IMPLEMENTATION OF E-PROCUREMENT BY THE GAUTENG DEPARTMENT OF INFRASTRUCTURE DEVELOPMENT AND ITS IMPACT ON THE DEVELOPMENT OF SMALL AND MEDIUM CONSTRUCTION FIRMS

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A dissertation submitted to the Faculty of Engineering and the Built Environment, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Science in Building (Project Management).

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18 OCTOBER 2017

DECLARATION

I declare that this dissertation is my own unaided work. It is being submitted to the Faculty of Engineering and the Built Environment, University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination to any other University or institution.

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18th October 2017

ABSTRACT

E-procurement has been implemented globally with the aim of optimising efficiency and effectiveness within procurement processes of organisations and has become one of the preferred systems for the acquisition of goods, works and services. In recent years, e-procurement processes have been widely adopted and their application has been the norm in many organisations' procurement processes. However, while e-procurement presents some significant opportunities, a set of challenges has emerged with the implementation of e-procurement. For example, in the South African context, small and medium construction firms (SMCFs) that do not have access to technological infrastructure are often not able to participate fully in the e-procurement transactions. In that regard, the implementation of e-procurement by the Gauteng Department of Infrastructure Development (GDID), a public sector organisation within the Republic of South Africa (RSA) and its impact on the development of SMCFs was investigated in this study. This was done to ascertain the extent of e-procurement implementation and the experiences of SMCFs, benefits and challenges associated with this in the study area. In order to address the research question, the research design adopted involved a detailed examination of the e-procurement methodologies used by the GDID in its procurement for infrastructure projects. This was done through the utilisation of questionnaires. 10 GDID officials chosen through the utilisation of a combination of the stratified random and purposive sampling methods, participated on the research. Secondly, to ascertain the impact of e-procurement implementation on the development of SMCFs, 250 SMCFs within the GDID supplier database were emailed questionnaires to obtain information regarding their experience, benefits realised and the inhibiting factors associated with their participation in e-procurement. The 250 SMCFs were selected through purposive sampling method were selected on the basis that they participated in the procurement of infrastructure projects implemented by GDID in the previous three financial years which are 2014/15; 2015/16 and 2016/17. Twenty-seven of the 250 SMCFs responded. The e-procurement methodologies used by the GDID were found to be e-notification, partial e-tendering, e-contract award, e-contract management and e-maintenance, repairs and operations (e-MRO). There was no single integrated e-procurement system used for carrying out all the e-procurement activities.

E-notifications were done through the notification of tender opportunities for infrastructure projects through the Government Tender Bulletin, Construction Industry Development Board (CIDB) website, Department of National Treasury e-tenders' portal and the Lead-2-Business website. Partial e-tendering is carried out through the Department of National Treasury e-tenders portal. E-contract award was done through sending of award letters to service providers as email attachments. E-contract management is done through the utilisation of Oracles' Primavera P6 and Unifier software and Microsoft Project and emails for normal formal communication and circulation of instructions and project reports. E-MRO was done through the e-maintenance software developed by GDID. It was also found that only around 33.3% of the 27 SMCFs that responded were able to fully engage with all the 5 major e-procurement methodologies, excluding e-MRO implemented by the GDID. The remaining SMCFs still relied on the utilisation of a combination of both electronic and paper based systems. The main impact of e-procurement on the development of SMCFs was found to be both positive and negative. On the positive side, it increased profitability through cost saving benefits and reduction in time required for transactions, increased their market access (as they are able to view more tender opportunities), made transactions faster, increased production rate on site (through reduction in the time spent on tendering, thus releasing more time for managing projects on site), and safer storage and back-up of information for reference purposes and benchmarking of other projects, as well as, for dispute resolution. The main disadvantages were found to be high capital cost of procuring and installing Information, Communication and Technology (ICT) infrastructure, the lack of resources, unreliable power supply, security risk and the lack of infrastructure and the non-compatibility of different software packages and application (interoperability challenge). The study confirms that the use of e-procurement by the GDID is still evolving and is yet to be fully implemented in a way that guarantees its full potential and benefits. It also confirms that e-procurement impacts both positively and negatively on the development of SMCFs, and that the systems need to be carefully designed and applied in order to ensure the growth, inclusiveness, sustainability and development of SMCFs in South Africa.

Keywords: e-procurement, implementation, inhibiting factors, benefits, development, Small and Medium Construction Firms (SMCFs).

ACKNOWLEDGEMENTS

I wish to acknowledge the contributions of the following persons for the successful completion of this dissertation;

1. My Supervisor, Professor Samuel Laryea, for assistance and guidance.
2. All participants who contributed through the allocation of their valuable time to this research.
3. My wife and children for their unconditional love and support during the process.

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LIST OF ACRONYMS

Acronym	Description
BAC	Bid Adjudication Committee
BEC	Bid Evaluation Committee
BSC	Bid Specification Committee
CAC	Customer Acquisition Costs
CD	Compact Disc
CHC	Community Healthcare Centre
CIDB	Construction Industry Development Board
DNT	Department of National Treasury
EDI	Electronic Data Interchange
E-GP	Electronic Government Procurement
E-MRO	Electronic Maintenance, Repairs and Operations
ERP	Enterprise Resource Planning
EU	European Union
GDID	Gauteng Department of Infrastructure Development
GDP	Gross Domestic Product
GIS	Geographic Information System
GP	Gauteng Province
GPS	Geographic Positioning System
GSSC	Gauteng Shared Security Centre

HDI	Historically Disadvantaged Individuals
ICT	Information and Communication Technology
IPM	Internal Project Managers
IT	Information Technology
KPI	Key Performance Indicators
MFMA	Municipal Finance Management Act
NDP	National Development Policy
PFMA	Public Finance Management Act
RFID	Radio Frequency Identification
RDP	Reconstruction and Development Programme
RSA	Republic of South Africa
SAP	System Administrative Processes
SCM	Supply Chain Management
SMEs	Small and Medium Enterprises
SMCFs	Small and Medium Construction Firms
STARS	Other Provincial Departments

DEFINITION OF TERMS

Term	Definition
Adoption:	Being in a state to accept and use methodologies or mechanisms used by some organisation or someone.
Barriers:	Advantages or profit gained.
Development:	An event constituting a positive new stage in a changing situation.
Drivers:	Those processes or items which produce benefits through the implementation of an e-procurement solution.
E-contract award:	Communication for the awarding of contracts to suppliers through electronic mechanisms.
E-contract management:	Use of electronic instruments to monitor and improve contract performance and document management.
E-evaluation:	Evaluation of proposals, subsequent communication of evaluation results, discussion and analysis of results using electronic systems or mechanisms.
E-invoicing:	The process of claiming for payment for goods, services or works ordered and delivered under agreed conditions through electronic means.
E-maintenance, repairs and operations (E-MRO):	The process of creating and approving purchasing requisitions, placing purchase orders and receiving the

	goods and services ordered via software based Internet technology.
E-notification:	Electronic methods or mechanisms used to inform, or provide notices on the available tender opportunities.
E-ordering:	The process that involves the use of the Internet to facilitate operational purchasing process, including requisitioning, order approval, order receipt and payment processing.
E-payments:	Processing of payments to service providers or suppliers through electronic mechanisms.
E-reverse auctioning:	A system that enables a purchaser to buy goods and services needed from a number of known or unknown suppliers.
E-sourcing:	Entails the identification of new supplier categories of purchasing requirements using the Internet technology.
E-submission:	Submission of proposals or bids through electronic means.
E-tendering:	The process of sending requests for information and prices to suppliers and receiving their responses using the Internet technology.
E-procurement:	Entails the electronic communication to notify or inform Stakeholders about tender opportunities, exchange of construction and data, conduct tendering for works,

	evaluate tenders, award and administer contracts.
Implementation:	Utilisation or using.
Inhibiting Factors:	Factors that deter or impede or limit utilisation of e-procurement.
Small and Medium Construction Firms (SMCFs):	Construction companies registered with the Construction Industry Development within grade 1 to 7.

CHAPTER ONE

INTRODUCTION

CHAPTER ONE

1.1 INTRODUCTION

Several organisations have implemented e-procurement methodologies based on their need to improve their procurement processes in line with their procurement objectives (Eadie, *et al.*, 2007). GDID, in this regard, implemented e-procurement methodologies to increase the efficiency and effectiveness of its procurement processes, while enhancing transparency, accountability, competitiveness, fairness and equality requirements. Further to these objectives, are the mandatory requirements for ensuring job creation, empowerment and developmnet of SMCFs in order to address the triple challenges.

Several e-procurement methodologies applicable in the industry have been devised. According to Croom & Brandon-Jones (2005), many organisations adopted the implementation of e-procurement. The degree of implementation, however varies, with some organisations operating a full paperless procurement system, while others apply selected e-procurement methodologies to specified activities within their procurement processes. The selected e-procurement methodologies are aimed at addressing specific challenges experienced in the operations of these organisations and their procurement objectives. The study was based on the procurement of infrastructure projects implemented by GDID. Participants in the project were GDID officials and SMCFs who participate in the procurement of infrastructure projects implemented by GDID.

However, in order to ascertain the impact of the adoption and implementation of e-procurement technologies and processes, there was need to investigate the e-procurement methodologies being implemented. Interviews and questionnaires were used to derive this information from GDID officials. The experiences of the adopters to those e-procurement methodologies based on their application needed to be explored. Further to that, the benefits derived from the adoption and implementation of the e-procurement methodologies needed to be established. The challenges associated with the implementation of these e-procurement methodologies required to be established. The experiences, benefits and associated challenges were drawn from questionnaires

sent to 250 SMCFs. Conclusions and recommendations were drawn from the data collected from GDID and SMCFs. A determination of the impact of the implementation of e-procurement methodologies was therefore made.

1.2 BACKGROUND TO THE STUDY

E-procurement implementation has been credited with improving procurement processes (Eadie, *et al.*, 2007). Adoption and implementation of e-procurement technologies and processes have however been slow and low, especially in the developing countries. According to Aduwo, *et al*. (2016), the uptake of e-procurement technologies and processes has been phenominal in the developed world whilst its uptake in the developing world has been slow and low. The reasons behind the slow and low uptake of e-procurement methodologies needs to be established.

According to Eadie, *et al*. (2007), organisations often adopt systems that improve communication and reduce their operational costs. This enhances these organisations' growth, sustainability and development. Thus the GDID and SMCFs could adopt and implement e-procurement only if they could forecast benefits in the utilisation of these technologies and processes. GDID adapts to systems that provide efficiency and effectiveness to its procurement processes while SMCFs adapt to processes that reduce their tendering costs and reduces tendering time.

The e-procurement methodologies implemented by GDID need to be explored, including the extent of their implementation in addressing the challenges associated with their current procurement processes. SMCFs experiences based upon the e-procurement methodologies implemented by GDID have to be explored. The benefits attained by SMCFs from the e-procurement technologies and processes implemented by GDID need to be established. SMCFs' adoption and implementation of e-procurement methodologies implemented by GDID is dependent on the benefits derived from the utilisation of these methodologies.

Sophisticated application of e-procurement may not align with the business capability of many SMCFs. Therefore many of the SMCFs may be affected adversely by e-

procurement application. Thus the challenges associated with the implementation of e-procurement have to be established.

The implementation of e-procurement by GDID and its impact on the development of SMCFs has to be investigated.

1.3 PROBLEM STATEMENT

The use of traditional paper based procurement methods is still dominant in the procurement of infrastructure projects in the public sector. This has many weaknesses including bureaucracy and lack of transparency (Khalil & Waly, 2015). Laryea, *et al*. (2014), established that among the many challenges associated with the current construction procurement practices implemented by two public sector organisations in South Africa are the tempering, misplacement or loss of project information or data. Eadie, *et al*. (2007) asserted that implementation of e-procurement improves all aspects of the procurement processes. Croom & Brandon-Jones, (2005) on the other hand indicated that adoption of e-procurement in the construction industry is evident. The degree of adoption however differs. Based on this, the adoption and implementation of e-procurement by public sector organisations needs to be established. Furthermore, it requires to be established how the implementation of e-procurement would improve procurement processes in the procurement of infratsructure projects implemented by public sector organsiations.

There is limited literature that relates to the impact of the implementation of e-procurement to the development of small contractors. There was an indication by some respondents in the study of Laryea, *et al*. (2014), that implementation of e-procurement might be detrimental to small contractors. These contractors are referred in this study as SMCFs. Based on the assertation made by Croom & Brandon-Jones (2005), it therefore has to be established if e-procurement implementation may be detrimential to the development of SMCFs given the benefits of implementation of e-procurement technologies and processes that were articulated by several authors amongst them Eadie, *et al*. (2007), Neupane, *et al*. (2012), Testa, *et al*. (2012) and Laryea & Ibem (2014). SMCFs' experiences, based on their adoption and implementation of e-procurement methodologies implemented by GDID, were examined. The set of benefits

and inhibiting factors associated with the implementation of e-procurement methodologies were investigated. When the experiences, benefits and inhibiting factors to e-procurement implementation have been gathered, the impact that e-procurement implementation on the development of SMCFs can be ascertained. Thus it is then that it can be concluded on whether implementation of e-procurement technologies and processes would be detrimental to SMCFs or not.

1.4 RESEARCH QUESTION

The research question for this study is:

- How does the implementation of e-procurement by the GDID impact on the development of SMCFs?

1.5 AIM OF THE RESEARCH

The aim of this research is:

- To establish the e-procurement methodologies implemented by the GDID and analyse the impact of the implementation of these e-procurement methodologies on the development of SMCFs.

1.6 RESEARCH OBJECTIVES

The specific objectives of this research are to:

- To identify the e-procurement methodologies implemented by GDID and ascertain how they are being implemented;
- To examine the experiences of SMCFs with e-procurement methodologies implemented by the GDID; and
- To analyse the benefits and the inhibiting factors experienced by SMCFs resulting from the adoption and implementation of e-procurement methodologies implemented by the GDID.

1.7 SCOPE OF THE RESEARCH

The e-procurement methodologies implemented by the GDID were identified. The extent of implementation of these e-procurement methodologies was determined. This information was obtained from GDID officials through the use interview questions and

questionnaires. Officials involved in the procurement of infrastructure projects from the Health Branch, Education Branch, STARS Branch (comprises of the infrastructure projects undertaken on behalf of the Department of Community Safety; Social Development; Sports, Arts, Culture and Recreation; Roads and Transport and Economic Development) and Supply Chain Management were targeted for participation.

The researcher had to determine how the SMCFs have adapted to these e-procurement methodologies. The experiences of the SCMFs based on the e-procurement methodologies implemented by GDID were established. The benefits attained by SMCFs based on the implementation of e-procurement methodologies was established, together with the inhibiting factors associated with the implementation of e-procurement methodologies. This information was obtained through the use of questionnaires sent out to 250 SMCFs within the GDID supplier database that had participated in the procurement of infrastructure projects implemented by GDID within the past three financial years, which are, 2014/15; 2015/16 and 2016/17. The SMCFs were selected through purposive sampling.

The Gauteng Province (GP) was chosen as the focus area for this research due to the fact that it is the economic hub of South Africa and accounts for greater population than other provinces (Laryea, *et al*., 2014; Statistics South Africa: Statistical Release P0302, 2016). Efforts made by government departments in improving procurement processes through the implementation of e-procurement in fast tracking service delivery in the study were investigated in this study.

The GDID was chosen as the public sector organisation where the research is based because it is the custodian and implementing agent of all infrastructure projects within the Gauteng province.

SMCFs are defined as small and medium construction firms that participate or are involved in the implementation of infrastructure projects. They include both consultants and contractors. However, for the purpose of this research, SMCFs shall only refer to contractors. Contractors were chosen based on the rigour of the tender processes that they go through in order to be awarded infrastructure projects. The contractor selection

process seeks to guarantee efficiency and effectiveness, hence the need to implement e-procurement. Tenders for the provision of consulting services for the infrastructure projects implemented by GDID are based on the functionality criteria, mainly, experience. Compensation for provision of these services is done through the use of the gazetted fee scales and therefore the tenderers do not tender based on the cost of their proposals.

1.8 BRIEF OVERVIEW OF THE RESEARCH METHODOLOGY

The thrust of this research study was to address the following objectives:

- To identify the e-procurement methodologies implemented by GDID and ascertain how they are being implemented;
- To examine the experiences of SMCFs with e-procurement methodologies implemented by the GDID; and
- To analyse the benefits and the inhibiting factors experienced by SMCFs resulting from the adoption and implementation of e-procurement methodologies implemented by the GDID.

In the bid to address these objectives and the research question, a qualitative approach was adopted to determine the existing e-procurement methodologies being implemented by the GDID and evaluation of the impact of these to the development of SMCFs. In order to ensure optimisation of the information pertaining to the procurement processes implemented by the GDID and the experiences of SMCFs, primary data sources were considered appropriate for implementation in this research study. Primary data sources are those sources where data were collected for the first time and are original in nature.

The data collection techniques that provided secondary data were utilised. Secondary data sources on the other hand provided data that have been collated before and been statistically processed before.

1.8.1 Primary Data Sources

In order to determine the e-procurement methodologies implemented by the GDID and to examine the experiences and the impact on the development of the SMCFs, the

following research instruments were utilised to collect data from the GDID officials and SMCFs.

- Interviews with GDID Officials (Pilot Survey)
  An interview entails the asking of questions, listening and recording of answers given by the interviewee (Saunders, et al., 2012).

  Structured and semi-structured interview guides were used to collect data on the e-procurement methodologies being implemented by the GDID during the pilot survey. Officials who are involved in the procurement of infrastructure projects were the targeted participants for the interviews. Pre-determined questions were drafted by the researcher. This was considered appropriate to ensure that all interviewees were asked same questions. The analyses of the responses were based on the same interview questions. Further to that, the use of pre-determined questions provided the direction which the interview should follow and lessened the time required when conducting interviews.

  A combination of stratified random sampling and purposive sampling was used to determine the participants within the pilot survey. It was considered that there are four (4) units within GDID, where targeted respondents were based. These are the Health Branch, Education Branch, SCM and STARS. The targeted respondents were drawn from these branches that are actively involved in the procurement of infrastructure projects. Eight participants were shortlisted to participate in the survey. The population who were shortlisted to participate in the pilot study were two participants from each of the following Branches; Health Branch, Education Branch and STARS and SCM. Purposive sampling was used to ensure that the participants identified have extensive experience in the procurement processes implemented by GDID and hence the requirement for officials who had worked for at least five years within GDID. However, seven out of the eight respondents selected from these Branches managed to participate. The results were recorded and analysed using the content analysis. The questions on the interview guide were consequently adjusted to align with the

objectives and aims of the research and to ensure that they are easily understood by the interviewees.

Interviews were considered appropriate in this research due to the realisation that they are advantageous in capturing accurate accounts on the e-procurement methodologies implemented by the GDID from officials. The other advantage is that the response rate for interviews is high and provide basis for analysis of the responses of the interviewee later (Saunders, *et al.*, 2012).

Electronic audio recording equipment was used to capture the responses given by the interviewees.

1.8.1.1 Questionnaire

Questionnaires comprising both structured and open ended questions were developed and utilised to collect data on the e-procurement methodologies implemented by the GDID from the GDID officials. They were also used to collect data on the impact the implementation of these e-procurement methodologies has on the development of SMCFs from the SMCFs perspective.

The open ended questions provided the respondents with an opportunity to air their views that could not have been captured in the structured part of the questionnaires. The effects of the limitations associated with the use of questionnaires were considered. These included reduced responds rate. In order to reduce the effect of this, the researcher emailed some of the questionnaires, whilst on others, the researcher requested other GDID Project Managers to distribute the questionnaires during meetings to the SMCFs that are working on their projects. Reminders for the completion and sending back of the questionnaires were regularly sent through emails and the Short Message Services (SMSs). The questions on the questionnaires were made as short as possible and in simple language that ensured that respondents could easily understand the language and the context of the questions. These were some of the strategic tools that were used by the researcher in order to optimise the advantages associated with the use of questionnaires in research as indicated in Chapter 3.

1.8.1.2 Pilot study

The researcher carried out a pilot study using the two research instruments. One of the pilot studies sought to establish the e-procurement methodologies implemented by the GDID through interviews using structured interview guide. Seven (7) respondents were interviewed. The results were recorded and analysed. The questions on the interview guide were consequently adjusted and aligned with the objectives and aim of the research to ensure that they are easily understood by the interviewees. However, due to limitations in securing timeous appointments with the proposed interviewees during the actual data collection process, the interview guide was converted to questionnaires with open ended questions for respondents to complete. The sending of questionnaires was considered advantageous because it provided respondents with ample time to complete the questionnaire and return them to the researcher.

A pilot study with 12 SMCFs, selected using the purposive sampling method, was undertaken to determine the nature and extent of the responses obtained. The heterogeneous or maximum variation sampling strategy of purposive sampling was utilised, taking into consideration, the diverse characteristics of the targeted respondents that comprised CIDB grade 1 to 7 contractors. These contractors have different experiences and expertise in the construction industry and hence, their different understanding and adoption level of e-procurement.

The questionnaires were adjusted after consideration was made on the responses obtained from the pilot study. This research instrument was used during the actual data collection tool of the research. Preliminary data collection, consolidation and analysis, based on the responses from the pilot study, were undertaken.

1.8.1.3 Analysis of the results

The data collected during the pilot survey and the fieldwork were analysed using the content analysis methodology. In doing so, the researcher took measures that ensured the quality and validity of the responses. These included the creation of a data requirements table, where outcomes were summarized. This helped in the provision of the direction and detail of the responses that were collected.

1.8.2 Secondary Data Sources

The secondary data sources were obtained from the GDID data base, archives, published and unpublished materials, project reports, minutes of site meetings and publications by any other stakeholders.

1.9 STRUCTURE OF THE DISSERTATION

This research is made up of six Chapters. The outline of the chapters is as follows:

Chapter 1: Introduction

This chapter provides the introduction, background, problem statement, project research question, aim, objectives, scope, of the research and the brief overview of the research methodology.

Chapter 2: Literature Review

The review on literature related to the application of e-procurement technologies and processes internationally is done in this chapter. The review process includes the detailed investigation into the e-procurement systems implemented by the GDID, benefits and inhibiting factors experienced by the SMCFs resulting from the e-procurement methodologies implemented by GDID.

Chapter 3: Research Methodology

This chapter provides information on the nature of the research question, formulation of appropriate research design and the data collection and analysis techniques and procedures used.

Chapter 4: Data Collection, Analysis and Results

The data collected are presented and analysed in this chapter. The data relating to the e-procurement methodologies implemented by the GDID were collected from 10 GDID officials drawn from all units involved in the procurement of infrastructure projects. These are the Health Branch, Education Branch, STARS Branch (comprising of the infrastructure projects undertaken on behalf of the Department of Community Safety; Social Development; Sports, Arts, Culture and Recreation; Roads and Transport and

Economic Development) and the SCM. The data relating to the experiences, benefits and inhibiting factors associated with the adoption and implementation of e-procurement methodologies were obtained from 250 SMCFs selected from the GDID supplier database.

Chapter 5: Discussion of the Results

This chapter provides a discussion of the results of this current study and relates it to the literature in Chapter 2 of this report.

Chapter 6: Conclusions and Recommendations

The Conclusions and Recommendations based on the data collection, analysis and results are presented in this chapter. Areas for further study are recommended in this Chapter.

CHAPTER TWO

LITERATURE REVIEW

CHAPTER TWO: LITERATURE REVIEW

2.1 INTRODUCTION

This Chapter provides a review of the literature obtained from different sources on the implementation of e-procurement, and how that impacts on the development of SMCFs.

2.2 PROCUREMENT

2.2.1 Procurement and Public Procurement definition

According to the Chartered Institute of Purchasing and Supply (CIPS) Australasia (2013), procurement is defined as the business management function that ensures identification, sourcing, accessing and management of the external resources that an organisation needs or may need to fulfil its strategic objectives. Strategic objectives of any business are not static, as they continuously change to respond and align to the ever-changing environment, and as such, businesses conduct procurement on a regular basis.

Governments and public sector organsiations, due to the nature of the services they provide and the targeted beneficiaries of those services, implement public procurement. Ambe & Badenhorst-Weiss (2012), defined public procurement as the function whereby public sector organisations acquire goods, services and development and construction projects from suppliers in the local and international market, subject to the general principles of fairness, equitability, transparency, competitiveness and cost-effectiveness. The United Nations, (1999) report, on the other hand, defined public procurement as the government busines system which is concerned about the government procurement process such as preparing project specification, requesting, receiving and evaluating bids, awarding contract and payment.

Public procurement is undertaken as a means of provision of service by governments to its citizens. In executing this mandate, governments formulate and give mandates to public sector organisations to provide services in defined work areas to its citizens. The basic principle of public procurement process is to acquire the right item at the right time with the right price (Neupane, *et al.*, 2012).

2.2.2 Procurement Guidelines

In order to regulate procurement so that it remains open, objective and transparent, government sets procurement guidelines. The objectives of these guidelines are to provide a prescription of standards of behaviour, ethics and accountability which it requires of its public service and to provide a statement of the government's commitment to a procurement system which enables the emergence of sustainable small, medium and micro businesses.

In their endeavour to ensure compliance with the procurement objectives, the South African government introduced the five pillars of procurement. Every public sector institution is therefore required to incorporate these pillars in their procurement processes. The main aim of these pillars is to optimise the growth and development of SMEs (van Rooyen, 2015).

2.2.2.1 The Five Pillars of Procurement

The five pillars of procurement are as shown in figure 2.1.

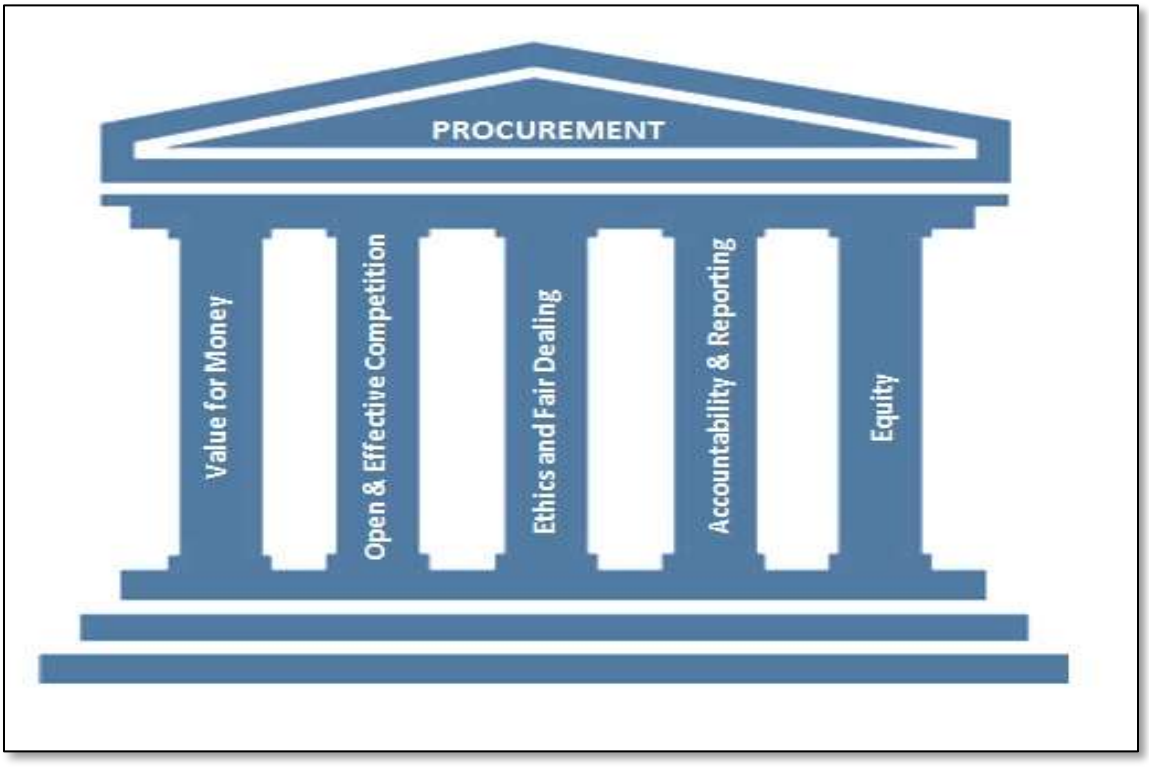

Figure 2.1 Five Pillars of Procurement
Source: Findoo Blog, (2014)

Pillar 1: Value for Money

This pillar requires that public sector organisations procure goods, services or commodities that optimise the quality requirements. It is therefore not necessarily the lowest priced tender that should be awarded, but the one that guarantees quality (van Rooyen, 2015). Price alone is not a reliable indicator. Public sector procurement officials need to investigate and go beyond the price. In this case, public sector organisations are required to:

- Avoid any unnecessary costs and delays for themselves or suppliers;
- Monitor the supply arrangements and reconsider them if they cease to provide the expected benefits; and
- Ensure continuous improvement in the efficiency of internal processes and systems (van Rooyen, 2015).

Pillar 2: Open and Effective Competition

Public sector organisations are mandated to ensure that in their procurement processes, everybody has a reasonable chance to compete for tenders (van Rooyen, 2015). They must not implement procurement processes that are exclusionary or result in the exclusion of interested parties. Their procurement processes must be transparent, accessible to all parties and easily understandable by all parties and strive to eliminate any chances for favouritism.

Public sector organisations need to ensure that the following are derived from the procurement processes and policies:

- Potential suppliers have reasonable access to procurement opportunities and that those available are notified, at least, through the Government Tender Bulletin;
- Where market circumstances limit competition, departments recognise that fact and use procurement methods that take account of it;
- Adequate and timely information is provided to all parties or suppliers to enable them to bid;

- Bias and favouritism are eliminated;
- The costs of bidding for opportunities do not deter competent suppliers; and
- Costs incurred in promoting competition are, at least, commensurate with the benefits received.

Pillar 3: Ethics and Fair Dealing

This pillar dwells on the conduct of public sector procurement officials. The pillar states that public sector procurement officials need to provide their service with integrity and should eliminate conflict of interest of any sort. The pillar requires that the conduct of public sector procurement officials should not be deterred through accepting of gifts and hospitality (van Rooyen, 2015). All public sector procurement and other officials dealing directly with suppliers need to:

- Recognise and deal with conflicts of interest or the potential thereof;
- Deal with suppliers even-handedly;
- Ensure they do not compromise the standing of the state through acceptance of gifts or hospitality;
- Be scrupulous in their use of public property; and
- Provide all assistance in the elimination of fraud and corruption (van Rooyen, 2015).

Pillar 4: Accountability and Reporting

This pillar requires that both suppliers and public sector officials incorporate appropriate reporting tools within their bids (van Rooyen, 2015). Public sector officials and organisations are required to report to the Accounting Officers and Ministers while suppliers must be able to report their plans, actions and outcomes.

Pillar 5: Equity

This pillar ensures government's commitment to economic growth by implementing measures to support industry generally and especially to advance the development of SMEs and Historically Disadvantaged Individuals (HDI) (van Rooyen, 2015). In line with the Reconstruction and Development Programme (RDP) and the National Development

Plan (NDP), SMEs and HDIs, the government needs to play a bigger role in the economy.

2.2.3 Constitutional mandate of public procurement

Public procurement is regulated by the Constitution of the Republic of South Africa (1996) Constitution. Section 217 of the Constitution states that when an organ of the state contracts for the provision of goods and services, it must do so in accordance with the principles of fairness; equitability, transaparency, competitiveness and cost-effectiveness. This requirement is further echoed in Section 51 (1) (a) of the Public Finance Management Act 1 of 1999 (PFMA). The Local Government: Municipal Systems Act 32 of 2000 and the Municipal Finance Management Act 56 of 2003 regulate procurement in Municipalities.

2.3 ELECTRONIC PROCUREMENT (E-PROCUREMENT)

In a bid to come up with procurement processes that satisfy and adequately address all the five pillars of procurement and meet the constitutional objectives of procurement, implementation of electronic procurement (e-procurement), in both the private and the public sector, has been promulgated. Proponents of e-procurement, amongst them Eadie, *et al.* (2010) asserted that implementation of e-procurement improves all facades of the procurement process. The e-procurement implementation methodology, the benefits and inhibiting factors impacting on its adoption and implementation were investigated in this research study.

2.3.1 E-procurement definition

Panayiotou, *et al.* (2004) defined e-procurement as an Internet based purchasing system that offers electronic purchase, ordering processing and enhanced administrative functions to buyers.

Schoenherr & Tummala (2007) defined e-procurement as the sourcing of goods and services via electronic means usually through the Internet. In simpler terms, e-procurement can be defined as the use of Internet technology in the procurement processes.

Laryea, *et al.* (2014), defined e-procurement as entailing the use of electronic communication to notify or inform stakeholders about tender opportunities, exchange of construction project information and data, conduct tendering for works, evaluate tenders, award and administer contracts.

E-procurement is thus an umbrella term that encompasses different electronic procurement processes. These processes incude electronic notification or infoming (e-notification/informing), electronic ordering (e-ordering), Internet bidding, purchasing cards, exchange of construction project information and data, tendering, evaluation, award, contract administration, reverse auctions and integrated automatic procurement systems (Fernandes & Viera, 2015; Laryea, *et al*., 2014). E-procurement automates and standardises procurement processes and eliminates chances of human error and interference within the processes. Moreso, e-procurement provides a traceable record of transactions and this gives the basis of the advantages of e-procurement for improving transparency and accountability within the procurement process (Neupane, *et al.*, 2012).

2.3.2 Public Sector e-procurement

Procurement by government or public sector sector organisations, as indicated before, is referred to as public procurement. In this regard, implementation of e-procurement by the government and or public sector organisations is referred to as public sector e-procurement. Public sector e-procurement is defined as the use of information and communication technology such as the Internet / web based systems by governments in conducting their procurement relationship with bidders for the acquisition of goods, works, services and other consulting services required by the public sector (Neupane, *et al*., 2012; Leipold, *et al*., 2004; Davila, *et al*., 2003). Adebiyi, *et al.* (2010) defined electronic government procurement (e-GP) as online applications of information technology and infrastructure management, processing, evaluation and reporting of government procurement. According to Vaidya (2007), public e-procurement is an inter-organisational information system, which automises any part of the procurement process in order to improve efficiency, quality and transparency in government procurement.

2.3.3 Adoption of e-procurement

Adoption of e-procurement in construction has been slower than expected. This is despite the articulation of the benefits of its adoption by several authors. However, despite the rate of adoption being slower, there is evidence that e-procurement is being implemented in varying degrees amongst organisations including public sector organisations (Whyte, *et al*., 2002 and Wong & Sloan, 2004).

2.3.4 E-Procurement in Supply Chain Integration

According to Jooste & de W. van Schoor (2003), e-procurement impacts supply chain in four key dimensions as follows:

a) *Information integration:* This involves information sharing and transparency across the supply chain units which SMCFs access in real time.

b) *Synchronised planning:* This involves collaborative training and replenishment across supply chains of SMCFs (Jooste & de W. van Schoor, 2003).

c) *Workflow co-ordination:* This focuses on automation of business processes and co-ordinating them (Jooste & de W. van Schoor, 2003).

d) *New business models:* This includes different supply and sell-side models that were previously not present in the off-line world (Jooste & de W. van Schoor, 2003).

