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Developing an enabling environment to maximise e-procurement adoption in the South African construction industry

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Abstract

The aim of this paper was to explore how the current environment of electronic procurement in South African construction industry can be improved to help in maximizing the diffusion and adoption of electronic procurement when it comes to the acquisition of construction works and services. Electronic procurement refers to the use of electronic communication systems and applications to buy services, goods and works or conduct tendering for construction works. While there is growing evidence of application and benefits of e-procurement in some countries, the use of e-procurement in South Africa has been limited and patchy, implying that the benefits are currently not being maximised to support economic growth and industry development. We explore some of the ways in which this problem can be addressed. The paper is organised into four parts. In the first part, we discuss general factors that enable e-procurement adoption based on evidence reported in the literature. These are the regulatory framework and policies guiding procurement; ICT infrastructure; and technology uptake by people. Second, a discussion of the three factors within the context of South Africa is presented. Third, an online survey was conducted in which 23 respondents gave an indication of the extent of their awareness and adoption of e-procurement in the South African construction industry. While 70% of respondents were aware of electronic procurement, only 33% of them had actually used e-procurement. Fourth, we conclude by discussing some of the ways in which the use of e-procurement can be diffused and maximized in the procurement of construction work in South Africa. Of the three main enablers of e-procurement, two are found to be quite sufficient i.e. the country's market and regulatory framework in supporting ICT uptake; and there is also a good ICT infrastructure environment. The main area of concern relates to technology uptake by people in the construction industry. This requires major cultural and organisational changes that can be brought about by targeted initiatives championed by, for example, CIDB, CBE and major procurers; investment in technology by firms; and clear roadmap for transitioning to e-procurement in appropriate areas of construction procurement.

Keywords: e-procurement, e-readiness, ICT infrastructure, online survey, Networked Readiness Index, procurement policy and framework, technology uptake

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1. Introduction

The concept of electronic procurement refers to the use of electronic communications to buy services, goods and works or conduct tendering for construction works (adapted from the European Union definition). Despite the advanced use of e-procurement in developed countries for acquisition of construction goods, services and works, the adoption of e-procurement in the South African construction industry has been limited and patchy. The aim here was to examine the e-procurement environment in South Africa, compare it with the e-procurement environment in leading countries where it is adopted, and discuss ways of improving the South African environment to help maximise the diffusion and application of electronic procurement in construction. The regulatory and policy environment for procurement in South Africa is reviewed. This is followed by a discussion of the information and communication technology environment. By examining Networked Readiness indices of leading e-procurement adopters with that of South Africa, the discussion focuses on ways of enhancing South Africa's environment and practices to maximise e-procurement adoption.

2. Research approach

The study is part of an on-going research project designed to investigate e-procurement adoption in the South African construction industry.

The data reported were obtained from the review of literature, documentary analysis and a pilot survey conducted between July 2013 and January 2014. Data for the first objective of the study were obtained through extensive analysis of the different pieces of legislation and policy documents that regulate procurement practices in South Africa. Table 1 is a summary of the documents analysed. For the second objective, the main literature analysed is the Global Information Technology (GIT) Report 2013. To identify any evidence of e-procurement use, which is the third objective of the study, a pilot survey was conducted between 4th of December 2013 and ended on the 31st January 2014. The target population for the survey was professional consultants (architects, engineers, and construction and project managers, quantity surveyors), client organizations and contractors. A short questionnaire containing for questions, relating to (i) the role of the respondents in the South African construction industry (ii) level of awareness of the use of e-procurement in construction (iii) whether or not the organization has used e-procurement in procuring construction works, services or supplies; and (iv) whether the respondents have personally participated in a construction project that involved the use of e-procurement. Data for the pilot survey were collected through an online survey using the qualitrics online survey software. Of the 29 respondents who participated in the online survey, 23 provided useful information that was included in the analysis.

Due to the nature of data collected, two types of analyses were conducted. The first was content analysis, which was used in the analysis of data collected from the literature review and documentary analyses. This analysis helped in the identification of the different pieces of legislation that have implications for e-procurement practices; and the state of ICT environment in South Africa. The second analysis conducted was simple descriptive

statistical analysis. This was used to analyse data derived from the online questionnaire survey.

3. Factors enabling the adoption of e-procurement

When it comes to factors enabling e-procurement adoption, two concepts that should be explained to provide a context are e-readiness and Networked Readiness.

