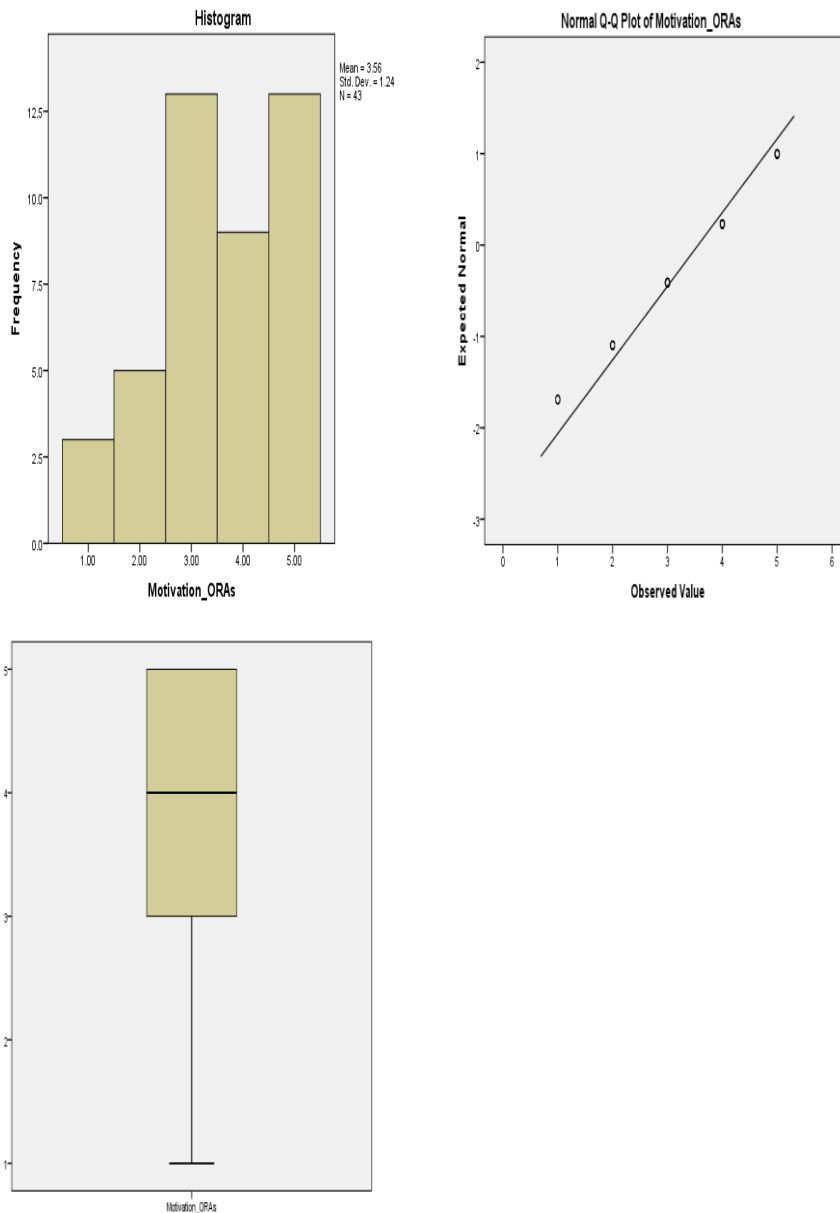
Figure 29:Motivation or purpose of using ORAs

5.7 Correlations and reliability

This sub-section presents the correlations and reliability results of the variables.

5.7.1 Adoption of ORAs

Table 9:Cronbach's Alpha:

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
.727	.742	5

Variable	Exposure to ORAs	Knowledge of ORA technology	Reverse Auction Transactions	Manual or Online Reverse Auction System	Reasons of preferred Reverse Auction	Cronbach's Alpha if Item Deleted
Exposure to ORAs	1	.694	.605	.727	.661	.742
Knowledge of ORA technology		1	.762**	.637**	.775**	.680
Reverse Auction Transactions			1	.682**	.718**	.690
Manual or Online Reverse Auction System				1	.854**	.790
Reasons of preferred Reverse Auction					1	.761

The construct's reliability is high; the Cronbach's alpha coefficient is .727. All five variables are highly correlated with each other. Therefore, none of the variables were excluded from the analysis as for every variable, Cronbach's alpha if Item Deleted is high; it is over 0.7.

5.7.2 Implementation and use of ORAs

Table 10:Implementation and use of ORAs

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
.963	.963	4

Variable	Duration of use of Online Auction System in organisation	Easy use of ORA technology vs Manual processes	Other tools used besides ORAs	Non-use of ORAs in organisation	Cronbach's Alpha if Item Deleted
Duration of use of Online Auction System in organisation	1	.896**	.834**	.700**	.906
Easy use of ORA technology vs Manual processes		1	.908**	.801**	.900
Other tools used besides ORAs			1	.767**	.905
Non-use of ORAs in organisation				1	.938

The construct's reliability is high; the Cronbach's alpha coefficient is .963. All four variables are highly correlated with each other. Therefore, none of the variables were excluded from the analysis as for every variable, Cronbach's alpha if Item Deleted is high; it is over 0.9.

5.7.3 Motivation or purpose for using ORA

Table 11:Motivation or purpose for using ORA

a. Cronbach's Alpha	b. Cronbach's Alpha Based on Standardised Items	c. N of Items
d. .552	e. .514	f. 3

Variable	Option to use ORAs by the organization	Adopt to the use of ORAs	Benefits of ORAs	Cronbach's Alpha if Item Deleted
Option to use ORAs by the organisation	1	.093	.210	.552
Adopt to the use of ORAs		1	.742**	.278
Benefits of ORAs			1	.710

The construct's reliability is low. Cronbach's alpha coefficient is .552. The variable "Option to use ORAs by the organization" is correlated with the others. For example, at the 10% level. So, it was excluded from the construct to improve the reliability of Cronbach's alpha coefficient of .710.

5.7.4 Overall Constructs

The correlation matrix of the four overall constructs is given below.

Table 12:Overall Correlation matrix:

Variable	Adoption of ORAs	Implementation and use of ORAs	Motivation or purpose for using ORA
Adoption of ORAs	1	.465** (.028)	.070 (.989)
Implementation and use of ORAs		1	.006*** (.009)
Motivation or purpose for using ORA			1

The results indicate that adoption of ORA is positively correlated with the implementation and use of ORAs (r = .465, prob. = .028 < .05).

5.8 Inferential Statistics

5.8.1 Exploratory Factor Analysis

Factor validity is a form of construct validity gained through factor analysis. Factor analysis is a statistical technique with lots of usage in humanities. In fact, it seems that usage of factor analysis in the researches in which test and questionnaire are used is essential (Kalantari, 2009). It should be noted that since number of factors, total variance explained, and communalities of the questions can be gained from factor analysis, in this part of the research, we aim at calculating the communalities and deleting the questions with little communalities. Indeed, when using factor analysis; the researcher can gain better results when applying confirmatory factor analysis and structural equation Model.

The EFA model can be written as:

Where

Y is a matrix of measured variables

X is a matrix of common factors

β is a matrix of weights (factor loadings), and

E is a matrix of unique factors, error variation.

Communality is computed for each variable. Communality is the variance in that variable accounted for by all the factors. It measures the percentage of variance in a given variable explained by all the factors jointly and may be interpreted as the reliability of the variable. In other words, each observed variable's communality is its estimated squared correlation with its own common portion, that is, the proportion of variance in that variable that is explained by the common factors. It is computed by summing squares of

factor loadings for all factors for a given variable (row). A large communality value indicates a strong influence by an underlying construct. A communality that exceeds 1.0 indicates a spurious solution, which may reflect too small a sample or that the study has too many or too few factors. If you perform factor analyses with several different values of m, as suggested above, you will find that the communalities generally increase with m. But the communalities are not used to choose the final value of m. Low communalities are not interpreted as evidence that the data failed to fit the hypothesis, but merely serves as evidence that the variables analysed have little in common with one another.

When the factor model fits the data, the factor loadings are chosen to minimise the discrepancy between the correlation matrix implied by the model and the actual observed matrix. The amount of discrepancies after the best parameters are chosen can be used as a measure of how consistent the model is with the data. The most commonly used test of model adequacy, the chi-square test, was applied in this study. The null hypothesis for this test was that the model adequately accounted for the data, while the alternative was that there was a significant number of discrepancies. Unfortunately, this test is highly sensitive to the size of the sample, such that tests involving large samples will generally lead to a rejection of the null hypothesis, even when the factor model is appropriate. The sample size of 43 was adequate since the rule of thumb for SEM is that modelling requires at least 10 observations per indicator (Nunnally, 1967). The exact sample size varies with the number of variables or indicators and factors in the model, but typically you require around 200 subjects for a standard model. Some researchers suggest a minimum sample size of between 100 and 200 for factor analysis to be conducted.

The measurement model contains the relationships between two or more factors and their indicators. The factors can either be correlated or not. Usually, each indicator loads on one factor, but models with one indicator loading on different factors are possible. The chi-square statistic is very sensitive to sample size, rendering it unclear in many situations, whether the statistical significance of the chi-square statistic is due to the poor fit of the model or to the size of the sample. This uncertainty has led to the development of many other statistics to assess the overall model fit (Stevens 1996).

Alternatively, the chi-square goodness of fit statistic tests the null hypothesis that there is no statistically significant difference in the observed and theoretical covariance structure matrices. Goodness of fit index (GFI) is a "measure of the relative number of variances, and covariances jointly accounted for by the model" (Joreskog and Sorbom, 1986, p. 41).It is roughly analogous to the multiple R squared in multiple regression. A model is considered to have a better fit when "it has a lower ratio computed as the noncentrality parameter divided by degrees of freedom" (Thomas and Thompson 1994, p.10). The closer the GFI is to 1.00, the better the model fits the data. The adjusted goodness of fit statistic is based on a correction for the number of degrees of freedom in a less restricted model, obtained by freeing more

parameters. Both the GFI and the adjusted goodness-of-fit statistic (AGFI) are less sensitive to sample size than the chi-square statistic. The values of GFI, AGFI, NFI, and CFI should exceed 0.9 for a good model fit.

The parsimony ratio is important when interpreting the data because the statistic takes into consideration the number of parameters estimated in the model. The fewer the number of parameters necessary to specify the model, the more parsimonious the model is and the simpler the interpretation of the model will be. It should be noted that more than one model may accurately describe the data and that a number of compatibilities determining indices should be used to determine the fit of the various models (Thompson and Borrello, 1989; Biddle and Marlin, 1987;). Therefore, finding a model with a good fit does not mean that the model is the only or optimal model for that data. In addition, because there are a number of indices which indicate the model is a good fit, with which to make comparisons, "fit should be simultaneously evaluated from the perspective of multiple fit statistics" (Campbell, Gillaspy and Thompson, 1995:6).

When a confirmatory analysis fails to fit the observed factor structure with the theoretical structure, the study can evaluate ways to improve the model by exploring which parameters might be freed that were fixed and which might be fixed that were freed. Computer packages can be utilised to change parameters one at a time in order to determine what changes offer the greatest amount of improvement in the fit of the model. The model needs to be modified to improve the fit, thereby estimating the most likely relationships between variables. The variables are selected on the basis of the theory, and factor analysis is used to see if they load as predicted (using the theory) on the expected number of factors. The clearer the true factor structure, the smaller the sample size needed to discover it. But it would be very difficult to discover even a very clear and simple factor structure with fewer than about 50 cases, and 100 or more cases would be much preferable for a less clear structure. You perform factor analyses with different numbers of factors, complete with rotation, and choose the one that gives the most appealing structure. Rotation allows you to identify meaningful factor names or descriptions. In this study, Principal Component Analysis (PCA), which seeks a linear combination of variables, such that the maximum variance is extracted from the variables used.

It is called the principal axis method because it results in an orthogonal (uncorrelated) factor that is necessary for discriminant validity. Principal axis factoring (PAF) seeks the least number of factors, which can account for the common variance (correlation) of a set of variables.

5.8.1.1 Rotation

Rotation serves to make the output or results more understandable and is usually necessary to facilitate the interpretation of factors. In this study, the orthogonal rotation method, Varimax method, which requires the factors to remain uncorrelated was used. Varimax rotation is an orthogonal rotation of the factor axes, which was used to maximise the variance of the squared loadings of a factor (column) on all the variables (rows) in a factor matrix. It has the effect of differentiating the original variables by the extracted factor. The tendency of this type of rotation is that each factor will have either large or small loadings of any particular variable. A varimax solution yields results, which make it as easy as possible to identify each variable with a single factor. This is the most common rotation option.

5.8.1.2 Model fit

Model fit refers to how well the proposed factor model accounts for the correlations between variables in the dataset. If one is accounting for all the major correlations inherent in the dataset (with regard to the variables in the model), then there will be a good fit; if not, then there is a significant "discrepancy" between the correlations proposed and the correlations observed, and thus one has a poor model fit, meaning that the proposed model does not "fit" the observed or "estimated" data (i.e., the correlations in the dataset). There are specific measures that can be calculated to determine the adequacy of the fit. The Kaiser-Meyer-Olkin (KMO) test measures sampling adequacy.

It is an index that is used to compare the magnitudes of the observed correlation coefficients to the magnitudes of the partial correlation coefficients (Refer to SPSS User's Guide). The KMO value should be greater than 0.5 for a satisfactory factor analysis to proceed. Large values for the KMO measure indicate that a factor analysis of the variables is justified. Bartlett's test of sphericity is used to test the null hypothesis that the variables in the population correlation matrix are uncorrelated.

The metrics that ought to be reported in factor analysis and SEM are listed below, along with their acceptable thresholds. Goodness of fit is inversely related to sample size and the number of variables in the model. Thus, the thresholds below are simply a guideline (Refer to Table 5). Structural Equation Modelling (SEM) and CFA specifically rely on several statistical tests to determine the adequacy of model fit to the data. As mentioned earlier, the chi-square test indicates the amount of difference between expected and observed covariance matrices.

Table 13:Model fit criteria and acceptable fit interpretation:

Standardized Root Mean Square Residual (SRMR)

Model fit criterion	Acceptable level	Interpretation
CMIN/DF (χ^2)	<2.0	Compares obtained χ^2 value with tabled value for given df
Goodness of fit (CFI)	>.90	Value close to .95 reflects a good fit; traditional
Standardised Root mean square residual (SRMR)	The standardised RMR – ranges from 0 to 1	Values <0.05 indicates a good model fit
Normed-Fit-Index (NFI)	0 (no fit) to 1 (perfect fit)	Values close to .95 reflects a good fit
Root mean square error of approximation (RMSEA)	< 0.05	<.05 Good; .05 - .10 moderate; >.10 bad
PCLOSE	>.05	Good fit
Incremental fit Index (IFI)	0 (no fit) to 1 (perfect fit)	Values >.95 indicate a good fit

Source: Adapted from Byrne (2001:79), Schumacker and Lomax (2004:82) and Arbuckle (2007).

A chi-square value close to zero indicates little difference between the expected and observed covariance matrices. In addition, the probability level must be greater than 0.05 when chi-square is close to zero; this is where the model is acceptable. In this study, the GFIs used, included the chi-square test, chi-square–degrees of freedom ratio, the Bentler comparative fit index (CFI) (Bentler, 1990), parsimony ratio, and the root mean square error of approximation (RMSEA) (which is an estimate of discrepancy per degree of freedom in the model). Acceptable model fit is indicated by a chi-square probability greater than or equal to 0.05. GFI and AGFI (Joreskog and Sorbom, 1989) were not used since the computer software (SPSS AMOS) does not compute them. As for exploratory factor analysis (EFA), in the case of CFA, a study should have at least two or three variables for each factor in the model. Unlike EFA, however, the study should choose variables that are strongly associated with the factors in the model.

The CFI is equal to the discrepancy function adjusted for sample size. CFI ranges from 0 to 1, with a larger value indicating a better model fit. Acceptable model fit is indicated by a CFI value of 0.90 or greater (Hu and Bentler, 1999). RMSEA is related to the residual in the model. RMSEA values range from 0 to 1 with a smaller RMSEA value indicating a better model fit. According to Hu and Bentler (1999), an acceptable model fit is indicated by an RMSEA value of 0.06 or less. If a model fit is acceptable, the parameter estimates are examined. The ratio of each parameter estimate to its standard error is distributed as a z statistic and is significant at the 0.05 level if its value exceeds 1.96 and at the 0.01 level if its value exceeds 2.56 (Hoyle, 1995). Unstandardised parameter estimates retain scaling information of variables and can only be interpreted with reference to the scales of the variables. Standardised parameter estimates are transformations of unstandardised estimates that remove scaling and can be used for informal comparisons of parameters throughout the model. Standardised estimates correspond to effect-size estimates. We now look at the confirmatory factor analyses of the individual key variables.

5.8.1.3. Exploratory Factor Analysis – Variable: "Adoption & Use of ORAs"

Error! Reference source not found. represents the result of KMO and Bartlett's test for the data related to the variable of Adoption of ORAs.

Table 14: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.802
Bartlett's Test of Sphericity	Approx. Chi-Square	38.915
	Df	9
	Sig.	.000

Table 5.4 KMO and Bartlett`s Test on Business Proposals

Since KMO is greater than 0.7 and Bartlett's test significance number is less than 0.05 (sig<0.05), we can say that the data is proper for doing factor analysis.

Table 15 shows the communalities of the questions related to ' Adoption of ORAs '.

Table 15:Communalities for Adoption of ORAs.

	Initial	Extraction
Exposure to ORAs	1.000	.967
Knowledge of ORA technology	1.000	.628
Reverse Auction Transactions	1.000	.976
Manual or Online Reverse Auction System	1.000	.584
Reasons of preferred Reverse Auction	1.000	.224

Extraction Method: Principal Component Analysis.