2.3.5 E-Procurement Process Flow

Figure 2.2 shows the e-procurement process flow as adopted and implemented by organisations in the construction industry. The e-procurement application is implemented in the two different project implementation phases which are:

- Pre-Award (e-Tendering); and
- Post-Award (e-Execution)

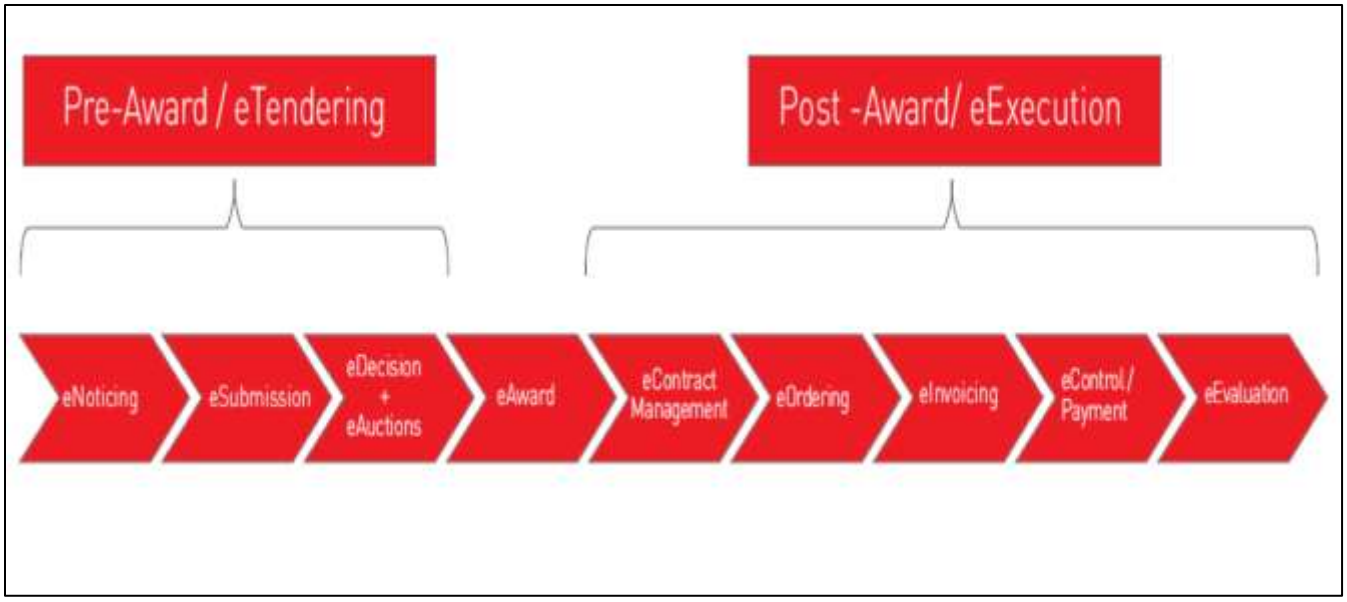

Figure 2.2: E-procurement process flow
Source: Tavares (2010)

According to Tavares, (2010), the implementation of e-procurement within the pre-award/e-tendering and post-award/e-execution stages is not homogenous. The implementation is dependent on organisation's infrastructure. E-noticing usage is widespread. Furthermore, Tavares (2010) asserted that phases that comprise the pre-award period are critical to better apply the principles of strategic procurement since they include tasks related to planning, environmental and social responsibility and certification and qualification of competitors. Post-award stage focus on operational issues that may also contribute to reducing costs and time due to better management and contractual control.

2.3.6 E-Procurement Methodologies

According to Croom & Brandon-Jones (2005), many organisations are implementing e-procurement. The degree of e-procurement implementation by organisations however vary. Some organisations do implement full electronic and paperless system, while others do adopt selected e-procurement methodologies. This section therefore provides an account of the e-procurement methodologies applicable to the procurement of infrastructure projects.

2.3.6.1 E-Notification (E-Informing)

E-notification processes are implemented to inform or notify interested parties on the availability of tendering opportunities. These are sometimes referred to as e-noticing or e-announcing. According to De Boer, *et al.* (2002); Boer, *et al.* (2001) and Essig & Arnold (2001), e-informing refers to the gathering and distributing purchasing information both from and to the internal and external parties using the Internet technonology. Costa & Grilo (2014), defined e-noticing as the electronic publication of public procurement notices.

E-notification is therefore achieved through the placement of tender notices on the Internet. This includes placement of tender advertisements and notices on the organisation's websites and through email notifications.

Laryea & Ibem (2014), identified the methodologies and applications used for e-notification as indicated in the Table 2.1.

Table 2.1: Methodologies and Applications used for e-notification

Construction Procurement Activities	**Technologies and Applications**	**References**
E-Notification (e-informing)	Web-Based Project Portals and Web sites	Zuo & Seo, (2006); Wong, (2007); Tindsley & Stephenson, (2008); Heddad, (2013)
	Web 2.0 technology	Klinc, *et al*., (2008); Underwood & Isikdag, (2011)
	Cloud Technology	Fathi, *et al*., (2012); Grilo & Jardim-Gonclaves, (2013)

Source: Laryea & Ibem, (2014)

a) The benefits of e-notification

- Real time acces to procurement information or real time bidding (Neupane, *et al.*, 2012). This means that bidders get procurement information on time for the preparation of their bids and at their conveniency.They have access to bid information twenty-four hours in seven days or beyond the operational or business hours of the organisations that placed tender notices on their websites. This objective of e-notification is in line with the provisions of Pillar 2 of the five pillars of procurement that stipulates the need for potential suppliers to have reasonable access to procurement opportunities;
- Economies of information (Croom & Brandon-Jones, 2005). Tenderers are able to receive more information on other tender opportunities available. For example, when tenderers access the Tender Bulletin or the CIDB website, they are exposed to all tender opportunities available within the South African public sector;
- Reduction in tendering costs. Centralisation of the provision of tender information means that tenderers do not need to incur costs while soliciting for tender opportunities. This is in line with Pillar 2 which states the requirement for bidding costs not to be prohibitive and scare off competent suppliers;
- Time saving benefit. The centralisation of information means that tenderers can access tender information for infrastructure projects being implemented by various public sector organisations in one place. This reduces the time that they spend while soliciting for tender information in line with Pillar 2, which advocates for the provision of adequate and timely information to all suppliers;
- Increases competition amongst bidders (Neupane, *et al.*, 2012). The provision of real time tendering information ensures that more bidders get the opportunity to participate in the procurement for infrastructure projects; and
- Enlarges the market. E-notification provides information on tender opportunities that exists even in areas beyond the geographical boundaries that the bidders are located. Bidders who are eager to expand their business and pursue business beyond their comfort zones find an opportunity to do so through e-informing.

b) Challenges associated with e-notification implementation

Below are the challenges that deter suppliers or contractors from the adoption of implementation of e-notification.

- Lack of knowledge amongst tenderers on where and how the information on tender opportunities may be accessed (Eadie, *et al.*, 2007);
- Lack of IT infrastructure that enables tenderers to access the information (Eadie, *et al.,* 2010);
- Unreliable Internet connections (Eadie, *et al.,* 2010); and
- Internet is expensive especially to small contractors.

2.3.6.2 E-Sourcing

E-sourcing entails the identification of new suppliers for specific categories of purchasing requirements using the Internet technology (De Boer, *et al.,* 2002; Knusden, 2003 and Fuks, *et al.,* 2009).This, includes the establishment of supplier and contractor databases.

a) The Benefits of E-Sourcing

Limberakis (2014) highlighted the following benefits that can accrue from the implementation of e-sourcing.

- Increased transparency in purchasing processes. Implementation of e-sourcing gives organsiations an understanding of the suppliers' culture of doing business and therefore improves transparency and provides a framework of how an organisation is going to market their goods and services;
- Get insight into buyer organization's culture and structure. Suppliers get an insight into the organisations' mission, vision and values. Thus it helps to understand the organisation more and helps in the determination on whether to continue doing business with the organisation;
- Improved diligence in validating product or service differentiators. This helps preparing suppliers for formal negotiation and contracting process;
- Creation of discipline/synergies within the supplier organisation;

- Reduced customer acquisition costs (CAC). The maintanence of the supplier database reduces tender procurement time and costs;
- Leveling of the playing field. Organisations included in the database complied with the minimum requirements'. This, then, means that they are eligible to implement or execute contracts as required. The only additional requirement would be for them to provide competitive pricing schedules;
- Better competitive intelligence. Implementation of e-sourcing provides bidders with a better understanding of their competitors; and
- Adoption of technology / innovation. E-sourcing implementation provides a platform that enables new technology adoption and implementation by bidders to increase efficiency in their processes. This provides a platform for benchmarking and measuring their performance and contract management.

b) Ten recommendations for e-sourcing success

According to Dwyer & Limberakis (2011), the following are ten (10) recommendations that ensure maximum benefits from the adoption and implementation of e-sourcing.

- Adopt and validate best-in-class strategic sourcing procedures before investing in e-sourcing technologies;
- Ensure proper executive and stakeholder support for sourcing and dedicate a manager to champion the program;
- Develop systems and competencies to make total spending analysis an efficient and repeatable process;
- Examine market dynamics, scrutinise supplier capabilities, and define sourcing tools and strategies prior to negotiation;
- Clearly define requirements & expectations to both internal stakeholders and suppliers;
- Tap external parties for category expertise and sourcing methods & process support;

- Define protocols for assessing proper negotiation tools and techniques for each spend category or sourcing scenario;
- Establish channel to communicate e-sourcing strategies and results to stakeholders;
- Align processes, systems, and incentives to ensure compliance; and
- Adopt procedures and systems to measure internal and external supply performance.

2.3.6.3 E-Tendering

E-tendering is defined as the process of sending requests for information and prices to suppliers and receiving responses using the Internet technology (Betts, *et al*., 2010; Boer, *et al*., 2001). Eadie, *et al*. (2007) concur with this view and added that the principle behind the implementation of e-tendering is to ensure a faultless system of transmitting input from the contractor's tender through to contract management, removing the inefficiencies, delays and cost involved in manually processing tender information and re-transcribing for contract management activity. In other words, e-tendering refers to the electronic publishing, communicating, accessing, receiving and submitting of all tender related information and documentation through the Internet thereby replacing the traditional paper based processes and achieving a more efficient and effective business process for all parties involved.

a) Basic Features of an E-tendering System

According to Kajewski, *et al.* (2003), the following are the basic features that constitute an e-tendering procurement system.

- All tender documentation to be distributed through a secure web-based tender system thereby avoiding collating paperwork and couriers;
- The client/purchaser should be able to upload a notice or invitation to tender onto the system;
- Notification is sent electronically (usually through email) for suppliers to download the information and return their responses electronically (online);

- During the tendering period, updates and queries are communicated and exchanged through the same e-tender system;
- The client/purchaser should only be able to access the tenders after the deadline has passed;
- All tender related information is held in a central database, which should be easily searchable and fully audited with all activities recorded;
- It is essential that tender documents are not read or submitted by unauthorised parties;
- Users of the e-tender system are to be properly identified and registered through controlled access. Security has to be optimised and data has to be encrypted and users authenticated by means such as digital signatures, electronic certificates and smartcards;
- All parties must be assured that no 'undetected' alterations can be made to any tender;
- The tenderer or bidder should be able to ammend the bid right up to the deadline date whilst the client/purchaser cannot obtain access until the submission deadline has passed; and
- The e-tender system may include features such as database of service providers with spreadsheet-based pricing schedules, which can make it easier for a potential tenderer to electronically prepare and analyse a tender.

b) The Benefits of E-Tendering Implementation

The following are the benefits that can be derived from the implementation of e-tendering. These benefits are categorised, for ease of reference, into three categories, which are: General, Industry Perspective and Government Perspective (Kajewski & Weippert, 2004 and Kajewski, *et al*., 2003).

- *General*
    - Streamlines tendering processes;
    - Provides improved and secure access to tender information;
    - Brings about innovative business processes;

    - Initiates greater opportunities for small and regionally based businesses;
    - Allows downloading of electronically submitted tenders in a form suitable for evaluation purposes without having to manually re-enter data; and
    - Makes it easier for businesses to obtain tender documentation and to submit an offer on time.
- *Industry Perspective*
    - Provides quick and easy access to public and private tendering information;
    - Increased tender opportunities;
    - Improved access for geographically isolated industry organisations;
    - Increased market share and competitiveness; and
    - Reduces the cost of printing- saving time and resources.
- *Government Perspective*
    - Best value for taxpayers money;
    - Increased efficiency and effectiveness;
    - Consistent tendering practice across government;
    - Promotes overall e-commerce initiative; and
    - Environmentally friendly due to a predominantly 'paperless' process (Kajewski & Weippert, 2004 and Kajewski, *et al.,* 2003).

c) Construction Specific Benefits of E-Tendering Implementation

Kajewski & Weippert (2004) and Kajewski, *et al.* (2003), went on to further identify and stipulate the benefits realised within the construction industry from the adoption and implementation of e-tendering. These benefits include the following:

- Reduction in tender costs. The cost of preparing, copying and distributing tender documents could be cut up to 90%;
- The time to import tender document data into estimating software is reduced from days to minutes;
- Avoids duplication of data interfaces;
- Faster turnaround of tender documents;

- Improved accuracy during tender analysis;
- Standardisation and uniformity of the information from supplier to tenderers;
- Tenders always legible;
- There is less likehood of missing the tender deadline;
- Faster distribution of tender information;
- Improved security of tender documents;
- Tenderers based further away are not disadvantaged;
- There are improved communication and audit trails;
- Less time is spent on routine administration;
- Better management information is provided;
- There is no need for paper copies;
- The standardised electronic format makes the comparison of bids more straightforward; and
- The process is transparent and open (Kajewski & Weippert, 2004 and Kajewski, *et al.,* 2003).

Further to benefits indicated above, use of e-tendering provides a platform for re-use of standard information of regular tenderers. Example of this information includes the pre-qualification documentation and information of a regular pool of tenderers.

d) Challenges Experienced in E-Tendering Implementation

Kajewski, *et al*. (2003) and Kajewski & Weippert (2004) divided the challenges experienced during e-tendering implementation into four broad categories. These are:

- *General*

  There are perceptions amongst consultants and contractors that the implementation of e-tendering is an unfair practice to those parties that are not in a position of receiving and sending documentation electronically. This can however be resolved through the provision of alternatives when receiving or sending documentation. The alternatives would be either manually (paper-based) or in electronic format. The e-tendering adoption rate has been generally low. Most tender documentation is transmitted through traditional means. There is

therefore the need for rapid education and training on the benefits derived from e-tendering implementation. Further to that, there is need for legislation to be enforced that makes it mandatory for implementation of e-tendering.

- *Employment*

  Implementation of e-tendering to existing contractors that have well established procurement sections within their organisations poses threat to the jobs of the people employed in those sections. This forces these employees to resist adoption of e-tendering. In this regard, employees need to be educated and trained to understand that electronic exchange of tender documentation allows them to use their valuable skills on 'profitable' tasks and spend less time on administration work. E-tendering implementation therefore empowers employees and increase their value to their employers and projects.

- *Security*

  There is concern on the security risk of the e-tendering transactions. The risk emanates from the possibility that data may end up in the hands of the wrong recipients or can be tampered with.

- *Legal*

  There is a general perception of the complication of the admissability of information that is disseminated electronically. The recent developments within the ICT sector and legislation however shows that this challenge has been to a larger extent been addressed though there remains some sector of the industry that is still unsure on the admissability of electronically disseminated information.

2.3.6.4 E-Submission

E-submission refers to the electronic submission of proposals or bids (Costa & Grilo, 2014). This concept is sometimes included within the e-tendering processes. E-submission is achieved through the submission of tender documents using emails, portals or dropboxes.

a) The benefits derived from e-submission

- Reduction of travel costs. Tenderers do not incur travelling costs to submit tender documents (Neupane, *et al.*, 2012);

- Easy and guarantee of submission. Neupane, *et al*. (2012) alluded to that in some instances, some tenderers are not able to submit their bids due to coercion and threats from influential competitors. E-submission eliminates such interferences and allows willing parties to participate in the tendering of infrastructure projects without being exposed to threats by other competitors;
- Increases chances of timeous submission of bids. Tenderers often submit their bids on the tender closing day. Sometimes timeous submission is hampered when they are delayed due to traffic jams. This means all the resources they had committed in completing the bid documents would have gone to waste. E-submission eradicates the impact of traffic jams on bid submission (Neupane, *et al.*, 2012);
- Quality of submission. The quality of submitted documents is often very high; and
- Avoids tempering with submitted documentation. Implementation of e-submission ensures that submitted tender documents are not tempered with (Neupane, *et al.*, 2012). All transactions or modification done are traceable (Costa & Grilo, 2014).

b) The challenges experienced with e-submission

- The effect of unreliable power outages. Bidders may fail to submit their bids during times when they do not have power. In this regard, there is a need to have alternative power source (Aduwo, *et al.*, 2016);
- Interoparability concerns. There are numerous e-procurement systems and software packages in the market. These software packages and systems are not compatible with each other. Hence documentation send by the bidder may not be opennable to the software used by the client or purchaser (Eadie, *et al.*, 2007); and
- If submission is done through emails, the emails with priced bid documents may be send to the wrong recipient thereby making the bidder non-responsive.

2.3.6.5 E-Evaluation (E-Decision)

E-evaluation entails the electronic evaluation of proposals, subsequent communication of evaluation results, discusssion and analysis of results (Costa & Grilo, 2014). E-evaluation is sometimes included in the e-tendering processes as well.

Evaluation stage of tenders are very critical and evaluation processes need to be undertaken in such a way that requests for information can easily and quickly be provided to the requestors within the shortest possible time. Delays in the issuing of the information raises suspicion on the decision-making process for projects. The adoption and implementation of e-evaluation addresses simple to complex evaluation processes given the high level of scrutiny that infrastructure projects may be subjected to. Thus a robust evaluation tool that enables access to individual procurement projects and providing a robust audit trail is required especially within the public sector procurement systems.

Mead & Gruneberg (2013) stated that e-evaluation provides a robust and efficient way to deliver multiple evaluations. It is possible to capture subject-matter, expert evaluators rationales and scores on spreadsheets. The processes would still be manageable and effiecient. It is critical that consistency is mainted in evaluations.

Laryea & Ibem (2014) identifed the following methodologies and applications implemented for e-evaluation in the Table 2.2.

Table 2.2: Methodologies and Applications used for e-evaluation

Construction Procurement Activities	**Technologies and Applications**	**References**
E-evaluation	Videoconference	Williams, *et al*., (2007); Garrido, *et al*., (2008)
	Cloud Technology	Fathi, *et al*., (2012)

Source: Laryea & Ibem, (2014)

a) The benefits of e-evaluation

- It provides standardisation and uniformity of the evaluation and scoring process. Eliminates the impact of human interference and favouritism during the evaluation process (Neupane, *et al.*, 2012);
- It provides an audit trail, which is critical for proving transparency and for accountability. This works well where other bidders request for de-briefs on where and why they were unsuccessful and request for more detailed feedback about the decision making process. This allows for efficient and effective resolution of the requests (Fernandes & Viera, 2015);
- Time spend on evaluations is drastically reduced (Eadie, *et al.*, 2007);
- Allows for evaluations to be done by evaluators in geographically dispersed areas. It allows evaluators to access and score the suppliers submissions by completing their sensitive work even in the privacy of their homes or off-site where there are no disturbances. It also allows for the removal of evaluators from the view of suppliers who may be present in the client offices and where offices are shared, a separate and secure suite of offices may be set-up to allow evaluators to complete their tender evaluations in private (Mead & Gruneberg, 2013);
- Reduction in errors made during the evaluation process; and
- Reduction in administration costs given the reduced time within which evaluations are concluded and the number of personnel required to do the evaluations (Eadie, *et al.*, 2007).

b) The challenges of e-evaluation

- There is a need for appropriate infrastructure that supports the installation and functionality of the sytem (Mead & Gruneberg, 2013); and
- There is need for continous education and training of evaluators on the new systems. This, however, makes them more marketable to other organisations and results in high staff turnover (Eadie, *et al.*, 2007).

2.3.6.6 E-Contract Award

Costa & Grilo (2014) indicated that e-award involves the electronic awarding of contracts to suppliers with the best proposals. Suppliers receive confirmation of appointments or appointment letters electronically or through emails. The supplier, in turn, would confirm willingness to take-up the contract electronically.

Other scholars include e-award within the processes that constitute e-tendering, just like e-submission and e-evaluation. Laryea & Ibem (2014) identifed the following methodologies and applications implemented for e-award in the Table 2.3.

Table 2.3: Methodologies and Applications used for e-contract award

Construction Procurement Activities	Technologies and Applications	References
E-Award	Email Technology	Zuo & Seo, (2006); Williams, *et al*., (2007); Garrido, *et al*., (2008)
	Wireless Technology	Williams, *et al*., (2007); El Ghazali, *et al*., (2012)

Source: Laryea & Ibem, (2014)

2.3.6.7 E-Contract Management / Administration

According to Neupane, *et al*. (2012), Yang & Zhang (2009) and Angelov & Grefen (2008), the use of information technology during the contract administration stage improves communication and stimulates the rate of production and reporting during project contracting processes. Costa & Grilo (2014), concur with this assertion and defined e-contract management as involving the use of electronic contract management instruments to monitor and improve contract performance and document management.

Laryea & Ibem (2014), identifed the following methodologies and applications implemented in e-contract management in the Table 2.4.

Table 2.4: Methodologies and Applications used in e-contract management

Construction Procurement Activities	Technologies and Applications	References
E-Contract Management	Radio Frequency Identification (RFID) Technology	Williams, *et al*., (2007); El Ghazali, *et al*., (2012)
	Bar code Technology	Williams, *et al*., (2007); El-Omari & Moselhi, (2011); El Ghazali, *et al*., (2012)
	BIM Technology	Grilo & Jardim-Gonclaves, (2011); Ren, *et al*., (2012); Vaid, (2013); Bynum, *et al*., (2013); Latiffi , *et al*., (2013)
	Electronic Data Interchange (EDI)	Gibson & Bell, (1990); Gunasekaran & Ngai, (2008)
	E-Marketplaces	Li, *et al*., (2003); Zuo & Seo, (2006); Alarcon, *et al*., (2009); Grilo & Jardim-Gonclaves, (2013)
	Wireless Technology e.g. Wi-fi networks, WLAN, longhaul wireless; cellular modems, satellites communications, page systems	Bowden, *et al*., (2006); Williams, *et al*., (2007); El Ghazali, *et al*., (2012); Kim, *et al*., (2013)
	Web-Supported Geographic Information System (GIS)	Li, *et al*., (2003); Williams, *et al*., (2007)
	Geographic Positioning System (GPS)	Williams, *et al*., (2007); Yassine, *et al*., (2012); Nawari, (2012); Kim, *et al*., (2013)

Table 2.4: Methodologies and Applications used in e-contract management

Construction Procurement Activities	Technologies and Applications	References
E-Contract Management	Customised Web-Based Procurement and Project management Software Packages	Zuo & Seo, (2006); Farzin & Nezhad, (2010)
	Web-Supported Sensor Networks	Underwood & Isikdag, (2011)

Source: Laryea & Ibem, (2014)

These e-contract management technologies are used for the project reporting, notification of meetings and distribution of minutes, issuing and confirmation of instructions, approvals, communication of project risks and other project communications.

a) The Benefits of E-Contract Management

- *Easy Access to Contract Agreements*

  Contract document storage is always a dilemna for most organisations. This is due to the fact that these contract documents are stored in hard copy, so they end up getting stored in various places, filed by the Legal Department, kept in the desk by the Procurement Manager or sent off to the relevant stakeholder. The dilemna comes when the documents have to be recovered for reference. It is at this time that they are found not to be readily available as required (Priest-Iasta, 2013).

  E-contract management tools allows organisations to store and organise contracts, documents and records them in an easily accessible centralised repository. These documents can easily be downloaded and reviewed with the easy click of a mouse (Priest-Iasta, 2013).

- *Organised Data = Smarter Spend*

  Contract management tools provides sorting and searching functionality to quickly locate documents needed. According to Priest-Iasta (2013), having

an easy-to-use catalog of your organisation agreements is one of the first steps to reducing off-contract spending.

- *Quick and Easy Location of Key Data (Searchable Contracts)*
  E-contract management tools provides administrators with a platform for finding key contract terms and fields for quick viewing and reference (Priest-Iasta, 2013).

- *Keep Track of Important Dates (Increased Visibility and Analytics)*
  Implementation of e-contract management provides a basis for easy monitoring and tracking the project performance through monitoring the achievement or meeting of key dates and milestones (Priest-Iasta, 2013).

- *Heightened Security*
  Information or documents stored in the cloud are secured by high level encryption, data loss prevention, secure server locations, and file corruption prevention. Documents stored in the cloud cannot be accessed by anyone to whom access is not granted. This is not the case where hard copies are secured by locks and keys that can easily be tempered with (Priest-Iasta, 2013).

- *Better Contracts*
  The use of e-contract management systems provides for the reduction of mistakes and errors in contract documentation during preparation. Increased collaboration amongst stakeholders can easily be achieved during contract document consolidation. There is a further advantage of contract standardisation with the content, language and application. This leads to better contracts (Priest-Iasta, 2013).

- *Simpler Negotiations*

  Contract negotiations can be carried out and concluded easily and quickly irrespective of the geographical locations of the negotiators. This can be done online utilising e-contract management tools. Maintenance of up to date drafts and content that can easily be downloaded, reviewed and dated is made possible. Data can further be recorded and retrieved efficiently and effectively (Priest-Iasta, 2013).

- *Intergrations and Approvals*

  Increased efficiency in communication of instructions and the approvals thereof, variation orders, payments and other contractual matters (Priest-Iasta, 2013).

- *Complete Control*

  Standard clause libraries are stored centrally and accessible by all, usage logs track data entry and compliance and improve compliance with the deadlines, payments, and deliveries (Priest-Iasta, 2013).

b) The Challenges in the implementation of e-contract management

- In order to enjoy the full benefits, a higher level of IT is required. Smaller businesses may however find this difficult and expensive to sustain;
- Little things that are taken for granted become big things – for example contracts stored in outlook may have to be copied into the document management system to make the best use of it;
- The effect of unlimited power outages. Data may be required to be accessed when there is no power hence the extra expense of having to procure and maintain alternative power sources (Aduwo, *et al.*, 2016); and
- High installation and maintenance costs of servers that smaller businesses may not sustain (Eadie, *et al.*, 2007).

2.3.6.8 E-Invoicing and E-Payments

E-invoicing entails the claiming for payment for goods and services ordered and delivered under agreed conditions (Costa & Grilo, 2014). Recently developed systems allow for the electronic submission of invoices by suppliers to the client. These are received electronically, checked electronically for compliance and the payments being processed electronically.

Costa & Grilo (2014) defined e-payment as the use of the agreed electronic payment management and execution to effect payments for goods and services. E-invoicing and e-payments are e-procurement methodologies implemented during the contract management phase of the project.

The main benefit from the adoption and implementation of e-invoicing and e-payments is increased cost savings. The manual handling and processing of paper invoices is complicated. Invoices are easily misplaced or lost. The manual capturing of invoices to be used with the core accounting systems take long and the resolution of errors discovered in the invoice takes longer. This, in essence, increases the cost of handling invoices and delays the invoice payment. E-invoicing and e-payments allow for the elimination of the costs associated with these processes. Hence e-invoicing and e-payment reduce invoices administration costs of invoices and allow for the timeous payments to suppliers (Neupane, *et al.*, 2012).

Other benefits flowing from the utilisation of e-invoicing and e-payments are more accurate data, better cash management and improved customer relations. However, on the other hand, there is a challenge of interoperability of electronic systems and applications (Eadie, et al., 2007). Suppliers use different systems for invoice generation. These systems may not be compatible with the client systems, and hence, the suppliers would have to be requested to submit paper invoices in those instances.

2.3.6.9 E-Ordering and ERP

E-ordering involves the use of the Internet to facilitate operational purchasing process, including ordering (requisitioning), order approval, order receipt and payment process (Reunis, *et al*., 2006; Harink, 2003). Costa & Grilo (2014) defined e-ordering as referring

to all activities, including sending an order document from public buyers to suppliers, to the transmission of delivery instructions for ordered goods and services.

According to the definitions of e-ordering presented in the previous paragraph, it can be realised that e-ordering and the Enterprise Resource Planning (ERP) is the same process. ERP is defined as the utilisation of the enterprise-wide software systems linked to the Internet to create purchasing requisitions, place orders and receive goods or services (Neupane, *et al.*, 2012).

a) The benefits derived from using e-ordering

- *Reduced Cycle Time*

  The use of Electronic Data Interchange (EDI) allows for data to be sent and received 24 hours a day. This reduces the time within which the order can be received by the buyer. It drastically reduces turnaround time for business transactions.

- *Increased Efficiency*

  The standardisation of the source of data, with regards to the specifications of orders, means that employees do not have to retype. This frees employees to execute other value adding activities and to spend time in the ordering processes of materials;

- *Improved Business Relationships*

  Setting up EDI requires both trading partners to gain a better understanding of each other's business processes. It typically brings different people into contact with their counterparts in other organisations. EDI expands channels of communication and can lead to better working relationships; and

- *Increased Competitiveness*

  To maintain competitive advantage, companies have to be nimble and quick to respond. Those companies that implemented EDI before their competitors would have a distinct advantage in their markets.

b) The challenges experienced in e-ordering implementation

- Unstandardisation of construction materials and products used in the construction industry. This makes it difficult for e-ordering to be applied since most materials are unique and specific to defined projects only. These would have to be manufactured only for these projects. There are however a considerable list of standardised materials where e-ordering can be taken advantage of in the construction industry.

2.3.6.10 E-Reverse Auctioning

Raffa & Esposito, (2006) defined E-Reverse Auction as a system that enables a purchaser to buy goods and services needed from a number of known or unknown suppliers. Carter, *et al*. (2004) and Teich, *et al*. (1999), however, defined it as the Internet based reverse auction technology which focuses on the price of the goods and services auctioned.

Reverse auction is the opposite of the ordinarily known auctions where there are many buyers and one seller. In ordinary known auctions, the buyers raise the price and the highest bidder becomes the ultimate winner of the auction, who then will buy the product. However reverse auctions are the opposite of this and hence the name. In this case, a clearer definition of e-reverse auction that they are an online and real-time auction between a buying organization and two or more invited suppliers (Chen, *et al.*, 2008).

The following practises are involved in e-reverse auction processes:

- use of e-procurement software to conduct an on-line, real-time bidding event;
- one buyer, and multiple sellers of the desired commodity or service;
- prices are driven down by sellers during the bidding event.

E-reverse auction increases competition amongst suppliers and comes with the benefit of reducing the price or cost with which the products or materials are procured or contracts are concluded. The challenge, however, is the applicability of the e-reverse auction in the construction industry where unique solutions and material specifications are required.

2.3.6.11 E-MRO and Web based ERP

Gunasekaran & Ngai (2008), Fink (2006) and Bruno , *et al*. (2005) defined electronic maintenance, repair and operations (EMRO) as the process of creating and approving purchasing requisitions, placing purchase orders and receiving the goods or services ordered via a software system based on Internet technology. EMRO deals with indirect items and web-based ERP deals with product-related items. The process is similar to that described on e-ordering, and so are the benefits and challenges experienced except that this is specifically applied to maintenance, repairs and operations works.

2.3.7 The Impact of E-Procurement Implementation

Sophisticated application of e-procurement does not guarantee the desired results, as business capability and misalignments may be encountered, which can inhibit optimal realisation of the desired benefits. In this regard, benefits derived from the adoption and implementation of e-procurement methodologies were investigated from the literature. Laryea & Ibem (2014) and Eadie, *et al.* (2007), referred to these as the drivers for e-procurement adoption and implementation. Drivers of e-procurement were defined as the processes or factors or situations which produce benefits through e-procurement use and promote the use and implementation of e-procurement and produce positive results.

The inhibiting factors that hinder e-procurement adoption and implementation were also investigated. Eadie, *et al.* (2007), referred to them as barriers to e-procurement implementation. The barriers were defined as the factors or circumstances that prevent the implementation of an e-procurement system. These are the resultant impediments that inhibit e-procurement adoption and implementation.

2.3.7.1 Benefits of E-procurement Implementation

The benefits of e-procurement implementation are summarised in Figure 2.3.

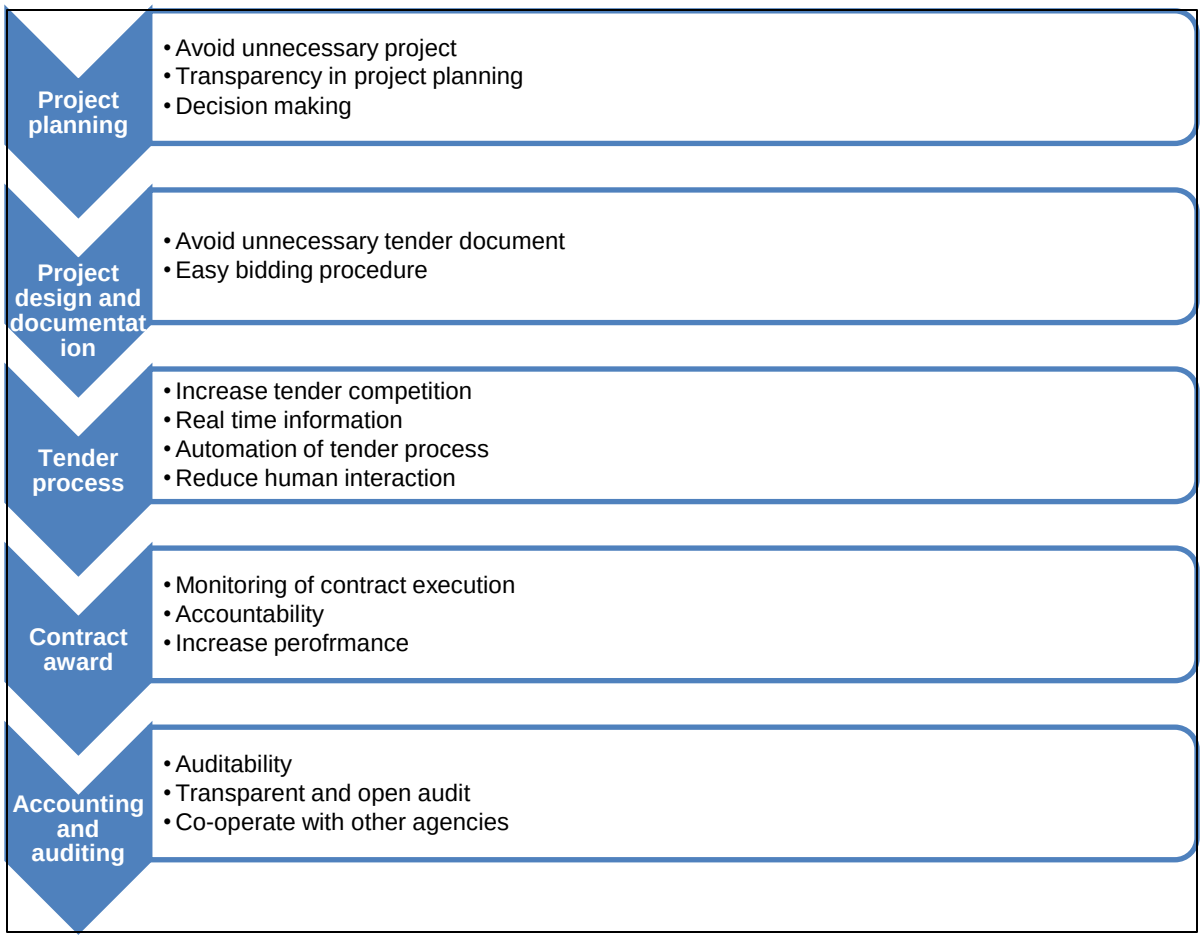

Figure 2.3: Benefits of e-procurement implementation
Source: Neupane, *et al.,* (2012)

a) Avoids unnecessary projects

Implementation of e-procurement ensures that the track record of projects exist right from project initiation. The details of the project needs analysis, the targeted beneficiaries and location of the project are inputted. This eradicates the creation of ad-hoc projects set to benefit the initiators and implementers of the project and helps in combating the unjustified spending of resources (Neupane, *et al.,* 2012).

b) Transparency in the project planning

During procurement, project specifications need to be fairly prepared to ensure that all potential tenderers get a fair chance to compete in the tendering processes.