E-readiness is a measure of the degree to which an organization, a society, or a country may be ready, willing or prepared to obtain benefits which arise from Information and Communications Technologies (see explained in a paper by Goulding and Lou (2013) on e-readiness in construction). E-readiness is the preconditions necessary for e-commerce, e-government, e-development and e-procurement. In the past, an E-Readiness Index has been published for countries by the Economist Intelligence Unit. This index is a statistical measure composed of quantifiable set of indicators and summarized broad set of characteristics to describe an organization, a society or a country's e-readiness. The higher the e-readiness index of a country, the better prepared it is for adoption of e-government or e-commerce (see The Global Competitiveness Report 2013–2014 published by Klaus Schwab for the World Economic Forum). A study by Ifinedo (2005) on e-readiness of nine African countries in the global networked economy concluded that "the mean e-readiness of Africa is poor in comparison to other economies. Particularly, Sub-Saharan Africa (SSA) - with the exception of South Africa and its neighbours - has a poor e-readiness score".

The Networked Readiness Index (NRI) measures the propensity for countries to exploit the opportunities offered by information and communications technology (ICT). The Global Information Technology Report (GITR) and the Networked Readiness Index (NRI) was created in 2001. It enables decision makers and investors to adopt business and financial strategies that would allow them to develop in the context of a fast-moving but nascent Internet economy (Bilbao-Osorio et al., 2013). The NRI provides a better understanding of the impact of ICT on the competitiveness of nations. It comprises of three components: the environment for ICT offered by a given country or community (market, political, regulatory, and infrastructure environment), the readiness of the country's key stakeholders (individuals, businesses, and governments) to use ICT, and the usage of ICT among these stakeholders.

There seems to be a close relationship between e-readiness / Networked Readiness index and e-procurement uptake in countries (see Table 3). A study conducted by Westcott (2002) indicated that the leading countries when it comes to e-procurement usage are US, Japan, Sweden, Australia, UK and Ireland. A close examination of the GTI Report 2013 (Bilbao-Osorio et al., 2013) shows that the leading countries when it comes to e-procurement adoption also score high when it comes to the Networked Readiness Index (NRI) published in the Global Information Technology (GIT) Report 2013. This may imply that the factors enabling e-procurement adoption are closely related to e-readiness and Networked Readiness. Therefore, the factors enabling e-procurement adoption may be summarized as (1) the regulatory framework and policies guiding procurement; (2) ICT infrastructure; and (3)

technology uptake by people in industry and business. This position is supported in part by research on e-procurement by Goulding and Lou (2013). These factors provide a context for

discussion, and clearly need to be addressed in the South African environment in order to maximise e-procurement use.

4. Regulatory and policy environment for procurement in South Africa

Although there are several definitions of procurement in the literature, the definition of procurement adopted in this study is drawn from two documents. The first is from the Wealden District Council document on procurement strategy (2011:2), which defined procurement as "*the process of acquiring goods, works and services, from both third parties and in-house providers*". The second is from the International Standard Organization Procurement document (ISO 10845-1, 2010), which also defined procurement as a succession of logically related actions occurring or performed in a definite manner and which culminate in the completion of a major deliverable or the attainment of a milestone. In a conceptual paper on a BIM-based integrated perspective to challenging electronic procurement in the AEC Sector, Grilo and Jardim-Goncalves (2011) explained that procurement is broader in scope than purchasing, because it encompasses both strategic and operational activities such as searching for requirement information of goods and services, their availability delivery arrangement, actual acquisition and delivery. The above definitions are very insightful as they indicate that procurement is more than mere purchasing, but a process comprising a sequence of closely-related activities that lead to obtaining deliverables such as acquisition of goods, utilities, services and works form supplies or vendors at the agreed price, time and legal terms.

In the context of the construction industry, the internationally accepted definition of construction procurement is also found in ISO 10845-1 (2010). According this document, construction procurement is a process through which contracts relating to the provision of goods, services and engineering and construction works or disposal, or any combination thereof are created, managed and fulfilled. It involves the procurement of materials, goods, equipment, professional and non-professional services required for the actualisation of construction projects as explained by Grilo and Jardim-Gonclaves (2011). Following from the above, e-procurement as applied to construction is the use of electronic systems and applications to acquire goods, equipment, professional and non-professional services for construction projects. It entails the use of electronic systems and applications to advertise for tender offers from professional consultants and contractors, exchange of project data and information, conduct tendering, evaluate tenders or proposals, award and management construction contracts.