Table 10 shows the inadequacy of some questions because of a lack of harmony with the other questions within the process of factor analysis (the fifth question on reasons for preferred reverse auction system). As we can clearly see, the communality of the mentioned question is less than 0.50. The total variance explained is presented in Table 16

Table 16: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.065	41.307	41.307	2.065	41.307	41.307	1.947	38.933	38.933
2	1.233	24.669	65.976	1.233	24.669	65.976	1.352	27.043	65.976
3	.931	18.619	84.595						
4	.725	14.496	99.091						
5	.045	.909	100.000						

Extraction Method: Principal Component Analysis.

The total variance explained in above table (before deleting the questions with little communalities) shows that these questions totally form two factors which explain and cover about 65.976 % of the variance of ' Adoption of ORAs '. After deleting the questions with little communalities (less than 0.5), we will deal with the mentioned issues again. The total variance after deleting communalities explained is presented in Table 17.

Table 17: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.020	50.499	50.499	2.020	50.499	50.499	1.950	48.760	48.760
2	1.191	29.773	80.272	1.191	29.773	80.272	1.260	31.512	80.272
3	.743	18.578	98.851						
4	.046	1.149	100.000						

Extraction Method: Principal Component Analysis.

Table 17 represents the communalities of the questions after deleting the questions with little communalities. The total variance explained in table (after deleting the questions with little communalities) shows that these questions totally form two factors and these two factors explain and cover about 80.272% of the variance of Adoption of ORAs. Comparing the two 'total variance explained' tables, it can be easily perceived that after deleting the questions with little communalities, the powers of explanation of the questions has risen. This result would be very useful in confirmatory factor analysis. Later we will deal with factor loads and naming each component.

5.8.1.4 Exploratory Factor Analysis – Variable: "ORAs Implementation & Usage"

The result of KMO and Bartlett's Test for the data related to the variable of ' Implementation and Use of ORAs ' is shown in Table 18

Table 18:KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.769
Bartlett's Test of Sphericity	Approx. Chi-Square	3.915
	Df	6
	Sig.	.000

According to table 5.8, the data is proper for doing the factor analysis. This is because KMO is greater than 0.7 and Bartlett's test significance number is less than 0.05 (sig<0.05).

The communalities of the questions for the variable of ' Implementation and Use of ORAs ' are presented in Table 19

Table 19:Communalities

	Initial	Extraction
Duration of use of Online Auction System in organisation	1.000	.784
Easy use of ORA technology vs Manual processes	1.000	.501
Other tools used besides ORAs	1.000	.582
Non-use of ORAs in organisation	1.000	.834
Easiness/difficultness of the system	1.000	.744

Extraction Method: Principal Component Analysis.

Since the numbers of communalities in table 5.9 are greater than 0.50, all the questions related to the variable of 'implementation and use of ORAs' are proper in the process of factor analysis; therefore, no question is deleted.

Table 20:Total Variance Explained 2

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.224	24.482	24.482	1.224	24.482	24.482	1.193	23.850	23.850
2	1.119	22.386	46.868	1.119	22.386	46.868	1.105	22.103	45.954
3	1.002	20.042	66.910	1.002	20.042	66.910	1.048	20.956	66.910
4	.906	18.126	85.037						
5	.748	14.963	100.000						

Extraction Method: Principal Component Analysis.

The total variance explained in Table 20 shows that these questions totally form three factors and these three factors explain and cover about 67% of the variance of Implementation and use of ORAs.

5.8.1.5. Exploratory Factor Analysis – Variable: "Motivation to use ORAs"

Table 21 presents the results of KMO and Bartlett's test for the data related to the variable of 'Motivation or purpose to use ORAs'

Table 21:KMO and Bartlett's Test of Sampling Adequacy

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.810

Bartlett's Test of Sphericity	Approx. Chi-Square	1382.905
	Df	15
	Sig.	.000

According to Table 21 the data is proper for doing the factor analysis. This is because KMO is greater than 0.7 and Bartlett's test significance number is less than 0.05 (sig<0.05).

The communalities of the questions for the variable of 'Motivation or purpose to use ORAs' are presented in Table 22

Table 22:Communalities

	Initial	Extraction
Opt to use ORAs by the organisation	1.000	.981
Companies should adopt the use of ORAs	1.000	.966
Benefits of ORAs	1.000	.961
The system is easy to use	1.000	.956

Extraction Method: Principal Component Analysis.

Since the numbers of communalities in Table 23 are greater than 0.50, all the questions

related to the variable of 'motivation or purpose of using ORAs' is proper in the process of factor analysis; therefore, no question is deleted.

Table 23: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.453	90.887	90.887	5.453	90.887	90.887
2	.378	6.308	97.195			
3	.113	1.884	99.080			
4	.028	.470	99.550			
5	.023	.389	99.938			
6	.004	.062	100.000			

Extraction Method: Principal Component Analysis.

The total variance explained in Table 23 shows that these questions totally form one factor and these factors explain and cover about 90.887 % of the variance of 'motivation or purpose to use ORAs'. This number indicates the very good power of explanation of research questions for 'purpose to use ORAs'.

5.8.2   . Structural Equation Model for Research Hypotheses Tests

One of the most suitable and the most powerful methods of analysis in the field of social sciences is the multi-variable analysis. This is because the nature of these researches is multi-variable, and cannot be solved by two-variable methods in which an independent variable is considered with one dependent variable in each time. Multi-variable analysis is attributed to a series of analysis methods whose main characteristic is the ability to analyze K independent variables and N dependent variables simultaneously. It should be said that the covariance structures analysis or Structural Equation Model is one of the main methods of analyzing complex data structures.

5.8.2.1. Structural Equation Modeling Procedure

 The process of covariance structures analysis includes a series of steps to be followed. These steps include:
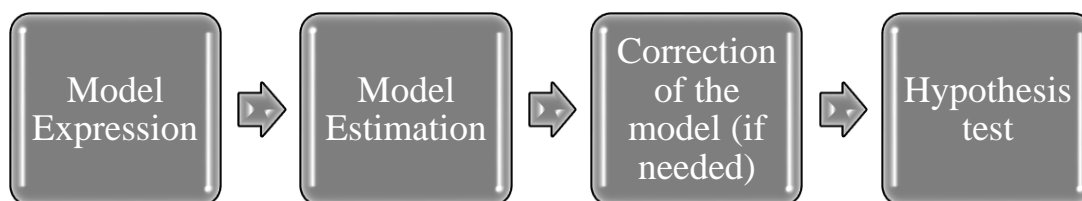
Figure 30: Structural Equation Modelling Procedure
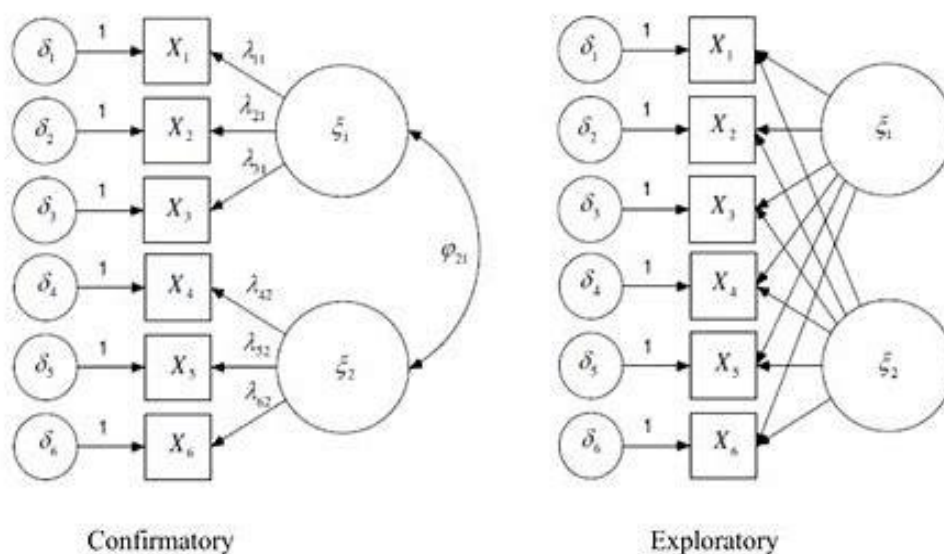
Figure 31: Basic symbolization

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In the structural model it is tried to make clear whether the relationships between the latent traits which are taken from the theory are confirmed by data gathered from the sample or not. The relationships between the variables in structural equation model are divided into two general areas: 1) the relationships between hidden and evident variables and 2) the relationships between hidden variables and hidden variables. The first group is called measuring model and the second is called structural model (Kalantari, 2009). According to what has been said above, the sign oval indicates the main variables (latent variables) and rectangular signs indicate the research dimensions (evident variables).

In Figure 32, the one-way arrow from the latent variable (oval) to evident variable (rectangular) indicates a correlation and two-way arrow Figure 32 between latent variables shows the relationship between variables which is known as (φ) in the structural equation model (Kalantari, 2009). In the conceptual model of the research there are three latent variables (oval) including: Adoption of ORAs, Implementation and use of ORAs and Motivation or purpose to use ORAs Figure 32. The evident variables are the research dimensions which have been gained after doing the factor analysis.
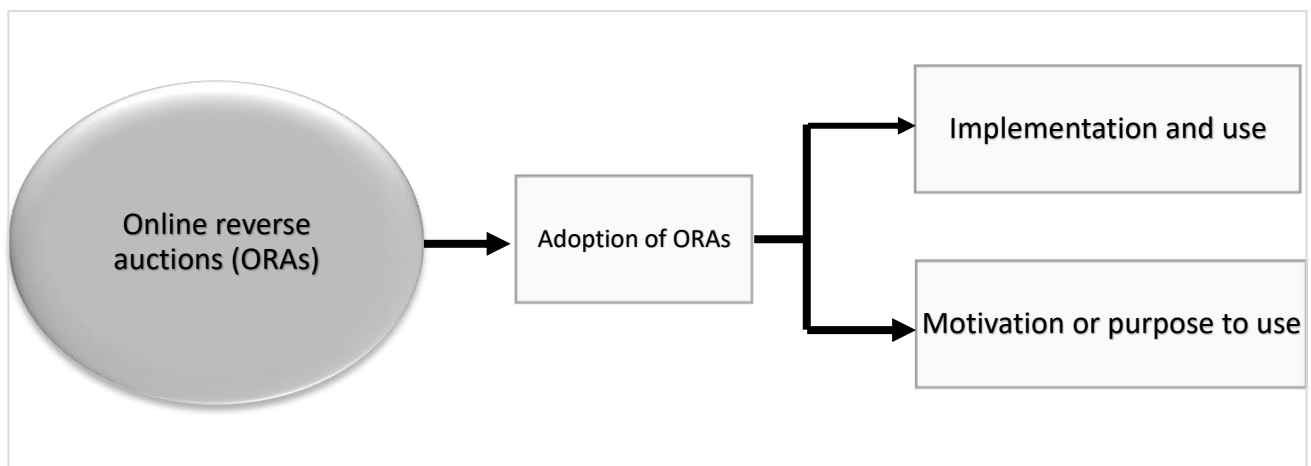
Figure 32: The research conceptual model

In this section the following steps will be followed:

1. Studying the accuracy of the measuring model by its indices

2. Correction of the model if it is needed (Kalantari, 2009)

3. Studying the significance of the relationships with t-value (if they are not significant, a special number will be determined)

4. Studying the correlation

The first basic question which is raised after modeling is whether the model is a proper one (accuracy of the measuring model) or not. To check this, some indices should be used including chi-square relative to

its degree of freedom which should be less than 3, root mean square error of approximation (RMSEA) whose value should be less than 0.08, p-value which should be less than 0.05, goodness of fit index (GFI) and also adjusted goodness of fit index (AGFI) which should be more than 0.9.

The mentioned indices in the table below indicate the suitability of the measuring model of the related variables. Indeed, chi-square relative to its degree of freedom is 2.88 (less than 3), RMSEA is less than 0.08, and the p-value is less than 0.05. The other fitness indices of the model are presented in Table 24.

Table 24: Fitness Indices

Indices	Recommended Value	Value	Fitness indices result
Chi-square relative to its degree of freedom	df<3	2.88	Suitable
p-value	p-value< 0.05	0.001	Suitable
Root mean square error of Approximation	0.08 < 0.05<RMSEA	0.078	Suitable
Goodness of fit index	GFI > 0. 9	0.805	Fairly suitable
Adjusted goodness of fit index	AGFI > 0. 9	0.885	Fairly suitable
Comparative fit index	CFI> 0.9	0.920	Suitable
Normed fit index	NFI > 0.9	0.920	Suitable

Having looked at Table 24, it can be easily perceived that the fitness of the model is suitable (Closely fit). In the next step, we study the significance of the results in the model.

It should be noted that since we are looking for hypothesizes test with a level of confidence of 0.95, the numbers that are significant are not between -1.96 and 1.96 (Kalantari, 2009). In the significance model, all the relationships are significant; therefore, the research hypothesizes can be studied. Hence, the primary conceptual model is hereby confirmed. Now, paying attention to the model with significant numbers and standard estimation model, the following hypotheses will be tested.

From Table 24, it can be deduced that:

1.Adoption of online reverse auctions is affected the perceptions on the online reverse system (β=.298, prob. = 0.001<0.05) at the 5% level; the results demonstrate that in South Africa the positive perception on online reverse auctions will result in high adoption of ORAs.

2.There is no relationship between perception on online reverse auctions and motive or purpose of using the ORAs (β =0.000, prob. = 0.099 > 0.05) at the 5 % level; and

3.Implementation or use of ORAs (β =-.459, prob. = 0.002 < 0.05) affects the motivation or purpose of using ORAs at the 5 % level. This is a highly significant relationship. The results of the SEM further indicate the perceptions on online reverse auctions relationships positively predicted low adoption of ORAs. The negative beta value denotes an inverse relationship between perceptions – adoption of ORAs.

Table 20: Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P
Adoption of online reverse auctions	<---	Perception on online reverse auctions	.298	.188	1.679	.001
Purpose of using ORAs	<---	Perception on online reverse auctions	.000	.109	-.001	.099
Implementation of ORAs	<---	Purpose of using ORAs	-.459	.153	-3.163	.002

Intercepts: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P
Perception on online reverse auctions	4.120	.091	38.995	***
Adoption of online reverse auctions	1.404	.587	2.066	.031
Purpose of using ORAs	3.875	.501	8.598	***
Implementation of ORAs	4.561	.383	10.622	***

All the intercepts are statistically significant. In conclusion, it has been found that adoption of online reverse auctions is affects the perceptions on the online reverse system. The following hypotheses were tested in this study:

Research Hypothesis 1

H_0: In South Africa, the positive perception on online reverse auctions will not result in high adoption

H_1: In South Africa, the positive perception on online reverse auctions will result in high adoption

The null hypothesis was rejected and the alternative hypothesis that in South Africa, the positive perception on online reverse auctions will result in high adoption of the ORAs at the 5% level.

Research Hypothesis 2

H_0: In South Africa, the positive perception on online reverse auctions will not result in high implementation and use

H_1: In South Africa, the positive perception on online reverse auctions will result in high implementation and use

The results indicate that there is no relationship between perception on online reverse auctions and high implementation and use at the 5% level. Therefore, we fail to reject the null hypothesis.

Research Hypothesis 3

H_0: In South Africa, the negative perception on online reverse auctions will not result in low adoption

H_1: In South Africa, the negative perception on online reverse auctions will result in low adoption

The results indicate that there is a relationship between negative perception on online reverse auctions and low adoption at the 5 % level. Therefore, it can then be concluded that the null hypothesis was rejected for the alternative that in South Africa, the negative perception on online reverse auctions will result in low adoption.

5.9 QUALITATIVE ANALYSIS

A semi-structured questionnaire was used to collect qualitative data on the issues that concern reverse auction, buyer-supplier relationships, and supplier development, as well as supplier performance. The following were the answers obtained for the open-ended questions from 43 participants.

Question 1

What is the relevance of the ORAs tools in your job or organization?

Fourteen (32.6%) out of 43 participants are of the view that online reverse auction is relevant in their organisations in the sense that ORAs tools achieve savings. This is in harmony with (Sehwail et al. 2008; Ganesan et al. 2009; Wooten et al. 2017), who posit that ORAs tools have acquired a lot of traction as a resource-saving procurement method. Seven (16.3%) of the participants thought that ORAs are relevant for the procurement and making payments. According to one participant, "ORAs allow organisations to communicate with suppliers all over the world in real time, as well as suppliers to participate in the procurement processes of a large number of potential clients." This is also highlighted by five participants (16.3%) ascribe ORAs tools relevance as tools used to procure technical equipment for their technology sites. Only 9.3% of the participants identified the relevancy of the ORAs as tools used for the simple and fixed scope of work, whereas 18.6% and 7% of the participants asserted that ORAs relevance is owed to minimising corruption and is for senior specialists respectively.