Specifications can easily be manipulated to the advantage of a selected supplier, if controls are not in place. E-procurement implementation provides a platform to check and assess the alignment of specifications with the organisation's policies (Neupane, *et al.*, 2012).

c) Decision Making

Where an e-procurement system is in place, it is easy to check the decision making procedure and whether, or not, decisions were made following due processes. Decisions, especially with regards to the procurement strategies, to be implemented can only be made after several considerations that include the time within which the project should be delivered, the cost and scope of the project among others (Neupane, *et al.*, 2012).

d) Avoid unnecessary tender document

E-procurement implementation ensures that the right information and documentation are prepared and presented. This is due to the fact that all transactions on an e-procurement system are traceable. It can easily be traced and picked should inappropriate documentation or communication transpire (Neupane, *et al.*, 2012).

e) Easy Bidding Procedure

Bidding in an e-procurement system is easy to follow and track. Tender documents are put on a portal or platform accessible to all bidders. The bidders can therefore download the documents. Once downloaded, the bidder may price the documents. When pricing is completed, the bidder can send back the completed bid documents including required returnable schedules. The bidding process is therefore easy to execute and to track (Neupane, *et al.*, 2012).

f) Increases tender competition

Provision of real time access to procurement information increases competition in the procurement process and/or tendering. According to Fernandes & Viera (2015) and Rankin, *et al*., (2006), due to the procedures publication via electronic platform, a larger

number of competitors take part in the bidding procedures, and this increases competitiveness, resulting in and market access to more potential tenderers.

g) Real time information

Implementation of e-procurement enhances communication within the project implementation life cycle. Neupane, *et al*. (2012) that the implementation of e-informing or e-notification provides real time access to procurement information to tenderers. Utilisation of e-procurement methodologies enhances timeous issuing and confirmation of instructions, variation orders, project status, risks, contractual claims and payments. This allows project team members to communicate effectively and efficiently and is able to resolve challenges encountered on projects speedily.

h) Automation of tendering processes

The following benefits arise from the automation of tendering processes.

- *Increases market transparency*

Eadie, *et al*. (2007) pointed out that the aim of the principle of e-tendering is to provide a faultless system of transmitting input from the contractor's tender through to contract management removing the inefficiencies, delays and cost involved in manually processing tender information and re-transcribing for contract management activity. Thus, implementation of e-tendering brings about many advantages that, among others, include, eradication of tempering with tender documents, issuing of tender documents with ununiform information, misplacement and disapperance of tender documents during tender adjudication processes (Laryea, *et al.*, 2014).

Implementation of e-tendering enables the monitoring and tracking of applications or status of submitted tenders (Neupane, *et al.*, 2012). Implementation of e-tendering increases transparency in works and services and improves interaction between supplier and vendors and citizens through online system (Adebiyi, *et al.*, 2010).

- *Cost Savings (Reduction in administration cost)*

According to Costa & Grilo (2014), implementation of e-procurement results in a reduction of more than 3% of public expenditures without reduction in outputs. When public procurement is implemented entirely through e-procurement, this benefit could be passed to tenderers through reduction in tender administration costs and time savings. Tender administration costs include the cost of travel to and from collecting tender documentation and costs of printing and photocopying required attachments.

- *Time Savings*

The time required to work on an electronic tender is drastically reduced. Fernandes & Viera (2015) estimated that the time savings are approximately 50%. Tenderers or their staff spend little time on the preparation of tender bids and allows them to spend more time on other productive and value adding project management activities on other projects. E-tendering allows contractors to work on many tenders at any given time.

- *Reduction in procurement staff*

Implementation of e-procurement permits utilisation of reduced staff in procurement processes. This reduction in staff means reduction in costs incurred on staff payments and therefore increases profit levels

- *Value for Money*

Competition provides market values thereby ensuring that value for money through the increase in the propensity for selecting the most economically advantageous proposal increases for the contracting authority and suppliers elaborate more informed and competent proposals.

- *Provides platform for information sharing*

Information sharing is critical to SMCFs they could draw lessons on each tender they would have participated in, should the process be open.

- *Increased quality through benchmarking*

Information send or received through electronic means remain in the system. This provides basis for retrieval of such information when it is to be referred to or to be utilised in future. The use of e-procurement provides a basis for benchmarking and utilisation of that information for other purposes. This can be applied to tenders and reduce drastically the time required for tender preparation.

i) Reduced human interaction

Use of e-procurement systems reduces human involvement in many procurement processes. This, subsequently, reduces the inefficiencies linked to, or associated with human behaviour and error. The advantages include the reduction within the time taken to execute evaluations, the associated errors and the impact of fraud and corruption that is rampant where human interaction is profound (Neupane, *et al.*, 2012).

j) Monitoring and contract execution

E-procurement systems provide for a basis for easy monitoring of projects. Government and other stakeholders are able to monitor the works and services more easily and efficiently when an e-procurement system is being implemented. (Neupane, et al., 2012). The creation and circulation of standardised reports provide an easy basis for benchmarking projects and rate supplier performance.

k) Accountability

E-procurement systems, by virtue to leaving traces of all transactions, provide a basis for accountability.

l) Increased performance

The performance of suppliers can easily be viewed through benchmarking and comparison from the standardised reports drawn from the systems. This pushes suppliers to provide their maximum effort and increase their performance for they do not want to be an example for poor performance (Eadie, *et al.*, 2007).

m) Auditability (transparent and open audit)

E-procurement systems provide all records of transactions implemented within the system. This provides easy records for audits. The implementation of e-procurement systems pushes for the highest standards of transparency to be employed during procurement processes (Eadie, *et al.*, 2007).

n) Provides motivation for employees

Implementation of new and up to date systems provides motivation for employees, especially, the young employees, who are keen to learn new methodologies and processes. This fosters efficiency, when the system is fully understood by the employees and gives them comfort that the employer is adding value to their career development.

o) Greening procurement processes

Implementation of e-procurement processes gives an opportunity to all stakeholders to green procurement processes by curbing the effects on climate change through use of reduced paper.

2.3.7.2 Barriers to E-Procurement Implementation

Laryea & Ibem (2014), grouped the barriers to e-procurement implementation into the following catergories.

- Compatibility (Interoperability);
- Financial Limitations (Cost Issue);
- Cultural Issues;
- Infrastructure;
- Legal Issues;
- Security; and
- General.

Table 2.5: Barriers to e-procurement implementation

Barrier Category	Barrier	References
Compatibility (Interoperability)	Integration of e-procurement systems with the existing work process and procurement system	Rankin, *et al*., (2006)
	Interoperability of e-procurement software and systems	Eadie, *et al*., (2007)
	Investment in compatible systems	Eadie, *et al*., (2010)
	Lack of widely accepted e-procurement software solution	Eadie, *et al*., (2010)
Financial Limitations (Cost Issue)	Information technology investment costs	Rankin, *et al*., (2006); Eadie, *et al*., (2007); Oyediran & Akintola, (2011)
	Other company initiatives	Eadie, *et al*., (2010)
Cultural Issues	Resistance to change	Pires & Stanton, (2005); Rankin, *et al*., (2006); Isikdag, *et al*., (2011)
	Lack of confidence in the new technology	Rankin, *et al*., (2006)
	Low or lack of awareness of e-procurement	Aranda-Mena, (2004); Oyediran & Akintola, (2011)
	Perception of no business benefit realised	Eadie, *et al*., (2007); Eadie, *et al*., (2010)
	Lack of business relationship with costumers due to low level of personal contact	Rankin, *et al*., (2006); Eadie, *et al*., (2007)
	Lack of upper management support/ Lack of leadership	Eadie, *et al*., (2007); Eadie, *et al*., (2010); Isikdag, *et al*., (2011)
	Barriers created by vendors or suppliers	Rankin, *et al*., (2006);
	Organisational culture	Eadie, *et al*., (2007)
	Lack of technical expertise	Eadie, *et al*., (2010); Isikdag, *et al*., (2011)
	Lack of flexibility in the use of e-procurement	Eadie, *et al*., (2010);
	Complicated procedures and extended relationships	Eadie, *et al*., (2010);
	Staff turnover	CRC Construction Innovation, (2006); Eadie, *et al*., (2010)

Table 2.5: Barriers to e-procurement implementation

Barrier Category	Barrier	References
Cultural Issues	Magnitude of change	Eadie, *et al*., (2010)
	Lack of trust between parties in the electronic commerce	Isikdag, *et al*., (2011)
Infrastructure	Access to the Internet and ICT infrastructure	Eadie, *et al*., (2007); Chege, *et al*., (2001)
	Insufficient assessment of systems prior to installation	Eadie, *et al*., (2010)
Legal issues	The legality of e-procurement contracts	Kajewski & Weippert, (2004); Eadie, *et al*., (2007); Oyediran & Akintola, (2011); Isikdag, *et al*., (2011); Chege, *et al*., (2001)
	Ownership of information used in tender process (copyright)	Rankin, *et al*., (2006)
	Lack of or poor implementation of IT policy relating to e-procurement issues	Oyediran & Akintola, (2011)
	Lack of pertinent case law	Eadie, *et al*., (2010)
	Different national approaches to e-procurement	Eadie, *et al*., (2010)
	Clarity of sender and tenderer information	Eadie, *et al*., (2010)
Security	Security in the process of data transmission	Isikdag, *et al*., (2011); Chege, *et al*., (2001)
	Proof intent-electronic signatures	Eadie, *et al*., (2007); Eadie, *et al*., (2010)
	Confidentiality of information-unauthorised viewing	CRC Construction Innovation, (2006); Eadie, *et al*., (2010); Isikdag, *et al*., (2011)
	Integrity of data (changes to data making it accurate, incomplete and corrupted)	Kajewski & Weippert, (2004); Rankin, *et al*., (2006); CRC Construction Innovation, (2006); Eadie, *et al*., (2007)
	Data transmission reassembly-incorrect reassembly of data transmitted in packets	Eadie, *et al*., (2010)
	Authentication of user identities	CRC Construction Innovation, (2006)

Table 2.5: Barriers to e-procurement implementation

Barrier Category	Barrier	References
General	Lack of Forum to exchange ideas on e-procurement	Eadie, *et al*., (2010)
	Lack of bodies supporting the shift towards e-procurement	Isikdag, *et al*., (2011)
	Lack of best practice studies and pilot projects	Isikdag, *et al*., (2011)
	Lack of training regarding the implementation and use of e-commerce systems	Isikdag, *et al*., (2011)
	Irregular power supply	Chege, *et al*., (2001)

Source: Laryea & Ibem, (2014)

a) *Compatibility (Interoperability)*

Compatibility or interoperability concerns arise from the fact that there is no single e-procurement solution in the market. There are different solutions and various suppliers compete for the provision of the best e-procurement solution. This results in the compatibility challenges amongst these solutions. Buyers or purchasers end up not knowing which solution to invest in (Laryea, *et al.*, 2014).

b) *Financial Limitations (Cost Issue)*

Adoption and implementation of e-procurement solutions is optimised when there is sufficient infrastructure. There is considerable capital investment that is required to invest in e-procurement infrastructure and in accessing the Internet. This investment is challenged by other organisational competing initiatives. Organisations end up prioritising depending on the importance and significance of the perceived benefits amongst e-procurement implementation and those of the competing initiatives (Laryea, *et al.*, 2014).

c) *Cultural Issues*

Cultural issues emanate from the fact that each organisation has a tried and tested way of doing things, and in this case, traditional procurement processes. Considerations for e-procurement adoption and implementation are dependent on the perceived benefits and barriers as determined by the implementers of the

existing systems. Where there is a belief that the adoption of e-procurement systems brings adverse results, resistance to change is experienced. Other challenges, like lack of expertise towards the implementation of the new systems, lack of knowledge, lack of management support, lack of awareness of e-procurement and the resultant benefit of its implementation, lead to the emergence of cultural issues contributing to inhibit e-procurement adoption (Laryea, *et al.*, 2014).

d) Infrastructure

Realisation of the optimal benefits of e-procurement needs sufficient and appropriate infrastructure. Internet access is still a challenge in many countries and communities. The costs of Internet are still very excessive especially for small businesses. This hinders e-procurement implementation (Laryea, *et al.*, 2014) . There is a lack of education and training on the e-procurement systems suitable to invest in for particular businesses. This leads to businesses investing in inappropriate technologies for their businesses and end up not realising the appropriate benefits (Laryea, *et al.*, 2014).

e) Legal Issues

There is uncertainty over the legality of electronic contracts, including copyright issues of tender information transferred electronically. This is compounded by the lack of pertinent case laws (Laryea, *et al.*, 2014).

Most governments do not have e-procurement enforcing policies and legislations. This leaves the willingness to implement e-procurement dependent on organisations. Had all countries have e-procurement policies and legislation like how it has been implemented in Portugal and France, that would result in the fast tracked implementation of e-procurement (Laryea, *et al.*, 2014).

f) Security

The world website web leaks like a sieve (Eadie, et al., 2007). As a result, there are major security concerns over the information send and received electronically. This is compounded by the fact that some organisations still demand originally signed documents for some communications or payments. This nullifies the use of electronic signatures since they are not considered original (Laryea, *et al.*, 2014).

Data transmitted electronically often require reassembly. Incorrect reassembly of data transmitted electronically is therefore a major risk. The other risks emanate from the unauthorised viewing and the fact that it is very easy for data or documents to be send to the wrong recipient. This wrong recipient may end up misusing the data (Laryea, *et al.*, 2014).

g) General

There is often no coordinated effort and organised initiatives such as bodies aimed at fostering implementing of e-procurement. The existence of such concerted efforts would assist with providing education and training on the adoption and implementation of e-procurement systems to the best advantage of organisations. This includes the determination of e-procurement best practices and the identification of the implementation approach plan (Aduwo, *et al.*, 2016).

The other limitation is the unreliable power supply. Organisations need to have alternative power sources in times of power outages. This adds to the cost of installation and infrastructure involved in the establishment and implementation of e-procurement systems (Adebiyi, *et al.*, 2010).

2.4 E-PROCUREMENT IMPLEMENTATION BY SMCFs

According to Croom & Brandon-Jones (2005), e-procurement adoption and implementation by organisations is widespread. The degree of implementation however varies. In the construction industry, it was indicated that e-procurement implementation

is still slower than expected (Eadie, *et al.*, 2007). This is attributed to the nature of business organisations that are a majority in this sector. Most organisations within the construction industry are SMCFs. They constitute more than 99% of the business registered by the CIDB as indicated in the Table 2.6.

Table 2.6: Registered Construction Firms

Designation (CIDB Grading)	**Total number of Construction Contractors in category**
1	136 817
2	5 907
3	2 377
4	2 926
5	1 907
6	2 175
7	1 244
8	456
9	218
TOTAL	**154 027**

Source: CIDB, (2016)

SMCFs are registered construction enterprises with grading 1 to 7. The total of these SMCFs constitute 153 353 of the 154 027 of construction companies registered with the CIDB, which is 99.56% (CIDB, 2016).

The operations of SMCFs are impacted by external and internal factors. External factors are factors resulting from the changes in the industry and market preferences, government policies and demand for infrastructure due to demographic changes, legislation and technology change (Eei, et al., 2012). SMCFs and their owners do not have control over these factors. The internal factors are the factors affecting organisations internally (Eei, et al., 2012). These include lack of capital and human resources (lack of administration skills and technical skills).

The benefits derived therefrom can be further classified into tangible and intangible benefits. Panayiotou, *et al*. (2004) and Eei, *et al*. (2012), identified these benefits as being both tangible and intangible to SMEs. The tangible benefits being those that have quantifiable effects that result from the adoption and implementation of e-procurement

systems by SMEs. The intangible benefits refer to those that have qualitative effects that are diificult to quantify or measure in definitive terms.

2.4.1 The tangible and intangible benefits

This section dwells on the tangible and intangible benefits derived by SMCFs from the utilisation of e-procurement methodologies.

a) Tangible Benefits

Tangible benefits are benefits that do fit in the SMCFs business process. There is, however, need for augmentations to ensure optimal benefit due to the limited financial and human capital resource base of SMCFs (Eei, et al., 2012).

- *Cost Savings*

  According to Panayiotou, *et al*., (2004), adoption and implementation of e-procurement systems result in the supply cost savings of 1% and the reduction in the cost per tender of 20%. The 20% cost savings on the cost per tender is however opportunistic due to the relocation of human capitals.

- *Time Savings*

  On time savings, Panayiotou, *et al*., (2004), indicated that adoption and implementation of e-procurement systems result in the 39.7% time savings in open tenders and 34.1% savings where restricted tenders are implemented by the Greece General Secretariat of Commerce.

b) Intangible Benefits

Though Panayiotou, *et al*. (2004), emphasised on the cost and time savings attributed to the implementation of e-procurement, there are other unquantifiable benefits that result from the electronic integration of business thereby improving procurement processes of SMEs. These intangible benefits are shown in Table 2.7.

Table 2.7: Intangible Benefits to SMCFs of E-Procurement Implementation

Process Improvement	Organisational benefits
Simpler ordering	Potential decentralisation of procurement
Reduced paperwork	More free time for purchasing specialists to investigate and negotiate strategically important issues
Decreased redundancy	Wider range of suppliers
Less bureaucracy	Improved communication and partnerships with suppliers
Standardisation of processes and documentation	
Online reporting	
Clearer and more transparent processes	
Ensured compliance with procurement laws and regulations	
Minimisation of errors	
Easier access to information	

Source: Eei, *et al*., (2012)

The organisational intangible benefits derived from e-procurement implementation are displayed in Table 2.8.

Table 2.8: Organisational Benefits of E-Procurement System

Benefit	Description
Control	Real time reporting system that enables management to have fast and reliable way to compare the spending with budget, allowing quick reaction to any problems occuring.
Transparency	Transparency of contract details such as the contractual conditions, time and terms of orders etc, making these visible to relevant parties both internally and externally.
Maverick buying	Refers to when a user or buyer purchases goods or services out of the negotiated contracts specified by his or her department. This will increase the total cost of ownership of the item purchased and contributes to internal inefficiency.
Decentralisation	Decentralisation of power on decision for purchasing to more users within the organisation thus reducing clerical work for the purchasing department and improves effectiveness.
Supply base rationalisation	Reduction and restructure of supplier base allows purchasing department to maintain a database of quality and prices of suppliers to consolidate spending

Source: Eei, *et al*., (2012)

2.4.2 Barriers to E-Procurement Implementation by SMCFs

Considerable research has been done on the benefits and barriers to the adoption and implementation of e-procurement at organisational level. According to Eei, *et al*. (2012), limited research has been done on the inhibiting factors militating against the implementation of e-procurement by SMCFs. They, however, mentioned that a closer look at the factors that inhibit e-procurement implementation at an organisational level, specific factors inhibiting e-procurement implementation by SMCFs can be deduced.

The inhibiting factors that hinder e-procurement implementation by SMCFs can be divided into two main groups according to their sources of origin. These are external factors emanating from external forces and internal factors emanating from internal factors within SMCFs (Eei, *et al.*, 2012).

- *External Factors*

  The external factors are attributed to the industry, market, government and technology change. The SMCFs owners do not have control over the cause or origins of the factors. However, the effects of some of these factors may be minimised from some collective efforts.

  - *Technology:* This barrier emanates from the lack of adequate support from the suppliers and vendors of electronic systems (Eei, *et al.*, 2012).
  - *Infrastructure and Legislation:* Nature and capacity of existing infrastructure and government legislation affect adoption of e-procurement systems. For example, where government requires that tenderers procure hard copied printed documents in physical offices for tendering, inhibits government's efforts of utilisation of adoption and implementation of e-procurement systems. Furthermore, utilisation of e-procurement depends largely on the availability, nature and capacity of the existing infratsructure such as broad band coverage. The other factor is the lack of standards in the development of e-procurement solutions. This leads to a situation where users of one system cannot communicate with the users of another e-procurement system (Eei, *et al.*, 2012).

- *Environment:* The environmental effect is caused by either SMCFs fighting to maintain a closer physical relationship with their clients or the untrustworthy of users or clients of electronic transactions or contracts (Eei, *et al.*, 2012).

- *Internal Factors*

  According to Eei, *et al*. (2012), internal barriers are caused by issues within SMCFs firms that can be eradicated or minimized with the SMCFs owner's own effort. Resource constraints, such as, financial and human capital, along with organizational and management characteristics, such as, organizational culture, decision maker's perception of risk and benefits of e-procurement system, firm size, business type and organisational structure hinder adoption of the e-procurement system. Some of these barriers are interrelated and hard to be clearly defined, for example, the lack of financial capital due to small firm size and volume of business can influence the owner to become risk-adverse when asked to invest in an e-procurement system. However, with collective efforts some internal barriers can be minimized.

  - *Resource Constraints:* These constraints emanate from the limited capital base of SMCFs, coupled with the limited number of employees. In most cases the level of knowledge of e-procurement systems amongst the owners and employees of SMCFs is limited. This results in owners becoming unwilling to take the risk of investing in e-procurement systems (Eei, et al., 2012).
  - *Organisational and Management Characteristics:* The characteristics of the firm affects e-procurement adoption. Business type, larger firm size in terms of financial capacity and the number of employees per physical establishment and the involvement with international trade or international groups are found to be favorable to e-procurement adoption. Meanwhile managerial characteristics such as company policy (use of Quality Assurance System), organisation structure, culture, supply chain

integration and, especially in the case of SMCFs, the decision maker's attitude towards ICT are important determinants of e-procurement adoption (Eei, *et al.*, 2012).

2.5 SUMMARY

Scholarly evaluation of international literature on the availability and application of e-procurement methodologies was undertaken. It was established that there are eleven e-procurement methodologies, namely, e-notification (e-informing/ e-noticing), e-sourcing, e-tendering, e-submission, e-evaluation, e-award, e-contract management, e-payments (e-invoicing); e-ordering (ERP), e- reverse auction and E-MRO (web based ERP).

It was established that e-procurement adoption and implementation does not mean incorporation of all of these e-procurement methodologies. The implementation of selected e-procurement methodologies constitutes e-procurement implementation. Organisations' adoption of e-procurement varies. Some do implement a full paper less electronic procurement system, while others implement selected or partial aspects of e-procurement methodologies.

The benefits derived from the adoption and implementation of e-procurement methodologies within the procurement processes of organisations and SMCFs were identified together with the associated limitations. Laryea & Ibem (2014) grouped the limitations into the following categories; Compatibility (Interoperability), Financial Limitations (Cost Issue), Cultural Issues, Infrastructure, Legal Issues, Security and General. Eei, *et al*. (2012), on the other hand, grouped the limitations according to the nature of their cause, which is, whether they are caused by external factors or by internal factors. The limiting factors were however found to be identical despite the fact that Eei, *et al*. (2012) separated the SMCFs specific factors from the general factors. The benefits and inhibiting factors derived from the implementation of e-procurement were considered at each level of the construction stage within the project life cycle.

Limited literature on the impact of the implementation of e-procurement by organisations on the development of SMCFs was obtained. That realisation necessitated the need to

embark on this research to establish the e-procurement methodologies implemented and how they impact on the development of SMCFs. It was therefore necessary to collect data to identify the e-procurement methodologies being implemented by GDID and to ascertain their impact on the development of SMCFs.

CHAPTER 3: RESEARCH DESIGN AND METHODS

CHAPTER 3: RESEARCH DESIGN AND METHODS

3.1 INTRODUCTION

It was endeavoured to investigate the implementation of e-procurement by the GDID and its impact on the development of SMCFs through this research study. The previous chapter provided the background to the study through a detailed review on the literature on the following subject matters:

- Procurement, Public Procurement;
- E-procurement;
- The benefits and limitations to e-procurement implementation; and
- E-procurement implementation by SMCFs.

In order to considerably address the research question, aim and the objectives of this research, suitable data collection and analysis means were considered. The use of two data collection research instruments was perceived ideal for this research study. One data collection instrument was focused on establishing the existing e-procurement methodologies currently being implemented by GDID, while the other sought to examine the experiences, benefits and limitations of the implementation of e-procurement methodologies to SMCFs.

A two stage data collection and analysis process was undertaken. The first stage involved the implementation of the pilot study, using the interview guide to collect data from the GDID officials and the questionnaires targeted to collect data from SMCFs. The second stage involved the collection of data, using one amended questionnaire, from both GDID officials and SMCFs.

Due to the wide geographic spread of the Republic of South Africa (RSA) and the timelines for the finalisation of the research study, focus was only on the infrastructure projects implemented by the GDID. Due consideration was given to the fact that public sector infrastructure projects are implemented at various levels within the various spheres of government: the national, provincial, local government and within parastatals. The undertaking of the research within all these spheres of government and

within the whole of the RSA was not going to be achieved with the time constraints within which this dissertation was to be concluded and submitted. The other hindrance factor was the financial resources that would be required for the implementation of the research at such scale. In this regard, the research was centred on the procurement of the infrastructure projects implemented by the GDID.

3.2 THE NATURE OF THE RESEARCH DESIGN

According to Saunders, *et al*. (2012), the nature of the responses obtained in a research study is dependent on the nature of the research design, that is, how the questions had been crafted. The nature of this research and the design of the data collection instruments meant that the research study yielded responses that were predominantly exploratory than explanatory or descriptive.

3.2.1 Exploratory Study

The data collection method selection employed in this research meant that this research was exploratory in nature. According to Saunders, *et al*. (2012), an exploratory study is a valuable means to ask open-ended questions to discover what is happening and gain insights about a topic of interest.

The instrument that was used for data collection was the questionnaire, designed and directed towards soliciting information from:

- GDID officials on e-procurement methodologies implemented by GDID; and
- SMCFs, to relate their experiences of benefits and limiting factors impacting their development arising from GDID e-procurement methodologies.

The GDID officials that participated in this research were actively involved in the procurement processes for infratsructure projects while the SMCFs were drawn from the GDID database.

The GDID officials and SMCFs involved in the procurement of infrastructure projects are thus deemed experts in this subject area and hence were targetted for participation in the research. Exploratory study has the advantage that it is flexible and adaptable to change and hence the researcher has to prepare for possible change of the direction of

the research as a result of new revelations that would have appeared from the data and insights (Saunders, *et al.*, 2012).

3.3 RESEARCH STRATEGY

The method for the selection of the research design was determined. The next step was then to determine the appropriate research strategy applicable to the research from the several available strategies that include; experiment, survey, archival research, case study, ethnography, action research, grounded theory and narrative inquiry.

A strategy is a plan of action to achieve a goal. Saunders *et al*. (2012), defined a research strategy as a plan of how a researcher would go around answering the research question. It therefore provides a linkage between the philosophy and the subsequent choice of methods for data collection and analysis. The nature of the research question required that one research instrument be designed for data collection. The selected instrument was designed to establish the existing e-procurement methodologies being implemented by GDID and to examine the impact of the implementation of these e-procurement methodologies to the development of SMCFs.

The nature of the responses and the research design determined that this research make use of predominantly qualitative research techniques to determine the existing e-procurement methodologies being implemented by GDID. Multiple methods of research design were adopted for the examination of the effects of the implementation of these methodologies to the development of SMCFs.

According to Saunders *et al*. (2012), research strategies are not mutually exclusive. This means that more than one research strategies can be utilised in one research. The appropriate research strategies adopted for this research were the survey and the case study.

3.3.1 Surveys

Surveys address the following questions; the ‘what’, ‘who’, ‘where’, ‘how much’ and ‘how many’ questions. Survey strategies are associated with a deductive research approach (Saunders, *et al.*, 2012). They tend to be used for exploratory and descriptive

research. Different methods can be used for data collection, with the use of questionnaires being the most popular. Questionnaires allowed for the collection of standardised data from a sizeable population in a highly economical way, allowing easy comparison. This implied that surveys were applicable for obtaining responses with respect to the investigation of the existing e-procurement methodologies being utilised by GDID and how they are implemented, and the examination of their impact to the development of SMCFs (Saunders, *et al.*, 2012).

The advantage of survey research strategy is that it is comparatively easy to explain and to understand. Closed and open ended questions were used in the survey for this research.

3.3.2 Case Study

Case study, like surveys, address the 'why', 'what' and 'how' questions (Saunders, et al., 2012). Case studies are applicable to the explanatory and exploratory research. Quantitative, qualitative or multiple methods design may be used for data collection for case studies.

In order to address the research question, aim and objectives of this research, just like surveys, structured and unstructured interviews and open-ended questionnaires could be used for data collection on case studies.

3.4 RESEARCH APPROACH

In a bid to address the research question, aim and the objectives of this research, the researcher firstly had to select the most appropriate data collection method, which is the research design. According to Saunders, *et al*. (2012), research design entails devising the general plan of how the researcher would go about answering the research questions. In line with this, the need for the utilisation of one data collection instrument was considered adequate for this research in order to address all aspects pertaining to the research question, aim and objectives of the research. This entailed the design of one research instrument focused on deriving data on the existing e-procurement methodologies being implemented by the GDID and for the examination of the

experiences, benefits and limitations experienced by SMCFs during the implementation of e-procurement methodologies by the GDID.

The nature of the research was investigative. According to Saunders, *et al*. (2012) it endeavours to establish the effects of a phenomenon where the available data in the literature specifically focused on the subject matter is limited. This phenomenon under investigation is the implementation of e-procurement methodologies by GDID and its impact to the development of SMCFs. After consideration of the approach the researcher went on further to consider whether, or not, the research would be qualitative or quantitative. However, the nature and scope of this research determined that it was qualitative.

3.4.1 Qualitative Research

The qualitative research approach was considered as the most appropriate research technique to address the investigation into the existing e-procurement methodologies currently being employed by GDID. The existing e-procurement methodologies implemented by GDID were ascertained through questionnaires send to GDID officials who are involved in the procurement of infrastructure projects. The benefit of the utilisation of the qualitative approach is that the data collected is richer and provides a deeper insight into the phenomenon under research, which is to provide the impact of the implementation of e-procurement methodologies on the development of SMCFs (Saunders, *et al.*, 2012).

In order to address the time constraints associated with the use of the qualitative approach, the researcher made use of the sample of participants both within the GDID and the SMCFs.

3.5 DATA COLLECTION TECHNIQUES

The appropriate collection techniques applicable to this research were as indicated below:

- Interviews (used for the pilot survey to establish the existing e-procurement methodologies implemented by GDID)
- Questionnaires

3.5.1 Interviews

Interviews were used to obtain information pertaining to the existing e-procurement methodologies currently being employed by GDID during the pilot study. Interviews involve asking questions, listening and recording answers given by the interviewee. Interviews are a purposeful conversation between two or more people requiring the interviewer to establish rapport, to ask concise and unambiguous questions, to which the interviewee is willing to respond and to listen to attentively (Saunders, *et al.*, 2012). The interview questions were designed to ensure that the responses obtained sufficiently addressed the first objective, that is, to determine the e-procurement methodologies implemented by the GDID. The targeted participants for interviews were the GDID officials involved in the procurement of infrastructure projects. These therefore included Supply Chain Management (SCM) officials, Directors, Chief Directors and Departmental Internal Project Managers (IPMs). The purpose of these interviews was to gather valid and reliable data relevant to addressing the research question, aim and objectives of this research study.

There are several ways of conducting interviews. These include open-ended interviews, unstructured interviews, structured interviews and semi-structured interviews. This research endeavoured to compare the responses obtained from the interviews and such that there was need for standardisation of the questions to be asked during interviews. The merits and demerits of each interview type were considered and the adoption of structured interviews was considered the most appropriate for this research study. The consideration was made to ensure that the most appropriate interview type is applied that would best address the research question, aim and objectives of the research. The structured interviews were based on the attached research instrument or questionnaire (Appendix B) designed to establish the existing e-procurement methodologies currently being implemented by GDID.

3.5.1.1 Structured Interviews

Questionnaires were made use of in these structured interviews. These questionnaires contained a predetermined and standardised or identical list of questions developed by the interviewer prior to conducting the interviews. During the interview, the interviewer

reads out questions and records the responses on a standardised schedule usually with pre-coded answers during the pilot study (Saunders, *et al.*, 2012).

The three main advantages that influenced the adoption of structured interviews for this research are:

- The answers are more accurate;
- The response rate can be high, especially if the respondents have been contacted directly; and
- The answers can be explored by finding out 'why' the particular answers are given by interviewees.

Despite having the above advantages, limitations exist in the utilisation of structured interviews. Below are the limitations and how the interviewer avoided the impact of the negative effect of these limitations.

- Control of the interview process. There was need to carefully control the direction of the interviews. Sometimes it was difficult to control the direction and pace of the interview. In order to minimise the effect of this limitation, the interviewer kept on referring to the questions outlined on the questionnaires to ensure that the responses obtained addressed the questions comprehensively (Saunders, *et al.*, 2012).
- Accuracy of the information provided. There is a tendency of not providing accurate, full and complete answers by the interviewees. This usually happens in areas where the interviewee is not comfortable with or threatens his/her position. Some of the given answers, end-up being vague due to lack of adequate support. In this regard, the interviewer assured the respondents that the information provided would only be used for the purpose of this research. Furthermore, interviewees were informed that should there be questions that they considered to be too sensitive, they were free to indicate and inform the interviewer, so that they were not asked to answer those questions (Saunders, *et al.*, 2012).

- Bias. There are three forms of bias that may be encountered, namely, Interviewer bias, Interviewee bias and Participation bias. Interviewer bias is where comments, tones or non-verbal behaviour of the interviewer creates a bias in the way the interviewees respond to the questions being asked (Saunders, et al., 2012). Interviewee bias is when interviewee ought not to discuss an aspect of the topic being explored because it would lead to probing questions that would lead or intrude on sensitive information that they do not wish to relay. Participation bias relates to the bias that results from the individuals or organisational participants who agree to be interviewed (Saunders, *et al.*, 2012).

  In order to minimise the effect of bias, the interviews were conducted in such a way that limits the interviewer's interjection when the interviewee was responding to the question. The sample size of eight participants for interviews during the pilot study has been considered to be large enough to eliminate the participation bias. Stratified sampling was utilised considering that the participants were supposed to be from four different units within GDID that are involved in the procurement of infrastructure project. These units are the Health Branch, Education Branch, STARS and SCM.

3.5.1.2 The Pilot Study

After the preparation of the first set of interview questions, a pilot testing of the questions was undertaken. The pilot survey was undertaken in order to:

- Refine the questions so that respondents encountered no challenges in answering them;
- Ensure that the researcher face no problems in recording data; and
- Enable the researcher to assess the questions' validity and reliability of the data collected in addressing the research question, aim and objectives.