From the review of international literature, it was found that greater part of construction procurement activities are conducted electronically in most developed countries such as Australia, Canada, Russia, the UK and USA. Studies also show that in the different

countries, several factors, including cost, cultural, legal, interoperability (Issa et al., 2003; Zou and Seo, 2005), ICT infrastructure, personnel, regulatory/policy environment and security issues (Eadie et al., 2011; Oyediran and Akintola , 2011) have influenced the use of e-procurement at the project, organizational and industry levels. In a study that examined the implementation of the World Bank's e-Procurement initiatives in the selection of consultants, Leipold *et al.* (2004) specifically explained that the ICT infrastructure and procedures engaged in by the World Bank in selecting consultants for its projects across the world were among other things determined by the existing public sector procurement policies and regulations. Similarly, in a multiple case studies on e-procurement implementations in Italy, New South Wales, New Zealand, Scotland and Western Australia by the Australian Government Information Office (2005), it was observed that e-procurement use was influenced by diverse socio-technical, institutional and policy contexts in the different countries. This was corroborated by a recent multiple case studies of five major e-procurement projects in UK-based public sector agencies by Doherty et al. (2013), which also found that procurement in the public sector was often constrained by institutional, political and regulatory factors. Further, in a conceptual paper that sought to develop a theoretical impact-role-factor assessment model to assess the importance of government, organizations and technology on a construction enterprises' e-procurement readiness level in the developing countries, Tran *et al.* (2011) noted that some of the roles of government in promoting e-procurement use included the provision of supportive policies and programmes; IT infrastructure, legal and regulatory framework. The above obviously suggest that regulatory, policy and ICT environment are enablers of e-procurement use

Table 1: Pieces of legislation affecting procurement in South Africa

S/N	Acts (various pieces of legislation)
1	Arbitration Act (Act 42 of 1965)
2	Auditor – General Act (Act 12 of 1995)
3	Broad-Based Black Economic Empowerment Act, 2003 (Act No. 53 of 2003)*
4	Competitions Act (89 of 1998)
5	Constitution of the Republic of South Africa, 1996 (Act No 108 of 1996)*
6	Construction Industry Development Board Act, 2000 (Act 38 of 2000)*
7	Electronic Communications and Transactions Act (Act No. 25 of 2002
8	Local Government: Municipal Finance Management Act, 2003 (Act No 56 of 2003)*
9	Local Government Municipal Systems Act, 2000 (Act No 32 of 2000)
10	Preferential Procurement Policy Framework Act, 2000 (Act No 5 of 2000)*
11	Prevention and Combating of Corrupt Activities Act, 2004. (Act No. 12 of 2004)*
12	Protected Disclosure Act (Act 26 of 2000)
13	Promotion of Access to Information Act, (Act 2 of 2000)
14	Promotion of Administrative Justice Act (Act 3 of 2000)*
15	Public Protector Act (Act 23 of1994)
16	State Information Technology Agency Act (Act 88 of 1998)
17	The Conventional Penalties Act (Act 15 of 1962)
18	The Promotion of Equality and the Prevention of Unfair Discrimination Act, 2000 (Act 4 of 2000)*

In the context of South Africa, literature survey reveals that there is a dearth of empirical studies on e-procurement use in the construction sector. However, a number of studies on the procurement practices in the country were identified. For instance, Watermeyer (2003) explained that in recent years, South Africa has witnessed some fundamental reform in the regulation of procurement, and is one of the countries in the world to have procurement subject to its constitution. Bolton (2006) in a study of government procurement as a policy tool in South Africa noted that before 1994, government procurement system in this country was in favour of large and established enterprises owned by whites and excluded newly

established businesses. He further explained that since 1994 when public procurement system was granted constitutional status, and was recognised as one of the ways to addressing past discriminatory policies and practices things have changed significantly. In a study on procurement challenges in the South African public sector Ambe and Badenhorst-Weiss (2012) added that reforms in public procurement in the country were initiated to promote the principles of good governance and address inconsistency in policy application, lack of accountability, supportive structures and fragmented processes.

One of key aspect of the reform in the procurement system of South Africa was the enactment of several legislation and policies to regulate procurement practices in the country. In fact, Watermeyer (2011) identified eighteen of such pieces of legislation that impact on construction procurement in South Africa (see Table 1) Ambe and Badenhorst-Weiss (2012) identified nine pieces of legislation, including the Public finance Management Act 1 of 1999 and the eight other Acts asterisked in Table 1 as forming the regulatory framework for procurement practices in the country.