Table 25: ORAs tools relevance as tools used to procure technical equipment

Ser. No.	Response	Frequency	Percent
1	Achieve savings	14	32.6
2	Minimise corruption	8	18.6
3	For the simple and fixed scope of work	4	9.3
4	For procurement and payments	7	16.3
5	To procure technical equipment for our technology sites	5	11.6
6	It is for senior specialists	3	7.0
7	Missing	2	4.7
Total		**43**	**100.0**
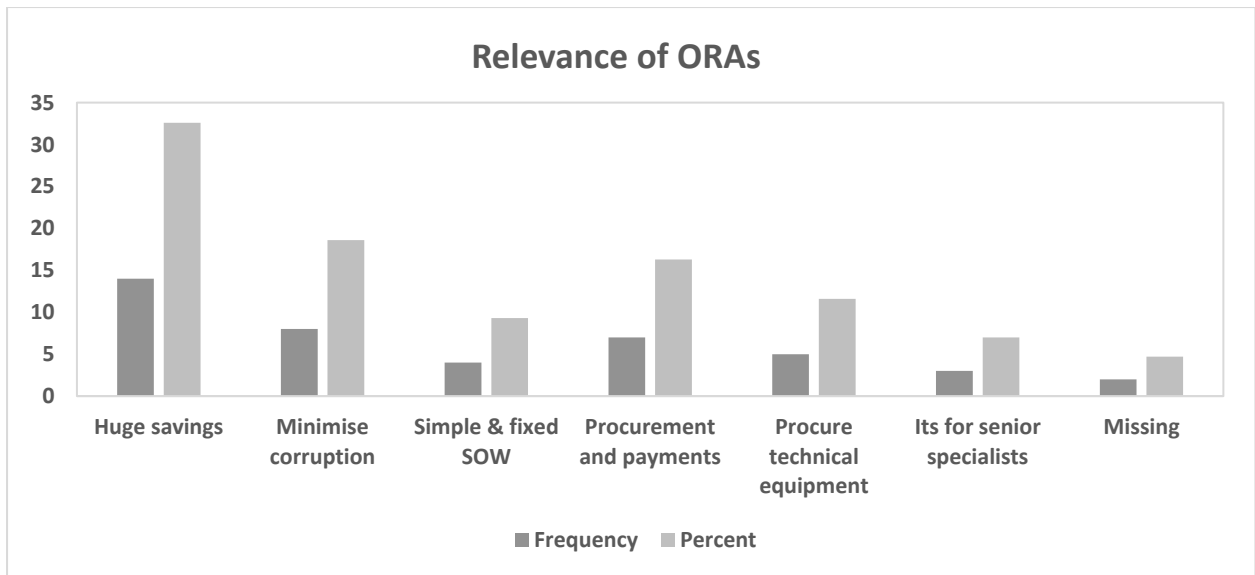
Figure 33: Relevance of ORAs

Question 2

How are the ORA helping you and your organization to improve your processes/ transactions?

It can be noted from the table that 37.2% of the participants suggest that ORA help improve their organisational transactions by being quick and transparent. One participant highlighted that "ORA increases efficiency due to its quickness thereby, reducing the time it takes to prepare for a successful reverse auction as well as the time it takes to execute it." Some even added that utilising online e-sourcing software such as Procure-Port have provided a smooth and transparent running of auction without a hitch. Twelve participants (27.9%) are of the view that ORA helps in procurement and payments. Phone calls and emails to the suppliers are minimised by the online communication. Furthermore, because reverse auctions are time-limited, the buyer receives instantaneous and real-time pricing from all of their suppliers. Seven (16.3%) of the participants said that ORA increase supplier competition, while three (7.0%) of the participants find everything as automated and straight forward. A total of three (7.0%) participants are not sure yet about how ORA has helped the transactions within their organisation as two participants claim that they have not yet experienced the usefulness of ORA.

Table 26: ORAs helping in transactions

Ser. No.	Response	Frequency	Percent
1	They are quick and transparent	16	37.2
2	They increase supplier competition	7	16.3
3	For the simple and fixed scope of work	2	4.7
4	For procurement and payments	12	27.9
5	Not experienced their usefulness	2	4.7
6	not sure yet	1	2.3
7	Everything is automated and straight forward	3	7.0
Total		**43**	**100.0**
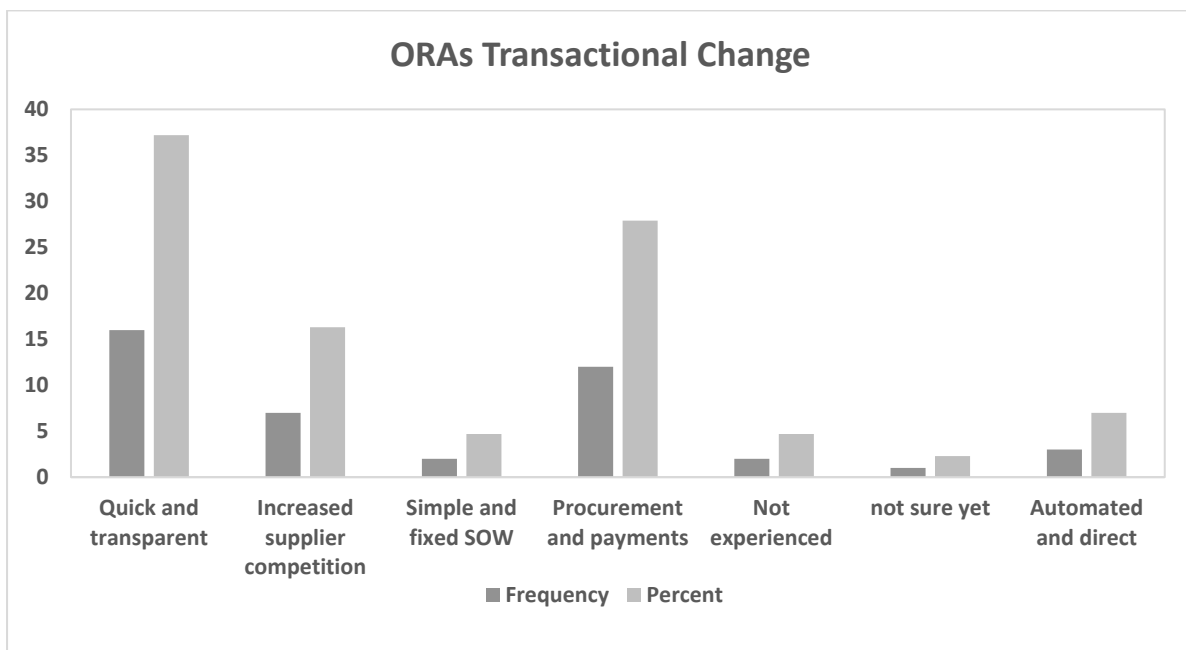
Figure 34: ORAs helping in transactions

Question 3

What are the external factors that make ORA do well in your environment?

Fifteen (34.9%) of the participants said, "Adoption from suppliers", is the main external factor that makes ORA do well in their environment. Only nine respondents (20.9%) suggested that Affordable data for small businesses has brought the success of ORA in their environment. Eight participants (18.6%) suggested that Password issues, registration issues and human errors were the main external factors that did well in their environment. Only five (11.6%) of the participants said that the global adoption has been the major external factor that makes ORA do well in their environment. Most participants aided that

global support is usually from the parent company abroad. The system has largely affected small businesses negatively and is highly unfair to them but has benefited large businesses.

Table 27: External factors that enhance ORAs

Ser. No.	Response	Frequency	Percent
1	Adoption from suppliers	15	34.9
2	Affordable data for small businesses	9	20.9
3	Password issues, registration issues and human errors	8	18.6
4	Global support from the parent company abroad	5	11.6
5	Not experienced their usefulness	3	7.0
6	Missing	1	2.3
Total		43	100.0
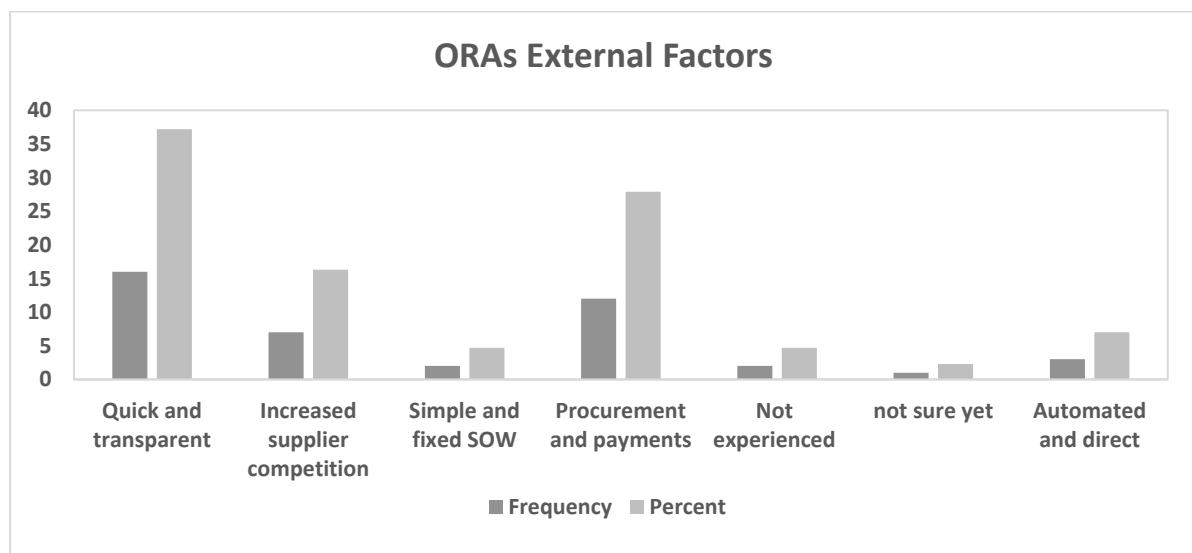
Figure 35: External factors that enhance ORA

Question 4

It is important for the company and the clients to have the same understanding of ORA processes if related transactions are to be successful. How is a smooth ORA understanding and usage promoted between the organization and its stakeholders?

22.2% of the participants suggested that: providing pamphlets, booklets and maybe a hotline promotes the understanding and usage of ORA between the organisation and its stakeholders. While 11.2% of the respondents suggested that training is provided to the buyers and suppliers as well as policy or a standard

operating procedure is a viable solution. (16.7%) of the participants believed that it is important for the company and the clients to have the same understanding of ORA processes if related transactions are to be successful as the suppliers they use are trained. Some participants added that there are online user manuals for refreshers and upgrades. One (5.6%) identified the smoothness of ORA understanding and usage promotion between organisation and its stakeholders as owe to: It is price driven, and not considering other factors like lead times service delivery, quality of goods and services and transformation. organisation need to drive this process directly not through a 3rd party. It is not well understood by both buyers and suppliers as there is not enough training and knowledge about the Reverse Auction. It is not friendly to small businesses, and no one to check the security of the system. It constrains suppliers to costs only. There is a high risk of receiving inferior products or service due to very low pricing by the supplier.

Table 28: Success of ORAs in transactions

Ser. No.	Response	Frequency	Percent
1	Providing pamphlets, booklets and maybe a hotline.	4	22.2
2	It is important and the suppliers we use are trained and there are user manuals online for refresher and upgrades.	3	16.7
3	Training is provided to the buyers and suppliers	2	11.1
4	Policy and a standard operating procedure will be a solution	2	11.1
4	It is price driven, and not considering other factors like lead times service delivery, quality of goods and services and transformation.	1	5.6
5	organisation need to drive this process directly not through a 3rd party	1	5.6
7	It is not friendly to small businesses, and no one to check the security of the system.	1	5.6
8	Lack of transformation.	1	5.6
9	It constrains suppliers to costs only.	1	5.6
10	There is a high risk of receiving inferior products or service due to very low pricing by the supplier.	1	5.6
11	It is a closed system with a few suppliers participating.	1	5.6
Total		**19**	**100.0**

Question 5

What makes ORA system usage fail in business environments (external factors or variables) that negatively affect the use of ORAs?

Table 29: Failure of ORAs in Business environments

Ser no.	Response	Frequency	Percent
1	Lack of awareness and negative information about the online systems.	12	27.9
2	they are doing well	5	11.6
3	Failure to accommodate all procurement requirements, so businesses choose to use a cheaper way which is manual process.	4	9.3
4	Fraud, weak system and corrupt officials	11	25.6
5	Not all the buyers are given the chance to use the system	6	14.0
6	Not fully incorporated into the organisations policies and frameworks	5	11.6
Total		**43**	**100.0**

Twelve (27.9%) of the participants Lack of awareness and negative information about the online systems.

Elven (25.6%) of the participants Fraud, weak system and corrupt officials.

14% Not all the buyers are given the chance to use the system.

Five (11.6%) of the participants they are doing well; Not fully incorporated into the organisations policies and frameworks.

Four (9.3%) Failure to accommodate all procurement requirements, so businesses choose to use a cheaper way which is manual process.

Question 6

Why would you advise companies to move towards the online reverse auction (ORAs) systems?

Table 30: Advise on progress of ORAs systems

Ser. No.	Response	Frequency	Percent
1	For huge savings and they are quick	9	20.9
2	To vet officials always and audit the system quarterly	10	23.3
3	For convenience and standardisation	4	9.3
4	To allow all the buyers to use the system	13	30.2
5	To stay competitive and on top of their supply chain	7	16.3
Total		**37**	**100.0**
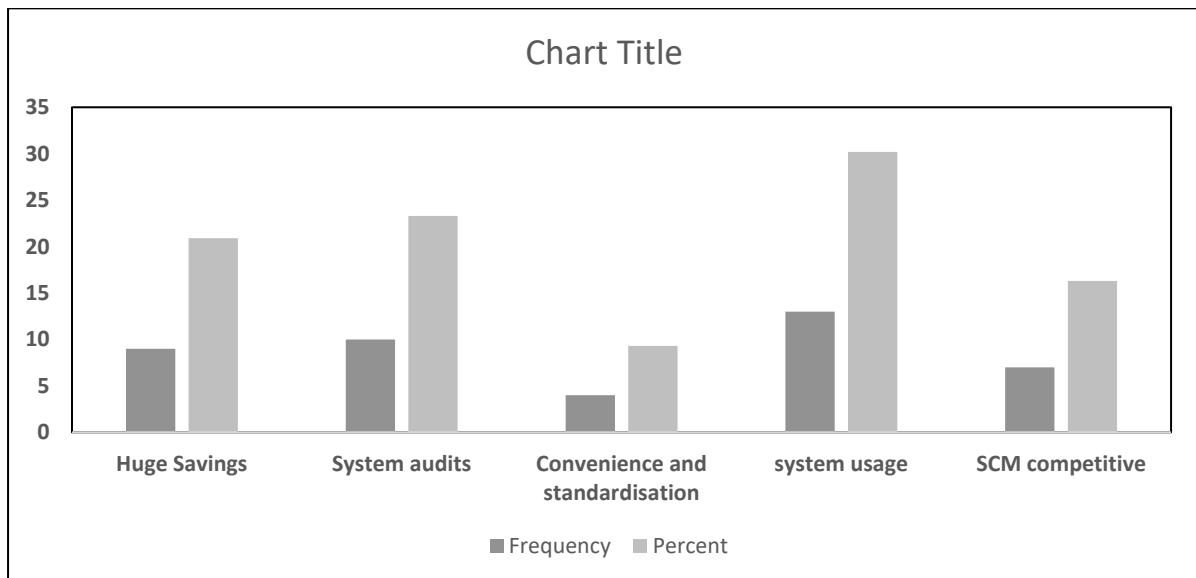
Figure 36: Advise on progress of ORAs systems

Thirteen (30.2%) of the participant`s reason was to allow all the buyers to use the system. Ten (23.3%) believed the reasons were to vet officials always and audit the system quarterly. Nine (20.9%) it was for huge savings and they are quick. Seven (16.3%) believed it was to stay competitive and on top of their supply chain. 9.3% of the participants` reasons were for convenience and standardisation.

Question 7

Why is the ORA usage not increasing in South Africa?

Eleven (25.6%) responses cited fraud as the main obstacle of the increase of the ORA usage in South Africa. Nine (20.9%) respondents said that ORA is not a common technological tool in South Africa, with one respondent stating that, "only few people are using the system". In support of this view, 9.3% of the participants lamented that low usage/ non increase in the usage of ORA in South Africa may be attributed to lack of advertisement and limitations in the sourcing space. 18.6% attributed non increase of ORA usage in South Africa to It is expensive to buy or hire a sourcing system and the organisations are not subsidised by government. 14% of the responses identified lack of appreciation of the system. In support to this point some respondents stated that most organisations, suppliers and clients lack understanding and approach to online sourcing as the future. Only Five (11.6%) claimed that ORA usage in South Africa is not increasing due to lack of incentives for the organisations to promote digital tools. Such incentives may include government rebates for using the ORAs.

Table 31: Usage in South Africa

Ser. No.	Respond	Frequency	Percent
1	It is expensive to buy or hire a sourcing system and the organisations are not subsidised by government	8	18.6
2	There are no incentives for the organisations to promote digital tools. There must be a government rebates for that	5	11.6
3	Fraud	11	25.6
4	Only few people are using the system	9	20.9
5	The understanding and approach that online sourcing is the future. The sooner we realised and appreciate the reality the better	6	14.0
6	Maybe they are not visibly advertised and they are limited in the sourcing space	4	9.3
Total		**43**	**100.0**
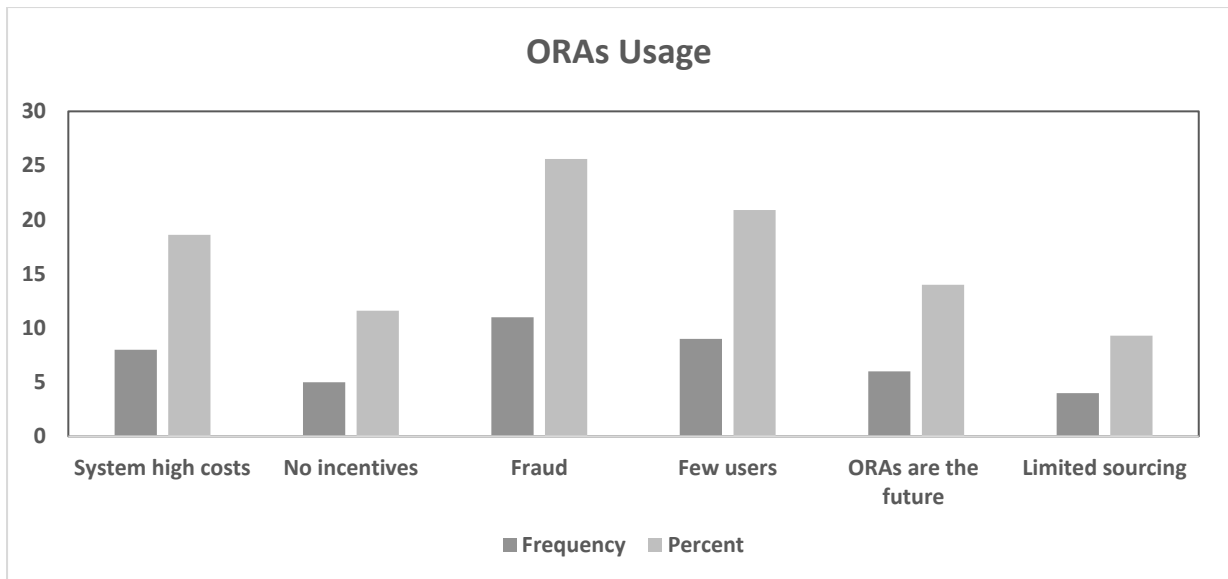
Figure 37: Usage in South Africa

Question 8

What is needed to improve effective use of ORAs in South Africa?