Pilot interviews were arranged with 8 participants. It was possible to interview 7 of the 8 prospective participants. The other participant could not be interviewed due to work commitments. The sampling method that was used was the stratified sampling to

ensure that participants were drawn from all the four units within GDID that are involved with the procurement of infrastructure projects.

Data from the pilot study was collected and the answers provided for each question were analysed to determine if the respondents did not face any challenges in answering the questions, and to establish if the responses were sufficient to address the research question, aim and objectives. The questionnaires and the data collected and analysed from the pilot study is attached in Appendix B and D, respectively. After this analysis, the interview questions were suitably amended to address the research question, aim and objectives. These were the questions that the data collection, presentation and analysis included in Chapter 4 were based on.

3.5.1.3 Interviews

Interviews were initially considered for collecting data from the GDID officials on the e-procurement methodologies they implemented. However, due to failure to secure timeous appointments during the execution of the fieldwork for the research, the researcher sent out questionnaires to GDID officials initially shortlisted for the interviews. The questionnaires were based on the amended questions after the pilot study and they were open-ended questions.

3.5.2 Questionnaires

Two sets of questionnaires were distributed to GDID officials and SMCFs. One was targetted at soliciting information on the e-procurement methodologies implemented by GDID. This questionnaire was send to GDID officials only.

The other questionnaire was designed to explore SMCFs experiences based on the e-procurement methodologies being implemented by GDID and the impact that these have on their development. The questionnaires were designed to address the research question, aim and objectives of the research. The questions were crafted to examine SMCFs experiences, benefits and limitations based on the e-procurement methodologies implemented by GDID and the impact that e-procurement had to their development.

Questionnaires were considered an appropriate data collection tool, given the number of the targeted respondents and the uniformity within which the responses were based on. Saunders, *et al*. (2012) defined questionnaires as a general term that include all methods of data collection in which each person is asked to respond to the same set of questions in a predetermined order.

Questionnaires offer the following advantages.

Advantages of questionnaires

- They permit respondents time to consider their responses carefully without interference from, for example, an interviewer;
- Cost. It is possible to provide questionnaires to large numbers of people simultaneously. For instance, on this research, the researcher sent out questionnaires to 250 respondents through emails. The cost and time implications this could had would have been unbearable had alternative research instruments been adopted;
- Uniformity. Each respondent receives identical set of questions. With closed questions, responses are standardised, which can assist in interpreting responses from large numbers of respondents;
- Questionnaires can address a large number of issues and questions of concern in a relatively efficient way, with the possibility of a high response rate;
- Often, questionnaires are designed so that answers to questions are scored and scores summed to obtain an overall measure of the attitudes and opinions of the respondent;
- Questionnaires may be mailed to respondents (although this approach may lower the response rate); and
- Questionnaires permit anonymity. It is usually argued that anonymity increases the rate of response and may increase the likelihood that responses reflect genuinely held opinions (Fink, 2009).

Limitations of the use of questionnaires

- It may be difficult to obtain a good response rate. Often there is no strong motivation for respondents to respond. Only 27 responded from the 250 questionnaires that were sent for this research;
- They are complex instruments and, if badly designed, can be misleading;
- They are an unsuitable method of evaluation if probing is required – there is usually no real possibility for follow-up on answers;
- Quality of data is probably not as high as with alternative methods of data collection, such as personal interviewing; and
- They can be misused – a mistake is to try to read too much into questionnaire results (Fink, 2009).

The main risk encountered when questionnaires are used for data collection is to ensure that research questions are answered appropriately and adequately. The design of the individual questions was made simple, clear and of a pleasing layout for individual question. A lucid explanation of the purpose of the questionnaire is considered a critical factor to ensure comprehensive and appropriate responses to questionnaires and to reduce the effect of the indicated limitations (Saunders, *et al.*, 2012).

The researcher implemented strategic tools to facilitate adequate completion of the questionnaires. Questionnaires were pilot tested before they were sent out to collect data. Purposive sampling was used to determine the sample size of the SMCFs that participated in the research while, a combination of stratified and purposive sampling was used to determine participants from the GDID. The researcher assessed the responses and checked the adequacy of the questions in addressing the research questions and the clarity of the questions. Preliminary data consolidation and analysis based on the answers from the pilot run of the research were undertaken. The method implemented in ensuring data validity and quality was to create a data requirements table, where the outcomes were summarized. The table helped to ascertain the level of detail that was required, the variables for which data were to be collected and thus to develop the questions.

3.5.2.1 The design of the questionnaire

The basis for the design of the questionnaire was to ensure that the questions in the questionnaire were understood by the respondent in the way intended by the researcher and the answers given by the respondent were understood by the researcher in the way intended by the respondent.

The self-completed questionnaires were used where respondents completed the questionnaires without the influence of the interviewer. These questionnaires were emailed for completion by the respondents.

A covering letter was attached to each questionnaire. This provided an introduction of the interviewer and an introduction of the research, providing details of the purpose of the research and a request for the respondent to complete the questionnaire as truthfully and comprehensively as possible and sent it back to the interviewer.

The questionnaire made use of the following questions.

- Closed questions, which are sometimes referred to as closed-ended questions or forced choice questions. These provide a number of alternative answers from which the respondent is instructed to choose from (Fink, 2006). These questions are predetermined and data collection and analysis based on these questions is easy; and
- Open questions, which are sometimes referred to as open-ended questions. These allow respondents to give answers in their own way (Fink, 2009).

3.5.2.2 Questions Formulation

The researcher drafted questions and prepared the questionnaires. The researcher requested fellow workmates to comment on the representatives and suitability of the questions and allowed for suggestions to be made on the questionnaire. This was considered necessary because the fellow workmates understood the environment within which GDID operates and the procurement processes implemented. This was undertaken to help establish the content validity. This was meant to enable the researcher to make the necessary amendments, prior to pilot testing of the

questionnaires. The questionnaires were accordingly amended and the final questionnaire was sent for pilot testing.

3.5.2.3 The Pilot Study

The questionnaires that were prepared were pilot tested. Pilot testing was undertaken to achieve the following purposes:

- To ensure that questionnaires are refined so that respondents do not face problems in answering the questions;
- To ensure that no problems are encountered in recording the data collected using the questionnaires; and
- To enable the researcher to assess the question's validity and likely reliability of the data that would be collected.

Questionnaires were sent to 35 SMCFs during the pilot testing stage. 12 respondents completed the questionnaires and sent them back to the researcher. Preliminary analysis of the data collected using the questionnaires completed during the pilot study was undertaken. This was to ensure that the data collected comprehensively addressed the research questions. Each completed questionnaire was checked to determine if each respondent had not faced problems responding to the questions and had followed all the instructions correctly. These responses provided the researcher with an account of the reliability and suitability of the questions, leading to the adjustment and realignment of the questions presented in the questionnaire. Based on the results from this pilot study, the questionnaires were accordingly aligned to ensure that the data collected addressed the research question, aim and objectives. The questionnaires used in the pilot testing and the data collected, presented and analysed from this pilot study are attached in Appendix C and E respectively.

3.5.2.4 Delivery and Collection of Questionnaires

Questionnaires were hand delivered or emailed to respondents. An introductory letter, attached in Appendix C, was presented to the SMCFs and a consent letter, attached in Appendix C, was also issued. The SMCFs were requested to sign the consent letter to confirm their willingness to participate in the research study. They were further

requested to include their names and contact details, but it was indicated on the consent letter that this was for reference purposes only, and their details would be treated in the strictest confidence and would not be included in the dissertation.

3.6 THE SAMPLE SIZE AND SELECTION

Two research instruments were used for data collection for this research. These research instruments were targeted at two sets of participants.

3.6.1 GDID Officials

The total number of GDID officials that are involved in the procurement of infrastructure projects was found to be 166 as shown in Table 3.1. This number comprises Project Managers, Quantity Surveyors, Architects, Engineers, and SCM officials, Directors, Chief Directors and Deputy Director Generals (DDGs). The GDID is structured in a way that these officials are spread among four Branches which are:

- Health Branch;
- Education Branch;
- STARS Branch; and
- SCM.

Table 3.1: Targeted Population: GDID Officials

Unit	**Total number of targeted participants**
Supply Chain Management	20
Education Infrastructure Branch (Departmental Project Managers & Quantity Surveyors)	56
Health Infrastructure Branch (Departmental Project Managers & Quantity Surveyors)	50
Other Provincial Department Branch (Departmental Project Managers & Quantity Surveyors)	40
TOTAL	**166**

Source: GDID, (2014)

In order to determine the participants in this research, a combination of stratified random and purposive sampling techniques were used. The stratified random sampling was used to ensure that participants were derived from all the four Branches, while purposive sampling determined the use of the researchers' judgement to select

participants who would best provide information based on their experience of the GDID procurement processes. The researcher targeted only officials that had worked for at least five years in GDID as shown on Table 3.2.

Table 3.2: GDID respondents profiles

Rank/ Position	Unit	Minimum Duration Working for GDID in Years
Deputy Director General	Health Infrastructure, Maintenance and Technical Portfolio Services	5
Director	Health Infrastructure, Maintenance and Technical Portfolio Services	5
Chief Construction Project Manager	Health Infrastructure, Maintenance and Technical Portfolio Services	5
Director	Education Infrastructure, Maintenance and Technical Portfolio Services	5
Chief Construction Project Manager	Education Infrastructure, Maintenance and Technical Portfolio Services	5
Quantity Surveyor	Education Infrastructure, Maintenance and Technical Portfolio Services	5
Director	Other Provincial Departments	5
Project Manager	Other Provincial Department	5
Director	Supply Chain Management	5
Deputy Director	Supply Chain management	5

Source: Author

3.6.2 SMCFs

In South Africa, it is mandatory for all construction companies intending to do business in the public sector in terms of the CIDB Act (Act 38 of 2000) to be registered with the CIDB. The CIDB maintains a register of existing construction companies. Table 3.3 provides the number of all CIDB registered construction companies. All CIDB registered companies are not restricted in tendering for any opportunities for infrastructure projects implemented by GDID irrespective of their geographic location. However, for the purpose of this research, 250 SMCFs were targeted. These were SMCFs that had participated in the procurement of infrastructure projects implemented by GDID in the previous three financial years which are: 2014/15, 2015/16 and 2016/17. Information on

these companies was obtained from the attendance registers of compulsory site briefing sessions.

Table 3.3: Targeted Population: SMCFs

Designation (CIDB Grading)	Total number of targeted participants
1	136 817
2	5 907
3	2 377
4	2 926
5	1 907
6	2 175
7	1 244
TOTAL	**153 353**

Source: CIDB, (2016)

3.6.3 The sample size

Due to time and budget limitations, it was not possible to include everyone in the target population and, hence, it was necessary to take a sample of the target population. Results from the sample were then generalised as a representation of the population. According to Fellows & Lui (1997), the objective of sampling is to provide a practical means of enabling the data collection and processing components of research to be carried out while ensuring that the sample provides a good representation of the population. Walliman (2005) indicated that the sample should be large enough to be free from bias. Otherwise, the type of selected sample would greatly affect the reliability of subsequent generalisation. Table 3.4 shows the prescribed minimum samples as indicated by Saunders, *et al*. (2012).

Table 3.4: Minimum Sample Size

Nature of Study	Minimum sample size
Semi-structured questionnaires and interviews/ in-depth interview	5 to 25
Ethnographic	35 to 36
Grounded theory	20 to 35
Considering a homogeneous population	4 to 12
Considering a heterogeneous population	12 to 30

Source: Saunders, *et al*., (2012)

The sample size of the respondents therefore had to comply with the minimum sample size for semi-structured questionnaires as indicated in Table 3.4.

3.7 METHOD OF DATA ANALYSIS

The data collected from the fieldwork was analysed using the content analysis. According to Hsieh & Shannon (2005), content analysis is a widely used qualitative research technique that rather than being a single method, makes use of three distinct approaches, which are, convectional, directed or summative. All the three approaches were used to interpret meaning from the content of the data. Hsieh & Shannon (2005), further mentioned that the major diffences among these approaches are the coding schemes, origins of codes and threats to trustworthiness. In conventional content analysis, coding categories are derived directly from text data. With directed approach, analysis starts with a theory or relevant research findings as guidance for initial codes, while a summative content analysis involves counting and comparisons of usually keywords or content, followed by interpratation of the underlying context (Hsieh & Shannon, 2005). Background knowledge derived from the literature review on the e-procurement methodologies was used to group the findings. The findings were grouped into the following categories: e-notification, e-tendering, e-contract award, e-contract management and e-payments. It was then analysed which e-procurement methodologies the GDID applies in the procurement of infrastructure projects. On the other hand, the benefits and inhibiting factors that SMCFs experienced from the use of these e-procurement methodologies were deduced from the SMCFs' responses to the questions in the questionnaire.

The data collected was recorded in a way that assured confidentiality of the respondents. Files for each respondent were opened and coded differently. The data collected was categorised initially as follows: data from questionnaires send to the GDID officials was kept separately to the data received from questionnaires from SMCFs. The responses from both GDID officials and SMCFs was summarized and analysed. Findings were made and conclusions drawn based on the relationship obtained from the data.

3.8 ETHICS

The data for this research was drawn from many sources, including registered SMCFs who have been, or are currently, involved in the procurement of infrastructure projects implemented by GDID, and the GDID officials involved with procurement of infrastructure projects. Participation in this research was entirely voluntary. Anonymity of research participants was upheld to protect the security and trade secrets of GDID. Participants were informed that the information they provided would be treated confidentially, and if published, would not be identified as theirs.

This research adhered to the framework and policies of the School of Construction Economics and Management, University of Witwatersrand (Wits) Research Ethics Committee. All data for research publication purpose was treated with anonymity, unless permission was granted. In addition, the data obtained would not be used for either commercial purposes or made available to third parties without the express written consent from the participants. Furthermore, to ensure that this research adheres to the School of Construction Economics and Management policy regarding research ethics, ethical challenges that might arise during this research were considered. The questionnaires that were sent out to different GDID officials and SMCFs had a full disclaimer explaining the purpose of the research and notified the recipients that they were being used as subjects for research. The disclaimer was to assure the GDID officials and SMCFs that the Data Protection Act was being complied with, especially with regards to anonymity. Formal consent was also sought and received from participants.

All participants providing information were not less than the age of sixteen (16) years (age of consent) and had the right to discontinue participation, should they wish to, without giving reason. The results from the study were to be made available to all participants on request.

CHAPTER 4: DATA COLLECTION AND ANALYSIS

CHAPTER 4: DATA COLLECTION AND ANALYSIS

4.1 INTRODUCTION

The data gathered through the utilisation of the instruments and methods described in Chapter 3 are presented and analysed in this chapter.

4.2 DATA COLLECTION OVERVIEW

The methodologies adopted for data collection were informed by the objectives of the research, nature of the data collected and the targeted participants who provided the data. The nature of the research objectives for this study dictates that data be collected from two sets of participants: the GDID officials and the SMCFs.

The data required to address the first objective of identifying the e-procurement methodologies implemented by GDID during the procurement of its infrastructure projects was obtained from targeted GDID officials.

The second and third objectives required the examination of the experiences of SMCFs in relation to the e-procurement implementation by GDID and to provide an account of the benefits and inhibiting factors impacting the development of SMCFs. The data to address these two objectives were obtained from the SMCFs.

4.3 E-PROCUREMENT METHODOLOGIES IMPLEMENTED BY GDID

Questionnaires were used for the collection of data on the e-procurement methodologies implemented by the GDID. The interviewer prepared a predetermined list or schedule of interview questions that were asked. The schedule of questions was standardised. All respondents were asked the same of questions.

It was noted and taken into consideration that the GDID had four units that are actively involved in the procurement of infrastructure projects. These units are:

- Health Infrastructure, Maintenance and Technical Portfolio Services;
- Education Infrastructure, Maintenance and Technical Portfolio Services;
- Other Provincial Departments (STARS); and
- Supply Chain Management (SCM).

Respondents targeted from these units in GDID were as shown in Table 3.4. Respondents were coded chronologically upon receipt of completed questionnaires. Each response or completed questionnaire was given a code that starts with the letters 'IR'. Thus the first questionnaire received was coded IR01 and the 10th one IR10.

4.3.1 Form of tender documentation

The respondents were asked to indicate the forms of tender documentation that the GDID utilise for tendering, including how the documentation is issued to the SMCFs. Table 4.1 shows that the issuing and collection of tender documents in the form of bills of quantities in hard copy is the commonly used method for issuing out tender documents. Around 80% of the respondents indicated the utilisation of specifications and Drawings. The drawings are either attached to the bills of quantities or to the specifications. Around 50% of the respondents indicated the issuing of electronic bills of quantities. Issuing of electronic bills of quantities was not popular due to that, either, it has been recently introduced or is still being piloted on selected projects.

Table 4.1: Form of tender documentation

Form of Documentation	Respondents	Percentage of Respondents
Bills of Quantities in Hard Copy	IR01; IR02; IR03; IR04; IR05; IR06; IR07; IR08; IR09; IR10	100%
Electronic Bills of Quantities	IR01; IR05; IR07; IR09; IR10	50%
Drawings on Compact Disc (CD)	IR01; IR02; IR03; IR04; IR05; IR06; IR07; IR08	80%
Specifications	IR01; IR02; IR03; IR04; IR05; IR06; IR07; IR08	80%

4.3.2 Issuing of Tender Documentation to SMCFs

The respondents were requested to indicate how tenderers are issued with tender documents for the procurement of infrastructure projects implemented by GDID. The results obtained were as indicated in Table 4.2. Based on the results shown in Table 4.2, it could be seen that the issuing of hard copy tender documents collected at GDID SCM offices remains the most popular media by which tenderers obtain tender documentation, from the GDID officials' perspective. Only 50% of the GDID officials indicated that they had access to electronic bills of quantities. This could be due to the

fact that most of the GDID officials are accustomed to the traditional paper based means of issuing of tender documents, while they are not aware of the new developments of having tender documents available through the electronic media.

Table 4.2: Form of documentation issued to SMCFs

Form of Documentation	Respondents	Percentage of Response
GDID SCM Offices	IR01; IR02; IR03; IR04; IR05; IR06; IR07; IR08; IR09; IR10	100%
Department of National Treasury e-tenders portal	IR01; IR05; IR07; IR09; IR10	50%
Department of National Treasury e-tenders portal	IR01; IR05; IR07; IR09; IR10	50%

4.3.3 Determination of the form of tender documentation utilised

GDID officials who participated in the research were asked to indicate what determined the nature of the form of tender that was used for the procurement of infrastructure projects that they implement as shown in Table 4.3.

The respondents identified six main determining factors that influenced the nature of the form of tender documentation used in the procurement for infrastructure projects by GDID. The determinants identified were:

- Procurement Regulations;
- The need to promote transparency;
- Estimated construction costs;
- Nature and scope of work;
- Knowledge and experience of officials; and
- Resources and infrastructure

All of the respondents indicated that the nature of the form of tender documentation was determined by the procurement regulations and SCM procurement policies. These stipulated procurement objectives. It is embedded in these policies and regulations that procurement has to promote equality, effective, transparency, accountability, fairness and be competitive.

The need to promote transparency then follows. This determinant was related or broadly falls within the procurement and regulations bracket. However, emphasis on transparency was always echoed especially in public sector procurement.

40% of the respondents indicated the effect of estimated construction costs on determining the nature and form of tender documentation used. Application of this factor can be witnessed in situations where there are projects less than R500 000 in value. In this regard, procurement can be implemented through quotations, while for projects above R500 000 competitive bidding has to be instituted. This is further intensified where projects are considered big or mega due to the estimated construction costs, where more stakeholders are interested on how procurement was implemented.

Nature and scope of works was identified by 30% of the respondents as used to determine the form of tender documentation. Quotations may be used for the procurement of a service provider to service blockages or leakages in pipes. Requests for quotations can even be sent electronically. However, for projects that exceeds R500 000 in value, tender documentation that includes bills of quantities, drawings and specifications are required. These may be obtained or issued manually or electronically.

The experience, knowledge, available resources and infrastructure determine the methods that officials use. Thus, officials use methods and techniques that they have acquired or been trained on. Around 10% of the participants indicated and mentioned the effect of these on the determination of the form of tender documentation used for the procurement of infrastructure projects. The results are presented in Table 4.3.

Table 4.3: Determination of form of tender documentation

Response	Respondents	Percentage Response
Procurement Regulations	IR01; IR02; IR03; IR04; IR05; IR06; IR07; IR08; IR09; IR10	100%
The need to promote transparency	IR01; IR02; IR03; IR06; IR07; IR08; IR10	70%
Estimated construction costs	IR01; IR05; IR06; IR10	40%
Nature and scope of work	IR04; IR07; IR08	30%
Knowledge and experience	IR10	10%
Resources and infrastructure	IR10	10%

4.3.4 E-Procurement Methodologies Implemented by GDID

Respondents were required to indicate the e-procurement methodologies implemented by the GDID during the project life cycle. The responses were as indicated in Table 4.4.

Table 4.4: E-procurement methodologies implemented by GDID

E-Procurement Methodology	Media Used
E-Notification	• Tender Bulletin • CIDB Website • Department of National Treasury e-tenders portal • Department of National Treasury e-tenders portal • Lead-2-Business website
E-tendering	• Department of National Treasury e-tenders portal
E-Contract Award	• Emails
E-Contract Administration (E-Contract Management)	• Primavera P6 • Primavera Unifier • E-payments (electronic submission and processing of payments) • Microsoft Project
E-Payments	• Primavera Unifier • SAP
E-Maintenance, Repairs and Operations (EMRO)	• E-maintenance

Further to the indications of the e-procurement methodologies implemented by GDID as indicated by the GDID officials on section 4.3.4 and Table 4.4, respondents were requested to indicate how these methodologies were implemented.

4.3.4.1 E-Notification

It was established from the responses that e-notification is the most commonly used e-procurement methodology by GDID. Infrastructure projects implemented by GDID are advertised or notified on several electronic media as indicated in Table 4.5.

The Tender Bulletin and the CIDB website were found to be the most common electronic platforms for notification used for infrastructure projects implemented by GDID. All respondents indicated the utilisation of these platforms. Other platforms

indicated were the use of the GDID e-tenders portal (70%) and the Department of Treasury e-tenders portal (60%). It was further indicated that downloadable versions of tender documents are available on these platforms in PDF. Tenderers who download tender documents on these platforms do not have to pay the R500 or R1000 usually required for the purchasing of documents.

The least common platform indicated was the use of the Lead-2-business website. This could be attributed to the fact that since this is a private initiative and contractors have to register and subscribe to their website in order to receive the information.

Table 4.5: E-notification

E-Notification Media Used	Respondents	Percentage Respondents
Tender Bulletin	IR01; IR02; IR03; IR04; IR05; IR06; IR07; IR08; IR09; IR10	100
CIDB Website	IR01; IR02; IR03; IR04; IR05; IR06; IR07; IR08; IR09; IR10	100
GDID e-tenders portal	IR01; IR02; IR03; IR05; IR08; IR09; IR10	70
Department of National Treasury e-tenders portal	IR02; IR03; IR05; IR08; IR09; IR10	60
Lead-2-Business	IR03; IR07	20

4.3.4.2 E-Tendering

All the respondents indicated that the GDID utilised e-tendering methodologies as shown in Table 4.6. The e-tenders portal of the National Department of Treasury was found to be used for both notifications of tender opportunities and for e-tendering.

The GDID upload tender documents on the e-tenders portal. SMCFs are able to view the tender notification and are presented with a platform to download the tender document from the e-tenders portal. The SMCFs that would have downloaded the tender document through the e-tenders portal are not required to pay the R500.00 or R1000.00 non-refundable deposit required during the procurement of paper based tender documents. These downloadable documents are in PDF format. SMCFs may directly request for editable electronic documents should they require them. These are provided on request. The application of this methodology however is for the provision of

tender documents only. The submissions of the tender documents, however, have to be done through the tender box located at the GDID offices. Responses are displayed in Table 4.6.

Table 4.6: E-tendering

E-Tendering Media Used	Respondents	Percentage Respondents
Department of National Treasury e-tenders portal	IR01; IR02; IR03; IR04; IR05; IR06; IR07; IR08; IR09; IR10	100

4.3.4.3 E-Contract Award

The award letters for infrastructure projects are often issued in hard copy (that is paper based). However, the respondents indicated that SMCFs may request for the issuing of the award letters electronically. Only two respondents responded to this question as shown in Table 4.7. On further analysis, it was realised that these respondents were based from the SCM department that is responsible for issuing of award letters.

Table 4.7: E-Contract Award

E-Contract Award Media Used	Respondents	Percentage Respondents
Emails	IR09; IR10	20

4.3.4.4 E-Contract Management (E-Contract Administration)

During the contract administration stage, GDID officials indicated that they use the following methodologies for communication: project reporting, monitoring and tracking.

The data in Table 4.8 showed that there were 2 respondents who did not answer the questions in this section. Further interrogation of the data showed that these were respondents from the SCM unit. Contract management activities are activities performed during the construction period of the project, that is, from site handover to certification of completion of the project. SCM officials are not involved in these processes.

All the 8 respondents indicated the use of e-procurement techniques in the following contract management activities:

- Communication;
- Project reporting;
- Project monitoring;
- Project tracking; and
- Project payments.

Five of the eight respondents indicated the use of electronic methodologies during project programming. The implementation of e-payments is however covered in more detail in section 4.3.4.5.

Table 4.8: E-contract management

Contract Management Activity	Electronic media used	Respondents	Percentage of Respondents
Communication	Emails; Phone calls	IR01; IR02; IR03; IR04; IR05; IR06; IR07; IR08	80
Project Reporting	Primavera P6; Emails (project circulation)	IR01; IR02; IR03; IR04; IR05; IR06; IR07; IR08	80
Project Monitoring	Primavera P6	IR01; IR02; IR03; IR04; IR05; IR06; IR07; IR08	80
Project Tracking	Primavera P6	IR01; IR02; IR03; IR04; IR05; IR06; IR07; IR08	100
Project Programing	Primavera P6; Microsoft Project	IR01; IR04; IR05; IR06; IR08	50
Project Payments	SAP; Primavera Unifier	IR01; IR02; IR03; IR04; IR05; IR06; IR07; IR08	80

4.3.4.5 E-Payments

GDID utilises the e-payments methodology through the processing of payments using the Primavera Unifier software and the SAP system. Table 4.9 shows the responses obtained from the respondents with regards to the utilisation of the e-payments methodology. The respondents indicated that SMCFs are required to submit their invoices or payment claims in hard copy to the GDID finance office. These invoices are

scanned and processed using the Primavera Unifier software, where all the approvals are issued by the relevant authorities. Once all the approvals are obtained the invoice processing is transferred to the SAP system and the payments are made electronically to SMCFs. Invoice submission is paper based, though the subsequent processes are done electronically.

Table 4.9: E-Payments

E-Payments Media Used	Respondents	Percentage Respondents
Primavera Unifier	IR01; IR02; IR03; IR04; IR05; IR06; IR07; IR08	80
SAP	IR01; IR02; IR03; IR04; IR05; IR06; IR07; IR08	

4.3.4.6 E-Maintenance, Repair and Operations (EMRO)

It was established that GDID is responsible for the maintenance and repair of Provincial Government's infrastructure facilities. These include hospitals, clinics, community health centres (CHCs) and other social amenities. All the respondents indicated that GDID has established, maintained and makes use of an electronic system called e-maintenance. This system is used for logging of faults and allocation of repair work among supervisors and artisans. It also provides confirmation of the rectification of the fault. It was established that reporting of faults can be done by staff and members of the general public. An application was developed that can be downloaded from smart devices and/or computers. Faults can also be logged through this application.

4.3.5 E-Procurement methodologies not implemented by GDID

There are other e-procurement methodologies that are not implemented by GDID.
These include e-submission and e-evaluation.

It was also considered relevant to investigate and establish the nature of problems that are experienced in the GDID procurement system.

4.3.6 Challenges Experienced by the GDID in Procurement

The challenges experienced in the GDID procurement processes were identified by the participants in the research. Eleven (11) challenges indicated in Table 4.10 are

attributed to the circulation or receipt of information, and handling and storage of documentation. Further investigations indicated that despite lockable physical storerooms, documents disappear or get misplaced. This exposes and compromises GDID's position given that it is the sole Provincial Government Implementing Agent for all infrastructure projects.

Table 4.10: Challenges experienced in GDID procurement processes

Identified Challenge	Respondents	Percentage for Respondents
Tenderers not obtaining tender documents in time	IR01; IR02; IR03; IR04; IR05; IR06; IR07; IR08; IR09; IR10	100
Misplacement of tender documents	IR01; IR03; IR04; IR05; IR06; IR07; IR08; IR09; IR10	100
Disappearance of tender documents	IR01; IR02; IR03; IR04; IR05; IR06; IR07; IR08; IR09; IR10	100
Unstandardised scoring of points during evaluation	IR03; IR05; IR06; IR07; IR08; IR09	60
Tampering with tender documents	IR01; IR03; IR04; IR05; IR07; IR08; IR09; IR10	80
Storage of tender documents	IR09; IR10	20
Security of documents	IR01; IR02; IR03; IR04; IR05; IR06; IR07; IR08	80
Late submissions	IR09; IR10	20
Tenderers not receiving addendums and other additional information	IR01; IR02; IR03; IR04; IR05; IR06; IR07; IR08	80
Missing pages in tender documents	IR02; IR03; IR05; IR06; IR08; IR10	60
Mathematical errors	IR01; IR02; IR03; IR04; IR05; IR06; IR07; IR08	80

4.3.7 Recommendations for improvement of GDID Procurement Processes

According to the GDID officials that participated in the research, there is a greater need for improvement of the procurement processes, especially in view of the challenges indicated in section 4.3.6 of this report. The scope of the areas that require improvement ranged from tender documents issuing, bids submission, evaluation, award up to, and including, project close-out processes. All participants recommended implementation of e-procurement for all processes in order to overcome challenges

indicated in section 4.3.6. This, according to them, enhances transparency and accountability, which are core objectives of public sector procurement, as previously highlighted in Chapter 2 of this report.

4.4 SMCFs EXPERIENCES ON THE GDIDs' IMPLEMENTATION OF E-PROCUREMENT

This section sought to address the impact of the implementation of e-procurement methodologies by GDID on the development of SMCFs, the second and third research objectives that entails examining the experience of SMCFs based on the implementation of e-procurement methodologies and the benefits and hindrances to the adoption of e-procurement.

4.4.1 SMCFs Response Overview

Questionnaires were sent to SMCFs within the GDID database. A total of 250 questionnaires were send to SMCFs. Some were sent through emails (230). Others were issued to GDID project managers (10) to issue to SMCFs for completion during meetings and some were self-administered by the researcher (10). Responses were obtained from 27 SMCFs. This constituted 10.8% response rate. Given that all respondents were obtained from the GDID database, the researcher found no need to ask them whether they have been involved in the procurement of GDID infrastructure projects.

The questionnaires were coded at the time they were received from the respondents. Each questionnaire was given a code with the prefix 'QR' followed by a number. The numbering was in chronological order from 1 to 27. Questionnaires were allocated numbers as they were received. The first one to be received was allocated number 1 and the coding was QR01. The 11th one was then coded QR11. This was done so as to identify the questionnaires and link them to the responses.

4.4.2 Respondents details: CIDB grading

Respondents were requested to indicate their CIDB grading. The CIDB grading for the targeted respondents were from grade 1 to 7. Responses from respondents on grade 8 and 9 would have been disqualified because they were deemed not to fall within the

SMCFs category. Table 4.11 gives an overview of the CIDB grading of the respondents who participated in this research.

Table 4.11 SMCFs respondents CIDB grading

	CIDB Grading	1	2	3	4	5	6	7	8	9
Respondent Code										
QR01			✓							
QR02		✓								
QR03						✓				
QR04			✓							
QR05										
QR06				✓			✓			
QR07								✓		
QR08								✓		
QR09		✓								
QR10			✓							
QR11						✓				
QR12										
QR13				✓	✓					
QR14		✓								
QR15		✓								
QR16								✓		
QR17							✓			
QR18					✓					
QR19		✓								
QR20					✓		✓			
QR21			✓							
QR22						✓				
QR23				✓						
QR24				✓						
QR25								✓		
QR26							✓			
QR27					✓					
OVERALL		**5**	**4**	**4**	**4**	**3**	**4**	**4**	**0**	**0**

4.4.3 Tender Notification

SMCFs were requested to indicate the platforms that they use to solicit for information with regards to the availability of tender opportunities for infrastructure projects. Table 4.12 shows that the SMCFs sampled used multiple methods during solicitation for

tender information. For instance, QR01 indicated the use of the Tender Bulletin, e-tender portal and newspapers.

Newspapers are the most common method used by SMCFs to solicit for tender information. They are followed by the use of the Tender Bulletin and the use of the CIDB website respectively. The least common methods used are the Lead-2-business and physical the site visits where construction works would be taking place.

It can be concluded that tenderers search for new tenders in the GDID e-notification of the e-procurement system on Tender Bulletin, CIDB website, E-Tender Portal and the Lead-2-Business website.

Table 4.12 gives an overview of the responses as provided by the respondents.

Table 4.12: Sources for tender notification

Source of tender notification	Respondents	Total number of respondents
Tender Bulletin	QR01; QR03; QR04; QR06; QR07; QR08; QR10; QR11; QR12; QR13; QR14; QR15; QR17; QR18; QR20; QR21; QR22; QR23; QR25; QR26; QR27	21
CIDB website	QR04; QR06; QR07; QR10; QR11; QR12; QR13; QR17; QR18; QR20; QR21; QR22; QR23; QR24; QR25; QR26; QR27	17
E-tenders portal	QR01; QR06; QR07; QR11; QR13; QR17; QR21; QR25	8
Lead-2-Business website	QR03; QR17; QR18; QR26	4
Newspapers	QR01; QR02; QR04; QR05; QR06 ; QR07; QR08; QR09; QR11; QR12; QR13; QR16; QR17; QR18; QR20; QR21; QR22; QR23; QR24; QR25; QR26; QR27	22
Word of Mouth	QR03; QR06; QR14; QR15; QR19; QR24; QR26	7

4.4.4 Form of tender documentation received and submitted

Respondents were requested to indicate the form of tender documentation that they receive from GDID and to further indicate how they submit their bids.

It could be drawn from Table 4.13 above that all the 27 respondents indicated the use of traditional paper based methodologies during the receiving and submission of tender documentation on infrastructure projects implemented by GDID. Nineteen respondents indicated that they received tender documents electronically. They could be receiving tender documentation through the e-tenders portal or requesting the electronic tender documents from the Quantity Surveyors. Six respondents indicated the experience with regards to electronic submission of tender bids. Table 4.13 indicate the responses from the respondents.