From the studies cited in the preceding paragraph we understand that 19 different pieces of legislation exist that regulate procurement practices in South Africa in several ways. These pieces of legislation are known to regulate procurement practices in South Africa by setting out the general principles for public procurement and establishing the regulatory framework, administrative procedures, manner for implementing preferential procurement policies and a code of conduct for parities engaged in construction procurement. However, these studies are silent on the implication of these pieces of legislation for e-procurement in the country. This is one aspect of the existing gap in the literature this study attempted to fill.

5. Technological environment for e-procurement in South Africa

As noted earlier, the ICT infrastructure environment has significant influence on e-procurement use in the construction industry in particular and other sectors in general. Therefore, for the purpose of our analysis in this paper, the technological context of e-procurement application is seen from the lens of the ICT environment of South Africa. The basis of our analysis and discussion is the Network Readiness Index (NRI) framework used in assessing the ICT infrastructure in the different countries across the world as presented in the Global Information Technology (GIT) Report 2013 (Bilbao-Osorio et al., 2013). The data used in the GIT report are derived from a survey of the ICT environment in the different countries and published by the World Economic Forum.

The Networked Readiness Index (NRI) is a framework that measures access and usage of ICT infrastructure, digital resources, software and skills and some of the economic and social impacts accruing from ICTs as explained in the Global Information Technology (GIT) Report (2013). Among other things, the NRI measures the (i) friendliness of a country's market and regulatory framework in supporting high levels of ICT uptake (ii) degree of a society's preparation to make good use of an affordable ICT infrastructure (iii) efforts of the main social agents—that is, individuals, business, and government to increase their capacity to use ICTs as well as their actual use of ICTs in day-to-day activities; and (iv) broad

economic and social impacts accruing from ICTs and the transformation of a country toward an ICT- and technology- economy and society (see Bilbao-Osorio et al., 2013:xii).

Specifically, the network readiness framework comprises of four sub-indexes that measure (i) the ICT environment (political, regulatory, business and innovation environments) (ii) the readiness of a society to use ICTs (infrastructure and digital content, affordability and skills) (iii) the actual usage of ICTs by all main stakeholders (e.g. individuals, businesses, government) and (iv) the impacts that ICTs generate in the economy and in society (economic and social impacts) see Figure 1). As explained in the GIT Report 2013 the first three sub-indexes can be regarded as the conditions that facilitate the result of the fourth sub-index. In assessing the ICT environment, countries are scored based on these four sub-indices. Therefore, the NRI score represents average of the four sub-index scores; and thus higher NRI means better access and usage of ICT infrastructure, digital resources and greater economic and social impacts accruing from ICTs. In assessing the ICT environment, countries are scored based on these four sub-indices. The latest GIT Report 2013 indicates that the top three ranking countries of the 144 surveyed in terms of RNI are Finland with RNI Score of 5.98, Singapore (5.96) and Sweden (5.91), respectively. The lowest ranked country is Burundi with RNI Score of 2.30.

Table 2: Networked Readiness indicators for South Africa

Networked Readiness variables	Rank (out of 144)	Score 1-7
Networked Readiness Index 2013	70	3.9
Networked Readiness Index 2012 (out of 142)	72	23.9
Environment Subindex	33	4.7
1st Pillar: Political and Regulatory Environment	21	5.0
2nd Pillar: Business and Innovation Environment	55	4.4
Readiness Subindex	95	4.0
3rd Pillar: Infrastructure and digital content	59	4.2
4th Pillar: Affordability	105	3.9
5th Pillar: Skills	102	4.0
Usage Subindex	72	3.5
6th Pillar: Individual usage	81	3.0
7th Pillar: Business usage	33	3.9
8th Pillar: Government usage	102	3.7
Impact Subindex	92	3.2
9th Pillar: Economic impact	51	3.5
10th Pillar: Social impact	112	3.1

Definition of parameters
The environment subindex gauges the friendliness of a country's market and regulatory framework in supporting high levels of ICT uptake and the emergence of entrepreneurship and innovation-prone conditions. A supportive environment is necessary to maximize the potential impacts of ICTs in boosting competitiveness and well-being.

The readiness subindex measures the degree to which a society is prepared to make good use of an affordable ICT infrastructure and digital content.