Table 32: Improvement needed for effective use of ORAs in South Africa

Ser. No.	Response	Frequency	Percent
1	Low acquisition costs, grants from the government for small businesses	13	30.2
2	To improve and expand their scope to handle complex project to increase their attractiveness	8	18.6
3	Honest and committed individuals and accredited systems	10	23.3
4	The will and commitment from organisations.	7	16.3
5	Full usage in the procurement department	3	7.0
6	To understand that the online sourcing is part of the mainstream sourcing globally rather than a by the way process	2	4.7
Total		**43**	**100.0**
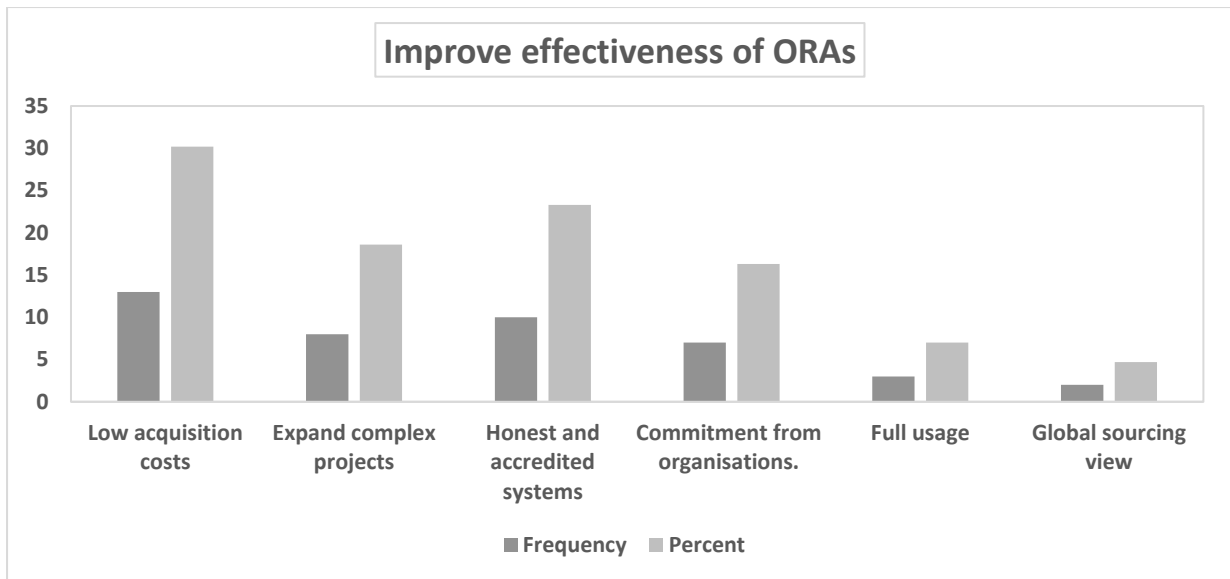
Figure 38: Improve effectiveness of ORAs

Thirteen (30.2%) of the participants believed that low acquisition costs, grants from the government for small businesses could be one of the things needed to improve effective use of ORAs in South Africa. Some respondent suggested that: Honest and committed individuals and accredited systems (23.3%), To improve and expand their scope to handle complex project to increase their attractiveness (18.6%), The will and commitment from organisations. But I thought the pandemic has changed the landscape of conducting business in South Africa and globally (16.3%). However, only three (7%) participants said that Full usage in the procurement department and two (4.7%) of the participants believed that understanding that the online sourcing is the part of the main stream sourcing globally rather than a by the way process.

Question 9

If buying, selling and bidding using online reverse auction tools allows parties from different regions to interact, a small emerging entrepreneur could fear unlawful behavior in these transactions, leading to limited uptake (and usage) of ORAs. What is the likelihood of this tendency in South Africa?

Thirty-four (79.1%) of the participants believed it was very likely that if buying, selling and bidding using online reverse auction tools allows parties from different regions to interact, a small emerging entrepreneur could fear unlawful behaviour in these transactions, leading to limited uptake (and usage) of ORAs. Some of the respondents cited that, "trust is very important, hence there must be features used to assure small businesses. Out of the nine (20.9%) respondents who believed that it was less likely, one participant said that "our small businesses are using the system and I have not heard of any complaints except for connectivity during load shading". Another participant said, "maybe a survey could help to find out".

Table 33: Fear unlawful acts

Ser. No.	Response	Frequency	Percent
1	It is highly likely.	34	79.1
2	It is less likely.	9	20.9
Total		**43**	**100.0**
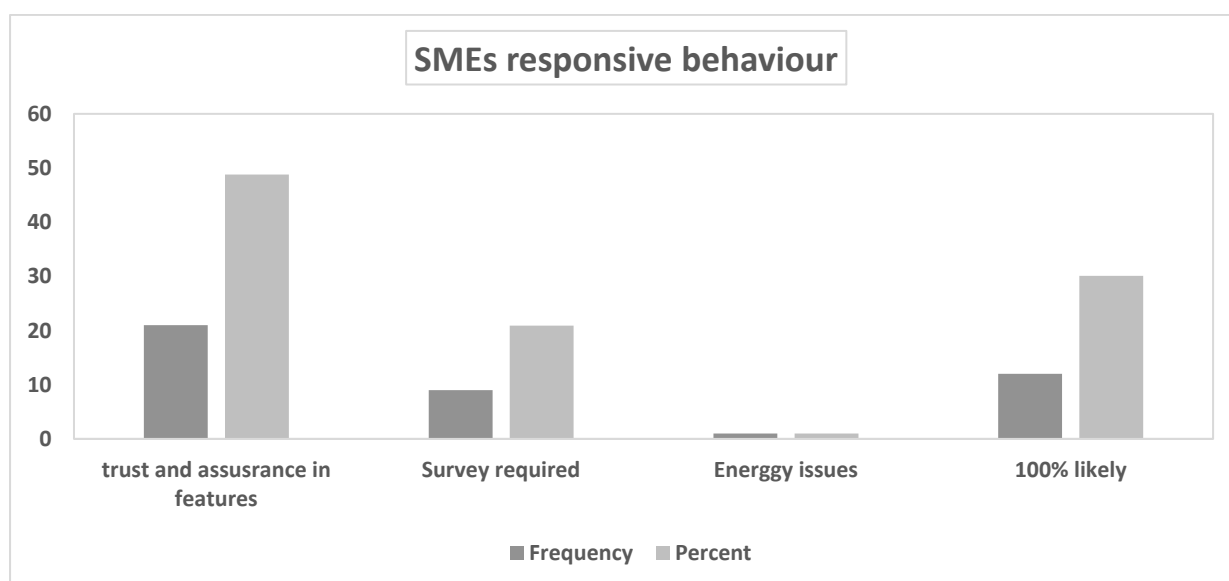
Figure 39: SMEs responsive behaviour

Question 10

It is a different story to have national policies and frameworks in place. But having them popularized to sensitize emerging local businesses against unlawful behaviour in online reverse auctions would have develop trust in this innovation. What have been your experience on publicity of policies on this sensitive subject?

Table 34: Publicity of the ORAs

Ser. No.	Response	Frequency	Percent
1	Small businesses have not been able to fully participate	25	58.2
2	Our organisational policies are firm and shared with old and new suppliers	4	9.3
3	small businesses are easy to corrupt	14	32.6
Total		**43**	**100.0**
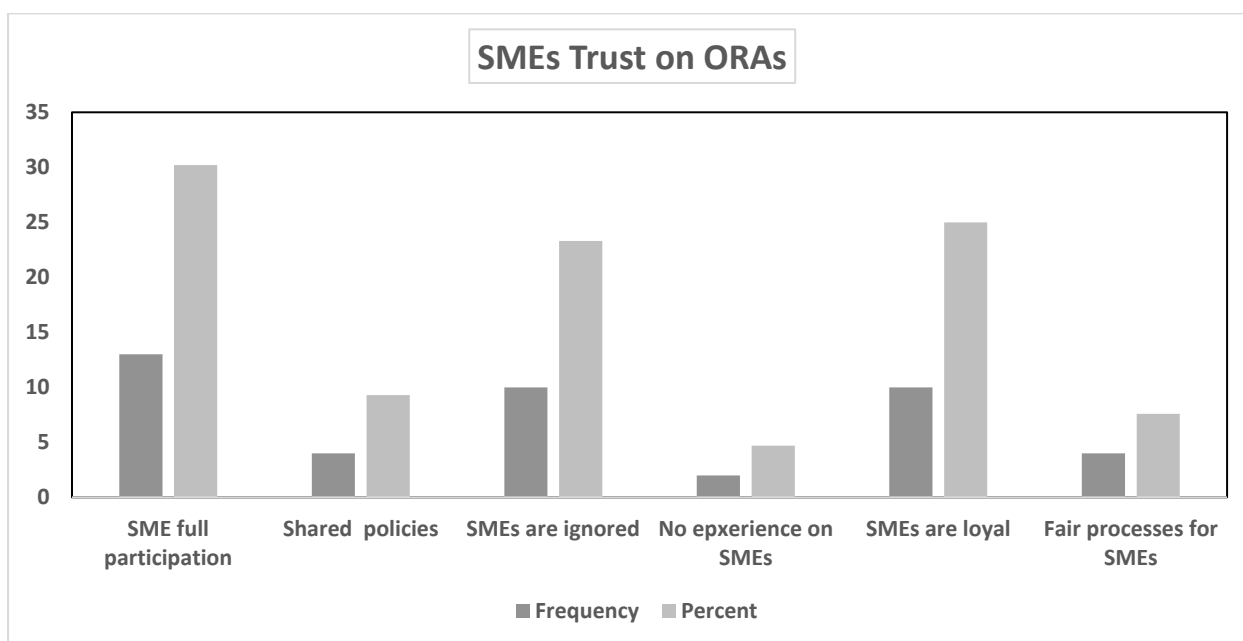
Figure 40: SMEs Trust on ORAs

Twenty-five (58.2%) of the participants believed that small businesses have not been able to fully participate due to high competition from large businesses. Legislation and policy allows for them to compete amongst themselves so as on the online business systems. Not all buyers follow the policies, and they are colluding with suppliers. Small businesses are mostly ignored because they cannot afford bribes. Two I have not seen many small businesses participating I don't have experience with small businesses. Fourteen (32.6%) opined those small businesses are easy to corrupt. Small businesses are easy to corrupt and there must be assurance to other small businesses of the fairness of the process. Four (9.3%) Our organisational policies are firm and shared with old and new suppliers.

Question 11

How could this policy related concern affect the adoption and use of the ORA technology among the South African small and emerging enterprises?

Table 35: Effect of policy to adoption of ORAs in South Africa

Ser. No.	Response	Frequency	Percent
1	Positively	19	44.2
2	Negatively	22	51.2
3	No effect	2	4.7
Total		**43**	**100.0**
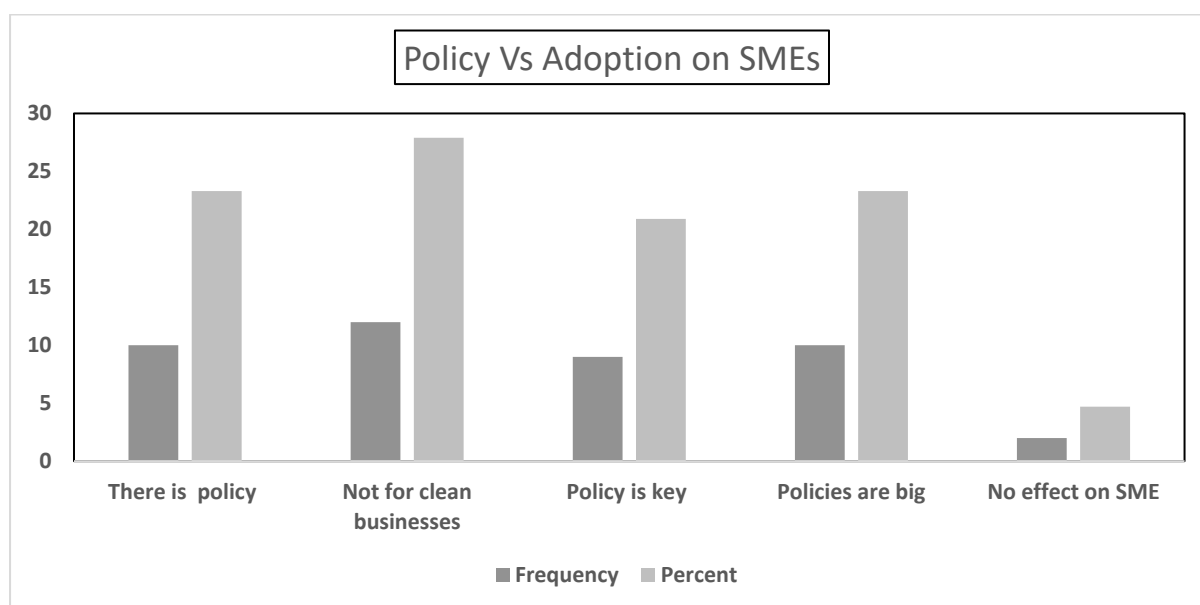
Figure 41: Policy Vs Adoption on SMEs

Nineteen (44.2%) of the participants believed that this policy related concern affects the adoption and use of the ORA technology among the South African small and emerging enterprises positively. From these responses, ten suggested that "the policy is in place it just needs to be implemented as intended", whereas the other nine stated that, "the policy is key and if it is not trusted it won't be used and attract suppliers to participate". Twenty-two (51.2%) of the participants believed that this policy related concern affects the adoption and use of the ORA technology among the South African small and emerging enterprises negatively. Reasons being that: the policies are always in favour of the big businesses and the policies do not bring a positive impact for the ones who are doing clean business. Only two (4.7%)

participants believed that the policies had no effect but the small businesses need to be on-boarded which is tedious but after that all is smooth.

Question 12

Over and above the anti-lawlessness policies, what is the essence of "effective usage and implementation frameworks" to promoting uptake and usage of ORAs among emerging business entities in South Africa?

Table 36: Effective implementation frameworks" for ORA uptake and usage

Ser. No.	Response	Frequency	Percent
1	Buyers must be consistent in applying policies to gain the trust from suppliers	7	16.3
2	Frameworks must be certified by government ICT and comms minister under ICASA	9	20.9
3	Organisations need to fully adopt and implement online sourcing as part of its daily procurement processes	13	30.3
4	There must be policies that are protecting small businesses over large ones	14	32.6
Total		**43**	**100.0**
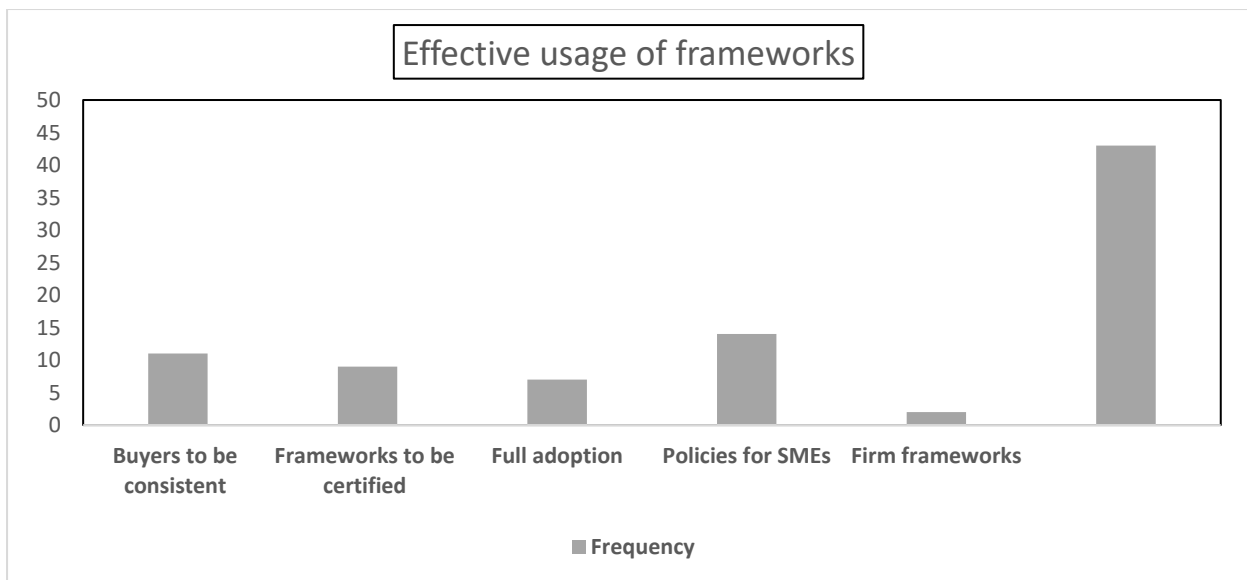
Figure 42: Effective usage of frameworks

Twenty-seven (92.9%) of the participants believe that organisations need to fully adopt and implement online sourcing as part of its daily procurement processes, have policies and processes embedded onto the official policies rather than as a separate and external process conducted by external parties. in that sense they will also be subjected to auditor general audits. currently they don't feature anywhere as part of the auditable processes. Some respondents added that "Yes our frameworks are firm and the same across continents suppliers have the

same treatment and experience in all our entities". In the essence of "effective usage and implementation frameworks" to promoting uptake and usage of ORAs among emerging business entities in South Africa, 20.9% participants suggested that Frameworks must be certified by government ICT and comms minister under ICASA and 16.3% of the participants opined that buyers must be consistent in applying policies to gain the trust from suppliers.