Table 4.13: Form of tender documentation received and submitted by SMCFs

Respondents	Receiving		Submission	
	Traditionally	***Electronically***	***Traditionally***	***Electronically***
QR01	✓		✓	
QR02	✓		✓	
QR03	✓	✓	✓	
QR04	✓	✓	✓	
QR05	✓		✓	
QR06	✓		✓	
QR07	✓	✓	✓	
QR08	✓		✓	
QR09	✓		✓	
QR10	✓	✓	✓	✓
QR11	✓	✓	✓	
QR12	✓		✓	
QR13	✓	✓	✓	
QR14	✓	✓	✓	
QR15	✓	✓	✓	✓
QR16	✓		✓	
QR17	✓	✓	✓	
QR18	✓	✓	✓	
QR19	✓	✓	✓	✓
QR20	✓	✓	✓	
QR21	✓	✓	✓	
QR22	✓	✓	✓	
QR23	✓	✓	✓	
QR24	✓	✓	✓	✓
QR25	✓	✓	✓	
QR26	✓	✓	✓	✓
QR27	✓	✓	✓	✓
TOTAL	**27**	**19**	**27**	**6**

4.4.5 Contract Award

It was requested of SMCFs to indicate how they receive or obtain confirmation of their letters of award from GDID in this section. It was established that most SMCFs (24) received their confirmation of award through traditional means, that is, through paper based means as indicated in Table 4.14. In other words, they received award letters on paper written and signed by the relevant authority. Thirteen respondents indicated that they received award letters electronically. Further interrogation of the data showed that 10 of the 13 respondents received award letters both electronically and through traditional paper based means. Only 3 respondents indicated receiving award letters electronically only.

It can be deduced that the receiving of award letters electronically is not common. SMCFs are sent award letters electronically upon request. These original award letters would then have to be sent in their original traditional format hence the receipt of award letters through both electronic and traditional paper based means. Other respondents, upon receipt of the electronic award letter, do not pursue the original one. They are satisfied with the electronic letter that they would have received. Table 4.14 summarises the responses obtained.

Table 4.14: Contract Award

Respondents	Contract Award	
	Traditionally (Receive award confirmation in hard copy)	***Electronically (Receive award confirmation electronically)***
QR01	✓	
QR02	✓	
QR03	✓	
QR04	✓	✓
QR05	✓	
QR06	✓	
QR07		✓
QR08	✓	
QR09	✓	
QR10	✓	✓
QR11	✓	✓
QR12	✓	
QR13	✓	

Table 4.14: Contract Award

Respondents	Contract Award	
	Traditionally (Receive award confirmation in hard copy)	***Electronically (Receive award confirmation electronically)***
QR14		✓
QR15	✓	✓
QR16		✓
QR17	✓	✓
QR18	✓	✓
QR19	✓	✓
QR20	✓	✓
QR21	✓	
QR22	✓	
QR23	✓	
QR24	✓	✓
QR25	✓	
QR26	✓	
QR27	✓	✓
TOTAL	**24**	**13**

4.4.6 Contract Management

It was requested that the participants indicate, based on their experience in implementing infrastructure projects from GDID, the media used for the various contract administration or management activities. The participants responded as indicated in the sections below.

4.4.6.1 Communication and Issuing of Instructions

The respondents' responses with regards to how communication and issuing of instructions evolves during the implementation of the infrastructure projects implemented by GDID indicated that they make use of the following methodologies in Table 4.15.

All the respondents who participated in this research indicated the use of electronic communication media during the implementation of the project. The electronic communication media indicated by these respondents are the emails, phone calls and short message service (SMS). Over and above the use of electronic communication means, 15 respondents indicated the further use of traditional paper based

communication systems. These are used as back-up to the electronic communication system. The use of the paper based systems also emanate from the doubt the SMCFs have on the permissibility of electronic information as evidence during dispute resolution and hence the need for the back-up system.

Twenty respondents indicated the use of traditional paper based systems for issuing of instructions. However, 23 respondents indicated the use of electronic media to communicate and validate instructions. In addition, 16 of the respondents included in the statistics above (20 and 23) indicated the use of both electronic and traditional paper based means for validating instructions. This leaves only 4 SMCFs accepting and effecting instructions only when they are written on the site instruction book. However, 7 respondents indicated the use of electronic instructions only.

Table 4.15: Communication and issuing of instructions

Respondents	Communication		Issuing of instructions	
	Traditionally	***Electronically***	***Traditionally***	***Electronically***
QR01		✓		✓
QR02		✓	✓	✓
QR03		✓	✓	
QR04	✓	✓	✓	✓
QR05	✓	✓	✓	✓
QR06		✓	✓	✓
QR07		✓	✓	
QR08	✓	✓	✓	
QR09	✓	✓	✓	✓
QR10		✓		✓
QR11	✓	✓	✓	✓
QR12	✓	✓	✓	✓
QR13	✓	✓	✓	✓
QR14		✓		✓
QR15	✓	✓	✓	✓
QR16		✓		✓
QR17	✓	✓	✓	✓
QR18	✓	✓	✓	✓
QR19		✓		✓
QR20	✓	✓	✓	✓
QR21	✓	✓	✓	✓
QR22	✓	✓	✓	✓
QR23	✓	✓	✓	✓
QR24		✓		✓

Table 4.15: Communication and issuing of instructions

Respondents	Communication		Issuing of instructions	
	Traditionally	***Electronically***	***Traditionally***	***Electronically***
QR25	✓	✓	✓	✓
QR26		✓	✓	
QR27		✓		✓
TOTAL	**15**	**27**	**20**	**23**

4.4.6.2 Project Reporting, Close-out reports

Respondents were requested to indicate the media that they use for project reporting and project close–out reports. The responses obtained from the project participants were as shown in Table 4.16.

The result shows that 20 respondents indicated that they use traditional methodologies when reporting, and 23 respondents indicated the use of electronic reporting methodologies. However, in these statistics, 16 respondents indicated that they use both electronic and manual reporting systems. This included project reports preparation and circulation. Electronic and manual systems are used to augment each other in the storage of project information. This may be attributed to the permissibility of electronic information as evidence during dispute resolution and hence adoption of systems as back-up of each other. Four (derived from the Table 4.16) of the respondents indicated the use of traditional paper based means for project reporting, while seven (derived from the Table 4.16) indicated that they only use electronic reporting means or tools.

The result shows that 25 of the respondents indicated the use of traditional paper based means for close-out reports on projects. This is mainly attributed to the need of original documents that include the certificates of compliance being attached to the close-out reports. These documents are issued in hard copy by the relevant authorities hence the prevailing use of the traditional means for close-out reports. Five respondents indicated the use of electronic means. Further interrogation showed that these are small contractors employed as subcontractors who submit their close-out reports electronically to main contractors. Three out of five (derived from the Table 4.16) however, indicated the use of both electronic and manual means for close-out reports.

Table 4.16: Project reporting and close-out reports

Respondents	Project Reporting		Close-out reports	
	Traditionally	***Electronically***	***Traditionally***	***Electronically***
QR01		✓	✓	
QR02	✓	✓	✓	
QR03	✓		✓	
QR04	✓	✓	✓	✓
QR05	✓	✓	✓	
QR06	✓	✓	✓	✓
QR07	✓		✓	
QR08	✓	✓	✓	
QR09	✓	✓	✓	
QR10		✓	✓	
QR11	✓	✓	✓	
QR12	✓	✓	✓	
QR13	✓		✓	
QR14		✓	✓	
QR15	✓	✓	✓	✓
QR16		✓		✓
QR17	✓	✓	✓	
QR18	✓	✓	✓	
QR19		✓		✓
QR20	✓	✓	✓	
QR21	✓	✓	✓	
QR22	✓	✓	✓	
QR23	✓	✓	✓	
QR24		✓	✓	
QR25	✓	✓	✓	
QR26	✓		✓	
QR27		✓	✓	
TOTAL	**20**	**23**	**25**	**5**

4.4.6.3 Payments

Respondents were asked to indicate how payments are done on the infrastructure projects implemented by GDID. Their responses are as shown in the Table 4.17.

It can be noted from Table 4.17 that payments are implemented both through traditional means and electronically. However, from the data collected from the respondents, electronic payment processes (20) are more commonly used than the traditional payment processes (12). On further investigation on what constitutes traditional payment systems, the respondents indicated that invoice signing and submission to

GDID offices is done manually. They have to submit invoices in hard copies. The processing of these invoices through the SAP system and Primavera Unifier, as indicated by the GDID officials, constitutes the electronic processing of invoices. SMCFs invoices are paid through electronic transfers as opposed to the traditional means of preparation and collection of cheques made by the Department in favour of the SMCFs.

Table 4.17: Payments

Respondents	Payments	
	Traditionally	***Electronically***
QR01	✓	
QR02	✓	
QR03	✓	
QR04		✓
QR05	✓	✓
QR06		✓
QR07		✓
QR08	✓	
QR09	✓	
QR10		✓
QR11		✓
QR12		✓
QR13	✓	
QR14		✓
QR15	✓	✓
QR16	✓	✓
QR17		✓
QR18		✓
QR19	✓	✓
QR20		✓
QR21		✓
QR22		✓
QR23		✓
QR24	✓	
QR25		✓
QR26	✓	
QR27		✓
TOTAL	**12**	**19**

4.4.7 E-MRO (Maintenance, Repairs and Operations)

It was noted from the responses collected from the respondents that the processes and activities followed through the e-MRO processes, as implemented by GDID, are the same processes as indicated above on e-notification, e-tendering, e-contract award, e-contract management and e-payments. In e-MRO faults can be reported by both GDID officials and members of the public using the e-maintenance software.

4.5 THE BENEFITS DERIVED FROM UTILISATION OF E-PROCUREMENT METHODOLOGIES BY SMCFs

The benefits experienced by SMCFs, based on their adoption and implementation of e-procurement methodologies are identified, discussed and ranked in this section. The ranking is based on the frequency upon which they have been identified by the respondents. These benefits are discussed in line with the project processes within the project life cycle as indicated by GDID officials and SMCFs.

4.5.1 Tender Notification

One of the e-procurement methodologies implemented by GDID is e-notification. SMCFs are notified of the availability of tender opportunities through the Tender Bulletin, CIDB website, e-tenders portal and the Lead-2-Business website. The benefits that SMCFs derive from the adoption and implementation of e-notification are as indicated in the Table 4.18.

4.5.1.1 The Benefits derived from the utilisation of e-notification

Despite most of the benefits indicated above being closely related, the researcher discussed these benefits as indicated by the respondents on the questionnaires. Thus the discussion is based on the raw data obtained from the respondents.

i. **Tender information reaches many contractors / Information is not limited by geographic location**

   Information circulated electronically can be accessed by many viewers in different locations. SMCFs have access to tender information on all projects implemented by GDID and those implemented by other Public and Private sector organisations. This assists them in diversification of their client base.

This gives all interested parties who intend to participate to prepare their bids and participate in the procurement of infrastructure projects. This information is not localised or dependent on the delivery of newspapers.

ii. Receive information beyond working hours of organisations

When information can be availed electronically, this information can be accessed and downloaded at any time of the day. SMCFs are able to access and download information even beyond business hours of organisations. This eliminates any chances of missing tender information.

iii. Saves Money / Cut costs (Limited costs required for soliciting tender information)

Respondents indicated that it is cheaper to access information electronically as compared to getting information manually. Getting information manually or through traditional means involves the use of more resources, such as buying newspapers and having to approach many organisations or construction companies. Tender information can easily be missed when the newspaper is missed. Furthermore, respondents indicated that through the utilisation of electronic means, there is no need to incur travelling costs, including, fuel, road tolls and parking costs. Printing and postage costs are also avoided.

iv. Availability and accessibility of information is prolonged

The accessibility of information shared electronically is prolonged. The information would always be available for viewing on the electronic media used and this provide bases for reference to this information should it be required.

v. Saves Time

It is quicker and convenient to receive information electronically. SMCFs receive information by a click of the button, while accessing information through traditional means involves utilisation of more resources and time.

vi. Tender information received on time

Sending tender information electronically provides SMCFs with the advantage that the information can be received timeously to enable them to prepare their bids in time.

vii. Speedy exchange of information

SMCFs often share and exchange information. When information is available electronically, it is easy for SMCFs to exchange that information because they would refer each other to the relevant website without investing resources.

viii. There is trace of information and no chance of missing the advertisement

There is trace of all information send electronically to determine the sender and to establish whether the information is genuine or not. This also provides the benefit that the information is always available for interested parties to view.

Table 4.18: Benefits derived from utilisation of e-notification

Benefits	Respondents	Frequency	Ranking
Information is not limited by geographic location	QR04; QR09; QR10; QR11; QR12; QR17; QR18; QR21; QR23; QR25; QR27	11	1
Get information beyond working hours of organisation;	QR04; QR09; QR10; QR17; QR18; QR20; QR21; QR23; QR27	9	2
Saves money / Cut costs (Limited costs required for soliciting tender information)	QR01; QR02; QR05; QR07; QR09; QR11; QR16; QR26	8	3
Availability and accessibility of information is prolonged	QR13; QR17; QR18; QR20; QR21	5	4
Saves time	QR01; QR05; QR07	3	5
Tender information received on time	QR21; QR22; QR23	3	5
There is trace of information and no chance of missing the advert or notice	QR13; QR16; QR17	3	5
Speedy exchange of information	QR08;	1	6

4.5.1.2 Ranking the benefits of utilisation of e-notification

Table 4.18 also provides a ranking of these benefits by order of popularity as derived from the data collected from the respondents.

It was established from the table above that the most common benefits realised by SMCFs from the implementation of e-notification is the availability of information on tender opportunities. Benefits that relate to the availability of tender opportunities occupy the first and second positions. The third benefit is the cost saving benefit associated with the adoption of e-notification while all the following benefits relate to the availability of information.

4.5.1.3 Categorisation of the benefits of e-notification

It was established that the benefits of the adoption and implementation of e-notification indicated and ranked before are interlinked. They can broadly be categorised into 3 broad categories namely:

- Information availability and accessibility;
- Time saving; and
- Cost saving.

The benefits are rearranged as shown on the Table 4.19 and ranked in order of the most frequently mentioned category.

Table 4.19: Categorisation of the benefits of e-notification implementation

Category	Benefit	Identification of respondents that indicated the benefit	Combined response	Frequency	Percentage
Information Availability and Accessibility	Get information beyond working hours of organisation	QR04; QR09; QR10; QR17; QR18; QR20; QR21; QR23; QR27	QR04; QR08; QR09; QR10; QR11; QR12;	16	59

Table 4.19: Categorisation of the benefits of e-notification implementation

Category	Benefit	Identification of respondents that indicated the benefit	Combined response	Frequency	Percentage
Information Availability and Accessibility	Information is not limited by geographic location	QR04; QR09; QR10; QR11; QR12; QR17; QR18; QR21; QR23; QR25; QR27	QR13; QR16; QR17; QR18; QR20; QR21; QR22; QR23; QR25; QR27		
	Availability and accessibility of information is prolonged	QR13; QR17; QR18; QR20; QR21			
	There is trace of information	QR13; QR17			
	Speedy exchange of information	QR08			
	Easy access for contractors	QR09			
	No chance of missing the advert	QR16			
Cost Savings	Saves money / Cut costs	QR01; QR02; QR05; QR07; QR09; QR11; QR16; QR26	QR01; QR02; QR05; QR07; QR09; QR11; QR16; QR26	8	30
Time Savings	Saves time	QR01; QR05; QR07	QR01; QR05; QR07	3	11

Around 59% of the respondents indicated that they benefit from the availability of information during e-notification. The cost savings benefits were indicated by about 30% of the respondents, while around 11% of the respondents indicated the time saving benefit derived from the adoption of e-notification.

4.5.2 Tendering (Bid Preparation)

It was established that the implementation of e-tendering is restricted to document provision through the e-tenders portal, where tender documents can be downloaded by SMCFs. The issuance of tender documents through the traditional paper based approach is still rampant. The benefits derived by SMCFs from the adoption and implementation of e-tendering were investigated and the following benefits were identified in the research.

4.5.2.1 The Benefits of e-tendering

This section dwells on the discussion of the benefits relating to the adoption and implementation of e-procurement as indicated by respondents.

i. Reduction in time required to compile and consolidate tender documentation

Table 4.20 shows that 9 of the respondents indicated having derived the time saving benefit through the use of e-tendering. The time saving is due to the speed with which information is disseminated. This includes the distribution of tender documentation. SMCFs are able to download tender documentation in the comfort of their homes or offices. They do not require to travel to obtain tender documents. This saves them a lot of time and resources.

Pricing tender documents based on electronic documents is quick. The overall time spent pricing the tender document is drastically reduced. This gives SMCFs ample time to work on other projects or price more tenders than they could, using traditional paper based pricing methods were used. Clarifications are often sent electronically and responses are received electronically. The clarifications are received in time by the relevant parties and responses are sent timeously as well. Responses are standardised and are received by all tenders.

ii. Quick and fast when filling in the document (pricing)

Pricing electronic tender documents often involves the inserting of the rates, while the extensions and additions are done automatically or formulae can be set to do the extension and additions. This results in the whole pricing process being fast. Table 4.20 shows that 11 respondents indicated this benefit. They further indicated that this makes it possible to price more tender documents than when use traditional paper based means.

iii. Minimises errors

Pricing electronic based tender documents reduces mathematical errors. Furthermore, it is easy to complete tender documents that are provided electronically. Formulae for extending or multiplication and totalling figures are provided for. This eliminates the need for rechecking, as totals would have been added or multiplied automatically. Even if the information obtained using electronic bids is to be transferred to hard copy documents, the resultant document is of improved quality. Table 4.20 indicated that 11 respondents alluded to having derived this benefit in their operations.

iv. Improves quality of submissions

The elimination of errors improves the quality of submissions. Limited cancelling and corrections are found within the documents.

v. Reduces tender administration costs

Tendering costs refer to all costs incurred leading up to the preparation and finalisation of tender bids. These costs include travelling costs, costs to procure hard copy documents, costs of photocopying, to mention but a few. The use of electronic documents eliminates these expenses. This reduces the overall tender administration costs.

Utilisation of electronic based documents reduces the need to make copies to solicit for quotations or prices from suppliers and subcontractors. SMCFs are not required to pay a deposit of either R500.00 or R1000.00 when they

download electronic documents. This deposit is required during the procurement of hard copy tender documents. This, therefore, reduces SMCFs' operation costs.

vi. Promoting green environment initiatives

The utilisation of electronic tender documentation helps in addressing the need to green procurement processes through reduction of paper use. It further reduces the effects of climate change.

vii. Reduction in the number of procurement staff employment

Pricing of electronical based tender documents requires less staff than when pricing is done manually. Further to that, pricing based on electronic tender documents is done faster than that on hard copy based tender documents. The expenses towards staff remuneration are reduced leading to reduced overall procurement costs and increased SMCFs' profitability.

viii. Easy to distribute document to suppliers and subcontractors

When SMCFs are pricing tender documents, they require input from material suppliers, subcontractors and other stakeholders. It is easy to extract this information and send to these stakeholders for them to price their sections and send back to the contractors.

ix. Get document soon after advertising

Issuing of tender documents electronically ensures that SMCFs obtain tender documentation soon after advertising. Documents are readily available electronically. It eliminates instances where demand for documents exceeds supply, resulting in SMCFs having to wait for documents thereby leaving little time for them to compile the documents.

x. Easy storage of documentation for future use

Electronic documents are easily stored this makes them easily available for future reference or benchmarking when working on other projects.

Table 4.20: Benefits derived from the utilisation of e-tendering adoption

Benefit	Identification of Respondents who indicated the benefit	Frequency	Ranking
Reduction in time required to compile and consolidate tender documentation	QR01; QR02; QR12; QR13; QR14; QR15; QR18; QR20; QR26	9	2
Quick and fast when filling in the document (pricing)	QR03; QR04; QR10; QR11; QR15; QR18; QR19; QR20; QR23; QR24; QR26	11	1
Minimises errors	QR04; QR09; QR10; QR11; QR12; QR14; QR16 ; QR19; QR23; QR24; QR25	11	1
Improves quality of submissions – returnable schedules	QR04; QR11; QR23; QR24	4	4
Reduces costs of having to make copies (cost saving)	QR02; QR04; QR07; QR10; QR12; QR13; QR23	7	3
Promoting green environment initiatives	QR05	1	7
Reduction in the number of procurement staff employment	QR07; QR12	2	6
Easy to distribute document to suppliers and subcontractors	QR16; QR16	1	9
Get document soon after advertising	QR17; QR20; QR21	3	5
Easy storage of documentation for future use	QR24; QR25	2	6

4.5.2.2 The Ranking of the benefits derived from e-tendering

The benefits experienced by SMCFs derived from the adoption and implementation of e-tendering was ranked according to the frequency indicated by the respondents. Table 4.20 provides the ranking of these benefits.

It was established that the most common benefits realised by the SMCFs pertain to ease of compilation and reduction of mathematical errors when e-tendering is implemented. These are then followed by the time saving benefits associated with the implementation of e-procurement. The time saving benefits are then followed by the cost saving benefits.

The least common benefits that were indicated by SMCFs are to do with the promotion of green environment initiatives and the ease of distributing documents to suppliers and sub-contractors.

4.5.2.3 The categorisation of the benefits of e-tendering

The benefits indicated in section 4.5.2.1 can be put into four broad categorises as shown in Table 4.21. These four broad categories are:

- Improved quality of tender submissions;
- Reduction in tendering time;
- Reduction in tendering cost; and
- Other.

The categorisation of the benefits indicated that around 59% of the respondents confirmed to have derived benefits related to the improved quality of tender submissions and the reduction in tendering time. This has given the tenderers more time to work on other tenders or other projects. About 26% of the respondents indicated that they have benefited from the reduction in tender administration costs while about 4% indicated the benefit associated with the promotion of green environment initiatives.

Table 4.21: Categorisation of the benefits of e-tendering

Category	Benefit	Identification of respondents that indicated the benefit	Combined response	Frequency	Percentage
Improved quality of tender submissions	Minimises errors	QR04; QR09; QR10; QR11; QR12; QR14; QR16 ; R19; QR23; QR24; QR25	QR04; QR09; QR10; QR11; QR12; QR14; QR16; QR17; QR19; QR20; QR21; QR23; QR24; QR25; QR26;QR27	16	59
	Get document soon after advertising	QR17; QR20; QR21; QR27			
	Improves quality of submissions – returnable schedules	QR04; QR11; QR23; QR24			
Reduction in tendering time	Quick and fast when filling in the document (pricing)	QR03; QR04; QR10; QR11; QR15; QR18; QR19; QR20; QR23; QR24; QR26	QR01; QR02; QR03; QR04; QR10; QR11; QR12; QR13; QR14; QR15; QR18; QR19; QR20; QR23; QR24; QR26	16	59
	Reduction in time required to compile and consolidate tender documentation	QR01; QR02; QR12; QR13; QR14; QR15; QR18; QR20; QR26			
Reduction in tendering costs (tender administration costs)	Reduces tender administration costs	QR02; QR04; QR07; QR10; QR12; QR13; QR23	QR02; QR04; QR07; QR10; QR12; QR13; QR23	7	26
	Reduction in the number of procurement staff employment	QR07; QR12			
Other	Promoting green environment initiatives	QR05	QR05	1	4

4.5.3 Tender Submission & Evaluation

In section 4.4.4, based on the responses from the participants, it was established that tender submission on GDID infrastructure projects are done manually, through the submission of documents in the tender box situated at the GDID offices. It can be said that GDID does not utilise the e-submission methodology of e-procurement. It can further be surmised that when tender documents are submitted manually, evaluation of those documents is done manually and that e-evaluation is not implemented.

4.5.4 Contract Award

In section 4.4.5, based on the responses from the participants, it was established that contract award is predominantly done manually. However, some respondents indicated that they have received electronic confirmations of award upon request for such award letters to be emailed to them. Below are the benefits that were indicated to have been derived by these respondents through the utilisation of the e-contract award methodology.

4.5.4.1 Benefits derived from the utilisation of e-contract award

Table 4.22 provides the benefits associated with the implementation of e-contract award. These benefits are:

i. Saves Time

The sending of award letters to SMCFs electronically is time saving in that SMCFs do not need to travel to get the award letter. Travelling consumes time and resources that could be channelled to other profitable tasks.

ii. Trace of award documents

Documents send electronically can be retrieved, verified and stored easily. Verification is done through tracing the address from which documents are sent.

iii. Notification is received faster

The sending of award letters electronically means that they can be received by SMCFs faster and quicker. They immediately start working and mobilising the necessary resources for the project.

iv. Publishing awards eliminate probability of corruption and officials holding on to appointments for financial gain

The respondents obtained on this section brought with them another dimension of e-contract award. This dimension involves the public notification of awards of infrastructure projects. According to the respondents, this assist in the provision of lessons learnt on pricing by SMCFs on the pricing methodologies employed by other companies and in elimination of corruption. It further eliminates the possibility of withholding of award letters for financial gain by officials.

v. Enhances transparency

Transparency is one of the main objectives to be achieved in procurement. Implementation of e-contract assures transparency through public notification of awards and the sending of award letters electronically.

vi. Reduces travelling costs

Sending of award letters electronically reduces the need of travelling to collect the award letters. The resources used to travel to collect award letters are channelled to other purposes that enhance the SMCFs operations.

Table 4.22: Benefits derived from the use of e-contract award

Benefit	Identification of Respondents who indicated the benefit	Frequency	Ranking
Saves Time (Reduce delivery timelines)	QR01; QR02; QR05; QR09; QR10; QR15; QR23; QR26; QR27	9	1
Trace of award documents	QR04; QR11; QR16; QR23; QR25	5	2
Notification is received faster	QR05; QR09; QR10; QR15; QR26	5	2
Publishing awards eliminated probability of corruption and officials holding on to appointments for financial gain	QR06; QR16	2	4
Enhances transparency	QR08; QR16	2	4
Reduces travelling costs	QR17; QR19; QR24; QR27	4	3

4.5.4.2 Ranking the benefits of utilisation of e-contract award

The benefits described above are ranked according to the frequency they were mentioned by the respondents.

The most frequently mentioned benefit experienced by SMCFs through the adoption and implementation of e-contract award is the time saving benefit. This is followed by the benefits attributed to the speed with which award letters are sent or communicated and traceability of documents. This is then followed by the cost saving benefit. Last on the list are benefits with regards to enhancing transparency and publication of awards.

4.5.4.3 Categorisation of the benefits of e-contract award

The benefits identified and ranked before can be categorised into three main categories, which are:

- Time saving;
- Cost saving; and
- Transparency and accountability.

Table 4.23: Categorisation of the benefits of e-contract award

Category	Benefit	Identification of respondents that indicated the benefit	Combined response	Frequency	Percentage
Time Saving	Saves Time (Reduce delivery timelines)	QR01; QR02; QR05; QR09; QR10; QR15; QR23; QR25; QR26	QR01; QR02; QR05; QR09; QR10; QR15; QR23; QR25; QR26	9	33
	Notification is received faster	QR05; QR09; QR10; QR15; QR26			
Transparency and accountability	Publishing awards eliminated probability of corruption and officials holding on to appointments for financial gain	QR06; QR16	QR04; QR06; QR08; QR11; QR16; QR23; QR26	7	26
	Enhances transparency	QR08; QR16			
	Trace of award documents	QR04; QR11; QR16; QR23; QR26			
Cost Saving	Reduces travelling costs	QR17; QR19; QR24; QR27	QR17; QR19; QR24; QR27	4	15

Table 4.23 shows that only 20 of the 27 respondents who participated in the research indicated to have benefited from e-contract award. The response rate was around 74%. The most common benefit indicated by the respondents after this categorisation was the time saving benefit. 33% of the respondents indicated benefitting from time saving. The

time saving benefit is followed by the need for transparency and accountability, which accounted for 26% of the respondents, while least on the list was the cost saving benefit, with only 15% of the respondents indicating this benefit.

4.5.5 Contract Management

It was mentioned in section 4.4.6 of this report that both traditional and electronic means are used in the contract administration or management stage. The research question, however, required that SMCFs indicate benefits they derived from the implementation of the electronic procurement systems. Table 4.24 provides the detailed list of the benefits as indicated by the respondents.

4.5.5.1 Benefits of utilisation of e-contract administration

The benefits realised from the implementation of e-contract management methodologies, as indicated above, are discussed in this section.

i. Real time communications of instructions, scope changes and reports

Communication is done in real time. Thus instructions and reports are received immediately following their sending. This enables work to commence immediately without the delays associated with waiting for documents or confirmations.

ii. Works can be done faster

This benefit is the result of (i) above. Fast and quick confirmation of instructions and reports means that work commences immediately without being subjected to waiting for confirmations in hard copy format.

iii. Cost savings on resources

It is easy to send instructions and reports to many recipients electronically at the same time. If this is done through traditional means, considerable amount of financial resource would be required to accomplish this. It is therefore cost efficient to use electronic means to send project instructions and reports. Further, electronic means guarantee receipt of the information immediately, whilst information sent by traditional means can be delivered late.

iv. Reduced staff compliment

The use of electronic communications eliminates the need of staff required to deliver documents. This reduces the overall staff complement required in SMCFs and their salary bill. This increases their profitability.

v. Increased efficiency

The use of electronic means to send and receive documents ensures that communication on a project is effective and efficient. Reduced resources are used on communication.

vi. Easy to keep, trace and backup records

Electronic transactions leave a trail that can be referred to in future. Documents send electronically are easy to keep or store and backup.

vii. Easy to manage contract parameters and performance of projects

Electronic record keeping, reporting, and project tracking and monitoring systems provide platforms for tracking and benchmarking on project parameters, status and project performance. It is easy to track project expenditure, progress relative to the baseline programme and quality specifications.

viii. Enables document management

It has been indicated that documents send electronically can easily be stored and backed-up. Document management is also made easier.

Table 4.24: Benefits of e-contract management

Benefit	Identification of Respondents who indicated the benefit	Frequency	Ranking
Real time communication of instructions, scope changes; reports	QR01; QR02; QR04; QR05; QR06; QR11; QR12; QR13; QR14; QR15; QR17; QR19; QR20; QR21; QR22; QR23; QR24; QR25; QR27	19	1
Works can be done faster	QR03	1	5
Cost savings on resources	QR07; QR27	2	4
Reduced staff complements in procurement units	QR07	1	5
Increasing efficiency	QR08	1	
Easy to keep, trace records and backup	QR09; QR13; QR19; QR20; QR22	5	3
Easy to manage contract parameters and performance of projects	QR04; QR10; QR11; QR12; QR14; QR23; QR24; QR25	8	2
Enables document management	QR12	1	5

4.5.5.2 Ranking the benefits e-contract management

Table 4.24 provides the ranking of benefits from utilisation of e-contract administration, as indicated by the respondents during data collection. The most common benefit realised, as indicated by the SMCFs, is real time communication. This is followed by the benefit of ease of managing and reviewing contract parameters and contractor performance. Document management then follows this benefit and then comes the cost saving benefit. At the bottom, are the benefits associated with speed of execution of the project and reduced staff complements in the procurement unit.

4.5.5.3 Categorisation of the benefits of e-contract management

It can be realised that the benefits indicated here are related to each. Regrouping of these benefits to identify the effect of the regrouping into different categories which are indicate below would mean that the results would be as indicated in Table 4.25.

The categories are:

- Real time communication;
- Easy document management;
- Easy contract monitoring and evaluation; and
- Cost saving.

Table 4.25: Categorisation of the benefits of e-contract management

Category	Benefit	Identification of respondents that indicated the benefit	Combined response	Frequency	Percentage
Real time communication	Real time communication of instructions, scope changes; reports	QR01; QR02; QR04; QR05; QR06; QR11; QR12; QR13; QR14; QR15; QR17; QR19; QR20; QR21; QR22; QR23; QR24; QR25; QR27	QR01; QR02; QR03; QR04; QR05; QR06; QR08; QR11; QR12; QR13; QR14; QR15; QR17; QR19; QR20; QR21; QR22; QR23; QR24; QR25; QR27	21	78
	Increasing efficiency	QR08			
	Works can be done faster	QR03			

Table 4.25: Categorisation of the benefits of e-contract management

Category	Benefit	Identification of respondents that indicated the benefit	Combined response	Frequency	Percentage
Easy contract monitoring and evaluation	Easy to manage contract parameters and performanc e of projects	QR04; QR10; QR11; QR12; QR14; QR23; QR24; QR25	QR04; QR10; QR11; QR12; QR14; QR23; QR24; QR25	8	30
Easy document management	Easy to keep, trace records and backup	QR09; QR13; QR19; QR20; QR22	QR09; QR13; QR19; QR20; QR22	5	19
Cost Saving	Cost savings on resources	QR07; QR27	QR07; QR27	2	7
	Reduced staff compliment in procuremen t units	QR07			

The regrouping of the benefits confirms that the most common benefit realised by SMCFs is the provision of real time communication (78%). The second benefit realised related to the ease of management of contracts through contract monitoring and evaluation mechanisms therein (30%). This is then followed by the provision of the platform for document management (19%), whilst the cost benefit is in fourth position on the list (7%).

4.5.6 Payments Processing

Section 4.4.6.3 of this report indicated that payments to SMCFs are done both manually and electronically. The explanation given was that the SMCFs submit invoices manually, which are then scanned and converted electronically, then processed electronically and payment done through electronic means. This section identifies the

benefits of the implementation of this electronic system in processing payments. Table 4.26 indicates the benefits derived for the data collected from SMCFs.

4.5.6.1 Benefits derived from the utilisation of e-payments

This section dwells on discussing the benefits indicated by the respondents.

i. Record of documents received is kept and easily retrieved for further reference

It was indicated that upon receipt of payment claims from SMCFs, they are immediately scanned. This provides a means of safeguarding submitted documentation and ensures that processing of the payment begins immediately. The scanned documents may easily be retrieved for reference purposes.

ii. Ease of storage

The scanning of invoices and attached documents provides a safe method of storing the submitted information. There is no need for having large archives for storing physical documents, since they can be stored easily electronically.

iii. Make payments faster (reduced payment turnaround time)

The implementation of e-payments has been credited with cutting down the payment turnaround timelines. Payments claims were processed faster.

iv. Payments are more secure

One of the main disadvantages of the use of traditional means, especially for storing documents, is that documents can easily be misplaced or lost. The implementation of e-payments eliminates the risk associated with misplacement of documents or losing them. The electronic document storage is more secure.

v. Easily viewed payment status

The status on the progress of payments of submitted invoices can easily be reviewed and tracked by SMCFs.

vi. Payments are traceable

It is easy to trace invoices and get update on the status or progress of payments.

vii. Cuts travel costs

The use of e-payments eliminates the need for travel, especially for collection of payments, as compared to where payments are made through cheques.

viii. Reduce risks associated with carrying cash or cheques

The use of e-payments reduces the risk associated with having to carry cash or cheques. The transactions are more secure and convenient.

Table 4.26: Benefits derived from the utilisation of e-payments

Benefit	Identification of Respondents who indicated the benefit	Frequency	Ranking	Percentage
Record of documents received is kept and easily retrieved for further reference	QR01; QR09	2	3	7
Easy for storage	QR01;	2	3	7
Make payments faster (reduced payment turnaround time)	QR02; QR04; QR05; QR08; QR09; QR10; QR11; QR12; QR13; QR14; QR23; QR24; QR25; QR26	14	1	52
Payments are more secure	QR02;	1	4	4
Easily view payment status	QR05;	1	4	4

Table 4.26: Benefits derived from the utilisation of e-payments

Benefit	Identification of Respondents who indicated the benefit	Frequency	Ranking	Percentage
Payments are traceable	QR05; QR10; QR17	3	2	11
Cuts Travel costs	QR07	1	4	4
Reduce risks associated with carrying cash or cheques	QR07	1	4	4

4.5.6.2 Ranking of the benefits of utilisation of e-payments implementation

Table 4.26 shows the ranking of benefits of utilisation of e-payments as indicated by respondents. The ranking is from the most common to the least common.