The usage subindex assesses the individual efforts of the main social agents—that is, individuals, business, and government—to increase their capacity to use ICTs as well as their actual use in their day-to-day activities with other agents.

The impact subindex gauges the broad economic and social impacts accruing from ICTs to boost competitiveness and well-being and that reflect the transformations toward an ICT- and technology-savvy economy and society.

Data Source: Bilbao-Osorio et al. (2013)

An examination of data summarized in Table 2 shows that the ICT environment in South Africa is sufficiently adequate to support the diffusion and maximisation of electronic procurement. South Africa ranks in the top 30% of countries in the world when it comes to quality of ICT infrastructure so there is a good enabling ICT environment. However, the quality of ICT infrastructure may not be the same throughout the country. Hence a main area of concern will relate to access of smaller firms in lesser developed areas to ICT facilities required to support a competitive business environment. The major problem areas from the data in Table 2 relate to Readiness subindex and Usage subindex. A comparison of South Africa with leading countries when it comes to e-procurement adoption and their networked readiness indices is shown in Table 3. Eadie *et al.* (2007) citing earlier work by Wescott and Mayer (2002) on e-Tendering from UK and European perspective noted that in terms of global ranking in the uptake of e-procurement in goods and services, the USA is number one, followed by Japan, Sweden, Australia, the UK and Ireland, respectively

Table 3: The rankings of with South Africa six major e-procurement adopters

Countries	Rank of country in terms of e-procurement usage (Westcott, 2002)	Rank out of 144 countries in GIT (2013) Report	Parameters for measuring NRI 2013			
			environment subindex	readiness subindex	usage subindex	impact subindex
South Africa	-	70	33 out of 144	95 out of 144	72 out of 144	92 out of 144
Unites States	1	9	16 out of 144	4 out of 144	13 out of 144	10 out of 144
Japan	2	2	26 out of 144	28 out of 144	9 out of 144	17 out of 144
Sweden	3	3	5 out of 144	3 out of 144	1 out of 144	4 out of 144
Australia	4	18	11 out of 144	25 out of 144	18 out of 144	18 out of 144
United Kingdom	6	7	6 out of 144	10 out of 144	11 out of 144	8 out of 144
Ireland	7	27	15 out of 144	16 out of 144	28 out of 144	33 out of 144

Data Source: Bilbao-Osorio et al. (2013)

Relating this to the GIT Report 2013 on the NRI of these six countries it seems evident that only Sweden, which ranked number three position according to the NRI score was among the top six adopters of e-Procurement in 2002. It is however intersting to observe that all the top six ranked countries in terms of e-procurement use in 2002 are among the top 21% of the 144 in RNI scores in 2013. Arguably, this goes to suggest that there is a relationship between the RNI scores and e-procurement use.

It was important to unpack the variables relating to Readiness subindex and Usage subindex to develop a better understanding of the 'real' problem areas (see Table 4). It was important to unpack the variables relating to Readiness subindex and Usage subindex to develop a better understanding of the 'real' problem areas (see Table 2). A close examination of the 28 variables relating to the two areas is summarized in Table 4.

Table 4: Comparison of South Africa with leading countries when it comes to Readiness subindex and Usage subindex

Variables relating to Readiness subindex and Usage subindex	Rank of South Africa / 144	Leading country	Leading country value	SA value
3rd pillar: Infrastructure and digital content				
Electricity production, kWh/capita	45	Iceland	53,637.7	5,004.3
Mobile network coverage, % pop	40	Azerbaijan	100	99.8
Int'l Internet bandwidth, kb/s per user	66	Hong Kong	1,046.3	18.9
Secure Internet servers/million pop	54	Iceland	3,025.1	73.9
Accessibility of digital content	85	UK	6.5	4.8
4th pillar: Affordability				
Mobile cellular tariffs, PPP $/min	117	Liberia	0.0	0.51
Fixed broadband Internet tariffs, PPP $/month	89	Israel	8.11	37.48
Internet & telephony competition, 0–2 (best)	118	Argentina	2.0	1.13
5th pillar: Skills				
Quality of educational system	140	Switzerland	6.0	2.2
Quality of math & science education	143	Singapore	6.3	2.0
Secondary education gross enrollment rate, %	56	Australia	131.3	93.8
Adult literacy rate, %	93	Estonia	99.8	88.7
6th pillar: Individual usage				
Mobile phone subscriptions/100 pop	37	Hong Kong	214.7	126.8
Individuals using Internet, %	96	Iceland	95.0	21.0
Households w/ personal computer, %	90	Iceland	94.7	18.3
Households w/ Internet access, %	94	Korea Rep	97.2	9.8
Broadband Internet subscriptions/100 pop	96	Switzerland	40.0	1.8
Mobile broadband subscriptions/100 pop	55	Singapore	114.1	19.8
Use of virtual social networks	86	Iceland	6.6	5.3
7th pillar: Business usage				
Firm-level technology absorption	38	Sweden	6.3	5.4
Capacity for innovation	41	Japan	5.9	3.5
PCT patents, applications/million pop	42	Sweden	297.1	6.0
Business-to-business Internet use	36	Finland	6.3	5.6
Business-to-consumer Internet use	52	UK	6.3	4.8
Extent of staff training	26	Switzerland	5.6	4.6
8th pillar: Government usage				
Importance of ICTs to gov't vision	105	Singapore	5.9	3.4
Government Online Service Index, 0–1 (best)	79	Korea Rep	1.0	0.46
Gov't success in ICT promotion	100	UAE	6.1	3.9