Question 13

What have been your experience in terms of availability and adequacy of implementation and usage frameworks to emerging business entities in underprivileged contexts of South Africa?

Table 37: Adequacy of implementation frameworks for South African entities

Ser. No.	Response	Frequency	Percent
1	Not at all unfortunately	4	9.3
2	It has been a mixed experience	15	34.9
3	Not adequate and needs serious attention	11	25.6
4	Good experiences	13	30.3
Total		**43**	**100.0**
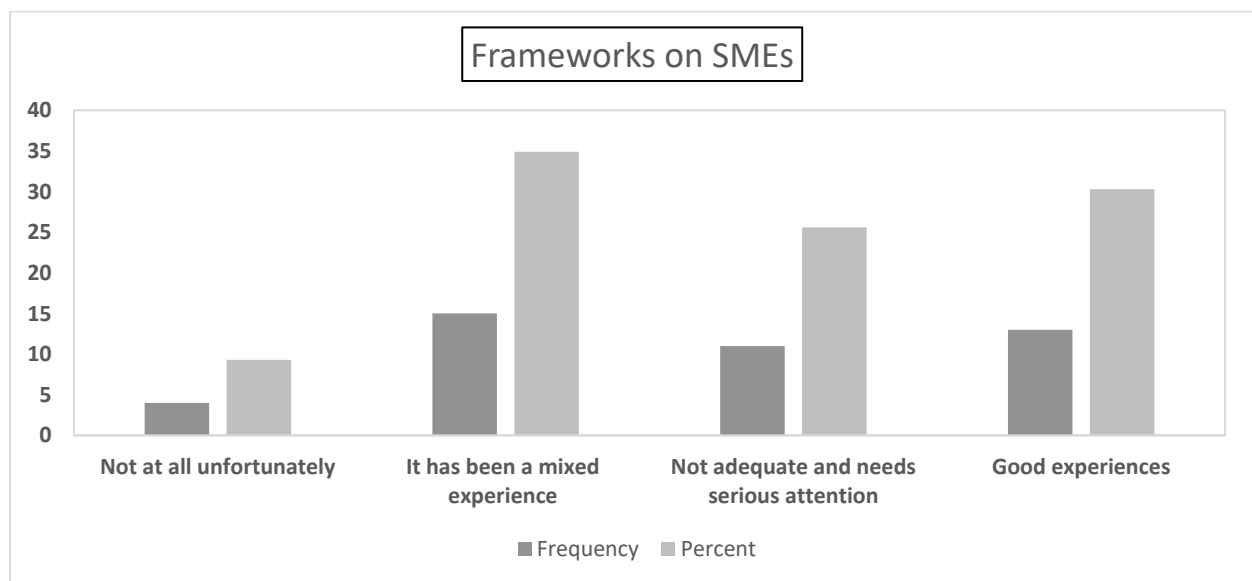
Figure 43: Frameworks on SMEs

In terms of availability and adequacy of implementation and usage frameworks to emerging business entities in underprivileged contexts of South Africa; fifteen (34.9%) participants had mixed experiences where some indicated highly unfair treatment and some benefiting a lot from the corruption act. Thirteen participants (30.3%) reported good experiences however, few made suggestions on revising the framework so as to accommodate more flexibility in relation to the South African context. Eleven (25.6%)

of the participants indicated low and inadequate usage. One participant suggested that "this needs serious attention", and another attributed low usage to lack of knowledge and biased policies".

Question 14

In view of your experience in the previous question above – Do you see a need for frameworks that would guide emerging businesses on effective ways of adopting, implementing and using ORA innovations to improve their business processes in South Africa?

Table 38: Ways of effective ORA adoptions in South Africa

Ser. No.	Response	Frequency	Percent
1	Yes	40	93.0
2	Unsure	3	7.0
Total		**43**	**100.0**
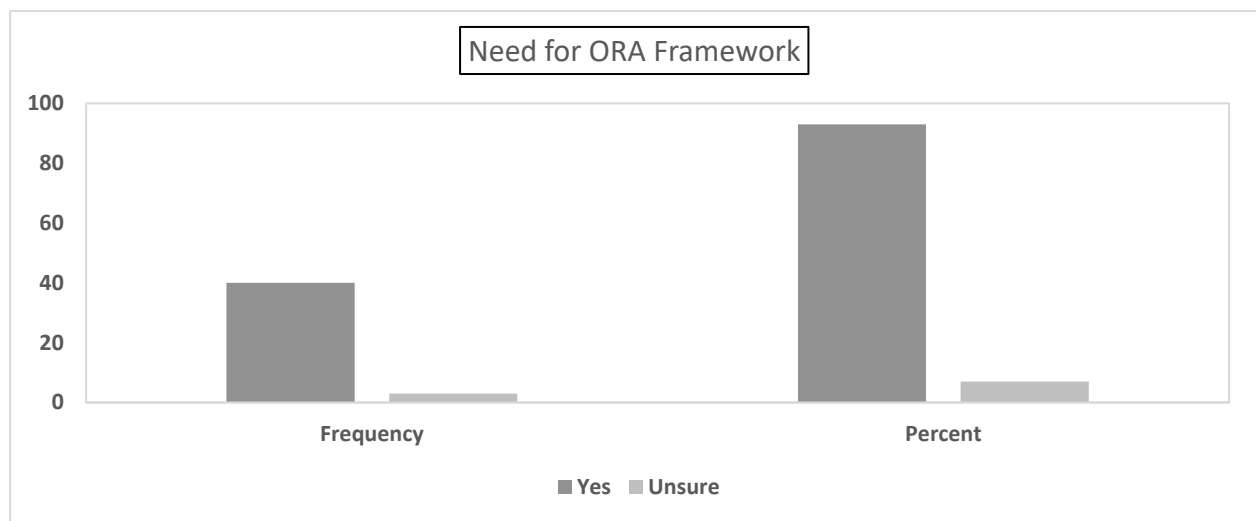
Figure 44: Need for ORA Framework

Forty (93%) of the responses agreed to the need for frameworks that would guide emerging businesses on effective ways of adopting, implementing and using ORA to improve their business processes in South Africa. One participant stated that, "this is long overdue and will certainly strengthen the empowerment and will uplift the small businesses". Another participant suggested that, "the framework must be approved by ICASA and only those should be implemented in South Africa, so that there is progress". Thus, the need of frameworks is very important for small businesses, considering that they are not adequately protected by the policy frameworks. However, relevant and updated frameworks are

necessary. Only three (7%) of the participants were unsure if there is need for frameworks as they have no experiences in the availability and adequacy of implementation and usage frameworks to emerging business entities in underprivileged contexts of South Africa.

Question 15

Finally, what would be the most basic guidelines you would recommend towards an increased adoption and use of ORAs for the South African business sector to benefit from efficiencies associated with this innovation?

Table 39: Adoption of ORA IN the South African business sector

Ser. No.	Response	Frequency	Percent
1	Accessibility and advertising of the system.	13	30.2
2	Approval and certification of the online systems	10	23.3
3	Adopt online sourcing processes	8	18.6
4	To expand supplier base	5	11.6
5	Lower the system costs.	7	16.3
Total		**43**	**100.0**
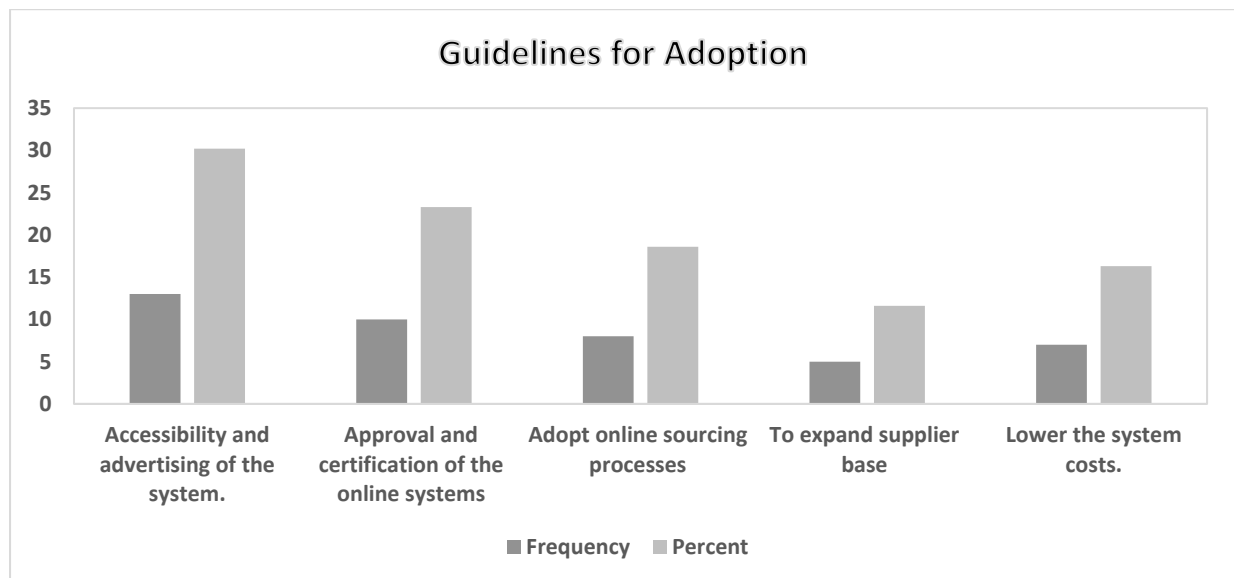
Figure 45: Guidelines for Adoption

Thirteen (30.2%) of the participants recommended advertisement and accessibility of the system as the main guideline that will increase adoption and use of ORAs for the South African business sector to benefit from efficiencies associated with this innovation. Ten (23.3%) recommended the approval and certification of the online systems that will also be audited on a quarterly basis. 18.6% of the participants suggested the adoption of online sourcing processes as part of the main stream procurement process, acquire the necessary tools or develop internal trusted tool and not to rely on hiring systems that are questioned by suppliers and perceived as unfair, unrealistic and untested to facilitate online procurement processes. Seven (16.3%) of the participants recommended the lowering of the system costs so as to make them affordable. One way of doing this is by subsiding small businesses to acquire the system. Only 11.6% recommended the expansion of supplier base: Thus, have more suppliers to participate especially small businesses.

5.10   INTEGRATION OF RESULTS - FINDINGS

In this part of Chapter Five, the quantitative and qualitative results are integrated. With the correlation between qualitative and quantitative results. It was valuable to conduct qualitative research as it offered the study some justification for the responses and also provided some solutions on how to address the current state of affairs with regards to reverse auctions, particularly in South Africa.

Firstly, the study has found that ORAs should be implemented in South Africa when all suppliers are empowered to participate – the basic reasons being that they would save costs, and technology advancement simplifies and standardise processes. ORAs tends to be rigid for small businesses. It is also European based and is expensive to implement and maintain. SMEs are likely to find it difficult to use, mostly because of failing to access the technology.

It is very interesting that buyer and supplier relationships are not strongly affected by the reverse auction technology, but rather the how and what that gets channelled through the reverse auction is what matters. The fact that reverse auctions are concerned with cost savings has been proved, based on the finding that a different approach has to be considered when it comes to reverse auctions. A special model and configuration are expected to qualify the total integration and full acceptance of the tool in South Africa. The conceptual framework is necessary for the completion of the study and to close the gaps as identified in the literature, as well as, the findings. It is interesting to acknowledge that the public sector is embracing the use of technology, and the participants in this study confirmed that reverse auctions and automation of procurement, in general, are long overdue. However, there are critical steps to follow before successful implementation can be claimed in this area as followed.

The following have been found in this research:

1. Costs savings cannot be the only drivers of the usage of ORAs.
2. Procurement processes have to be revised and aligned before implementation.
3. Legislation for all supplier inclusion with deliberate accommodating SMEs, savings and clear legislation must be embedded in the processes, sound policies developed and standard operating models to complement the system.

There should also be a matrix developed to test the type of contracts that should be implemented through reverse auctions, because according to the research findings not all contracts are suitable. A review of the literature suggests that several conditions must be met to ensure the successful implementation of reverse auctions. The major purpose of this research was to empirically study several of the constructs that have been discussed in the supplier-buyer relationships, supplier development, procurement process improvement, as well as, procurement legislation, as possible factors that may contribute to increased levels of adoption of reverse auction systems.

Specifically, this research study addressed the following.

1. The adoption, implementation and purpose of Online Reverse Auctions in South Africa.
2. Legislation to govern ORAs in South Africa.

The hypotheses were tested to determine the effect of perceptions on online reverse auctions on adoption, implementation and purpose of ORA and research findings provided possible ways to improve the tool to be effective in the context of developing countries like South African and its neighbouring countries. From the outcome of the research, reverse auctions should only be used in short-term contracts and once off procurement that requires arm's-length relationships; not long-term contracts.

5.11   CONCLUSION

This chapter was able to perform data analysis of the research study and managed to provide legitimate results of the study and ensured validity, consistency and reliability of the results. The statistical tool SPSS was used to analyse the data which provided accurate results and assisted to solve the research problem, to answer problem questions and to address the hypotheses posed by the study.

The first null hypothesis was rejected and the alternative hypothesis that in South Africa, the alternative hypothesis that in South Africa, the positive perception on online reverse auctions will result in high adoption of the ORAs was accepted. The second null hypothesis was not rejected. There is no

relationship between perception on online reverse auctions and high implementation and use. The third null hypothesis was also rejected and results indicated that that there is a relationship between negative perception on online reverse auctions and low adoption.

The study found that ORAs should be implemented in South Africa when all suppliers are empowered to participate – the basic reasons being that they would save costs. Technology advancement simplifies and standardise processes. Through the work performed in this chapter the envisaged formulation of the conceptual framework is developed in Chapter Six and the significance of the study is validated. The next chapter discusses the findings, and provides the conclusions and recommendations of the study.

6. CHAPTER SIX: DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

This chapter concludes the research effort by analysing how each chapter has contributed to addressing the research questions. After the introduction, section 6.2 presents an overview of the research, section 6.3 continues with the discussion of the findings of this study, section 6.4 presents the conclusions, section 6.6 Reinventing supply chain strategy, section 6.7 provides the recommendations, and 6.8 shows the original contribution of the research, section 6.9 the future research, and finally section 6.10 concludes the chapter.

6.2 OVERVIEW OF THE RESEARCH

This section outlines the overall overview of the research study per chapter and included is the significant contribution to the body of knowledge, limitations and the existing conceptual frameworks.

Developing countries, organisations and communities have increasingly been implementing ICT based initiatives with the implicit objective of improving their developmental levels. Studies have suggested that the implementation of ICT-related initiatives should consider the human element (relationships) and the need for situated change in order to fit the ICT initiatives into the organisational context in which they are implemented. The first chapter introduced major viewpoints, which form the basis of the research, namely ORAs adoption, ORAs implementation including factor that will negatively or positively influence the adoption and implementation uptake. For empirical research, a case setting within the South African context was selected.

Chapter One discussed the significance of this research, research questions and the objectives of the study. The key contribution of this study arises from the application and the development of the conceptual framework for the empirical analysis of South Africa as a case study in order to optimally benefit ORAs. Chapter Two presented the literature review, and significant themes and critical factors relating to the research topic were revealed. The review of the literature showed that ORAs have benefits, that is; cycle time reductions, quality improvement, a broader supply base (Yeniyurt *et al.*, 2011), faster information transmission, and increased competition (Kros *et al.*, 2011). Suppliers may also benefit from ORAs. The participation in ORAs could provide suppliers with specific benefits, such as new distribution channels, a wider customer database, new means to increase sales, to reduce excess inventory, and reduce the cost of products for sale (Tarazona-Bermudez *et al.,* 2014). However, ORAs have negative

aspects. Firstly, research suggests overstated savings due to price reduction focus and not total supply chain cost focus.

Secondly, ORAs potentially damage buyer-supplier relationships (Mabert, 2011; Schoenherr 2011; Caniëls, 2009; Van Raaij 2009), and challenge suppliers' trust in buyers (Nadler and Kros, 2010). Thirdly, ORAs constitute a potentially coercive use of buyer market power (Emiliani, 2007; Giampietro, 2007). Buyer-supplier tensions exist, especially since suppliers think ORAs only benefit buyers (Tassabehji *et al.* 2006; Emiliani 2004). ORAs competition may induce suppliers to substantially lower their bids, which ultimately results in a buying organisation that benefits at the expense and profitability of the 'winning' supplier (Yeniyurt *et al.,* 2011). Ethical concerns, benefits and existing gaps on ORAs were identified.

Chapter Three outlined the existing conceptual models with an aim to evaluate and identify the best framework suitable to be used in conjunction with ORAs for the best outcome. The first part detailed the ORAs theoretical framework on adoption and acceptance models, buyer-supplier relationships and the ORAs generic model.

The second part of the conceptual framework provided an overview model, which further evaluated the impact of ORAs on buyer-supplier relationships in relations to all stakeholders involved.