The most common benefit noted by the respondents was that payments are made faster (52%). This improves the SMCFs' cash flows, increases their production rate on site and eliminates the detrimental effect of having to be charged interest on late payments by their creditors. The second common benefit is the traceability of documents or invoices (11%). This eliminates the chance of having to resubmit documents. The third benefit concerns the recording and ease of retrieval of documents (7%) and the storage of documents (7%). Least of the ranking are the benefits indicated with respect to the payments being more secure (4%), ease of viewing payment status (4%), cutting on travel costs (4%) and the reduction of risks associated with carrying cash or cheques (4%).

4.5.7 Project Closure

In section 4.4.6.2, it was indicated that project closure is currently done through traditional means. This is attributed to the issuing of compliance certificates in hard copy format by the relevant legislated authorities. The resultant documentation is therefore done in hard copy or through traditional means.

4.6 FACTORS INHIBITING E-PROCUREMENT ADOPTION BY SMCFs

Having established the GDID implemented selected e-procurement methodologies, it was prudent to investigate and determine the impacts of these adopted e-procurement methodologies through assessing the factors that hinder adoption and implementation of e-procurement systems by SMCFs.

The approach adopted was to derive these factors from the responses provided by the respondents. These factors were tabulated, indicating the respondent that mentioned them. The factors were ranked according to the frequency they had been mentioned by the respondents. Similar factors were grouped.

The methodology adopted was to identify the factors impacting SMCFs e-procurement adoption at each stage of the project life cycle. The stages considered were as follows:

- Tender notification;
- Bid preparation;
- Tender/ Bid submission;
- Tender/ Bid Evaluation;
- Contract Award;
- Contract Administration;
- Payments Processing; and
- Project Closure.

4.6.1 E-notification

The respondents were requested to identify the inhibiting factors that hinder the adoption and implementation of e-notification. Their responses were recorded as indicated in Table 4.27.

4.6.1.1 Factors inhibiting e-notification implementation

This section provides a discussion on the captured inhibiting factors that impact the SMCFs uptake of e-notification.

i. **Lack of technology (e.g. laptops, data)**

Most SMCFs do not have the financial resources to procure the equipment needed for them to realise this benefit. This equipment includes laptops and the associated ICT infrastructure.

ii. **Access to ICT infrastructure**

ICT infrastructure in South Africa is not as advanced as in other developed countries. There is limited, to no ICT infrastructure, in some areas. This infrastructure includes reliable networks to feed into the equipment that contractors have.

iii. **Internet fraud**

There has been growing fraud crimes encountered on the Internet. This makes people wary of information found on the Internet, leading them to be unresponsive to notifications scoured from the Internet.

iv. **Computer Skills**

The degrees of computer skills that are available within most SMCFs are very low. There is a general lack of knowledge on how to use computers and how to access information on the Internet.

v. **Lack of knowledge**

Most SMCFs indicated that they do not know where information on infrastructure projects tender notifications is obtained.

vi. **Limited access to electronic media**

Limited access to electronic media is common to most SMCFs. This is caused by the high set up cost of ICT infrastructure and equipment.

vii. Internet costs are too high

Internet costs are too high for many SMCFs, especially the new industry entries. These costs include the set up costs of ICT infrastructure, equipment and data. Most SMCFs cannot afford them. SMCFs end up having restricted or limited access to the Internet.

viii. Immaturity of providers of e-procurement services

There are many e-procurement service providers. Despite them being many, their services do not complement each other, and as a result, SMCFs end up not knowing which e-procurement software to procure given that they are many. E-procurement providers need to collaborate to produce software that can easily be interfaced.

ix. Lack of supplier preparation

Suppliers of e-procurement methodologies are not well versed with the operations of the SMCFs and this renders their developments unsuitable for SMCFs.

x. Restricted access to Internet

SMCFs often have restricted access to the Internet. This is caused by the high set-up costs of the ICT infrastructure and that of the data.

xi. Resistance to change

Most SMCFs are used to obtaining information on tender notifications using traditional means and are reluctant to change and adopt new systems. Others have well established procurement units with resources already deployed to provide this function. Fear of job losses causes resistance to change.

xii. Lack of capital

The set-up costs of ICT infrastructure are too high most SMCFs cannot afford them.

Table 4.27: Factors inhibiting e-notification

Inhibiting factor	Identification of Respondents who indicated the inhibiting factor	Frequency	Percentage	Ranking
Lack of technology (e.g. laptops, data)	QR01; QR10; QR23	3	11	6
Access to ICT infrastructure	QR02; QR04; QR10; QR11; QR12; QR13; QR22; QR23; QR25	9	33	2
Internet fraud	QR02	1	4	8
Computer skills	QR02; QR20; QR21	3	11	6
Lack of knowledge	QR03; QR05: QR09; QR11; QR12; QR13; QR14; QR17; QR18; QR21; QR23; QR24; QR26; QR27	14	52	1
Limited access to electronic media	QR06	1	4	8
Internet costs are too high	QR02; QR07; QR10; QR14; QR17; QR20; QR27	7	26	3
Immaturity of providers of e-procurement services	QR08;	1	4	8
Lack of supplier preparation	QR08;	1	4	8
Restricted access to Internet	QR09; QR17; QR20; QR25	4	15	5
Resistance to change	QR11; QR21	2	7	7
Lack of capital	QR11; QR13; QR14; QR22; QR24; QR25	6	22	4

4.6.1.2 Ranking of the factors inhibiting e-notification implementation

Table 4.27 shows the ranking of the negative impacts associated with the utilisation of e-notification as experienced by the SMCFs. The ranking showed that the most common inhibiting factor hindering SMCFs' adoption of e-notification is the lack of knowledge (52%). This is followed by the limited access to ICT infrastructure (33%), high Internet costs (22%) and high capital costs required for setting up ICT

infrastructure and equipment (22%). Some of the factors indicated by the respondents are to do with restricted access to the Internet (15%), lack of computer skills (11%) and resistance to change (7%). The less common inhibiting factors, mentioned by respondents are to do with the security of transactions or Internet fraud (4%), limited access to electronic media (4%) and the lack of supplier preparation (4%).

4.6.2 E-tendering

The respondents were requested to indicate the inhibiting factors that they experience in their adoption and implementation of e-tendering methodologies. The indicated factors are as represented in Table 4.28.

4.6.2.1 Factors inhibiting e-tendering implementation

This section provides a discussion of the factors that inhibit e-procurement implementation by SMCFs.

i. Experience on utilisation of information

There is lack of knowledge amongst SMCFs on how to access, download and utilise the information in the tender documentation received. There is lack of experience of dealing with electronic information with respect to bids.

ii. Use of software that small contractors do not have

The documents that are provided electronically sometimes come in software that is not compatible with the software that SMCFs have. These documents fail to open as a result.

iii. High Internet costs

Tender documents, specifications and drawings are often voluminous documents. The data used for downloading these documents is quite substantial and this makes the whole process expensive.

iv. Manual tendering (manual pricing and submission)

It was indicated by some respondents that even though GDID provides electronic tender documents on the e-tenders portal or by request, the pricing

of the documents has to be transferred and submitted manually. This eliminates the benefits that could have been realised by pricing electronically.

v. Lack of knowledge

There is lack of knowledge amongst SMCFs with regards to the platforms where electronic tender documents are obtained.

vi. Resistance to change

SMCFs are used to obtaining hard copy documents, where they pay a deposit fee of either R500.00 or R1000.00 depending on how big the document is. They are reluctant to explore and adopt new practices, where they can obtain tender documents from internet platforms.

vii. Non compatibility of software

Sometimes the software that the electronic documents are generated on is not compatible with the software that SMCFS have. This forces SMCFs to revert to tendering using traditional means.

Table 4.28: Factors inhibiting e-tendering implementation

Inhibiting factor	Identification of Respondents who indicated the inhibiting factor	Frequency	Percentage	Ranking
Experience on utilisation of information	QR01	1	4	5
Use of software that small contractors do not have	QR01	1	4	5
High Internet costs	QR01; QR07; QR10; QR14; QR16; QR20; QR21; QR22; QR24; QR25; QR27	11	41	1

Table 4.28: Factors inhibiting e-tendering implementation

Inhibiting factor	Identification of Respondents who indicated the inhibiting factor	Frequency	Percentage	Ranking
Manual tendering i.e. pricing and submission	QR05; QR11; QR12; QR13; QR18; QR23	6	22	2
Lack of knowledge	QR06; QR09; QR20	3	11	3
Resistance to change	QR08; QR21	2	7	4
Non compatibility of software	QR17; QR24; QR25	3	11	3

4.6.2.2 Ranking of the factors inhibiting e-tendering implementation

Table 4.28 shows the ranking of the inhibiting factors that hinder the adoption and implementation of e-tendering methodologies by SMCFs. The most frequently indicated inhibiting factor to e-tendering adoption and implementation was the high Internet costs (41%). Rates and totals of pricing still have to extracted and submitted manually in hard copies (22%). SMCFs consider that there is no need to use the electronic version after considering the labour that will be involved to transfer the information. Following these, are the inhibiting factors relating to lack of knowledge (11%) on where and how to get electronic documents, and non-compatibility of software. The non-compatibility of software packages (11%) means that SMCFs are unable to open documents and have to resort to the procurement of hard copy documents.

4.6.3 E-submission and E-evaluation

The respondents indicated that these processes were still being done manually. There are therefore no negative impacts that SMCFs are experiencing in the electronic submission and evaluation of tenders or bids.

4.6.4 E-contract award

Some respondents indicated that they received award letters electronically from the GDID. There was therefore need to establish the inhibiting factors that impact on the uptake or usability of e-contract award. Below are the factors that were indicated by

respondents on the adoption and implementation of e-contract award methodologies implemented by the GDID.

4.6.4.1 Factors inhibiting e-contract award implementation

This section provides a discussion on the e-contract award inhibiting factors as indicated in Table 4.29.

i. No feedback process on project award

The respondents indicated that the current e-contract award process does not broadcast the award winning tender to all bidders. Tenderers do not get feedback when their bids fail.

ii. No platform for drawing lessons based on the previous tenders

The fact that there is no feedback system or the evaluation report means that tenderers do not have a platform for drawing lessons learnt on each tender. Lessons learnt are important indicators to SMCFs on how they should adjust their tendering methodology.

iii. Access to the Internet

The high Internet costs mean that SMCFs are not often online. This results in SMCFs missing out on some tender opportunities.

iv. No guarantee of security and control

Myriad internet fraud cases have been reported. There is therefore need for cross checking and verifying information shared or send electronically before committing resources.

v. Documents may be sent to the wrong address or recipients

Documents sent electronically are exposed to the risk of being sent to the wrong address or to the wrong recipients.

Table 4.29: Factors inhibiting e-contract award implementation

Inhibiting factor	Identification of Respondents who indicated the inhibiting factor	Frequency	Percentage	Ranking
No feedback process on project award	QR04; QR12; QR13; QR15; QR19; QR23	6	22	1
No platform for drawing lessons based on previous tenders	QR05	1	4	4
Access to the Internet	QR07; QR14; QR24; QR25	4	15	2
No guarantee of security and control	QR08	1	4	4
Documents send to wrong address/ recipients	QR10; QR27	2	7	3

4.6.4.2 Ranking the inhibiting factors to e-contract award utilisation

Table 4.29 provides the ranking based on responses by respondents on the negative impact experienced by SMCFs during e-contract award. The greatest negative impact experienced by SMCFs in contract award is lack of feedback on contract award (22%). The next inhibiting factor identified was access to the Internet (15%), mainly attributed to the high Internet costs. This is followed by the risk associated with sending of information to wrong recipients (7%). At the bottom of the rankings are the inhibiting factors associated with the security (4%) and the non-existence of platforms to draw lessons learnt (4%).

4.6.5 Contract Management

The respondents indicated that they used e-contract management methodologies. The researcher sought to establish the inhibiting factors that hinder adoption and implementation by SMCFs.

4.6.5.1 Factors inhibiting e-contract management implementation

A discussion on the inhibiting factors that hinder e-contract management implementation is undertaken in this section.

i. **High Internet cost**

Internet costs are high to most SMCFs and impede their desire to incorporate the use of Internet in their day to day operations. Staying online require data and the cost of data is very high, especially to small companies.

ii. **Records can easily be lost if not properly managed**

Records storage and management electronically can be too risk since the information can be lost due to mistakes. There is therefore need to have substantial investment in back-up systems, which further increases the cost of migration to electronic systems.

iii. **Training requirement**

Extensive amount of resources are required to train employees on the electronic systems to ensure optimal use and benefit.

iv. **Computer literacy**

Computer literacy level in SMCFs is very low. Over and above that, some software requires special skills for employees to derive optimal benefit of their usage.

v. **Non compatibility of software packages**

Documents and reports circulated between team members are often generated with different software. It has been found that most of these software are not compatible with each other meaning the recipient may not be able to open the documents or reports sent.

vi. Security of transactions

The worldwide web is prone to hacking. This exposes the information circulated electronically to tampering. Some of the information may be corrupted with viruses that may damage electronic equipment of the recipient of the information.

vii. Legal implications of electronic communications

There are different views on the legality and permissibility of information send electronically, especially when it is required to be used in dispute resolution. This compounded by the lack of pertinent case law. Therefore the use of electronic communications has to be backed up always or its permissibility must be included in the contract.

viii. Resistance to change

Resistance to change is often experienced where there are new systems or processes being introduced. This is often realised through reluctance to adapt to the new systems in favour of the way things were done previously. Some recognise only instructions written in the site instruction books as valid instructions and not those send through electronic means.

ix. Information not reaching intended recipients

Sometimes the information send may not reach the intended recipients due to a number of reasons. Either the email address used would have been captured wrongly, or the mail box of the recipient would be full and the recipient would not have realised it due to internet connection problems. This affects the efficiency of electronic communications.

x. Effect of power outages

Unreliable power supplies means that SMCFs have to have back-up power supply if they are to continue using electronic equipment during periods of

power outages. The provision of back-up power increases the capital costs of establishing ICT infrastructure.

xi. Unreliable Internet connections

The unreliability of Internet connectivity affects SMCFs if the areas are not well served with telecommunication infrastructure.

Table 4.30: Factors inhibiting e-contract management

Inhibiting factor	Identification of Respondents who indicated the inhibiting factor	Frequency	Percentage	Ranking
High Internet costs	QR01; QR10; QR14; QR19; QR20; QR22; QR25	7	26	1
Records can easily be lost if not properly managed	QR05	1	4	5
Training requirement	QR09	1	4	5
Computer literacy	QR09	1	4	5
Non compatibility of software packages	QR11; QR21; QR25	3	11	3
Security of transactions	QR11	1	4	5
Legal implications of electronic communication	QR11; QR13	2	7	4
Resistance to change	QR12	1	4	5
Information not reaching intended recipients	QR13; QR19; QR22; QR27	4	15	2
Effect of power outages	QR17; QR21	2	7	4
Unreliable Internet connection	QR21; QR25	2	7	4

4.6.5.2 Ranking the factors inhibiting e-contract management

Table 4.30 shows the ranked factors that are experienced by the SMCFs that inhibit the optimum benefit of e-contract management practices in the study area. The most frequently indicated inhibiting factor to the adoption and implementation of e-contract management is the high Internet costs (26%) required for constant and regular Internet access. Trying to reduce costs through switching on and off of the Internet drives away benefits linked to the provision of real time communication. The second inhibiting factor arises from the risk that information sent may not reach the intended recipients (15%). Non-compatibility of software packages (11%) was indicated as one of the factors that impact enormously on the adoption of e-contract management methodology. This is then followed by the risk associated with the effect of unreliable power supply (7%) caused by power outages during load shedding. The other factors at the same level with these include the unreliable Internet connection (7%) in some areas and the uncertainty on the admissibility of electronic information as evidence during dispute resolution (7%).

4.6.6 Payment Processing

It was established in section 4.4.6.3 of this report that payment processing involved the implementation of both electronic and traditional procurement methodologies. The traditional procurement methodologies involve the submission of invoices in hard copy format by SMCFs. The electronic methodologies commence from the electronic capturing of the invoices, scanning and approvals, up to and including, effecting electronic payments or transfers to SMCFs accounts. The negative impact experienced by SMCFs during the implementation of the current payment processes are as indicated in Table 4.31.

4.6.6.1 Factors inhibiting e-payments implementation

The section below provides a discussion of the inhibiting factors that impact on e-payments implementation.

i. **Scared to adopt to e-payment technology (due to phishing, scams and virus attack)**

Respondents indicated reluctance to use electronic technology due to the risks associated with phishing, scams and virus attack. This reason though not aligned to negative impacts experienced during payment processing, it does affect the adoption of e-procurement technologies by SMCFs.

ii. **Delays in payments processing**

Delays in payments processing were attributed to the fact that contractors are required to submit invoices in hard copies. These are exposed to misplacement or getting lost. The service provider in such instances would have to resubmit the invoice.

The other delay that can be experienced is due to the fact that SAP and the Primavera Unifier systems do not take payments that exceed the amounts or budget originally set for the project. In that case, normal project approval process would have to be followed so that the approved documents can be uploaded for the system to be able to process affected payments.

iii. **Not sure which e-procurement solution best meets companies' needs**

Though this negative impact is not aligned to payment processing, it is a valid negative impact that affect adoption of e-procurement methodologies by SMCFs. There are so many e-procurement solutions on the market and SMCFs do not know which ones best suit their operations.

iv. **Lack of computer skills**

Lack of computer skills was found not to be aligned to payment processing but a negative factor that inhibit e-procurement uptake by SMCFs.

v. Risk of making payments to wrong recipients

Respondents indicated the risk of making payments to wrong recipients. This can be contributed to the common practice of copying or cutting and pasting of supplier details. This affects the SMCFs who rightfully deserved to be paid when a payment is made to the wrong recipient. The correction period of this situation often take time and affect the cash flows of the SMCFs.

Table 4.31: Factors inhibiting e-payments application

Inhibiting factor	Identification of Respondents who indicated the inhibiting factor	Frequency
Scared to adapt to technology (due to phishing, scams, etc.)	QR01;	1
Delays in payments processing	QR03; QR04; QR05; QR06; QR12; QR13; QR18;	7
Not sure which e-procurement solution best meets companies needs	QR08	1
Lack of computer skills	QR09	1
Risk of making payments to wrong recipients	QR11; QR25	2

4.6.6.2 Ranking the inhibiting factors of e-payments application

Having realised that some of the factors identified by the researcher do not resonate with the inhibiting factors experienced by SMCFs in adoption and implementation of e-payments, the researcher eliminated these factors. The ranking therefore was only done based on the factors that were aligned to the inhibiting factors that impacted on the adoption and implementation of e-payments.

Table 4.32: Ranking of the factors that inhibit e-payments implementation

Inhibiting factor	Identification of Respondents who indicated the inhibiting factor	Frequency	Percentage	Ranking
Delays in payments processing	QR03; QR04; QR05; QR06; QR12; QR13; QR18;	7	26	1
Risk of making payments to wrong recipients	QR11; QR25	2	7	2

It was established from table 4.32 above, that only two factors reflect the negative impacts experienced in the payment processing. The more common negative impact is the delay in payments attributed to the submission of invoices through traditional means and the non-flexibility of electronic systems to be used in situations where project budgets are exceeded. The non-flexibility of the SAP and Primavera Unifier systems is however a good thing for effective project financial or expenditure controls. Responsible parties have to be pro-active and resolve authorisations upfront. The second negative impact is the one involving the risk of making payments to wrong recipients.

4.6.7 Project Closure

It was established in section 4.4.6.2 of this report that project closure is predominantly implemented through traditional methodologies. There are no electronic mechanisms implemented in project closure activities or processes.

4.7 OPPORTUNITIES IN E-PROCUREMENT ADOPTION

Respondents were asked to indicate the opportunities that they have realised from the adoption of e-procurement methodologies. These are discussed in section 4.7.1 of this report.

4.7.1 Opportunities realised from e-procurement adoption

The SMCFs sampled indicated that they derived the following opportunities from the implementation of e-procurement methodologies by the GDID.

i. Time Saving

Respondents indicated that some of the opportunities they realised included the reduction in tendering time. This gave them the opportunity to complete more tender documents and to concentrate on managing other projects that they were already implementing.

ii. Costing Saving

It was indicated that the cost saving arose from the elimination of incurring tender procurement costs, travel expenses, printing and postage charges. This reduced the entire tender administration expenses incurred by SMCFs.

iii. Quicker turnaround times in issuing and receiving project instructions

Implementation of e-procurement methodologies improved information flow. This reduced turnaround times from the time instructions were issued, received and executed.

iv. Reduction of their physical presence at the GDID offices

Utilisation and adoption of e-procurement methodologies helped to ensure that SMCFs did not spent most of their time unproductively while following up or purchasing documents at GDID offices.

v. Faster processing of procurement requirements

The reduction in turnaround times for information flow means that the processing of procurement requirements can be done more speedily to ensure that projects are completed within the set parameters.

vi. Increased profitability

The implementation of e-procurement methodologies increases SMCFs profitability. This was attributed to the reduction in tender administration costs (tendering costs) and operations costs of SMCFs. Reduced staff in the procurement units that implements e-procurement methodologies means that their salary bills are reduced. The increased production attributed to the reduced tendering times and the time spent managing projects on site contribute to increased profitability of SMCFs, which in turn improves their sustainability.

vii. Market enlargement (Increase sphere of influence of contractors)

Implementation of e-notification ensures that SMCFs received information on tender opportunities for infrastructure projects form many different areas. Information on projects obtained from the Tender Bulletin, CIDB website, e-tenders portal and the lead-2-business website is for infrastructure projects happening in South Africa and not restricted to Gauteng only. Thus SMCFs are able to grow their businesses.

viii. Increases competition

E-tendering allows bidders from all regions of the country to bid and the increased competition is to the benefit of the buyer. For tenderers, competing in many tenders, assist them in improving their tendering skills. This further increased their market visibility through the tendering of projects from different areas. The lessons learnt on each tender provided them with the market intelligence of tendering in different regions of the country.

ix. Creates fair environment

The implementation of e-procurement methodologies created a fair environment where information is shared at the same time among all SMCFs. It eliminated cases where other tenderers only get tender documents a few

days before tender closure, and as a result do not have ample time to prepare their bids.

x. Employee motivation

The nature and training involved in e-procurement provided more knowledge and skills to employees. This raised their motivation towards work and reduced staff turnover.

xi. Increases production rate on other projects

The reduction in tendering time, meant that more time was spent focussing on managing projects already on site and this increased productivity of the projects on site.

xii. Provides basis for project evaluation and monitoring

E-procurement methodologies provided basis for project evaluation and monitoring. Projects performance was monitored and benchmarked with other projects and ensured that corrective measures were taken without delay.

xiii. Provides Feedback and Information sharing platform

Implementation of e-procurement provided a platform for SMCFs to draw lessons learnt during procurement processes through the provision of feedback. This further provided a platform for information sharing. This is critical because most SMCFs have limited experience and knowledge of the construction industry.

xiv. Promotes transparency and accountability

The implementation of e-procurement methodologies enhanced transparency and accountability in procurement of projects. Information and documentation is availed at the same time and all transactions can be traced.

xv. Implementation of green building initiatives

Implementation of paperless procurement systems in e-procurement helped in curbing the effects of climate change and is compliant with the green building initiatives.

xvi. Improves quality of submissions

E-procurement implementation enhanced the quality of documents received by all parties. The documents were visible and assembly of documents was often easy.

xvii. Real time communication on tender information

SMCFs were able to receive tender notification on infrastructure projects in time and at their convenience. The information was available throughout the tendering period and after. This information can therefore easily be referred to in future.

Table 4.33: Opportunities realised through e-procurement implementation

Opportunity	Identification of Respondents who indicated the opportunity	Frequency	Percentage	Ranking
Time Saving	QR01; QR11; QR12; QR19; QR21	5	19	4
Cost Saving	QR01; QR02; QR19; QR20; QR21; QR27	6	22	3
Quicker turnaround times in issuing and receiving project instructions	QR02;	1	4	8
Avoiding physical presence at GDID offices	QR03	1	4	8
Faster processing of procurement requirements	QR03; QR15; QR20; QR26	4	15	5

Table 4.33: Opportunities realised through e-procurement implementation

Opportunity	Identification of Respondents who indicated the opportunity	Frequency	Percentage	Ranking
Increased profitability	QR04; QR10; QR11; QR12; QR13; QR14; QR16; QR17; QR19; QR21; QR23; QR25	12	44	1
Market enlargement (Increase sphere of influence of contractors)	QR04; QR10; QR12; QR13; QR17; QR21; QR22; QR23; QR24; QR25; QR27	11	41	2
Increases competition	QR04; QR06; QR23	3	11	6
Creates fair environment	QR06	1	4	8
Employee motivation	QR07; QR09; QR12; QR17	4	15	5
Increases production rate on other projects	QR11; QR12; QR13; QR22	4	15	5
Provides project evaluation and monitoring basis	QR11; QR25	2	7	7
Provides feedback to bidders and information sharing platform	QR11; QR25	2	7	7
Transparency and accountability	QR11	1	4	8
Implementation of green building initiatives	QR13; QR17	2	7	7
Improves quality of submissions	QR14	1	4	8
Real time communication on tender information	QR18; QR20; QR22; QR26; QR27	5	19	4

4.7.2 Ranking the opportunities realised from e-procurement adoption

Table 4.33 shows the ranking of the opportunities realised by SMCFs through the implementation of e-procurement methodologies. The ranking of the opportunities realised by SMCFs, as a result of the implementation of e-procurement methodologies, showed that the most frequently mentioned opportunity gained was the increased profitability (44%). This was attributed to the cost saving benefits of e-procurement methodologies that, among others, included reduction in travelling costs, tender administration costs, salary bills, printing and postage costs.

Second on list is the opportunity with regards to market enlargement (41%). This is mainly contributed to the adoption of e-notification that ensures that SMCFs get real time tender information on infrastructure projects, even beyond business hours and in the comfort of their business premises or homes.

Opportunities, as indicated by respondents, were given as: cost saving (22%), time saving (19%) and real time communication (19%). These are however closely related to increased profitability and market enlargement opportunities.

Other opportunities indicated included increased motivation of employees due to the training received (15%), increased production rate on site (15%) and faster processing of requirements (15%). These increase efficiencies of operations of the SMCFs.

At the bottom of the rankings are the opportunities related to quicker turnaround times in issuing and receiving project instructions (4%), avoiding physical presence at GDID offices (4%), transparency and accountability (4%) and the improved quality of submissions (4%).

4.8 BARRIERS TO E-PROCUREMENT ADOPTION ON THE SMCFs

The following factors indicated in Table 4.34 were given by the respondents as threats to the implementation of e-procurement by the SMCFs.

4.8.1 Barriers to e-procurement adoption as perceived by the SMCFs

The section below provides a discussion of the barriers to e-procurement implementation in the study area.

i. Lack of financial resource (high capital costs)

Installation and maintenance costs of e-procurement systems and equipment are very high and most SMCFS do not afford them. This is further compounded by the continuous updating of software, at a cost to the SMCFs.

ii. Lack of technical expertise (skills)

Most SMCFs do not have the technical knowhow of using e-procurement methodologies. They end up reverting to old ways of doing business.

iii. Lack of infrastructure

ICT infrastructure needs installation, maintenance and continuously upgrade. The availability of ICT infrastructure is not uniform. Some areas are well advanced and have sufficient ICT infrastructure, while others do not have. There is lack of ICT infrastructure in some areas. Further, SMCFs are required to procure compliant equipment for use with this infrastructure.

iv. Acceptability of electronic evidence

Some respondents are still afraid of the legal risk of the acceptability of electronic transmitted evidence or information's permissibility at law and in dispute resolution.

v. Security risk

Electronic transactions are exposed to hacking, Internet fraud, phishing and attacks by viruses. There is need for backup of information stored and sent electronically.

vi. The lack of government support

The government of South Africa has not been leading the cause for the utilisation of e-procurement, especially in public sector procurement. The government needs to promulgate legislations that enforce the implementation of e-procurement, otherwise organisations are not obligated to adopt and implement e-procurement, despite its benefits and impact on climate change.

vii. Continuous training requirements (skill development)

Most e-procurement systems are still new. There is therefore need for training of employees on how to adopt and use these systems. This adds to the operational costs of organisations and most SMCFs do not afford this training and hence they end up resorting to using traditional means.

viii. High Internet costs

Internet costs are very high for SMCFs. Internet connections are slow and unreliable. Some of the documents to be downloaded are too big and they require a lot of data that SMCFs can ill-afford.

ix. Unreliable power supply

The use of electronic systems is dependent on the availability of electrical power to operate the ICT equipment. The power from the national grid is however not reliable and sometimes prolonged periods of power outages are experienced. This jeopardises communication and operations in ICT dependent organisations. The installation of alternative power sources is expensive and most SMCFs do not afford it.

x. Non compatibility of software packages and applications

It is common that documents generated from different software are not compatible and may not be opened in other software. This presents a dilemma to SMCFs on which e-procurement solution to invest.

xi. Lack of knowledge

Some SMCFs lack the knowhow of where to get information. Thus the placement of tender notification on the Internet is not helpful to them because they do not know where to get this information. They, thus, continue to solicit for tender information through the mechanisms that they are accustomed to.

xii. Resistance to change

Resistance to change to adopt new systems is natural and affect all transformation initiatives. This is attributed to the fear of the unknown where organisations fear to invest in new systems that they do not have confidence in or have a record of its performance. They prefer the old way of doing.

Table 4.34: Barriers to e-procurement adoption

Threat	Identification of Respondents who indicated the threat	Frequency	Percentage	Ranking
Lack of resources (high capital costs)	QR02; QR07; QR09; QR11; QR12; QR15; QR20; QR22	8	30	2
Lack of technical expertise (skills)	QR02; QR05; QR06; QR11; QR15; QR26	6	22	4
Lack of infrastructure	QR04; QR12; QR18; QR22; QR23	5	19	5
Acceptability of electronic evidence	QR04; QR23	2	7	8
Security risk	QR02; QR03; QR04; QR06; QR13; QR19; QR23	7	26	3
No government support	QR04; QR17; QR23	3	11	7
Continuous training requirements	QR07	1	4	9
High Internet costs	QR10; QR12; QR13; QR14; QR17; QR19; QR20; QR22; QR24; QR25; QR26; QR27	12	44	1

Table 4.34: Barriers to e-procurement adoption

Threat	Identification of Respondents who indicated the threat	Frequency	Percentage	Ranking
Unreliable power outages	QR10; QR11; QR12; QR13; QR14; QR20; QR21; QR24	8	30	2
Non compatibility of software packages and applications	QR11; QR13; QR17; QR21	4	15	6
Lack of knowledge	QR14; QR18; QR26	3	11	7
Resistance to change	QR21	1	4	9

4.8.2 Ranking of the threats to e-procurement adoption

Table 4.34 provides the ranking of the threats experienced in the implementation of e-procurement methodologies by SMCFs. The most common threat impacting e-procurement adoption amongst SMCFs is the high Internet costs (44%). The high Internet costs mean that SMCFs are not able to derive full benefits of electronic systems in enhancing their operations. Second on the list are threats resulting from the lack of resources (high capital costs) for installation of ICT equipment and the unreliable (30%) and frequent power outages (30%). The high capital costs include the high Internet costs. These threats are interlinked.

These are followed closely by the security risk threats (26%) that are associated with the use of electronic systems or the use of the Internet. Lack of expertise (22%), lack of infrastructure (19%) and non-compatibility of software packages and applications (15%) threats follows in that order. At the bottom are threats associated with resistance to change and continuous training requirements (4%) and resistance to change (4%).

4.9 SUMMARY

The data collected from the fieldwork was presented and analysed. Ten GDID officials participated in the research and indicated that GDID implements the following e-procurement methodologies; e-notification using the Tender Bulletin, CIDB website,

Department of National Treasury E-tenders portal and Lead-2-Business website; e-tendering using the Department of National Treasury E-tenders portal; e-contract award, e-contract management, e-payments and e-MRO using the GDID E-Maintenance portal. It was established that GDID does not implement e-submission and e-evaluation. Questionnaires were sent to 250 SMCFs. However, only 27 responded providing a response rate of 10.8%. The SMCFs indicated the benefits and inhibiting factors that they derive from the implementation of the e-procurement methodologies by GDID. These benefits and inhibiting factors were provided per each of the following categories; e-notification; e-tendering; e-contract award; e-contract management and e-payments. These benefits and inhibiting factors were scored and ranked according to the frequency that they were identified by the SMCFs. Opportunities and threats associated with the implementation of e-procurement methodologies to SMCFs were also indicated and ranked.

CHAPTER 5: DISCUSSION OF THE RESULTS

CHAPTER 5: DISCUSSION OF THE RESULTS

5.1 INTRODUCTION

This chapter is provides a discussion of the results obtained in the previous chapter in relation to the literature reviewed. It provides the basis to compare the similarities and difference between the two.

5.2 E-PROCUREMENT METHODOLOGIES IMPLEMENTED BY GDID

According to Eadie, *et al*. (2007), e-procurement and e-tendering offers improvements on all aspects of procurement processes. It is in this regard, GDID implements e-procurement in order to improve its procurement processes in line with its procurement objectives. The degrees of e-procurement implementation vary amongst organisations. Some organisations implement the entire electronic procurement methodologies while others implement selected aspects of e-procurement. Neupane, *et al*. (2012), asserted that there are many different types of e-procurement systems available on the market. They further observed that each type is built for special purpose and has its own specific functionality and characteristics.

The GDID implements selected aspects of these e-procurement methodologies as drawn from the data collected and results obtained in the previous chapter. The e-procurement methodologies implemented by the GDID were found to be e-notification, e-tendering, e-contract award, e-contract management and e-payments. It was further noted that GDID implements some aspects of the identified e-procurement methodologies as identified by the respondents. The e-procurement methodologies implemented by GDID, as discovered in the research, are compared to the e-procurement methodologies, as documented, in the literature review.

5.2.1 E-notification

It is sometimes referred to as e-informing and e-noticing. According to Tavares, (2010), application of e-noticing is most widespread as compared to other e-procurement methodologies. Costa & Grilo (2014), defined e-notification as the electronic publication of public procurement notices. Fernandes & Viera (2015), indicated that European

Union member states use e-notices for at least 85% of the contracts, with many states employing e-notification on more than 95% of the time.

The publication of notices of tender opportunities for infrastructure projects in the Tender Bulletin is mandated through the 5 pillars of procurement that have been promulgated by the government. This makes it compulsory that public sector departments advertise their tenders for infrastructure projects in the Tender Bulletin. Pillar 2 of the 5 pillars of procurement stipulates the requirement that all potential suppliers have reasonable access to procurement opportunities and that these opportunities be notified, at least, in the Government Tender Bulletin. It was found in the research that GDID uses the Tender Bulletin, the CIDB website, e-tenders portal and the Lead-2-Business website platforms for notifications to SMCFs on available tender opportunities for infrastructure projects. All infrastructure projects implemented by GDID are advertised electronically in the Tender Bulletin, CIDB website and the e-tenders portal. The Lead-2-Business, being a private initiative, might miss some of the tenders.