Data Source: Bilbao-Osorio et al. (2013)

From Table 3 and Table 4, the main questions emerging are: How far is South Africa from the leaders? How can the current uptake of technology by people be improved? And what can South Africa learn from the leaders? These questions are considered in the discussion.

6. Preliminary study on extent of e-procurement awareness and adoption in the South African construction sector

Figure 1 show the distribution of the respondents to the online survey conducted to develop an initial idea of the extent of awareness and application of e-procurement. This was a pilot study and the preliminary findings are to be investigated in a wider study that is ongoing.
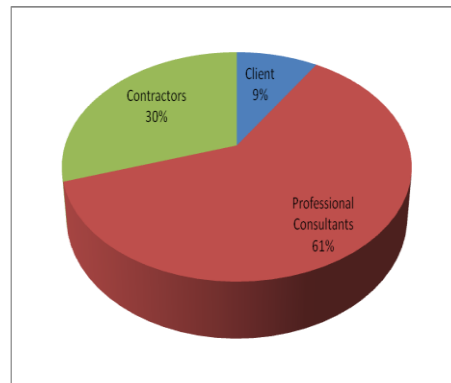
Figure 1: Distribution of Respondents in the survey

A majority of respondents (70%) are aware of the use of e-procurement in construction. On whether their organizations use e-procurement in procuring construction works, services or supply, the majority (76%) said their organizations do not use e-procurement, while 24% indicated that they use e-procurement in acquiring construction works, services or supply. The result also reveals that among the 23 respondents 15 (68%) have not participated in a construction project that involved the use of e-procurement systems and applications. In contrast seven representing around 32% of the respondents indicated that they have participated in construction projects that involved the use of e-procurement. These issues are being investigated further to also address issues relating to the attitudes of clients, vendors and suppliers to electronic procurement and how they think it may work.

7. Discussion

The study was conducted to examine three key issues. These are the regulatory framework and policies guiding procurement; ICT infrastructure; and technology uptake by people in construction industry in South Africa. The 19 different pieces of legislation and two policy documents that regulate procurement practices in South Africa and the GIT (2013) reports were used as the framework for analysing the regulatory and ICT environment for e-procurement adoption in South Africa. Data from a pilot survey formed the basis of evidence of e-procurement technology uptake by people in construction industry in South Africa.

 Although it may be argued that any piece of legislation that regulate procurement practices will most likely have impact on e-procurement, result of the analysis of the 19 pieces of legislation found to be regulating construction procurement practices in the literature reveals that 11 of them have provisions that can facilitate or inhibit e-procurement use in the South African construction industry. It seems evident from the result that Acts such as (i) the Constitution of the Republic of South Africa Act No 108 of 1996 (ii) The Promotion of Equality and the Prevention of Unfair Discrimination Act N0 4 of 2002 (iii) Local Government: Municipal Finance Management Act, 2003 (Act No 56 of 2003)(iv) Local Government: Municipal Finance Management Act, 2003 (Act No 56 of 2003) (v) Local Government Municipal Systems Act, 2000 (Act No 32 of 2000) (vi) Construction Industry Development Board Act, 2000 (Act 38 of 2000) (vii) State Information Technology Agency