The third and the last part of this chapter explored three existing supplier relationship management theories, which were used to solve the dilemma of complex supplier-buyer relationships, especially when using reverse auction. The theories are:

- Technology adoption and acceptance models
- The online reverse auction model
- Generic Supplier Relationship Management Types Robertson Cox
- Buyer-Seller Relationships Cannon and Perreault's model
- The Key Mediating Variable (KMV) model, Morgan and Hunt

Chapter Four presented the research design as well as data collection techniques employed in the fieldwork. It discussed the research methodology which was the predominantly quantitative methodology. Mixed methodology is the corner stone of research within social science that is experienced within everyday life (Creswell and Plano Clark, 2011; Johnson and Onwuegbuzie, 2004). Mixed methodology is described as "the third paradigm" (Johnson and Onwuegbuzie, 2004, p. 15); a "third methodological movement" (Teddlie and Tashakkori, 2009, p.1); and includes two (or more, or both) quantitative and/or qualitative approaches (Morse and Niehaus, 2016). It no longer restricts the study to particular paradigms that have been traditionally the case and is considered a legitimate means of undertaking research in social and human science (Creswell and Plano Clark, 2011).

Moving to the design and the philosophy of the research, the philosophical assumptions that underpinned this research were basically those which correspond to the positivism research. The aim of the research was to create a better understanding and investigate the potential of ORAs damaging buyer-supplier relationships in the context of a developing country such as South Africa. As stated, the quantitative multiple case study strategy was the most appropriate approach for this research in order to gain rich insights (on how ORAs affect buyer-supplier relationships in South African organisations) into the process and to achieve concrete and tangible results targeting professional in power utility, ICT and the public/government institutions. To be clear, the study did not look at specific organisations, but it was rather industry or sector based.

In Chapter Five, the findings of the research were presented and interpreted at the level of quantitative results. The study hypotheses were tested using structural equation modelling. The first hypothesis was rejected, the second one was not rejected, and the third hypothesis was also rejected. It was found that buyer-supplier relationships are likely to be affected but not because of the reverse auction mechanism, but rather due to how reverse auctions are implemented and the type of contracts which were key to the research. Reverse auctions should only be used in short-term contracts and once off procurement that requires arm's-length relationships, not long-term contracts.

Chapter Six, in a way, provides the summary of all the chapters; it provides the research conclusions, proposed conceptual framework, recommendations, and future research.

6.3   DISCUSSION OF THE FINDINGS

Procurement is an important business function that ensures identification, sourcing, access, and management of the external resources that a firm requires for fulfilling its long- and short-term objectives. The procurement function is responsible for a number of initiatives from spending the firm's funds in sourcing goods and services to establishing and managing relationships with qualified suppliers. Ultimately, procurement has a significant effect on the organisation's performance, not only in terms of cost but also in terms of quality, innovation, responsiveness, and revenue generation (Nair *et al.,* 2015). With the recognition of the importance of procurement in overall corporate performance, the majority of organisations have started paying close attention to their procurement functions (Lawson *et al.,* 2009). These efforts, have created online procurement tools that the firms employ to strengthen the management of their supplier networks and the procurement processes. Among these tools, electronic reverse auction, which is also known as procurement auction, e-procurement, business-to-business auctions, has become a commonly used online procurement tool. This background re-enforces and further supports the relevance and criticality of this study.

The Use of Online Reverse Auctions in South Africa

In terms of section 217 of the Constitution, public procurement by organs of state in all spheres of government must take place in accordance with a system that is fair, equitable, transparent, competitive, and cost-effective. To give effect to these constitutional requirements, framework legislation was enacted regulating public procurement. The first Act is the Public Finance Management Act, (hereafter the PFMA) which prescribes the general system for public procurement that must be followed by national and provincial governments, the public entities listed in Schedules 2 and 3 of the Act, constitutional institutions, Parliament, and provincial legislatures. The second Act is the Local Government: Municipal Finance Management Act, (hereafter the MFMA) which regulates public procurement on local government level.

There are numerous other acts that either directly or indirectly deal with or have an influence on public procurement. They were not promulgated to exclusively regulate public procurement but rather to regulate other aspects of government administration. In principle, the public procurement regime of South Africa does not exclude the use of ORAs. The Electronic Communications and Transaction Act indeed promote e-government services and electronic communications and transactions with public and private bodies, institutions, and citizens. The regulations promulgated in terms of the MFMA, in fact, allow the use of auctions as a method of procurement. Although auctions are mentioned as a method of procurement in the PFMA, the MFMA and the regulations promulgated in terms thereof, do not specifically regulate the use of ORAs. ORAs will, in every instance where they are used, have to comply with the constitutional requirements of fairness, equitableness, transparency, competitiveness, and cost-effectiveness.

When considering whether ORAs should be used for a specific public procurement, the specific circumstances in South Africa need to be taken into account. Not all suppliers or potential tenderers, especially the smaller ones, have access to reliable e-communication, especially in the more rural areas. Many of them also do not necessarily have the expertise or self-confidence to use e-communication, and some do not trust IT. In the case of small local government procurement entities, the possibility of collusion is real, as the value of the contracts may limit participation to local suppliers who all know each other. ORAs need well trained specialists in the specific field to properly draft specifications and to determine the value to be allocated thereto.

It is doubtful whether all the smaller procurement entities do have such expertise. The use of consultants to manage ORAs on behalf of the procuring entity has inherent risks. In particular, if little capacity is available in the procuring entity it will make it vulnerable for abuse by consultants. All public procurement

entities have their own procurement policies, which may lead to a duplication of resources and different specifications, standards and criteria when using ORAs. In low value procurement, the costs of consultants may not justify the outsourcing of this function.

A substantial part of suppliers who do not have the necessary technology, or expertise or self-confidence to partake in ORAs could be excluded from participating when using ORAs. They could quite often be people from the previously disadvantaged section of the population. Special measures will have to be taken to ensure that the Preferential Policy Framework Act is implemented when using ORAs. This can be done by a system of pre-qualification and awarding the necessary preferential points beforehand to tenderers who wish to partake, in particular, ORAs. Such points can then be factored in when utilising the ORAs.

The review of the literature identified gaps in terms of the existing conceptual frameworks as demonstrated in section 2.5. These existing conceptual frameworks have assisted with the perspective and the angle to formulate the relevant proposed conceptual framework (Refer to Figure 40). The proposed conceptual framework though was formulated purely based on this study's findings, not necessarily improving on the existing ones. The existing frameworks as augured in the study report are too narrow and very limited to price, process and cost savings, hence they could not be enhanced by the findings of the research, but it was appropriate to propose a new and relevant conceptual framework (Refer to Figure 47).

The depth worries of the potential damage from ORAs raised pertinent questions, which needed to be answered and these questions were identified to be investigated by future studies, hence this study attempted to close existing gaps in the existing literature. All three referenced studies which are discussed in depth in chapter two (conceptual Frameworks) and many others, have price and savings as a basis of their analysis. The three mentioned above have made some attempts to look at buy-supplier relationships and other relevant procurement related factors, but they have not touched on the supplier performance, legislation and supplier development. This study has capitalised on the gap that exists and developed a new conceptual framework to mitigate the risk that may be caused by the implementation of ORAs and the acceleration of ORAs adoption and implementation in both the private and the public sector in South Africa and potentially in the rest of the African continent.

The speed and measure of the changes coming about by the fourth industrial revolution are not to be ignored. These changes will bring about shifts in power, shifts in wealth, and knowledge. Only in being knowledgeable about these changes and the speed in which this is occurring can we ensure that

advances in knowledge and technology reach all and benefit all. The speed of current breakthroughs has no historical precedent. When compared with previous industrial revolutions, the fourth is evolving at an exponential rather than a linear pace. Moreover, it is disrupting almost every industry in every country. And the breadth and depth of these changes herald the transformation of entire systems of production, management, and governance Schwab (2015). This study has become relevant and critical in this digital era to ensure that the supply chain management fraternity is adopting relevant technological tools to support their organisations for growth and sustainability.

In principle, there is no reason why electronic auctions should not be extensively used in public procurement in South Africa. It, in fact, has many advantages, including enhancing the constitutional principles of fairness, equitability, transparency, competitiveness, and cost-effectiveness. The proper utilisation thereof may lead to substantial savings in costs and time for all parties, especially on supplier development and supplier performance. One of its attractions is that it could limit procurement irregularities, if properly used as recommended, as the auction takes place in a real-time setting with little or no human interference while the information is immediately available to all participating tenderers; therefore, the buyer-supplier relationships are taken care of since the correct contract candidate would have been selected.

Rašic et al. (2019) found just two public tenders that used ORAs in 2018 in Croatia. On the other hand, there are pioneering institutions that apply ORAs in all suitable public tenders successfully, such as the town of Znojmo in the Czech Republic (Znojmo City 2012). The relationship between buyers and sellers in public procurement is complex, and there are various issues that can be seen as both positive and negative.

Therefore, the low adoption is a major issue globally hence the need for a structured and trustworthy process and framework is required. However, in a study done by Ochieng', E.,O (2016) on role of e-procurement performance in state corporations in Kenya it was found that state corporations have adopted e-tendering, e-award, e-ordering and e-invoicing to some extent in order to enhance their procurement performance. Schoenherr (2019) challenged that level of needed participation by stating that ORAs can be successful with a minimum of 3 suppliers, although the lower extreme can arguably be sub-optimal. A specific optimal number of participants is most likely impossible to generalise. However, one must know after a certain point there will be relevant trade-offs between the attained level of competition within the ORAs event and the required attention to supplier pre-qualifications. The adoption levels are different for different countries

Previous studies have proven that the correct adoption of e-procurement tools can yield substantial benefits of direct and indirect nature. These tools have saved millions of Rands for organisations who adopted them properly. Obviously, reverse auction, like all other methods and solutions, comes with its streamlined efficiencies and potential challenges. Any un-analytical adoption may result in a devastating loss because these solutions cost millions. Reverse Auction participates in modern intelligent procurement in gaining a strong strategic profile for the procurement in supply chain management.

The cost-saving role of e-procurement ORAs is the most prominent trait that gains it the attention of any forward-thinking supply chain manager, wherein this research has expanded ORAs to the greater level of achieving additional benefits in addressing developing countries (the South Africa case study) challenges.

Furthermore, e-procurement solutions present significant potential through several tangible and intangible benefits and will also help drive online supply chain collaboration processes between organisations. Several implementations have not achieved the promised results as they considered e-procurement from a solution rather than a business and strategy point of view. Before the e-procurement solution decision, organisations should have a sourcing strategy for each of the commodity groups they procure.

A comparison with Kenya and Tanzania on Electronic Procurement

South Africa ORAs study is very similar to what other African countries are experiencing when it comes to adoption and implementation of eTools. Mushi (2018) conducted a study on the determinants of electronic procurement adoption in an organisation by comparing a public organization (TANESCO) and private organization (TBL). The study looked at determinants of electronic procurement adoption in an organisation: a comparative study of Tanzania Breweries Limited (TBL) and Tanzania Electricity Supply Company (TANESCO). The employees of both organisations TBL and TANESCO in Kenya.

The study had four objectives, the influence of individual factors in e-procurement adoption, the influence of organizational factors in an organization, level of e-procurement adoption and the challenges facing organisations on implementation of e-procurement. The finding for TBL reveals the individual age and education, motivation and teamwork, found to have a significant relation to e-procurement adoption, while individual skills and education, and organisational structure and teamwork, found to have a significant relationship with e-procurement adoption in TANESCO. System compatibility and supplier readiness were found to be challenging for implementing the system and lack of electronic infrastructure and fund were the challenges of the adoption process.

On comparability between private and public organisations it is being found that private organisations in this case TBL adopted e-procurement at the uppermost level stage compared to public organisations TANESCO, which are in the preliminary stage of adopting e-procurement Evelyne (2014) carried out a study concerned e-procurement in Kericho County, Kenya and observed that legal infrastructure, costs, security and supplier involvement are critical for effective execution of e-procurement business in the organisation. The research recommended that, the tea companies in Kenya need to focus on enhancing e-procurement as a significant investment and put aside enough financial resources in their budgeting procedure. Jenifa (2013) using a case study research design observed that not all obstacles impeding implementation of electronic business in Kenya are affecting private sectors in Tanzania, though the study discovered that most developing countries are challenged by similar problems. Moreover, post COVID 19 pandemic these tools have been proven to be the new normal and the future of doing business across the globe. Africa will have to rise to the new requirements, and this may require an African holistic ICT strategy to collaborate amongst different countries in the African continent.

Procurement and Legal Framework

The Public Procurement Authority and the Government must enact laws on the adoption of e-procurement to all Public Procuring Entities. Providing legal framework and assistance to the entities will have the greatest impact on the influence of adoption of e-procurement by Public Entities the case of the Temeke Referral Hospital.

Adoption of e-procurement

Adoption of e-procurement will result in organisation reaping advantages associated to e-procurement, in terms of enhancing efficiency as a result of time taken to complete procurement cycle will be reduced, procurement cost will be reduced as there will be little if not none cost associated with paper work. E-procurement adaptation as a process the hospital will be preparing implementation reports of monthly, quarterly and semi-yearly as the need may be. African governments are in more trouble than the private sector, therefore collaboration between government and private sector is crucial. The proposed collaboration will accelerate the proper adoption and sound implementation of the electronic procurement tools included are the ORAs.

Another study conducted in Kenya by Koech and Ayoyi (2016) on the factors influencing adoption of e-procurement in Kenya's public sectors, the study found that enforceability/legality electronic contracts is the critical determinant of adoption of e-procurement in Kenya, also the study revealed that resistance to change and leadership which are cultural issues are among the critical barriers of adoption of e-procurement within the public sector in Kenya.

They further established that the adoption of e-procurement assists the organisation in improving the policy level in terms of helping the policy makers in understanding the interaction and impact of the policy in the procurement system, and also improve the performance of the Government practices as e-procurement infrastructures lead to the achievement of organisations objectives (Njeru et al., 2016). According to Rahman, (2017) the success of any new system employed within the organisation, mostly need the efficient process at the level of internal workflow, as the achievement of electronic procurement is also influenced by the attainment of compliance by the internal users, in the sense that there should be a customer satisfaction as a key consideration. Lastly Mahdillo and Akbary (2014) also studied the"e-procurement adoption, its benefits and costs", found that the adoption of e-procurement in an organisation improve the performance of supply chain management through value creation, efficiency and transparency allowing the companies to simplify the procurement processes

6.4 CONCLUSION

This study has found that online reverse auctions affect buyer-supplier relationships, which in turn influence supplier performance in South Africa. ORAs are beneficial and should be implemented by South African organisations. For example, they save costs for technology advancement, simplifies and standardise processes. Buyer-supplier relationships are not strongly affected by the reverse auction technology, but rather the how and what that gets channelled through the reverse auction is what matters. It was also found that the public sector is embracing the use of technology, and the participants in this study confirmed that reverse auctions and automation of procurement, in general, are long overdue. The buyer-supplier relationships are likely to be affected but not because of the reverse auction mechanism, but rather due to how reverse auctions are implemented and the type of contracts which were key to the research. Reverse auctions should only be used in short-term contracts and once off procurement that requires arm's-length relationships.

6.4.1 The developed Conceptual Framework for South Africa's use of ORAs

This section introduces a conceptual framework which is developed from the findings of the study, and it was the initial and the main motivation for this research to be embarked on, therefore it is extremely necessary for the completion of the study and to close the gaps as identified in the findings and literature. The conceptual framework in Figure 46 below should be adopted when implementing reverse auction within the South African context and can be extended to other developing countries. Figure 46 represents and directly addresses the findings that will prevent the damage on buyer-supplier relationships. Organisations should be aware that supplier performance is influenced by ORAs through supplier-buyer

relationship, and an organisation must deal with the relationship it has with the supplier in order to benefit from the ORAs.

The following should be considered while implementing this conceptual framework:

- Costs savings should not be the only drivers of the usage of ORAs.

- Procurement processes must be revised and aligned to the conceptual framework before implementation which must be fully legislated to protect all parties including SMEs.

- Regulated framework(s) must be embedded in the processes, sound policies developed and standard operating models to complement the system.

- Buyer-supplier relationships will be taken care of should all the above elements be addressed.
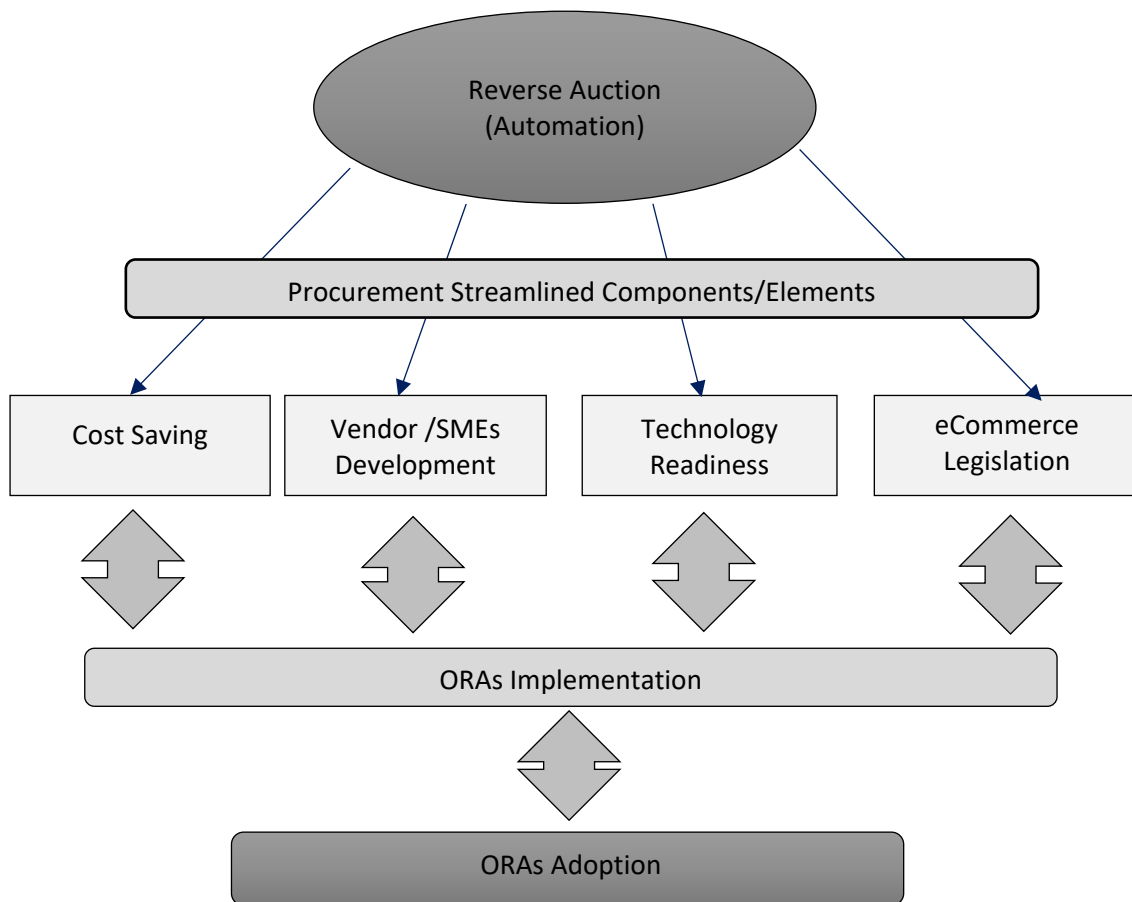
Figure 46: Conceptual framework

The findings attest to the fact that most professionals in the supply chain management environment are eager to use digital tools, especially in the 4th industrial revolution era, however they would like the ORAs tools being modified to not only be emphasised on savings but rather to look at all elements (Supplier inclusion, cost savings, technology readiness, training and procurement legislation).