5.2.2 E-tendering

E-tendering was defined in the literature as a faultless system of transmitting input from the contractors' tender through to contract management, removing the inefficiencies, delays and cost involved in manually processing tender information and re-transcribing for contract management activity (Eadie, *et al.*, 2010). Kajewski, *et al*. (2003) identified 11 basic features that constitute e-tendering procurement system, as indicated in the literature review. However, it was observed that the GDID only implements e-tendering to as far as issuing of tender documentation. The e-tendering processes implemented by GDID only comply with the first 3 features of e-tendering as indicated in section 2.3.6.3(a) of this report. All tender documentation is to be distributed through a secure web-based tender system, the e-tender portal. The second feature is that the purchaser should be able to upload notice or invitation to tender onto the system. Lastly, notification is to be sent electronically for suppliers to download the information. The GDID e-tendering system is not compliant with the 4^{th} feature through to the 11^{th} feature, as described in section 2.3.6.3(a) of this report. It can be established that GDID

only implements selected aspects of the e-tendering methodology. E-procurement aspects of e-submission and e-evaluation, that are usually associated with e-tendering, are not implemented by GDID.

5.2.3 E-contract award

E-contract award involves the electronic awarding of contracts to suppliers with the best proposals (Costa & Grilo, 2014). Laryea & Ibem (2014) identified the use of email technology and wireless technology as the commonly used mechanisms for communication tender awards. It has been established, from the results, that GDID sometimes send award letters to SMCFs electronically in line with this e-procurement methodology.

5.2.4 E-contract management

Costa & Grilo (2014), defined e-contract management as the use of electronic contract management instruments to monitor and improve contract performance and document management. Laryea & Ibem (2014), identified and listed the technology and applications used in e-contract management. Of the identified technology and applications, GDID makes use of the customised web-based procurement and the project management software. GDID's use of these applications was established to be centred on communication, issuing instructions and reporting. The use of emails for communication and circulation of project reports and the use of the Oracle Primavera P6 and Unifier software, as the project management tool, were identified by the respondents.

5.2.5 E-payments

Costa & Grilo (2014), defined e-payments as the use of the agreed electronic payment management and execution. Respondents alluded to the fact that GDID utilises the SAP and the Primavera Unifier for payment processing. It was established though that SMCFs submit their invoices manually. It can be concluded that GDID does not implement the entire e-payment methodology as it should.

5.3 SMCFs EXPERIENCES WITH THE E-PROCUREMENT ADOPTION BY THE GDID

The finding from Chapter 4 shows that there is evidence of e-procurement methodologies adoption by SMCFs as shown in Table 5.1, which depicts the overview of e-procurement implementation by the respondents' organisations.

Table 5.1: E-procurement implementation by the respondents

SMCFs Details	E-notification	E-tendering	E-contract award	E-contract Management	E-payments	Out of 5
QR1	✓			✓		2
QR2				✓		1
QR3	✓	✓		✓		3
QR4	✓	✓	✓	✓	✓	5
QR5				✓	✓	2
QR6	✓			✓	✓	3
QR7	✓	✓	✓	✓	✓	5
QR8	✓			✓		2
QR9				✓		1
QR10	✓	✓	✓	✓	✓	5
QR11	✓	✓	✓	✓	✓	5
QR12	✓			✓	✓	3
QR13	✓	✓		✓		3
QR14	✓	✓	✓	✓	✓	5
QR15	✓	✓	✓	✓	✓	5
QR16	✓		✓	✓	✓	4
QR17	✓	✓	✓	✓	✓	5
QR18	✓	✓	✓	✓	✓	5
QR19		✓	✓	✓	✓	4
QR20	✓	✓	✓	✓	✓	5
QR21	✓	✓		✓	✓	4
QR22	✓	✓		✓		3
QR23	✓			✓	✓	3
QR24		✓	✓	✓		3
QR25	✓	✓		✓	✓	4
QR26	✓	✓		✓		3
QR27	✓	✓		✓	✓	4

Table 5.1 shows that only 9 respondents out of the 27 were able to adopt and implement all the e-procurement methodologies implemented by GDID. These are QR4; QR7; QR10; QR11; QR14; QR15; QR17; QR18 and QR20. This constitutes around 33.3% of the respondents. The remaining respondents only implement selected e-procurement methodologies. This is in agreement with the assertion made by Croom &

Brandon-Jones (2005), that there is evidence of e-procurement adoption by organisations. The degree of adoption however varies from one organisation to another.

5.4 BENEFITS DERIVED BY SMCFs FROM THE ADOPTION OF E-PROCUREMENT METHODOLOGIES BY THE GDID

According to Eadie, *et al*. (2007), organisations adopt or implement systems that ought to bring benefits to their operations and enhance their development. The benefits that SMCFs realised from the adoption and implementation of e-procurement methodologies implemented by GDID have been established. These benefits were established on each and every stage of the project life cycle that SMCFs are involved. These stages are tender notification, tendering, tender award, contract management, payment processes, project closure, and maintenance, repairs and operations. The benefits that SMCFs derived at each of these stages were established. Details were provided in detail on where and how the benefits arose and how they impact on SMCFs' operations and development. The benefits of e-notification, e-tendering, e-contract award, e-contract management and e-payments were considered individually. This is however unlike the studies made by Eadie, *et al*. (2007), Neupane, *et al*. (2012) and Azanlerigu & Akay (2015) that generalised the benefits derived from the adoption and implementation of e-procurement, without providing stage by stage benefits and where the benefits emanate from.

5.4.1 Comparison of the benefits in e-procurement implementation

The resultant benefits indicated in the studies by Eadie, *et al*. (2007) are similar in nature with the benefits established in this study. This showed that the impact of e-procurement implementation are similar, irrespective of where it is implemented, and that SMCFs have similar objectives.

Eadie, *et al*. (2007), went on to rank the benefits derived from adoption and implementation of e-procurement methodologies. This exercise was also done on each of the pre-contract and post contract stages that SMCFs are involved in. Table 5.2 provides the comparison of the benefits. The benefits established in this research are based on the overall evaluation as indicated by SMCFs.

Table 5.2: Comparison of the benefits from e-procurement implementation

Benefits	Ranking based on the outcome of this research study	Ranking based on study by Eadie, *et al*., (2007)	Ranking based on study by Hawking, *et al*., (2004)
Increased profitability (through reduced administration costs)	1	2	4
Market enlargement (Increase sphere of influence of contractors or market intelligence)	2	N/A	5
Cost Saving	3	3	1
Real time communication on tender information	4	1	N/A
Time Saving	4	5	N/A
Faster processing of procurement requirements	6	N/A	N/A
Employee motivation	6	N/A	N/A
Increases production rate on other projects	6	N/A	N/A
Increases competition	9	4	N/A
Provides project evaluation and monitoring basis	10	N/A	N/A
Provides feedback to bidders and information sharing platform	10	N/A	N/A
Implementation of green building initiatives	10	N/A	N/A
Quicker turnaround times in issuing and receiving project instructions	13	N/A	N/A
Avoiding physical presence at GDID offices	13	N/A	N/A
Creates fair environment	13	N/A	N/A
Transparency and accountability	13	N/A	N/A
Improves quality of submissions	13	N/A	N/A
Reduced operating and inventory costs	N/A	5	6
Reducing staffing levels in procurement	N/A	6	N/A
Enhanced decision making	N/A	7	7
Negotiated unit cost reduction	N/A	N/A	2
Improved communication in customer demand	N/A	N/A	3

Table 5.2: Comparison of the benefits from e-procurement implementation

Benefits	**Ranking based on the outcome of this research study**	**Ranking based on study by Eadie, *et al*., (2007)**	**Ranking based on study by Hawking, *et al*., (2004)**
Improved communication in Supply Chain Management	N/A	N/A	10
Improved compliance	N/A	N/A	8
Enhanced management inventory	N/A	N/A	12
Increased accuracy of production capacity	N/A	N/A	11

Despite similarities in some of the benefits, there are some differences noted in the 3 studies presented in Table 5.2. The 'N/A' written on some of the benefits means that these benefits were not indicated by the respondents in this study or by the other authors.

The top ranked benefit indicated, based on the results of this research, was the increase in profitability that arises due to the reduction in administration costs. However, the top ranked benefit in the study of Eadie, *et al*. (2007), was the improvement in communication, while that in the study by Hawking, *et al*. (2004) was price reduction in tendering. Similarities can be seen in the results of the current study and that of Hawking, *et al*. (2004) in that, price reduction in tendering leads to increased profitability.

The benefit ranked second, based on the results of the current study, was identified as market enlargement and mainly attributed to the impact of e-notification. However, the second ranked benefit based on the study of Eadie, *et al*. (2007), was the increased profitability, while in the study by Hawking, *et al*. (2004), it was the negotiated unit cost reduction.

Upon further analysis, it can be realised that the top five benefits based on the results from these 3 studies have to do with increased profitability (cost reductions/savings), improving communication, reduction in tendering time (time savings) and increasing the market or enhancing market intelligence. The position in the rankings are however

different, though they all relate to the cost saving, improving communications and reduction in tendering time. This is in agreement with the assertion made by Eadie, *et al*. (2007), that e-procurement and e-tendering offer viable alternatives to traditional paper based processes in terms of improving procurement processes through improving communication and time and cost reduction. They went on to state that a system which improves communication and reduces the prices of tendering will gain approval with the contractors who use e-procurement systems. E-procurement adoption by the SMCFs can be seen to be associated with the characteristics attached to e-procurement methodologies. Thus, it can be concluded that there are typical benefits that influence SMCFs' adoption and implementation of e-procurement methodologies.

5.5 INHIBITING FACTORS TO E-PROCUREMENT ADOPTION BY SMCFs

E-procurement adoption and implementation rate has been found to be low, according to Eadie, *et al*. (2007) and Aduwo, *et al*. (2016). This is inspite of the benefits associated with the adoption and implementation of e-procurement methodologies, as discovered in several studies, amongst them, Eadie, *et al*. (2007), Eadie, *et al*. (2010), Testa, *et al*. (2012) and Neupane, *et al*. (2012). The low adoption and implementation rate therefore means that there are challenges associated with the adoption and implementation of e-procurement methodologies.

Challenges associated with the adoption and implementations of e-procurement methodologies implemented by the GDID were identified as indicated by the respondents. A List comprising these inhibiting factors was presented in Chapter 4 of this report. The inhibiting factors were identified according to the construction activity stages that SMCFs are involved in. SMCFs were required to provide the factors inhibiting their adoption and implementation of e-procurement methodologies, such as, e-notification, e-tendering, e-contract award, e-contract management and e-payments.

5.5.1 Comparison of the inhibiting factors associated with e-procurement implementation

The impact of these challenges, as indicated by the SMCFs, was established. These factors were ranked in this study according to the frequency that they had been identified by the SMCFs. Similar studies with the same approach on this subject were

implemented by Hawking, *et al*. (2004), Eadie, *et al*. (2007), Hashim, *et al*. (2013) and Aduwo, *et al*. (2016). Table 5.3 provides a comparison of the ranking done in these studies.

Table 5.3: Comparison of the inhibiting factors associated with e-procurement implementation

Inhibiting factors	**Ranking based on the outcome of this research study**	**Ranking based on study by Eadie, *et al*., (2007)**	**Ranking based on study by Hawking, *et al*., (2004)**	**Ranking based on study by Aduwo, *et al*., (2016)**
High Internet costs	1	10	5	1
Lack of resources (high capital costs/ do not have ICT infrastructure)	2	11	1	1
Unreliable power outages	2	N/A	N/A	4
Security risk	4	1	N/A	5
Lack of technical expertise (skills)	5	5	7	2
Lack of infrastructure	6			3
Non compatibility of software (lack of interoperability of e-procurement software packages)	7	5	N/A	7
No government support	8	N/A	N/A	8
Lack of knowledge	8	4	2	9
Acceptability of electronic evidence (unsure of legal position of e-procurement)	10	1	N/A	21
Continuous training requirements	11	N/A	N/A	N/A
Resistance to change	11	N/A	N/A	14
Lack of a business relationship with suppliers providing e-tendering	N/A	3	N/A	N/A
No business benefit realised	N/A	7	11	N/A
Company culture	N/A	8	6	N/A
Upper management support	N/A	9	12	13
Inadequate technical infrastructure of business partners	N/A	N/A	3	N/A
Lack of integration with business partners	N/A	N/A	4	N/A
Lack of cooperation with business partners	N/A	N/A	10	N/A

Table 5.3: Comparison of the inhibiting factors associated with e-procurement implementation

Inhibiting factors	Ranking based on the outcome of this research study	Ranking based on study by Eadie, *et al*., (2007)	Ranking based on study by Hawking, *et al*., (2004)	Ranking based on study by Aduwo, *et al*., (2016)
Lack of uniform standard in the use of e-procurement transaction	N/A	N/A	N/A	6
Technical challenges associated with the transition from paper based methods to e-procurement	N/A	N/A	N/A	10
Lack of national policy	N/A	N/A	N/A	11
Lack of forum to exchange ideas on the use of e-procurement	N/A	N/A	N/A	12
Lack of widely accepted e-procurement software solutions in the construction industry	N/A	N/A	N/A	15
The fear that e-procurement will help to curb corruption	N/A	N/A	N/A	16
The complicated nature and process involved in e-procurement use	N/A	N/A	N/A	17
Lack of universal format and standard in which construction materials are described, displayed and specified	N/A	N/A	N/A	18
Lack of confidentiality in e-procurement transactions	N/A	N/A	N/A	19
The fear for loss of jobs and staff turnover	N/A	N/A	N/A	20
Inaccurate display of data and information at the receivers' end	N/A	N/A	N/A	22
Delays in the transmission of data and information	N/A	N/A	N/A	23
Lack of flexibility in the use of e-procurement	N/A	N/A	N/A	24
The benefits of using e-procurement in the construction industry are not very clear	N/A	N/A	N/A	25
Relatively low human to human contact in e-procurement transaction	N/A	N/A	N/A	26

The results from this study and those done by Hawking, *et al*. (2004) and Aduwo, *et al*. (2016) showed that the highest ranked inhibiting factor impacting on e-procurement adoption and implementation was associated with the high investment costs or high capital costs that some referred to as high Internet costs. These were studies done in South Africa, Australia and Nigeria. However the highest ranked inhibiting factor in the study done by Eadie, *et al*. (2007) was uncertainty with the legal position of e-procurement and the security risk. This was a study conducted in the Northern Ireland. The discrepancy in the highest ranked inhibiting factor associated with e-procurement implementation depicts the differences in e-procurement implementation phases in these countries.

The top 5 inhibiting factors, based on this study, were high Internet costs, lack of resources, unreliable power outages, security risk and the lack of technical expertise. The top 5 inhibiting factors indicated in the study by Aduwo, *et al*. (2016) are high cost of investment, lack of technical expertise, poor Internet and ICT infratsructure, unrealiable power outages and safety and security risk. These two studies were based in South Africa and Nigeria respectively. The environment within which these two studies were undertaken are more or less similar hence the similarities amongst the highest ranked inhibiting factors. It is only in these studies that the effect of unrealiable power outages have been mentioned and are ranked high at number 2 and 4 respectively. This inhibiting factor was not identified in the other studies.

The top 5 inhibitng factors identified by Eadie, *et al*. (2007) are security of transactions, uncertainty of the legal position of e-procurement, lack of business relationship with suppliers, lack of knowledge and interoperability concerns. The results from this study showed that these are ranked 4^{th}, 10^{th}, N/A, 8^{th} and 7^{th} respectively. This shows the difference in the environment that contractors are exposed to.

The study by Hawking, *et al*. (2004) had the following inhibiting factors among its top 5 - lack of ICT infrastructure, lack of skilled e-procurement knowledge, inadequate technical infrastructure of business partners, lack of integration with business partners and costly ICT. It realised that there are similarities with the factors drawn from the results of this

study. The overall list of the inhibiting factors are similar in nature except that there are more similarities between the studies done in South Africa and Nigeria.

Aduwo, *et al*. (2016), further classified the factors that inhibit e-procurement adoption into different categories. These categories are external and internal factors. External factors are inhibiting factors that arise due to the impacts of technology, infrastructure, and legislation (Aduwo, *et al.*, 2016). The internal factors are caused by the effect of resource constraints and organisational and management characteristics (Aduwo, *et al.*, 2016).

Table 5.4 shows the classification of the results obtained in this study, based on source of the inhibiting factors, that is, whether they arose from external or internal forces.

Table 5.4: Classification of the inhibiting factors associated with e-procurement implementation

Cause of the inhibiting factor	**Inhibiting factor**	**Description of the inhibiting factors**
External Factors	Technology	Non-compatibility of software
		Lack of technical expertise (skills)
	Infrastructure	Lack of infrastructure
	Legislation	Security risk
		No government support
		Acceptability of electronic evidence
Internal Factors	Resource Constraints	High Internet costs
		Lack of resources (high capital costs)
		Unreliable power outages
	Organisational or management characteristics	Lack of knowledge
		Continuous training requirements
		Resistance to change

The inhibiting factors that were obtained in this study can be subdivided into the categories as indicated by Aduwo, *et al*. (2016), that is, they can be subdivided as being caused by either external and internal factors.

Laryea & Ibem (2014), further classified the inhibiting factors associated with the implementation of e-procurement methodologies under the classes indicated below.

a) Compatibility (Interoperability);
b) Financial Limitations (Cost Issue);
c) Cultural Issues;
d) Infrastructure;
e) Legal Issues;
f) Security; and
g) General.

The inhibiting factors obtained from this study are further tested to find out if they fit this categorisation in the Table 5.5.

Table 5.5: Categorisation of the inhibiting factors to e-procurement implementation

Inhibiting factor category	**Inhibiting factor**
Compatibility (interoperability)	Non-compatibility of software
Financial limitations	High Internet costs
	Lack of resources (high capital costs)
Cultural issues	Resistance to change
	Lack of knowledge
	Continuous training requirements
Infrastructure	Lack of infrastructure
Legal issues	No government support
	Acceptability of electronic evidence
Security	Security risk
General	Unreliable power outages

The inhibiting factors that were obtained from this study do fit into the categorisation that was presented by Laryea & Ibem (2014), which comprises seven different categorises as indicated in Table 5.5.

5.6 THE IMPACT OF E-PROCUREMENT IMPLEMENTATION TO THE DEVELOPMENT OF SMCFs

The benefits derived by SMCFs from the implementation of e-procurement methodologies implemented by GDID have been identified. The overall effect of the benefits, as indicated by the SMCFs, is to increase the efficiency and effectiveness of their procurement processes of infrastructure projects. Wider dissemination of information on tender opportunities eliminates the exclusion of SMCFs in the bidding processes for infrastructure projects. This provides SMCFs with opportunities to tender for infrastructure projects and to be considered for the award. The provision of tender information without geographic limitations and the continued availability of information allow SMCFs to access all tender notices. SMCFs increase their market. The reduction in tendering time allows SMCFs to work on more tender documents than when traditional paper based processes are employed. The reduction in tender administration costs reduces operational costs for SMCFs. The overall effect is to increase the profitability of SMCFs. The profitability increases their sustainability and allows for greater contribution to the Gross Domestic Product (GDP) of South Africa. This can be further enhanced by the utilisation of contract management mechanisms designed to evaluate contract monitoring and performance.

However, despite the positive contribution that the implementation of e-procurement could provide to the development and sustainability of SMCFs, there are factors that negatively impact SMCFs adoption of e-procurement. These include the high Internet costs, high capital costs (lack of infrastructure), unreliable power supply, non-compatibility of software packages and applications, security risk of Internet transactions, lack of knowledge and resistance to change. These inhibiting factors require to be addressed in order to realise the maximum benefits of the implementation of e-procurement.

5.7 SUMMARY

Discussion of the results obtained in Chapter 4 was undertaken. The discussion included comparison of the results derived from this research with results from other researches on the implementation of e-procurement. Similarities and differences were

presented in this chapter. One of the similarities singled out is that several organisations are implementing e-procurement, though the levels of implementation vary. Some implement part of the e-procurement methodologies, while others operate a full paperless system. The comparison on the ranking of the benefits and inhibiting factors to e-procurement implementation was undertaken. Some of the discrepancies noted by authors Aduwo, *et al*. (2016), Eadie, *et al*. (2007) and Hawking, *et al*. (2004) identified benefits and inhibiting factors for the entire e-procurement system and not adoption of each e-procurement methodology. This research provided the benefits and inhibiting factors per each e-procurement methodology. Whilst the ranking of benefits showed that SMCFs indicated the increased profitability, market enlargement, cost saving and real time communication benefits, in that order, as crucial in South Africa, results from other the studies, such as the one by Eadie, *et al*. (2007) in Northern Ireland, showed that real time communication, increased profitability, cost saving and increase in competition are the benefits derived by SMCFs, in that order. Comparing the inhibiting factors shows similarities in the results for this study and the one done by Aduwo, *et al*. (2016) in Nigeria. These results indicate that high Internet costs, lack of resources and unreliable power supply are among the dominant inhibiting factors to e-procurement implementation. However, the study by Eadie, *et al*. (2007) shows that acceptability of electronic evidence, lack of knowledge and lack of business relationship with suppliers are among the top inhibiting factors in Northern Ireland. Thus, the order of the rankings is dependent on the country and, possibly the era of the study.

CHAPTER 6:

CONCLUSIONS AND RECOMMENDATIONS

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

This chapter is the conclusions and recommendations section of the report. The conclusions and recommendations on the implementation of e-procurement methodologies by GDID and “its impact on the development of SMCFs” are indicated in line with the research question, aims and objectives.

6.2 CONCLUSIONS RELATING TO THE E-PROCUREMENT METHODOLOGIES IMPLEMENTED BY GDID

GDID has adopted and was found to be implementing e-procurement methodologies. The adoption and implementation of these technologies, however, were found to be in its infancy and still evolving. GDID implements selected e-procurement methodologies, which are, e-notification, partial e-tendering, e-contract award, e-contract management, e-payments and e-MRO. The identified methodologies implemented by the GDID are e-notification through the notification of tender opportunities for infrastructure projects on the Government Tender Bulletin, the CIDB website, the Department of National Treasury e-tenders portal and the Lead-2-Business website. E-tendering was found to be done through the uploading of tender documents that can be downloaded by SMCFs from the Department of National Treasury e-tenders portal. E-contract award is done by sending award letters through emails. E-contract management is carried out through the use of Oracle’s Primavera P6 and Unifier for project reporting, use of email communications and circulation for reports and instructions, and use of Microsoft Project for developing and tracking project programme of works. E-payments are done through the use of Primavera Unifier and SAP payment systems. GDID was found to be utilising e-MRO through use of their own in-house developed e-maintenance software for logging or reporting defects or faults.

It was established that GDID does not implement some of the aspects of e-procurement methodologies. GDID is not implementing e-submission of tender documents and e-evaluation of tender documents, despite these being regarded as part of e-tendering. GDID can be said to be implementing partial e-tendering. In terms of e-payments,

SMCFs submit invoices through traditional paper based systems. Upon receipt, invoices are scanned before processing and electronic payment. Hence, GDID implements partial aspects of the e-payment methodology. The other e-procurement methodologies that are not implemented by GDID are e-ordering or ERP and e-reverse auctioning.

It was further established that there was no single or integrated e-procurement system implemented by GDID. The systems used are fragmented with no discernible relationships among the systems.

6.3 CONCLUSIONS RELATING TO THE EXPERIENCES OF THE SMCFs DERIVED FROM THE E-PROCUREMENT METHODOLOGIES IMPLEMENTED BY GDID

The SMCFs have adapted to the implementation of e-procurement technologies and processes. An overview of all the responses on the adoption and implementation of e-procurement technologies and process by the respondents indicated that all the 27 respondents that responded had adapted to the implementation of e-procurement methodologies. The degree of adoption however varied. Out of all the respondents, only 33.3% indicated that they are able to engage with all the 5 major e-procurement methodologies implemented by GDID. The remaining SMCFs still use a combination of electronic and paper based systems. The most commonly adopted and used e-procurement methodology among all the respondents was the e-contract management. The activities therein included communication using email technology, circulation of project reports, issuing and receiving of contract instructions and project closure. The SMCF that had least adapted to e-procurement was found to be implementing 2 e-procurement methodologies, namely, e-notification and e-contract management.

6.4 CONCLUSIONS RELATING TO THE BENEFITS DERIVED BY SMCFs FROM E-PROCUREMENT ADOPTION

It was found that the SMCFs derived several benefits from the adoption and implementation of e-procurement methodologies. The benefits were found to be attained at each and every stage of the e-procurement methodologies that were adopted and implemented by the SMCFs, irrespective of the fragmented nature of the implementation of e-procurement methodologies.

On e-notification, the highest ranked benefit related to the dissemination of tender information. This benefit was found to be the receipt of information beyond working hours of organisations. Information availability and accessibility is not limited by geographic location and time constraints. The top ranked benefits of adoption and implementation of e-tendering included, faster and easier pricing of documents, minimisation of errors and the reduction in tendering time. For e-contract award, the top ranked benefits related to time saving (reduction in delivery timelines), trace of award documents and faster notification of the recipient. On e-contract management, the top ranked benefits related to the real time communication, ease of management of contract documentation and traceability of records. The highest ranked benefits of e-payments included the timeous release of payments, traceability of payments, and ease of document storage and management.

It can therefore be inferred that there are direct relationships between benefits accruing to SMCFs, through adoption and implementation of e-procurement, and the stages of the project life cycle. The benefits relating to the implementation of e-procurement cannot be generalised. They should be identified relative to the stage of the project life cycle. This is especially so in situations where there is no single or integrated e-procurement methodology being implemented. However, this also applies to a situation where there is an integrated system in place but evaluation of the efficiency and effectiveness of the system is required.

6.5 CONCLUSIONS RELATING TO THE INHIBITING FACTORS HINDERING SMCFs E-PROCUREMENT ADOPTION AND IMPLEMENTATION

Adoption and implementation of e-procurement by SMCFs was found to be hindered by a host of factors. In order to draw a comprehensive list of the factors that hinder e-procurement implementation by the SMCFs, taking into consideration the fragmented nature of the application of e-procurement methodologies by the GDID, the inhibiting factors impacting adoption and implementation of various e-procurement processes was undertaken.

The top ranked inhibiting factors that hinder the adoption and implementation of e-notification, as indicated by the respondents, are lack of knowledge, access to ICT

infrastructure, high Internet costs and lack of capital. On e-tendering, the respondents indicated the following inhibiting factors - high Internet costs, completion and submission of hand written tender documents and lack of knowledge, as the most common factors. The respondents further identified the following top ranked inhibiting factors to the e-contract award implementation as the non-existence of the feedback process, access to the Internet and the sending of documents to wrong recipients. The top ranked barriers to e-contract management implementation were identified by the respondents as high Internet costs, information not reaching intended recipients and the non-compatibility of software. E-payments are impacted negatively by delays in payments processing and the risk of making payments to wrong recipients, as indicated by the respondents.

The significance of these inhibiting factors is dependent on the construction stage or activity of the adoption and implementation of e-procurement methodologies. The causes of these inhibiting factors were divided into two categories that are external factors or internal factors. The external factors are those that were attributed to the effect of technology, legislation and infrastructure. The internal factors are those that are attributed to resource constraints and organisational or management characteristics. In order to optimise the benefits derived from the adoption and implementation of e-procurement methodologies, these challenges need to be addressed. There is need for concerted effort to reduce or eliminate their impact on e-procurement adoption and implementation.

6.6 CONCLUSIONS ON THE IMPACT OF E-PROCUREMENT IMPLEMENTATION TO THE DEVELOPMENT OF SMCFs

The implementations of e-procurement technologies and processes have both positive and negative impacts to SMCFs. It was found that sophisticated application of e-procurement applications may therefore not fully align with the business capability of SMCFs. There is therefore need for considerable designing of these e-procurement systems to ensure that they provide growth, inclusiveness, sustainability and development of SMCFs.

6.7 RECOMMENDATIONS

The following recommendations are suggested on the implementation of e-procurement by GDID and how they impact the development of SMCFs to ensure improvement of GDID procurement processes and the growth, inclusiveness, sustainability and development of SMCFs.

- The expansion of the e-procurement methodologies that are implemented by GDID to include e-submission and e-evaluation. This would reduce the risks associated with the failure to submit tender bids by SMCFs. E-evaluation provides for a standardised means of evaluation of tender bids. It eliminates human error and chances of favouritism, normally associated with evaluation through traditional paper based systems.
- The designing and development of an integrated e-procurement system that provides end-to-end encryption of tender documentation. Thus, the notification, tendering, submission, evaluation and award could be done within this system. This eliminates the inefficiencies associated with human interaction and human error in the procurement processes. The system, however, has to be easily accessible and compatible with most devices.
- There is a need for SMCFs training and development roadshows that could be co-ordinated with the CIDB to educate and inform SMCFs on the e-procurement methodologies available for adoption and utilisation in the construction industry. This could involve dissemination of information of where SMCFs can obtain information regarding tender opportunities. Government and other interested parties, such as the Lead-2-Business can be invited to showcase their products/platforms.
- There is a need for government to demonstrate commitment to the implementation of e-procurement through relevant legislation that provides a paradigm shift from the traditional paper based procurement processes to the electronic based procurement and use of e-procurement systems. This would include the setting of a Body or Council that is mandated to monitor and ensure compliance with the implementation of e-procurement technologies and processes.

- There is a need to foster investment in the provision of ICT infrastructure. This would ensure that more role players are attracted to this industry. The increased number of ICT infrastructure suppliers will push down prices of ICT infrastructure making it more affordable and accessible to SMCFs.
- There is a need for the provision of cheaper alternative power sources to complement electrical grid power sources. These alternative power sources could be used during times of electrical power outages.

6.8 RECOMMENDATIONS FOR FURTHER STUDY

It is recommended that further studies aimed at investigating the impact of the implementation of e-procurement methodologies on the development of consulting firms be undertaken. The Competition Commission has ordered that the provision of consulting services should be tendered for as the case with contracting services. Therefore implementation of e-procurement methodologies for the procurement of consulting services needs to be established.

It is further recommended that further studies that aim to investigate the possibility of GDID adopting and implementing a fully integrated e-procurement system, which includes all methodologies and procurement of construction and consulting services, for the benefit of all stakeholders, be instituted.

6.9 SUMMARY

The e-procurement methodologies that are implemented by GDID were identified as: e-notification, e-tendering, e-contract award, e-contract management, e-payments and e-MRO. The benefits and inhibiting factors to the implementation of e-procurement methodologies derived by SMCFs were highlighted. It was further established that only around 33.3% of the SMCFs are able to engage all five major e-procurement methodologies implemented by GDID, while the remainder still make use of a combination of electronic and paper based systems. It was noted that the sophisticated application of e-procurement systems may not align with the business capabilities of SMCFs. Therefore considerable steps need to be taken to provide resources to SMCFs before application of e-procurement methodologies, for SMFCs to fully benefit from the implementation of e-procurement.

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APPENDIX A: ETHICS CERTIFICATE

School of Construction Economics & Management

University of the Witwatersrand, Johannesburg -PO Box 20, Wits 2050, South Africa • Tel: +27 (0)11 717 7662/77689 • Fax: +27 (0)11 717 8728 Email:CEM@wits.ac.za

SCHOOL OF CONSTRUCTION ECONOMICS AND MANAGEMENT RESEARCH ETHICS COMMITTEE

CLEARANCE CERTIFICATE **PROTOCOL NUMBER** CEM/16/08/RAS/MSC

PROJECT TITLE: How the implementation of e-procurement affects the development of Small and Medium Enterprises Contractors in South Africa

INVESTIGATOR **Ronald Alfred Sithole** 421990

SCHOOL/DEPARTMENT **SCHOOL OF CONSTRUCTION ECONOMICS AND MANAGEMENT**

DATE CONSIDERED 11/10/2016

DECISION OF THE COMMITTEE Approved conditionally with respect to the declaration and forwarded moderate corrections. Please note these corrections.

EXPIRY DATE 28th October 2017

DATE 12 October 2016

CHAIRPERSON _____
Dr. Kola Ijasan

cc: Supervisor: Prof S. Laryea

DECLARATION OF INVESTIGATOR (S)

To be completed in duplicate and **ONE COPY** returned to the Secretary Mrs. M. Sithole at the CEM reception desk.

I fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to completion of a yearly progress report.**

_____ _____/_____/_____

Signature **Date**

APPENDIX B: PILOT STUDY: INTERVIEW QUESTION SCHEDULE

INTERVIEW SCHEDULE

1. In your opinion, in the procurement for infrastructure projects, does GDID implement a full e-procurement system (paperless) or selected aspects of e-procurement?

   _____
   _____
   _____

2. If your answer to (1) above is it implements a full e-procurement system, could you describe how the system is operated that impact on the plight of SMCFs?

   _____
   _____
   _____

3. If your answer to (1) above is, it implements selected aspects of e-procurement, could you indicate the e-procurement aspects implemented and the targeted activities within the project life cycle that impact on the plight of SMCFs?

   _____
   _____
   _____
   _____
   _____
   _____

4. Do you have any recommendations on the implementation of e-procurement by GDID in addressing the plight of SMCFs?

   _____
   _____
   _____
   _____
   _____

APPENDIX C: PILOT STUDY: QUESTIONNAIRES TO SMCFs

Letter of Introduction

School of Construction Economics and Management
Faculty of Engineering and the Built Environment
University of the Witwatersrand, Johannesburg
Private Bag 3, WITS, 2050

22 November 2016

TO WHOM IT MAY CONCERN

This letter serves to introduce myself and the research that I am undertaking in fulfilment of the requirements of the Masters in Building (Project Management) in the Faculty of Engineering and Built Environment at the University of the Witwatersrand.

My name is Ronald Alfred Sithole and I am a postgraduate student in the Faculty of Engineering and Built Environment at the University of the Witwatersrand (School of Construction Economics and Management (CEM)). This research is being done under the supervision of Professor Samuel Laryea and focuses on "how implementation of e-procurement influences the development of small and medium construction firms (SMCFs) in Gauteng, South Africa."

Your participation in this research is voluntary and will be highly appreciated.

Should you wish to know the findings of this research, the summary of the analysed data will be gladly sent to you upon receipt of your written request in the regard.

With Thanks,

Ronald A. Sithole

My details:

Ronald A. Sithole
Student No. 421990
Email: 421990@students.wits.ac.za
Cell Number: 073 863 2995

Questionnaire on how the implementation of e-procurement influences the development of small and medium construction firms in Gauteng, South Africa.

You are requested to complete the attached questionnaire and or tick the appropriate answer.

SECTION 1: BACKGROUND INFORMATION

1) Indicate whether you have participated in the procurement of infrastructure projects implemented by the Gauteng Department of Infrastructure Development (GDID)? (Tick the applicable box)

☐ Yes
☐ No

2) Please indicate the CIDB grading of your organisation? (If you have multiple grading indicate all)

CIDB Grading	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**

SECTION 2: E-PROCUREMENT

3) Based on your experience in the procurement processes for the implementation of infrastructure projects implemented by GDID could you indicate the various e-procurement methodologies implemented by GDID in the entire project life cycle that impact on SMCFs? (Indicating the media of communication and forms of documentation)

_____
_____
_____
_____

_____

_____

_____

_____

4) Could you indicate and explain the benefits that you (SMCFs) derived from the utilisation or adoption of the methodologies of e-procurement implemented by GDID?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

5) Could you indicate and explain the negative impacts that you (SMCFs) experienced in the utilisation or adoption of the e-procurement methodologies implemented by GDID?

_____

_____

_____

_____

_____

_____

_____

_____

_____

6) Could you indicate the opportunities and threats to SMCFs for the adoption of e-procurement for infrastructure projects implemented by GDID?