Act 88 of 1998 (viii) Competitions Act N0. 89 of 1998 (ix) Promotion of Access to Information Act N0.2 of 2000 (x) Electronic Communications and Transactions Act (Act No. 25 of 2002) and one policy document- Government procurement: General conditions of contract July 2010 have provisions that can facilitate or act as drivers for the uptake and diffusion of e-procurement in the construction sector. On the other hand Acts like the Preferential Procurement Policy Framework Act N0 5 of 2000. Preferential Procurement Regulations, 2001; Broad-Based Black Economic Empowerment Act No. 53 of 2003 and policy documents such as the South African National Standards (SANS 294:2004) and the CIDB Standard for Uniformity in Construction Procurement have provisions that may constitute barriers to e-procurement adoption in the construction industry. It is important to mention that among the existing pieces of legislation examined, the Electronic Communications and Transactions Act No. 25 of 2002 appears to have the highest number of provisions that really support e-procurement adoption in the South African construction industry. It can be inferred from the above that ten of the existing Acts and one policy document have provisions that favours the adoption of e-procurement, while only two Acts and two policy documents have provisions that are not favourable to the adoption of e-procurement in construction. This goes to suggest that the South African procurement regulatory environment is considerably favourable for e-procurement use in the construction sector.

The content analysis of the GIT Report 2013 on the RNI scores for 144 countries, including South Africa reveals the position of South Africa in terms of here ICT infrastructure. Out of the 144 countries, South Africa is there at the middle (70th position); indicating that although her ICT infrastructure is not the best when compared with the top six countries in the e-procurement adoption, namely the USA, Japan, Sweden, Australia, the UK and Ireland, South Africa's is however among the top 49% in the world in terms of networked readiness index ranking. In fact, result of our analysis of the ranking of South Africa in the different sub-indices for measuring NRI, shows that in terms of ICT environment, South Africa is among the top 23 % in the world, meaning that the ICT environment in the country is generally sufficient in supporting the use of e-procurement systems and applications in the construction sector. However, there are areas where huge challenges exist. These are related to readiness and actual usage of the ICT infrastructure (see Table 4). It can be seen in Table 4 that there are wide gaps between the leading nations and South Africa in most of the 28 variables used in assessing readiness and usage sub-indexes in the RNI ranking as presented in the GIT Report 2013. This might help to explain the relatively low ranking of South Africa in these two areas.

On the evidence of use of e-procurement in the construction sector, result of the pilot survey shows evidence of e-procurement use in the sector. Although, the majority of respondents had neither used e-procurement systems nor participated in construction projects that involved the use of e-procurement, about one-third of the respondents have participated in a construction project that involved some form of electronic procurement. Compared to evidence from some of the countries summarized in Table 3, this indicates a relatively low level of e-procurement use in our industry. A set of targeted initiatives are needed to enable

greater adoption of e-procurement in appropriate areas of construction procurement particularly in the area of technology uptake by people in business organisations.

8. Conclusions

The aim was to examine e-procurement in the South African construction industry context. To achieve this goal, the study examined the procurement regulatory, policy and ICT environment in South Africa as it related to how it can impact on the uptake of e-procurement in the construction sector. Result from the review of literature, documentary analyses and pilot survey indicates that at least ten pieces of existing legislations that regulate procurement practices in South Africa have provisions capable of facilitating the uptake of e-procurement in construction, while two of such Acts have provisions that appear to be inconsistent with e-procurement. Also, using the GIT (2013) report as a framework for assessing the ICT environment in the country, it was observed that although there are areas of challenges, the ICT infrastructure of South Africa is 49% in the world and it is comparatively good with the capacity to support e-procurement use in the construction sector. Evidence of the use of e-procurement in the construction sector was also found among the respondents in the pilot survey.

Based on evidence from this study, the following conclusions can be made. The first is that the existing procurement regulatory, policy and ICT environment in South Africa can support e-procurement adoption in the construction sector. The second conclusion is that there is indeed empirical evidence of e-procurement use in the South African construction sector. Although, this study did not investigate the extent of use of e-procurement in the South African construction industry, an attempt has been made to provide some insight into the different pieces of legislation that have implication for e-procurement use in South Africa. The paper has also helps to develop a better understanding of the ICT environment as it relates to the adoption of e-procurement; and   provide empirical evidence of the use of e-procurement in buying constructions works, services and supplies in South Africa. This study implies that some aspects of the existing regulatory, policy and ICT environment constitute barriers to e-procurement uptake in the South African construction industry. There is a need to address these issues as discussed in the paper.

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