Attention must be focused to the implementation and adoption process.

In addition, a selection criterion should also be adopted and configured onto the reserve auctions proposed framework system based on the highest scoring method. The selection scoring criteria shown in Table 40 below must be embedded and configured onto the system to enable the system to be more inclusive and balanced.

Table 40: Scoring criteria

Category	Proposed Rating	Own Suggested %
Implementation and Adoption	10% - 15%	10%
Cost Savings	35% - 50%	50%
Supplier Development (SMMEs)	20% - 30%	30%
Procurement Legislation	10% - 15%	10%
Total Score	**100%**	**100%**

These selection criteria will cater to small businesses, coupled with extensive training to avoid suppliers quoting very low prices resulting in poor performance and poor delivery of services. The legislation and contracting conditions will promote good corporate governance within the process. A supplier who scores the highest % score will be the winning bidder, a combination of the four areas as stated in the Table 40 above. Where suppliers score the same points, an automated rotation process should be built within the system to appoint a supplier on a fair and transparent basis. In the table, the % score per category can vary, on a case-by-case basis.

Since the findings indicated a reasonable number of users who expressed suspicion on the system by the suppliers, it is therefore necessary for further improvement, enhancements and recent ICT updates to increase the trust amongst users and suppliers and subsequently to increase the adoption of the tool. In the process of modifying the functionality of the tool security features must be closely looked at in order to provide suppliers with a high level of trust in participating in ORAs. The evaluation of suppliers has an impact in two main ways: The rating has a discriminatory effect; in that it helps to distinguish differences between suppliers and thus you would better avoid it. The rating has a predictive effect, in the sense that a rating that has already been received indicates that it will be successful in the future. Reputations very important information in two points of view. It:

- assists the e-auction participant (advertiser, buyer) in the decision-making process among several sellers who have submitted relatively similar offers for the same product.

- supports the process of eliminating occasional (negative) supplier behaviour which would be unprofitable in the long term as it would lead to the rating downgrade and discouraging business partners from future cooperation.

Both public and private entities that implement e-procurement systems ORAs should ensure that any new procedures that are established meet the same legal and policy obligations that govern all government procurement. In addition, a public entity will need to ensure that it adopts additional policies and standards covering the different procedures and risks associated with e-procurement. Even small and medium suppliers must not suspect that they are being treated unfairly and marginalised. The inclusion of all relevant procurement evaluation criteria will boost the confidence of both the buyers and suppliers to use the tool more frequently to improve efficiency, speed and achieve a huge saving. Though the issue of buyer-supplier relationships has proved not to be a major concern and a hindrance, should the proposed framework get implemented and realise the benefits as intended, it will further strengthen the buyer-supplier relationships.

6.4.2 Solving Supply Chain Management Trending Issues

Digital technology is disrupting traditional operations, and now every business is a digital business. The impact on supply chain management is particularly great. Businesses cannot unlock the full potential of digital without reinventing their supply chain strategy. This research will immensely contribute into the procurement and supply chain management environment, it is relevant today considering what SCM is grappling with. All the top supply chain management priorities as shown in Figure 47 are still trending across industries.
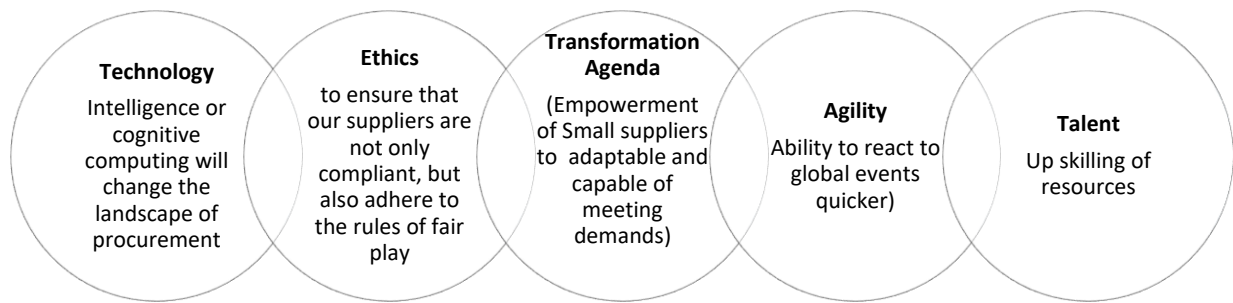
Figure 47: Top Supply Chain priorities from 2011

Many organisations understand the elemental nature of these changes and are already working to introduce digital technology into their operations. However, simply adding digital technology is not the answer. This approach overlooks the fundamental difference between traditional supply chains that have been "digitally enhanced" and truly integrated, re-invented supply chains whose DNA is fundamentally digital. For digital technology to create a significant improvement in business outcomes, businesses need to:

6.5   REINVENTING SUPPLY CHAIN STRATEGY

6.5.1   Reimagine supply chain as a digital supply network (DSN) that unites not just physical flows but also talent, information and finance.

This new breed of supply chain is more connected, intelligent, scalable and rapid than traditional supply chain management. In a metaphorical sense, the DSN enables people and data, as well as materials, products and supplies to travel together across the extended enterprise. This is vastly different from digitally enhanced supply chains which (because they are never stronger than their weakest links) have less potential to help organisations:

- - Develop new synergies

- - Relate more fully to customers

- - Benefits of the developed conceptual framework

The newly developed conceptual framework is intended to derive the following benefits:

- - Stimulating practitioners to approach their day-to-day jobs differently.

- - Increasing transparency and agility to respond quickly.

- - It will drastically improve efficiencies, speed and integrity of the procurement process

- Curbing corruption and building an undisputed audit trail for all transactions

- Empowering the procurement practitioners to work ethically without any interference and favoring of certain suppliers.

- Positively contributing to the bottom line of organisations (costs and environment friendly-green procurement)

- Attracting technical staff (especially technology IT professionals) within the SCM environment, that will increase variety, new way of thinking and even great innovative ways of procuring.

The proposed framework will then assist in aligning the susceptible commodity groups with a potential e-procurement solution and will also assist in choosing the most suitable solution. An e-procurement solution should be viewed as a catalyst to control and improve the efficiencies of a category of a company's purchases. South Africa, however, has several unique problems facing the implementation of a first-world solution such as e-procurement. Aspects such as a limited and monopolised supply base, limited bandwidth and BEE and SMME policies all complicate the feasibility and achievability of savings and improvements generally accepted with the implementation of such a solution.

Organisations opting for an e-procurement solution should, therefore, consider a staggered-process automation approach. Starting with the implementation of low value and off-the-shelf online auctions for some of the commodities could be first steps before a full-fledged e-procurement rollout.

6.6   LIMITATIONS

The limitation of the study was strongly negatively impacted by the fundamental issues facing the procurement and supply chain management fraternity in South Africa where uncertainty and some level of apprehension prevailed amongst targeted participants. Regulations around the procurement and SCM function in both the private and the public sector (though the private sector regulations are not as stringent as the public sector) contributed significantly and to an extent presented certain limitations. As a result, the following limitations were encountered during the study:

The procurement and supply chain management environment are highly regulated and lately proved to be the most vulnerable and sensitive functions, this limitation necessitated for the fieldwork to prolong for an additional period to persuade potential participants to respond.

- Some participants withdrew their submitted responses siting the potential risks of being accused to be leaking confidential and restricted information.

- The fear of automation and potential job losses prevented some of the participants to partake in the study. Verbal feedback was expressed by some of the potential participants.

- Participants were somehow uncomfortable in giving their responses suspecting that the research may be part of the many investigations taking place in South Africa within the procurement and SCM environment.

- Initially the study targeted certain organisations within South Africa, formal requests were sent to senior executives of those organisations, and unfortunately all of them declined to participate hence the study only concentrated on professionals based on their individual willingness to participate.

6.7   RECOMMENDATIONS

6.7.1   Recommendation 1

South Africa's organisations should use the conceptual framework developed in this study.

Piotrowitz and Irani (2010) classify e-procurement benefits in four categories or areas, namely; financial, growth and learning, customer and business process. Others are operational, tactical, strategic, compliance, leverage, and process efficiency (Rajkumar, 2001). These benefits are aligned with the findings of this study whereby respondents have confirmed that there is potential for ORAs to realise these benefits provided the adoption, and the implementation process is well articulated and elaborated. The benefits will be a reality in the SCM environments. This framework has the potential to improve the procurement processes especially in government departments.

The newly developed conceptual framework is intended to derive the following benefits:

- Stimulating practitioners to approach their day-to-day jobs differently.
- Increase transparency and agility to respond quickly.
- Drastically improving efficiencies, speed and integrity of the procurement process.
- Curbing corruption and building an undisputed audit trail for all transactions.
- Empowering the procurement practitioners to work ethically without any interference and favoring of certain suppliers.
- Positively contributing to the bottom line of organisations (Costs and Environment friendly-green Procurement).
- Attracting technical (especially technology IT professionals) within the SCM environment, that will increase variety, a new way of thinking and even great innovative ways of procuring.

In order to derive these intended benefits, the proposed framework is recommended to use the Cox model as a guide as far as relationships, particular approach based on the types of products and

categories are concerned. The Cox model is not compulsory but is recommended to be used in conjunction with the conceptual model for optimum benefits.

This study has allowed a great opportunity to analyse the growing interest that organisations turn to web-based tools to support the supply chain. The analysis shows that the recent success of the models of ORAs has a potential to create even more value to improve efficiencies, to save money for organisations through the strategic use of procurement and supply chain function. The strength of this solution consists in the possibility to integrate the online reverse auction into the procurement processes that are not necessarily standard in nature where additional attributes are added such as supplier development and empowerment of emerging organisations.

The proposed framework will allow a customised framework that will enable South African organisations to effectively utilise ORAs without undermining the general procurement requirements that are meant to uplift the country's economic growth.

6.7.2   Recommendation 2

Training of the supply chain management practitioners. The supply chain management practitioners need to be introduced to the proposed conceptual framework and be provided extensive training on how to implement the framework. The training can also form part of the accredited training by the SCM professional bodies to enable certification and endorsement thereof. The training can be introduced in different levels of the SCM career path, this proposal is legitimate in this digital era and the fourth industrial revolution. The certification of the framework will address the limitations raised in the study on stringent regulations that is largely necessitated by lack of vague rules and implementation processes that are currently in place. Having an endorsed tool will promote visibility, integrity of the process, transparency, well documented and auditable process. The SCM fraternity will regain the trust of both the private and the public sector across South Africa. The training should encompass both supplier and the buyer inherent risks and opportunities to make each ORAs event a success

Table 41: Curriculum recommended inclusion

	Suppliers	Buyers
Reasons	• **New business:** Promises of increased business and improved communication about the market. • **Market penetration:** Easier when the seller can see the market prices. • **Cycle time Reduction:** Time reduced between bidding and winning the business, less paperwork between buyer and seller. • **Inventory management:** Seller can better plan inventory level through product scheduling – less time lost between bid and sale.	• **Reduced purchase prices:** price reductions are a must for running ORAs. • **Administrative costs:** Reduced the time to process the FRQ by 25% to 35%. • **Inventory levels:** Allowed inventory to be quickly replenished thus less safety stock needed. Improved planning.
Risks	• **Buyers focused on the lowest price:** Results in no chance of a long-term relationship with the buyers.	• **Lack of trust**: Develop between the buyer and the supplier and destroy a previously established relationship.

	• **Negotiation ploy:** Buyer may be trying to get an existing supplier to lower its price and not award business to the suppliers participating in the bid process. • **In the excitement of the electronic reverse auction:** The supplier may offer an unrealistic price to the buyer and lose business by trying to back out of the agreement.	• **Lack of buyers:** Commitment could result in supplier not investing in the tooling, employee training or capital investment for the buyers. • **Too few suppliers:** Could result in a non-competitive electronic reverse auction environment. At least four or five suppliers are needed to begin the bidding process.

6.7.3   Recommendation 3

Enabled implementation and adoption of ORAs. An enabler can be defined as something or someone that makes it possible for a particular thing to happen or to be done (Cambridge English Dictionary, 2019). The success of the implementation and adoption of ORAs requires top and middle management support and strategy involved in the early adoption of ORAs. The proposed framework, together with the suggested improvements in procedures, aim to assist a positive adoption and sustainable online reverse auctions to ease the implementation process.

With the creation of more sophisticated systems, new developments could be made in the online platforms that support e-auctions, allowing more services and options to be included in the tool. Unless organisations adopt innovative ways to utilise technology to their own advantage, they will soon render themselves irrelevant especially post COVID 19 situation. E-procurement as associated tools such as ORAs are viewed as a destructive innovation Barahona and Elizondo (2012) that can drive a radical transformation, thereby uprooting some institutionalized work practices. It may conflict with slow, unstructured adoption and implementation of technology especially in the public sector.

The management may likewise consider the following recommendations:
- Improvement of the processes.
- Firm adoption strategies.
- Investing in technology and business intelligent tools.

With the creation of more sophisticated systems, new developments could be made in the online platforms that support e-auctions, allowing more services and options to be included in the tool.

Additional information to make adoption seamless and possible:

Financial Readiness. Financial readiness and technological readiness encourage adoption of governmental reverse auctions, consistent with inter-organisational systems literature Grover, V. (1993). Both the associations' experts perceived that many member organisations are not willing to invest to support governmental reverse auctions, especially the smaller organisations. The most expensive requirement is trained personnel who could search effectively for new bid opportunities among governmental reverse auction web sites Premkumar, G., Ramamurthy, K., (2005).

Technological Readiness. Both the associations' experts perceived that many member organisations do not have adequate infrastructure (such as dedicated computers with web browsers and high-speed internet connection) to carry out reverse auctions processes. They also said that there is a lack of competent people having training in dealing with reverse auctions. When asked for factors that would enable member organisations to effectively adopt reverse auction sites, an expert of SA association pointed out that "Some companies have a contract person on staff. Working with the governmental reverse auction sites could be a full-time job.

In some cases, a person would need to specialize in certain reverse auction sites or products…." Poor financial and technological readiness of the member organisations of the two associations dissuaded them from adopting governmental reverse auction sites, consistent with interorganisational systems adoption literature Lacovou C.L., Benbasat, I., Dexter, A.S., (1995).

6.7.4   Recommendation 4

The new normal of conducting business is a reality and a disruptor. Most organisations who failed to comply and lack flexibility and technology readiness have not survived the COVID 19 economic disaster. The virtual event tech guide published by Events Industry Council (2020), reveals that ten months into the 2020 COVID 19 pandemic crisis, Zoom has launched On Zoom: a virtual event marketplace and platform that tries to bridge the gap between Zoom's basic live streaming functionality and the plethora of other features needed to make a virtual event worth attending. However, it remains to be seen whether the features will be worth the wait for the B2B events community. In fact, Zoom seems to be somewhat geared toward content creators, called "hosts" on the marketplace platform.

A marketplace is a virtual meeting platform between buyers and suppliers on which they can form "Many-to-Many" relationships. It allows more tangled relationships and offers additional services to the various partners such as negotiation spaces, tenders, electronic reverse auctions, etc. By fundamentally transforming the business buying process, electronic reverse auctions are opening up real opportunities for the business world. Whether used to carry out purchasing or sourcing operations, the electronic reverse auction makes it possible to streamline the Supply Chain process by reducing its cost and its execution duration. But even more, it offers the company the opportunity to reorganize the purchasing function, to simplify the procedures and to optimize the sequence of tasks. Electronic reverse auction is a way of working that changes the behaviour of buyers and suppliers. However, today the task of the management of the company is to find the most effective price reduction methods. Since the products and services purchased constitute a large portion of the cost of goods sold, buyers may put ongoing pressure on suppliers. Indeed, it is well known that suppliers are often forced to accept this pressure to continue to receive orders. This, however, can be detrimental to their logistics performance.

The global supply chain remains the key to successful reverse auctions in the B2B sphere POIRIER, P. (2017). Indeed, the buyer as the supplier must rigorously prepare the upstream and downstream of the auction in order to take full advantage of this technique. It is in this perspective that weighted multi-criteria reverse auctions have shown convincing results via marketplaces. By moving from a focus primarily on reducing the price to a more global view allowing a better relationship between buyers and suppliers. Public purchasing departments in France are now particularly very interested in this type of reverse auction insofar as it takes several other criteria besides the criterion of price reduction. Despite the growing interest in multi-criteria reverse auctions and the advantages they suggest, we must not lose sight of the training and support of suppliers, which are a mandatory condition to successfully conduct and benefit from this type of reverse auction. Both the buyers and the suppliers are expected to step out of their comfort zones and adapt, innovate and maintain the technological ever-changing world.