_____

_____

_____

_____

_____

_____

_____

_____

_____

7) Could you recommend on the procurement best practices that optimise the development of SMCFs?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Yours Sincerely

Ronald A. Sithole

APPENDIX D: PILOT STUDY INTERVIEW RESPONSES

E-PROCUREMENT METHODOLOGIES IMPLEMENTED BY GDID

Interviews as indicated in Chapter 1 and Chapter 3 were used for gathering data on the e-procurement methodologies currently being employed by GDID during the procurement of infrastructure projects. The targeted sample size for interviews was eight (8) participants. Seven (7) respondents were interviewed while the 8th respondent could not participate due to work commitments. The participation ratio therefore was 87.5%.

GDID E-Procurement Methodology

There was agreement by all the 7 respondents that GDID implements selected aspects or methodologies of e-procurement. They further indicated that these aspects are targeted at addressing some of the processes within the project life cycle where it is deemed that the utilisation of these aspects is feasible and less capital intensive to the advantage of both GDID and the SMCFs in making procurement more effective and efficient. It was therefore noted and confirmed that the GDID procurement processes for infrastructure projects is not paperless with some of the processes being executed through various committees as appointed by the accounting office in accordance with the GDID SCM policy. These include the Bid Specification Committee (BSC), Bid Evaluation Committee (BEC) and the Bid Adjudication Committee (BAC).

Selected E-procurement Methodologies Implemented by GDID

Below is the selected e-procurement methodologies identified from the interviews with the 7 respondents who participated on these interviews.

a. E-Notification

It was established from the interviews that e-notification is one of the e-procurement methodologies currently being implemented by GDID. GDID implements this aspect through the calling of tenders or the placement of tender notices on the tender bulletin, CIDB website, Department of National Treasury e-tenders portal and utilisation of the Lead-2-Business website. The placement of tenders through the tender bulletin was echoed by all the 7 interviewees. This thus seems to be the most common medium

through which tenderers are notified of the existence of tendering opportunities for infrastructure projects being implemented by GDID.

The utilisation of the CIDB website was mentioned by 5 interviewees that make it the second popular medium of tender notification. The e-tender initiative being implemented through the Department of National Treasury was mentioned in 3 interviews. One responded went on to indicate that electronic formats of tender documents are available for free download by potential tenderers.

The Lead 2 Business initiative was mentioned once and it was indicated that it is a private initiative. The Lead 2 Business consultants often call enquiring about the tender opportunities that they then put on their website for viewing by contractors that subscribe to their website.

b. E-Contract Management

It was established in the interviews that GDID implements electronic contract management methodologies. Oracle's Primavera P6 is the methodology that is being utilised in this regard. Project data is populated on P6 which in turn will be used for reporting and tracking project progress. It was however established the P6 Project Management tool is only available for viewing and downloading to GDID's Project Managers and Management only. Other stakeholders can view the project tracking through this project management tool only if they visit the GDID Lutsinga Infrastructure House where the system is hosted.

It was established that most communication on projects is done through emails. These communications include calling and confirmation of meetings, minutes, projects reports, issuing instruction and compensation events (variation orders).

c. E-Payments

The 7 respondents indicated that GDID has adopted the use of the Primavera P6 Unifier as a payment processing tool. SMCFs submit invoices in hard copies. These invoices are scanned and captured into the Primavera P6 Unifier system. Approvals of the

invoices are thus done electronically by the GDID Project Managers and Management. After approval, payments are then processed electronically.

It was indicated that there are initiatives that are aimed at having SMCFs not to submit invoices in hard copy but electronically. This system is currently being piloted on selected projects.

d. E-Maintenance, Repairs and Operations (EMRO)

Among the responsibilities that GDID is mandated to perform is the maintenance of public sector infrastructure facilities. These include public hospitals, clinics, community healthcare centres (CHCs), and other facilities utilised for public sector social, economic and rural development. A system has been developed and is currently being utilised for the maintenance of these facilities. The system involves the logging of a defect by anyone including members of the public. Once the defect is logged then it is allocated to a Supervisor or Foreman who will in turn allocate it to an artisan. Once the defect is rectified, then the responsible person will log it in the system as rectified or resolved. This system is called e-maintenance and is being operated on a 24 hour basis, 7 days a week and 365 days (24/7/365).

E-Procurement Aspects Not Implemented by GDID

It was established that due to the fact that GDID implements selected me-procurement methodologies, there are some e-procurement methodologies that it does not implement to address other aspects or activities within the project life cycle.

Below are the e-procurement methodologies that GDID is not implementing as established from the interviews by the 7 respondents.

a. Tendering

Despite e-notification being used for calling for tenders, SMCFs are expected to procure hard copies of tender documents. Pricing and determination of the bid price and submission of the offer are done electronically. It is stipulated in the tender documents that valid bids should be deposited in the tender box located at the GDID offices on or before the predetermined date and time. It is further stipulated in the tender document

that faxed and electronic bids are not acceptable. The tendering process and submission of the offers are therefore done traditionally. It was noted in the interviews that this exposes the GDID to sending out documents that are not uniform. Some pages might be missing in other documents. The other issue that was raised was the missing or disappearance of other tender documents or attached information and returnable schedules when they are submitted to the GDID after tender closure.

b. Tender Evaluation

It was derived from the interviews that tender evaluation is done manually. A BEC is appointed which is tasked with the evaluation of tenders. The Preferential Points Scoring is thus undertaken manually which leaves the scoring process depended on an individual. This means that there is no standardisation of the scoring process that leads to the determination on the recommendation on the contract award.

It was established as well that the duration within which tender evaluation is concluded is very long. On average it was said to take about 3 to 6 months. Tender validity for most GDID tenders is 90 days and hence appointment often happens after expiry of the tender validity period or just before that is if not extension has been effected.

c. Contractor Appointment

The appointment of the contractor was reported to be done manually. The appointment letter is written and signed, then dispatched to the contractor whom the contract would have been awarded to. There is currently no system that feedback the other bidders on whom the contract has been awarded to neither the system that gives trail of information of how the evaluation and awarding process was done especially to the other bidders who would have expressed an interest on the project.

d. Contract Administration

Despite having most of the activities within the contract management and or administration process being done electronically, there are still other processes that are still done manually. The processing of payment certificates and final account preparation were discovered to be done manually. This is attributed to need for original

documentation which therefore excludes the possibility of the use of electronic capturing on these documents.

e. Invoice Submission

Though payments are processed electronically, it was noted that submission of invoices by SMCFs is still manual. There exists therefore the risk of losing invoices or attached information after invoice submission and before they are electronically captured.

Concluding and Recommendation Remarks by GDID Officials

The 7 respondents concluded by calling for the expansion of the e-procurement methodologies being employed by GDID to include some methodologies that include e-tendering, e-submission, e-evaluation and e-award to optimise chances for SMCFs growth and development and to make the entire procurement process electronic and paperless. According to these respondents they have faced numerous changes with the current system especially relating to issuing of unstandardised documentation (some pages missing), tempering of documentation, handling of huge volumes of hard copy documents resulting in the misplacement of other documents and unstandardised point scoring system.

They further alluded to the need for government policy to enforce adoption and implementation of e-procurement by public institutions. This they say increases accountability and transparency.

APPENDIX E: PILOT STUDY- RESPONSES TO QUESTIONNAIRES

SMCFs EXPERIENCES ON GDIDS' IMPLEMENTATION OF E-PROCUREMENT

In order to determine the experiences of SMCFs from the e-procurement methodologies being implemented by GDID, questionnaires were prepared and send to SMCFs.

SMCFs Response Overview

Questionnaires were sent to 35 SMCFs who are currently engaged on GDID infrastructure projects or do participate in the procurement of infrastructure projects being implemented by GDID. The questionnaires were sent on email and self-administration was done on others. Responses were obtained from 12 SMCFs. This constitutes 35.3% response rate.

All the respondents indicated that they have participated in the procurement of infrastructure project implemented by the GDID. The respondents were requested to indicate the CIDB grading of their organisations. This is to enable analysis of the responses based on the experience of the SMCFs. Table E1 below shows the statistics populated from the questionnaires of the CIDB grading of the SMCFs who responded.

Table E1 SMCFs Respondents CIDB Grades

	CIDB Grading	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Respondent Code										
01						X				
02								X		
03								X		
04				X						
05					X					
06							X			
07								X		
08						X				
09							X			
10								X		
11					X					
12							X			

The can be represented in table E2 below:

Table E2 SMCFs Respondents Population

	CIDB Grading	1	2	3	4	5	6	7	8	9
Number of Respondent		0	0	1	2	2	3	4	0	0

SMCFs Experiences

Based on their experience in the procurement processes implemented by GDID, SMCFs were asked to indicate the e-procurement methodologies that they have used or are using in the procurement of infrastructure projects implemented by GDID.

a. Tender Notification

SMCFs were requested to indicate how they come to know of the availability of tender opportunities for infrastructure projects being implemented by GDID. Table E3 provides the responses obtained.

Table E3: Media of Tender Notification

FORM OF TENDER NOTIFICATION	Tender Bulletin	CIDB Website	Treasury Website	Lead 2 Business Website	Newspapers	Word of Mouth
SMCFs RESPONSE						
01	X	X			X	
02	X	X			X	
03	X	X		X	X	X
04					X	X
05					X	X
06	X	X		X	X	
07	X	X			X	
08	X	X			X	
09	X	X			X	
10	X	X			X	
11					X	X
12	X	X			X	

Thus 75% (9 out of 12) of the SMCFs make use of the tender bulletin and the CIDB website to solicit for information of the availability of tender opportunities for infrastructure projects being implemented by GDID. None do make use of the E-tender

tool by the Department of Treasury. This is due to the fact that the Department of Treasury e-tender system is still new and is not yet well known amongst SMCFs. The Lead-2-Business platform as well accounts for 16.7% (2 out of 12). Advertising in the newspaper is a popular tool that is made use by all SMCFs. 25% of the SMCFs makes use of word of mouth. Further investigation shows that SMCFs with lower CIDB levels are the ones making use of this tool and it is these same SMCFs that do not use any form of electronic media to solicit for information on the available tender opportunities for infrastructure projects.

b. Tender Submission

SMCFs were requested to indicate on how they receive tender documents for the determination of their bid prices and further indicate how they submit their bids for evaluation. Table E4 below shows responses obtained:

Table E4: Form of Tender Documentation

SMCFs RESPONSE	FORM OF TENDER DOCUMENTS			
	Tender Documents Received for Pricing		**Submitted Tender Documents**	
	Traditionally (Paper Based)	*Electronically*	*Traditionally (Paper Based)*	*Electronically*
01	X		X	
02	X		X	
03	X		X	
04	X		X	
05	X		X	
06	X		X	
07	X		X	
08	X		X	
09	X		X	
10	X		X	
11	X		X	
12	X		X	

The data in table 4.4 above show that despite tender notification being done sometimes electronically, all SMCFs have to procure tender documents in hard copy (paper based). SMCFs are thus required to price these documents. Submissions of these documents are to be done in hard copy. It is stipulated in the tender documents that tender

submission should be in a tender box situated at a given address on or behalf a certain date and time. It is further stated in the tender documents that faxed and electronic responses will be disqualified. This therefore means that the procured tender documents are manual and tender submission is also manual.

c. Tender Evaluation and Award

SMCFs indicated that though they do not participate in tender evaluation, they are called to witness GDID officials doing tender evaluation. The process is done manually. SMCFs indicated that they are informed of having been awarded a contract through an appointment letter that they are called to pick up. Should they fail to get the contract, there is no communication that provides feedback as to who the contract was awarded to. This information will only be obtained when the SMCF calls the responsible project manager to find out the status of the tender evaluation and awarding process.

d. Contract Administration

Contract administration stretches from site handover to the certification of completion and therefore consists of many activities aimed at managing the cost, time, quality and ensuring stakeholder involvement on the project. SMCFs were required to give an account on whether contract administration activities are implemented by traditional means or electronically. Results are represented in the Table E5 below.

Table E5: Contract Administration Activities

SMCFs RESPONSES	CONTRACT ADMINISTRATION ACTIVITIES									
	Communication		Issuing Instructions		Project Reporting		Payment Processes		Final Account & Project Closure	
	T	*E*	*T*	*E*	*T*	*E*	*T*	*E*	*T*	*E*
01		X	X	X	X	X	X		X	
02		X	X	X	X	X	X		X	
03		X	X	X	X	X	X		X	
04		X	X		X	X	X		X	
05		X	X		X	X	X		X	
06		X	X	X	X	X	X		X	
07		X	X	X	X	X	X		X	
08		X	X	X	X	X	X		X	
09		X	X	X	X	X	X		X	
10		X	X	X	X	X	X		X	
11		X	X		X	X	X		X	
12		X	X	X	X	X	X		X	
T – Traditional Procurement Systems; E – Electronic Procurement Systems										

- **Communication**

SMFCs indicated that email communication is the most used communication tool.

- **Issuing of Instructions**

It was noted that instructions are predominantly issued manually or verbally. However 75% of the SMCFs indicated that these manual or verbal instructions are confirmed electronically. This notifies all stakeholders of the instruction issued so that they can as well provide their contributions should it be required or for their noting.

- **Project Reporting**

SMCFs confirmed that project reports are circulated electronically through emails. These include project technical and progress reports, quality reports, risk registers and minutes all meetings held on the project.

- **Payment Processes**

All SMCFs who responded indicated that the submission of payment certificates and invoices to GDID is still being done manually. GDID insists on receiving original invoices in order for them to process payments. That means that scanned and electronic signatures are not acceptable.

- **Final Account and Project Closure**

Final accounts and project close-out reports are presented manually. GDID requires original copies of the final account and the close-out reports. This therefore excludes the use of scanned and electronic signatures.

e. Maintenance

SMCFs were requested to indicate on whether they had implemented maintenance projects with GDID. The responses are indicated on Table E6 below:

Table E6: Response on SMCFs on Maintenance Contracts

	SMCFs RESPONSES											
RESPONSE	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**
Yes		X	X	X	X		X			X		
No	X					X		X	X		X	X

The responses show that 50% of the respondents have done maintenance projects with GDID. These were further asked to indicate on how the they were notified of the existence of these opportunities, form of documentation received and submitted to GDID and how the contract was administered. Their responses are summarised on Table E7 below.

Table E7: SMCFs on Maintenance Contracts Documentation

SMCFs RESPONSES	**MAINTENANCE CONTRACTS**									
	Notification		**Nature of documentation received**		**Nature of documentation submitted**		**Tender Evaluation and Award**		**Contract Administration**	
	T	*E*	*T*	*E*	*T*	*E*	*T*	*E*	*T*	*E*
02	X		X		X		X		X	
03	X		X		X		X		X	X
04	X		X		X		X		X	
05	X		X		X		X		X	
07	X		X		X		X		X	X
10	X		X		X		X		X	
T – Traditional Procurement Systems; E – Electronic Procurement Systems										

This shows that the procurement of contractors for maintenance contracts is predominantly traditional. The SMCFs indicated that they made notified of maintenance contracts opportunities usually through call or adverts on notice boards on the health or social development facilities. 2 of the 6 SMCFs indicated based on their experience on the projects that they implemented, project communication, reporting and issuing of further instructions were done electronically.

THE IMPACT OF E-PROCUREMENT IMPLEMENTATION TO SMCFS

SMCFs were asked to indicate on the benefits or positive impacts and the negative impacts that they have experience during the adoption and implementation of the e-procurement methodologies being implemented by GDID. It was established that the positive impacts emanates from the adoption and utilisation of the e-procurement

methodologies implemented by GDID. The causes of the negative impacts were realised to be two faced. The first being the negative impacts being experienced while utilising the e-procurement methodologies implemented by GDID and secondly, the negative impacts emanates from the non-implementation of all the e-procurement methodologies or the non-implementation of the full e-procurement process.

THE POSITIVE IMPACTS

- **E-Notification**

E-notification has been credited by SMCFs as providing real time tender information. This availability of this information is not affected by geographical location or boundaries. Thus SMCFs get information about tender opportunities for infrastructure projects existing within the whole of the Republic of South Africa (RSA) and not only being restricted to infrastructure projects implemented by GDID or being implemented within the vicinity.

Furthermore they have access to the information every time beyond the business hours of organisations. SMCFs that does not only rely on contacting business within their comfort zones but have a desire to expand their business through the country thus realise the possibility of that endeavour through the use of e-notification. It has been shown in table 4.3 before that 75% of SMCFs do rely on e-notification from the Tender Bulletin, CIDB Website, Department of National Treasury E-tenders website; and the Lead-2-Business website.

- **Enlarges SMCFs Market**

The utilisation of e-notification thus presents SMCFs with an opportunity to enlarge their market beyond their comfort zones.

- **Competition**

SMCFs asserted that the widespread provision of tender opportunities information for infrastructure projects gives them the opportunity to participate and thereby compete in the procurement of those infrastructure projects there by increasing competition on tenders for infrastructure projects.

- **Time Saving**

SMCFs alluded to the fact that the use of e-notification provides a time saving benefit. They indicated that without the use of e-notification, SMCFs would be required to visit several organisations, Departments and notice boards and buy newspapers soliciting for information on the availability of tender opportunities for infrastructure projects. The use of e-notification ensured that that information is readily available and easily accessible.

- **Contract Administration**

The use of email communication has been described as widespread during contract administration. The data collected shows that all the SMCFs that responded do utilise email communications during contract administration. Emails are used for issuing of instructions, confirmation of instructions, disseminating project reports, meeting minutes, preparation and confirmation of payment certificates and other discussions. Emails thus provide real time communication and are convenient way of disseminating information.

- **Cost Saving**

The other benefit that SMCFs assert to is the cost saving benefit of the use of the e-procurement methodologies currently being implemented by GDID. SMCFs alluded to the fact that the utilisation of e-notification and use of email communications drastically reduces the costs that they could incur had traditional procurement means have been used for notification of tender opportunities. These traditional procurement means are; placement of tender advertisements on newspapers and on notice boards. SMCFs indicated that had traditional means been used they would have to procure newspapers or visit notice boards on where notices for tender opportunities could be made. This therefore required SMCFs to buy newspapers or incur transport costs to get access to this information.

SMCFs further indicated that the adverts for tender opportunities for infrastructure projects are placed only once in newspapers. This therefore increases the risk of

SMCFs missing the advert and the opportunity to participate on the procurement for infrastructure projects.

The respondents also indicated that notices on the notice boards are easily vandalised. This puts a risk that other SMCFs could not be able to view the notice and thereby fail to have information on the existence of the tender opportunities.

- **Payments**

The implementation of e-payments by GDID reduced the payment processing time. This ensures that SMCFs receive timeous payments. This improves their cash flows and increases that production rate when they timeously procure and pay for materials, plant, equipment and labour.

- **Project Management Reporting**

The utilisation of the Oracle Primavera P6 system provides a standardised project reporting tool. This therefore provides a platform for rating the performance of SMCFs and benchmarking the performance of SMCFs and projects. Thus SMCFs would be able to rate themselves and identify the areas that they need to address if improvement is required.

- **Project Tracking**

Project information populated on the Oracle Primavera P6 system provides SMCFs with opportunities for tracking project progress and performance. They therefore have the opportunity to identify and rectify defective areas before they are detrimental contract remedial actions are effective for defective performance.

THE NEGATIVE IMPACTS

It was established that negative impacts arise firstly, due to the limitations experienced within the adoption and implementation of the current e-procurement methodologies implemented by GDID. Secondly, they are attributed to the limitations due to the non-implementation of some of the e-procurement methodologies. Below are the limitations indicated:

- **Limitations from Existing Methodologies**

Lack of Knowledge

3 of the 12 SMCFs on Table 4.3 indicated that they rely on newspapers and word of mouth for obtaining information on the availability of tender opportunities for infrastructure projects. This constitutes 25% of the respondents. Upon further interrogation, it was found out that these SMCFs did not have information that the existence of tender opportunities can be obtained electronically from any of these platforms; the Tender Bulletin, CIDB website, Department of National Treasury E-tenders website and Lead-2-Business website. These SMCFs were on CIDB level 3 and 4. These are SMCFs that can be said to be having little experience within the construction industry.

Lack of Resources and Infrastructure

The other limitation that is experienced as alluded by SMCFs that impact on their full utilisation and benefit of the e-procurement methodologies being used by GDID is due to lack of resources. These resources include the finance to procure complying equipment like laptops and installation of Internet. The 3 SMCFs that still uses newspapers and word of mouth indicated that despite the lack of knowledge they do not have Internet connections in their offices. They only make use of personal Internet connections through cellular phones. This therefore cannot be used for business use except reading emails. It was further discovered that the emails that are used in these companies are not company emails but Gmail and Yahoo email accounts.

Large Volume of Procurement Personnel

Due to that fact that tender documents has to be completed, consolidated and submitted manually, SMCFs are forced to employ more human resource within their procurement units to execute these tasks. They therefore have to incur in administration costs and salaries on these employees. This increases their expenses and reduces the profits.

Non-Availability of Platforms for Information Sharing

Information sharing is critical especially between the knowledgeable and experienced SMCFs and the newly established SMCFs that would still be lacking on construction knowledge and experience especially in following and interpreting the trends within which the industry would be going through. This is made possible where full e-procurement systems are implemented.

Technical Capacity Limitation

The responses from the 3 SMCFs that are not yet using e-notification indicate that there is a general lack of knowledge on how to access information on the Internet. They can access emails but when it comes to know how to search for the other information like to search for tender opportunities notifications from various organisations on the Internet they cannot.

- **Limitations from Limited E-procurement implementation**

E-tendering

SMCFs indicated that implementation of e-tendering allows them benefit from the tendering costs and time savings. This allows them to focus more on the projects that they will be implementing than to spend a lot of time and to employ considerable human resource only focussing on tendering.

SMCFs further indicated that indicated that even if you obtain electronic versions of the tender documents on the Department of National Treasury E-tenders website, pricing and submission of the submitted bids has to be done on the originally issued documents by GDID. Thus pricing of tender documents received from GDID is through traditional systems. This means that the pricing is done on paper based tender documents that are issued by GDID after SMCFs paid a non-refundable deposit for the documents. Mistakes during the pricing processes thereby arise and depending on the magnitude of the mistake sometimes the cost SMCFs the contract opportunity. SMCFs indicated that had this process been done electronically and a platform for electronic submission was available, this could assist SMCFs to spend limited time on pricing and reduce or totally eliminate the errors that they are exposed to during the pricing of tender documents.

The fact that pricing is done manually, requires that SMCFs employs a number of staff in their procurement sections (units) to be able to complete all the bids that they price in a given year. This increases the operational expenses of SMCFs and limits their annual profit margins on the contracts that we get. In this regard, it has also been indicated that failure to implement e-tendering increases the cost of tendering incurred by SMCFs. SMCFs further alluded that implementation of e-tendering could reduce these costs drastically.

E-submission

SMCFs asserted that the non-implementation of e-tendering makes provision for submission of priced tender documents in hard copies. SMCFs expressed concern over the security of their submitted bids against tempering of documents to their detriment. They further indicated that had e-tendering been implemented, electronic submission and transaction give them comfort because any adjustment to any document can be easily tracked.

It has been raised by SMCFs that when the deadline for submission of bids is looming, they rush consolidation of documents and attachment of required returnable schedules. This rushing sometimes makes them to forget to attach other important documents required. This it has been suggested could not be the case when e-tendering had been implemented.

E-evaluation and award

SMCFs made the assertion that due to the non-implementation of e-tendering, evaluation of submitted bids are done manually. Thus the scoring of Preferential Points to bids and bidders is subjected to individuals and as a result is not standardised. This gives rise to favouritism, fraud and corruption. In that regard, SMCFs expressed their desire for a standardised mechanism of tender evaluation that excludes human contact in the main stream. This can only be achieved when e-tendering is implemented. Transparency and accountability are easily confirmed through the tracking mechanisms that exist when e-tendering is implemented.

Furthermore, SMCFs indicated that the lack of tracking mechanisms for checking the status of contracts on evaluation puts them in the dark on whether the contract have been awarded or not. They further indicated that GDID does not provide feedback on the awarded contracts. This makes it impossible for other bidders who had not been awarded the contract to use their pricing for this contract as a benchmark for other contracts or bids that they will express interest on.

Lack of IT Policy (E-procurement adoption policy)

SMCFs alluded that the non-implementation of e-procurement by themselves (SMCFs, GDID and other organisation is pinned on the lack of legislation or IT policy on the implementation of e-procurement. SMCFs indicated with the benefits of e-procurement having been recorded for all stakeholders in the procurement of infrastructure projects, is sufficient motivation for government to legislate it to ensure that transparency and accountability is preserved in procurement. Legislating the implementation of e-procurement thus make it mandatory for all role players to implement electronic means to ensure that all procurement processes are implemented electronically.

OPPORTUNITIES AND THREATS TO SMCFS ADOPTION TO E-PROCUREMENT

SMCFs were requested to identify the opportunities (that stimulates their e-procurement adoption) and threats (that impedes their e-procurement adoption) that impact on their development and growth. Below are the responses obtained from SMCFs.

OPPORTUNITIES THAT STIMULATE SMCFS E-PROCUREMENT ADOPTION

It was established that SMCFs are keen to adapt to processes that enhances their chances of and eliminates their exclusion in participating in procurement processes for infrastructure projects implemented by GDID. The following opportunities were identified as driving SMCFs to adapt to e-procurement. Some of these opportunities have however been heighted on the positive impacts of e-procurement to SMCFs.

- **Greening procurement processes**

Greening construction processes has been under the spotlight amid calls for combating all activities that stimulate climate change. SMCFs indicated that they endeavour to

have their contribution to combating climate change through greening procurement process.

- **Communication**

Implementation of e-procurement improves communication from the notification stage for the existence of the tender opportunities for infrastructure projects till to the completion of projects and disposal of immovable assets.

- **Reduction in Tendering Costs**

SMCFs indicated that implementation of full e-procurement reduces their need to travel to procure tender documents, price them then have to incurring costs having to deliver them again, reproduction of documents and returnable schedules to be attached. This constitutes a significant amount after some time. The reduction of this therefore ensures reduction in tendering costs.

- **Reduction in Tendering Time**

Reduction in travelling and the easy of pricing the tender documents means a lot of time is saved by SMCFs. This then ensures that they have more time to focus on other things like running projects already awarded.

- **Increased Profitability**

SMCFs indicated that implementation of e-procurement reduces tendering costs and time; this therefore reduces the expenses they incur and increase their profitability.

- **Improved Accountability and Transparency**

SMCFs asserted that implementation of e-procurement ensure that there is accountability and transparency within the procurement systems since there is a trace of all transactions. This limits the effect of fraud and corruption and enhances changes of being awarded contracts.

- **Provision of Feedback System**

SMCFs attested that implementation of e-procurement provides them with a platform to easily draw lessons learnt on each tender use it to benchmark other tenders that they will participate on and other projects that they are engaged.

THREATS THAT IMPEDES SMCFS E-PROCUREMENT ADOPTION

Despite there being opportunities, there are factors that impede the adoption of e-procurement by SMCFs. Some of them have been indicated under the negative impacts before. The following threats have been raised by SMCFs as impeding or compromising their adoption to e-procurement.

- **Unreliable Power Outages**

Unreliable power outages pose a big risk to the adoption of e-procurement by SMCFs. Power outages means that SMCFs will not be able to work during the time when there is no power.

- **Lack of Government Policy**

GDID and SMCFs alluded to the need for government to institute legislation to enforce mandatory implementation of e-procurement. Without government enforcement, implementation of e-procurement will take long.

- **Security Concerns**

SMCFs expressed their fears and concerns over the security of e-procurement transactions. Sometimes emails can be sent to the wrong recipient meaning that the SMCF would be deemed non-responsive to a tender that the SMCF would have allocated a lot of resources in completing and consolidating.

- **Resistance to Change and Lack of Management Support**

Resistance to change to adapt to new technologies has been listed by SMCFs as another reason that impedes e-procurement adoption. Legislation of an e-procurement policy by government would force to fight the stigma of resistance to change.

- **Existence of Incompatible Various E-procurement Solutions**

There exist a lot of e-procurement solutions in the market. These solutions a noted by SMCFs is not compatible with each other. SMCFs therefore recommend that when GDID needs to consider this when they are implementing full e-procurement system because this might significantly affect the participation of SMCFs.

- **Lack of Capital and Infrastructure**

SMCFs noted that there is need for upgrading and expanding the existing infrastructure. Internet accessibility is still a problem in other areas and hence this needs to be addressed.

SUMMARY

In this Chapter, data collected through interviews from GDID officials and through questionnaires from SMCFs has been presented. This data relates to the e-procurement methodologies currently implemented by GDID, the experiences of SMCFs and the positive and negative impacts experienced by SMCFs based from the e-procurement methodologies implemented by GDID. The positive impacts relate to the benefits derived by SMCFs while the negative impacts relate to the limitations experienced by SMCFs. The opportunities and threats to SMCFs adoption of e-procurement were also explored as indicated by SMCFs.

APPENDIX F: QUESTIONNAIRES SENT TO GDID OFFICIALS

QUESTIONNAIRE SENT TO GDID OFFICIALS

1. Could you please indicate how you go out on tender including the form of documentation that you go out on tender on and how tenderers obtain these documents?

   _____
   _____
   _____
   _____
   _____

2. What determines the choice of the form of tender documentation used for tendering indicated above? (Indicate if there are any regulations or legislations that govern its adoption and utilisation)

   _____
   _____
   _____
   _____
   _____
   _____

3. Could you please take me through the procurement systems (methodologies) that GDID implements during the following procurement processes including the media of communication utilised?

   - *Tender notification*

     _____
     _____
     _____
     _____
     _____

- *Tender submission*

- *Tender evaluation*

- *Award*

- *Contract Administration*

- *Project Closure*

  _____
  _____
  _____
  _____
  _____

- *Maintenance*

  _____
  _____
  _____
  _____
  _____

4. Based on your experience with GDID procurement processes could you please indicate the challenges that you have experienced with the use of the current procurement systems?

   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____

5. Could you indicate the corrective measures that have been implemented resolve that challenges indicated before if any?

_____
_____
_____
_____
_____
_____
_____
_____
_____

6. Please provide recommendations on how GDID could improve its procurement processes given the challenges indicated above?

_____
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_____
_____
_____
_____

Thank You

APPENDIX G: QUESTIONNAIRES SENT TO SMCFs

Letter of Introduction

School of Construction Economics and Management
Faculty of Engineering and the Built Environment
University of the Witwatersrand, Johannesburg
Private Bag 3, WITS, 2050

14 March 2017

TO WHOM IT MAY CONCERN

This questionnaire is part of a research to understand the impact of the implementation of electronic procurement on the development of small and medium construction firms. Your responses are important in enabling me to obtain as full an understanding as possible of this topical issue. Your decision to participate in this research is entirely voluntary.

If you do decide to take part, the questionnaire should take you about 20 minutes to complete. Please answer the questions in the spaces provided. If you wish to add further comments, please feel free to do so. The information you provide will be treated in the strictest confidence. You will notice that you will be asked to put you name and contact details on the consent form, the information provided therein will be used for reference purposes and will neither be disclosed to any stakeholder nor included in the dissertation.

The answers from your questionnaire and others will be used as the main data set for my research project for my Masters in Science in Building (Project Management) at the University of Witwatersrand.

I hope you will find completing the questionnaire enjoyable. Please return the completed questionnaire to me, Ronald Sithole, by 31st March 2017 through hand delivery or using the email address below. If you have any questions or would like further information, please do not hesitate to contact me on my details below.

My details:

Ronald A. Sithole
Student No. 421990
Email: 421990@students.wits.ac.za
Cell Number: 073 863 2995

Thank you for your help.

Mr. Ronald A. Sithole

Questionnaire on the implementation of e-procurement by the Gauteng Department of Infrastructure Development and its impact on the development of small and medium construction firms.

You are requested to complete the attached questionnaire and or tick the appropriate box.

SECTION 1: BACKGROUND INFORMATION

1. Please indicate the CIDB grading of your organisation? (If you have multiple grading indicate all)

CIDB Grading	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**

SECTION 2: E-PROCUREMENT METHODOLOGIES

2. Could you indicate which of the platforms below that you use to solicit for tenders for infrastructure projects implemented by GDID? *(Tick the appropriate box of the sources that you use)*
   - Tender Bulletin ☐
   - CIDB Website ☐
   - Department of Treasury (E-Tenders Portal) ☐
   - Lead-2-Business Website ☐
   - Newspapers ☐
   - Community Notice Boards ☐
   - Word of Mouth ☐
   - Others, (Specify……) ☐

3. Based on your experience in the tendering for infrastructure projects implemented by GDID, please indicate in what form do you receive and submit tender documents? *(Tick the appropriate box)*

	Receiving	***Submission***
• Traditionally (Paper-based)	☐	☐
• Electronically	☐	☐

4. Based on your experience in the tendering for infrastructure projects implemented by GDID, how are you informed of your appointment? *(Tick the appropriate box)*
   - Traditionally (Paper-based) ☐
   - Electronically ☐

5. (a) Based on your experience in the procurement processes for the implementation of infrastructure projects implemented by GDID could you indicate how the various contract administration activities are implemented? *(Tick the appropriate box and note that you may tick both boxes should the forms be applicable to both of them)*

	Traditionally	***Electronically***
• Communication	☐	☐
• Issuing and or confirmation of Instructions	☐	☐
• Project Reporting	☐	☐

- Payments ☐ ☐
- Project Closure ☐ ☐

(b) Please provide brief explanations of the forms of how the above are implemented including the form and media used?

- *Communication*

  _____
  _____
  _____
  _____
  _____

- *Issuing and or confirmation of instructions*

  _____
  _____
  _____
  _____
  _____

- *Project Reporting*

  _____
  _____
  _____
  _____

- *Payments*

  _____
  _____
  _____
  _____

- *Project Closure*

  _____
  _____
  _____
  _____

- *Maintenance*

  _____
  _____
  _____
  _____

6. Could you please indicate and explain the benefits that small and medium construction firms derived from the utilisation or adoption of the electronic procurement (e-procurement) methodologies implemented by GDID at various levels within the project procurement life cycle?

- *Tender Notification*

- *Bids Preparation*

- *Tender / Bid Submission*

- *Tender / Bid Evaluation*

- *Contract Award*

- *Contract Administration*

- *Payments Processing*

- *Project Closure*

- *Maintenance*

7. Could you indicate and explain the negative impacts that Small and Medium Construction Firms experienced in the utilisation or adoption of the e-procurement methodologies implemented by GDID?

- *Tender Notification*

- *Bids Preparation*

- *Tender / Bid Submission*

- *Tender / Bid Evaluation*

- *Contract Award*

- *Contract Administration*

- *Payments Processing*

- *Project Closure*

- *Maintenance*

8. Could you indicate the opportunities that Small and Medium Construction Firms benefit from the adoption of e-procurement methodologies for the procurement for infrastructure projects implemented by GDID?

9. Could you indicate the threats that inhibit Small and Medium Construction Firms from optimizing the benefits attributed to the adoption of e-procurement methodologies implemented for the procurement for infrastructure projects implemented by GDID?

10. Could you provide your ideas on how GDID should implement (or improve) its procurement processes to ensure optimal benefit to Small and Medium Construction Firms?

Thank you for taking the time to complete this questionnaire. If you have any queries, please do not hesitate to contact Ronald A. Sithole on 073 863 2995 or emailing 421990@students.wits.ac.za.

Ronald A. Sithole