6.7.5 Improved Quality Function Deployment

There is also the issue of tangled reverse e-auction application. Organisations complain about the lack of a simple and clear reverse e-auction application method which is supported by the findings from participants. Using the quality function deployment (QFD) method can be a possible solution to solve this difficulty. QFD is a useful and improved approach to help managers choose (traditional negotiation or auctioning) when they should use an e-procurement tool to buy a product or service, which products to choose for ORAs, conflict resolution additionally the customer and supplier service satisfaction.

Journal of Marine Science and Technology, Vol. 28, No. 1 (2020) Customer Requirements Service Provider Requirements Customer Satisfaction Conflict Resolution Service Provider Satisfaction Multi-layer QFD Three-dimensional QFD Design Technical Measures Conflict Resolution Cross-Synthesis Process FAHP Priorities of Customer FAHP Priorities of Service Provider Revaluation of Satisfaction Requirements Revaluation of Satisfaction Requirements Source: Duru et al., (2013). The concept of QFD methodology was initially established by Akao (1992) intended to help understand the features of products based on customer feedback. The most important QFD structure is the House of Quality (HoQ), which was primarily used in the Kobe Shipyard of Mitsubishi Heavy Industries for advancing a new oil tanker shipbuilding project. Akao introduced the application of QFD for the shipbuilding industry, and its popularity shortly became widespread among different industries. The HoQ is useful in allocating possible improvements for customer requirements. However, the service provider can maximize customer satisfaction by executing alternative improvements. (Hauser and Clausing, 1988).

The relationship matrix is the key part of HoQ, with relationships represented by three symbols: strong relationship ('■' corresponding to 9), moderate relationship ('▲' corresponding to et al.(2018) applied multilayer QFD to evaluate the service quality of Kansai International Airport in Japan by combining the passengers' and airline's considerations.

Final technical solutions were provided for the airport authority to improve the service quality of Kansai Airport. This is a modified traditional QFD by proposing multilayer QFD analysis for the voice of both the customer and the service provider. The multilayer QFD is applied to evaluate service quality by combining customer and service provider considerations. The outcome is defined by synthesizing the priority requirements and their cross-correlation. This is a recommended method to further clarify when, how to use ORAs and maintain strong relationships between buyers and suppliers in the highest level of satisfaction and sound conflict resolution process.

6.8   ORIGINAL CONTRIBUTION

Theoretically, this study has contributed to the body of knowledge by proposing a conceptual framework to be used to implement ORAs in South Africa. This proposed conceptual framework will be a game changer in the entire value chain (including finance, project management, procurement, logistics and top executive management level across the various sectors of the economy of South Africa and in other developing countries with similar work environments. Subjective decisions and outcomes of the ORAs might be something of the past for the SCM function might raise the bar in terms of reliability, trust, visibility and might stand the highest scrutiny of global audits and probity in both the private and the public sector in South Africa.

The conceptual framework can be customized and be used in another developing country across the African continent with ease given similar environment of socio-economic challenges and requirements. This means that there must be some minor modification to it in terms of the relevant enterprise development strategies, and legal, political and cultural dynamics to suit the environment.

6.9   SCOPE FOR FUTURE RESEARCH

Future research will be necessary to look at an extensive implementation and adoption process in developing countries, and to expand the scope to other African countries. The security features of the tool are highly necessary to be studied in-depth to identify areas of improvement. Another critical element to be considered as a study is potential use of ORAs even on complex, high-value goods and services, including which commodities are a perfect match to be used on ORAs without compromising the quality of the goods supplied and the performance of the suppliers.

The importance of electronic communication in public procurement should not be underestimated. Electronic commerce is steadily growing, and its use will increase in the future. Although ORAs have their own inherent limitations, they can be successfully used for the procurement of standardised, simple, and generally available goods as demonstrated on the stepladder of external and internal contractual relationships. A systematic identification and categorisation of suitable goods and potential services is a necessitated for future research. Included in the process is to access the infrastructure to enable technology adoption such as availability of electricity, cost of date and electronic tools in general.

Reskilling of procurement personnel is critical, it is a reality that some of the administrative activities within the procurement environment will significantly reduce and some jobs may be lost. Organisations and the training institutions must align and start skilling people for the future. In depth future study is fundamental to access the potential effect of ORAs and other e-commerce tools on existing procurement skills and the future required skills.

The study is to be expanded to other progressive African countries, to explore the readiness of the procurement regulations, supplier development to what extent are the suppliers equipped to participate on ORAs especially the SMMEs. After some few years of implementation of the proposed framework it will be essential for a future research to assess the effectiveness, benefits and where applicable the improvement of the proposed conceptual framework.

6.10 CONCLUSION

The aim of this study was to contribute towards buyer-supplier relationships when implementing ORAs in the context of South Africa as a case study. There were other elements, which are critical and are embedded on the South African procurement and SCM environment in both the private and the public sector, the elements are supplier development, supplier performance and SME legislation. To this end, the thesis adopted an interpretative stance and a single case study strategy. It is argued that ICT-related initiatives can only contribute to human development if the implementation of these initiatives is aligned with the developmental programmes of the country within the social context. Deducting from the initiation of the study right to the end the research has indeed met the primary objectives and the intended outcome of the case study in South Africa.

The study has delivered:

- A conceptual framework for online reverse auction's adoption and its implementation in South Africa has been developed.
- ORAs proposed conceptual framework being modified to not only be emphasised on savings but rather to look at all elements (ORAs implementation and adoption , cost savings, SME development and eProcurement legislation).
- A solution has been derived to ensure that infinitesimal attention to ORAs implementation and adoption process is achieved.

It will be to South Africa's advantage to adapt to the international trends in e-procurement. It should, however, not be done indiscriminately but be incrementally implemented, within a proper regulatory conceptual framework, policies and procedures, taking into account the specifically mentioned challenges in the South African public procurement environment. Hence, the conceptual framework, together with the selection scoring criteria will facilitate the effective implementation of ORAs in South Africa, particularly in the public sector space. The implementation of the framework will effectively govern reverse auctions and will further strengthen the buyer-supplier relationships and trust.

These refers to likely gain someone or an institution is expecting by undertaking certain decisions and action (Aboelmaged, 2019). Supplier will be motivated and ready to adopt e-procurement provided they anticipate positive outcomes such as improved process efficiency, better information sharing, wide market base and lower transactional cost.

ANNEXURE A: GENERAL QUESTIONS – TRANSCRIPT SAMPLE

311 – ANNEXURE E: QUANTITATIVE QUESTIONNAIRE

Dear Prospective Participant

I am currently pursuing my Doctorate in Business Leadership studies at the UNISA Graduate School of Business focusing on Reverse Auction and Supplier Relationships. The purpose of my research is to develop a conceptual framework for the potential Adoption and Implementation of Reverse Auction in a Developing World Context: Case of South Africa. The framework will be customised in the South African business context.

You are part of a carefully selected representative sample of 200 which consist of procurement professionals, Project Management, Senior/Executive management and Technical Professionals. Your attitude, opinion and your experience on e-auctions are critical to the success of my study which will positively and enormously contribute in the procurement fraternity. Responses are anonymous and all the information provided will be treated with high level of confidentiality.

Voluntary Participation

Participation in the study is entirely voluntary. As such you are free to decline to participate in the study and may withdraw at any time during the study period. If you decide to decline, there will be no negative consequences for yourself and your cooperative. Our interaction will be recorded so that after the interview, accurate documentation of our interaction can be followed.

Confidentiality

Your participation in the study will be kept confidential. The recordings will after acceptance of the study by the university, be destroyed. You are also free to inform the study at any point of the documentation to stop any recording and that decision will be respected unconditionally. Please be advised that the interview will not take more than 30 minutes of your time. I recognise the value of your time, and sincerely appreciate your effort and input into the study. The conceptual framework to be developed will be shared with all participants.

Thank you for your time.

BACKGROUND

Artificial Intelligence (AI) presents firms with automated efficiencies that can significantly impact sales, both in the offline and online environments.

Online procurement auction (OPA) practices are expanding across the operations management (OM) research communities. Along this trend, a more exponential growth is anticipated to parallel similar demand from individuals, businesses, institutions of learning and other technology receptive institutions. SAP, Oracle, Netsuite, SYSPRO,Odoo and many other technology systems are being used to improve efficiencies, especially to record and retain stock in retail services. Along this trend has been the emergence of a similar set of technology solutions, called the Online Reverse Auctions (ORAs) systems used to facilitate electronic procurement/purchases, sales and digital negotiations, online.

Online Reverse Auctions (ORAs)

In the context of procurement, a reverse auction can be defined as "a real-time online competitive bidding event where the buyer sends out a request for quotation and suppliers bid on the business, decreasing their selling prices until optimally a true market price has been reached" – using **dedicated ORA systems** as facilitating tools

GENERAL QUESTIONS

311 Q – 1: Industry/Sector

Category		Mark X
Public Sector		
ICT Sector		x
Financial/Banking Sector		
Other (Please Specify)	**Transportation and logistics**	

311 Q – 2: Function/Discipline

Category		Mark X
Supply Chain Management		
Technical/IT environment		x
Management		
Other (Please Specify).		

SECTION A: ADOPTION, IMPLEMENTATION AND USE OF ORAs

311 Q1: AWARENESS

311 Q 1-1 Have you been exposed to Online Reverse Auction system in your work or organisation?

Category		Yes	Not Sure	No
		x		

311 Q 1-2 How did you get to know of the ORA technology systems?

Category		Mark X
Adverts from system suppliers		
Company training and presentations		
Personal Knowledge from vocational training		x
Mass Media		
OTHER		

………………………………………………………………………...……………………………

311 Q 1-3 Does your organization engage in a real-time online competitive bidding events where the buyer sends out a request for quotation and suppliers bid on the business (reverse auction transactions)?

Category		Yes	Not Sure	No
		x		

What does the process usually entail (transactions, payments, and if electronic or manual):

……………………………………………………………...………………………………………………

………………………………………………………………………………………………………

311 Q 1-4 Do you prefer an Online or a Manual Reverse Auction process?

Category		Yes	Not Sure	No
Online			x	
Manual		x		

311 Q 1-5 What makes you prefer reverse auction process over the rother: *Please select no 3 more than options:*

Category		Yes	Not Sure	No
It's what we familiar with		x		
It works better for us & our clients				

It is easier to use				
It makes everything faster and accurate				
It links with the distant world, quicker, anytime				
It improves our efficiency & competitiveness		x		
OTHER				

Other, give other reasons for your preference above

It is imposed on us

………………………………………………………………………………...…………………………………………

311 Q 1-6 What is the online auction system referred to or called in your organisation?

Category		Mark X
ORA		
ERA		
ERP		
OTHER		x

In case of **other**, please specify name of an online reverse auction used in your work or organisation:

ARIBA SAP Sourcing system (ERP)

………………………………………………………………………………...…………………………………….…

311 Q 1-7 Why did your organization choose this particular model, rather than other systems?
Please select no more than 2 options:

Category		Mark X
It suitable to our needs		
Inter-operable to sister systems		x
Has all features that we need		x
Reliability and Accuracy		
Cheaper, compared to others		
Company Policy		

311 Q 1-8 Other, give other reasons why you use or adopted this online reverse auction model in your organisation

………………………………………………………………………………...…………………………………………

311 Q 1-9 For how long have these systems being used in your organization?

Category		Mark X
Always been used (before I came here)		x

Since the past five years		
Since the past 10-15 years		
Don't know		

311 Q 1-10 The ORA Technology is easier to use, compared to manual processes.

Category		Yes	Not Sure	No
Easy		x		
Difficult				x
Don't know				

311 TR 1-11 If not using ORA, what is being used to facilitate the reverse auction processes?

Category		Mark X
Inhouse Manual System		
Excel Tool		
Physical Negotiations		

Other, give other systems or tools that you use instead of ORA

All transactions are on the system SAP

....

311 TR 1-12 Why are ORA systems not being used in your organization? *Please select no more than 3 options:*

Category		Mark X
Expensive to acquire		
Not aware of the tool		
Physical Negotiations are better		
Unreliable availability of electricity		
Complex to use		
Susceptible to Hacking (and Fraud)		
Our clients are not familiar with electronic processes		

Other, give other reasons what is the cause of not using the ORA system in your organisation. No manual system is allowed unless the system is down

…………………………………………………………………………………………...……………………………………………

MOTIVATION OR PURPOSE TO USE

311 Q 2-1 Why have you/organisation opted to use the ORA system? *Select no more than 3 options:*

Category		Mark X
Usefulness		x
Company policy		x
Ease of use		
Reliability and Accuracy		
Procurement Savings		x
Agility/Time Saving		
Procurement Savings		

Other, give other reasons

………………………………………………………………………………...……………………………………

311 Q 2-2 Why should companies adopt and use the ORAs? *Please select no more than 3 options:*

Category		Mark X
Improve efficiency, accuracy & speed of transactions		x
Sychronises with other systems		x
Expand clients reach across wider destinations		
Fashionable thing to use		
Sychronises with other systems		x
Minimize operational costs		

Other, give other reasons

The system is sometime tedious to use with many approvers

………………………………………………………………………………...……………………………………

311 Q 2-3 What are the Benefits brought by the ORA system? *Please select no more than 2 options:*

Category		Mark X
Improve accuracy of transations		
Sychronises with other systems		x
To reach broader audiences		x
Fashionable thing to use		
Improve efficiency & competetiveness		x

Other, give a specific name that you use for online reverse auction in your work or organisation:

…………………………………………………………………………….....………………………………………

311 Q 2-4 Is the system easy to use?

Category		Yes	Not Sure	No
Easy		x		
Difficult				x

Other,

It takes too long to apply for access and sometimes the roles assigned are not correct and you have to start the process all over again. Once registered it is easy to use

…………………………………………………………………………….....………………………………………

311 Q 2-5 What makes the system easy/ difficult? *Please select no more than 2 options:*

Category		Yes	Not Sure	NO
The system is intuitive		x		
Helpful user manuals				
There is constant training				
A faster & powerful network		x		
Very skilled, & supportive help-desk		x		

If it is difficult, what could be the reasons (please describe them):

Our help desk is in India but very effective

…………………………………………………………………………….....………………………………………

SECTION B: ADOPTION, IMPLEMENTATION AND USE OF ORAs

311 Q B.1   What is the relevance of the ORAs tools in your job or organization?

To procure technical equipment for our technology sites

………………………………………………………………………………...…………………………

311 Q B.2   How are the ORA helping you and your organization to improve your processes/ transactions?

Everything is automated and straight forward

………………………………………………………………………………...…………………………

311 Q B.3   What are the external factors that make ORA do well in your environment?

Global support from the parent company abroad

………………………………………………………………………………...…………………………

311 Q B.4   *It is important for the company and the clients to have the same understanding of ORA processes   if related transactions are to be successful*. How is a smooth ORA understanding and usage promoted between the organization and its stakeholders?

It is important and the suppliers we use are trained and there are user manuals online for refresher and upgrades …………………………………………………………………………………………………

311 Q B.5   What makes ORA system usage fail in business environments (external factors or variables) that negatively affect the use of ORAs

I think they are doing well

……..

311 Q B. 6   Why would you advise companies to move towards the online reverse auction (ORAs) systems?

For convenience and standardisation

………………………………………………………………………………...…………………………

311 Q B.7   Why is the ORA usage not increasing in South Africa?

There are no incentives for the organisations to promote digital tools. There must be a government rebates for that

………………………………………………………………………………...…………………………

311 Q B.8   What is needed to improve effective use of ORAs in South Africa?

The will and commitment from organisations. But I thought the pandemic has changed the landscape of conducting business in South Africa and globally

……..

311 Q B.9   If buying, selling and bidding using online reverse auction tools allows parties from different regions to interact, a small emerging entrepreneur could fear unlawful behavior in these transactions, leading to limited uptake (and usage) of ORAs. What is the likelihood of this tendency in South Africa?

…………………………………………………………………………………………...……………………………

311 Q B.10　　It is a different story to have national policies and frameworks in place. But having them popularized to sensitize emerging local businesses against unlawful behavior in online reverse auctions would have develop trust in this innovation. What have been your experience on publicity of policies on this sensitive subject?

Our organisational policies are firm and shared with old and new suppliers

…………………………………………………………………………………………...……………………………

311 Q B.11　　How could this policy related concern affect the adoption and use of the ORA technology among the South African small and emerging enterprises?

No effect the small businesses need to be onboarded which is tedious but after that all is smooth

…………………………………………………………………………………………...……………………………

311 Q B.12　　Over and above the anti-lawlessness policies, what is the essence of "*effective usage and implementation frameworks*" to promoting uptake and usage of ORAs among emerging business entities in South Africa?

Yes our frameworks are firm and the same across continents suppliers have the same treatment and experience in all our entities

…………………………………………………………………………………………...……………………………

311 Q B. 13　　What have been your experience in terms of availability and adequacy of implementation and usage frameworks to emerging business entities in underprivileged contexts of South Africa?

Good maybe a revised framework to accommodate more flexibility in relation to SA context

…………………………………………………………………………………………...……………………………

311 Q B.14　　In view of your experience in the previous question above – Do you see a need for frameworks that would guide emerging businesses on effective ways of adopting, implementing and using ORA innovations to improve their business processes in South Africa?

Relevant and updated frameworks are necessary

…………………………………………………………………………………………...……………………………

311 Q B. 15　　Finally, what would be the most basic guidelines you would recommend towards an increased adoption and use of ORAs for the South African business sector to benefit from efficiencies associated with this innovation?

To expand supplier base and have more suppliers to participate especially small businesses

…………………………………………………………………………………………...……………………………

THANK YOU

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