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INVESTIGATING THE EXISTENCE OF COMMON AND AGREED DESIGN AND CONSTRUCTION PROCESS AMONG CONSULTING PROFESSIONALS

RESEARCH REPORT

Submitted by

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A research report submitted to the Faculty of Engineering & Built Environment, University of the Witwatersrand, in fulfilment of the requirements for the degree of Master of Science in Building (Project Management in Construction).

Johannesburg

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DECLARATION

I declare that this research report is my own unaided work. It is being submitted to the degree of Master of Science in Building to the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination to any other university.

.....

Siapenga Simango

..... day of..... 2017

ABSTRACT

The prevalence and persistence of problems of late project delivery, cost overruns, poor quality and many others, coupled with the lack of concrete solutions to eliminate the causes of these problems over many years have driven construction industries around the world to reconsider their design and construction processes that are used to deliver projects. A government led study in the UK recommended re-thinking the design and construction process; learning from the manufacturing industry. The process protocol was developed as a result, in order to bring about a common and agreed project delivery process. Other construction industries around the world have considered adopting similar models, believing change intended to introduce process-thinking for consistency and standardisation is required to improve project delivery.

In South Africa, the existence of a common and agreed project delivery process is not clear. This study has endeavoured to explore the current phenomenon among professional councils and bodies on the existence of a common and agreed design and construction process. The research is a general opinion survey without the need for a statistical analysis. Therefore, utilising the qualitative research method was deemed to be most appropriate at this high level stage.

From the research findings, it has been concluded that while there are six stages recognised by all professional councils and associations, these stages are not used as a project delivery process. The six stages are only applied to the measurement of the professional fees due at a given stage though not applied the same way by all professional disciplines. The underlying details in the stages overlap between disciplines in some instances and are inconsistent as well.

The general consensus, from the research participants, is that a more defined and agreed process is required. The government has already taken the lead with the initiative of developing the Infrastructure Delivery Management System (IDMS) for public infrastructure projects. There is unanimous agreement among the research participants that the IDMS would be appropriate to be applied throughout the industry as a starting point for process standardisation.

ACKNOWLEDGEMENT

I express pleasure and gratitude for all the assistance and support I received from everyone to produce this work. While there is a temptation to list the names of all the people that assisted and supported me in any way, I have chosen not to do so because it would have been an immense exercise that would not have been accurately or reliably completed. I know that such an undertaking can be an error prone mission and therefore, I believe this decision will be understood to be reasonable and acceptable.

Nevertheless, I hereby sincerely thank Professor David Root who accepted the request to supervise my work on behalf of the university. Professor Root's guidance and advice made this work possible.

In recognition of everyone else and in no way undervaluing your support for not according specific mention, I thank all the friends and family, fellow students, work colleagues, lecturers and staff at the University of the Witwatersrand that provided me with guidance, support and encouragement for me to complete this research. I also thank the interview participants and the institutions they represented for finding time to participate in the research and provided their views on the research topic.

DEDICATION

This work is dedicated to my wife and children. Continue studying and acquiring knowledge and skills throughout your lives. I will do so.

LIST OF FIGURES

Figure 1: The Process Protocol

Figure 2: Gates (Control points) relating to the delivery and maintenance of infrastructure

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Table 1: Summary of participants' opinions on the pertinent information relevant to the research questions

LIST OF ABBREVIATIONS AND ACRONYMS

ASAQS	Association of South African Quantity Surveyors
BEE	Black Economic Empowerment
CBE	Council for the Built Environment
CESA	Consulting Engineers South Africa
CIDB	Construction Industry Development Board
ECSA	Engineering Council of South Africa
GDCPP	Generic Design and Construction Process Protocol
IDMS	Infrastructure Delivery Management System
IT	Information Technology
JBCC	Joint Building Contracts Committee
MTEF	Medium Term Expenditure Framework
NPD	New Product Development
PFMA	Public Finance Management Act
PP	Process Protocol
PROCSA	Professional Consultants Services Agreement Committee
SACAP	South African Council for the Architectural Profession
SACPCMP	South African Council for the Project and Construction Management Professions
SAQSP	South African Council for the Quantity Surveying Profession
SAIA	South African Institute of Architects
SIPDM	Standard for Infrastructure Procurement and Delivery Management
TQM	Total Quality Management
UK	United Kingdom
UNIDO	United Nations Industrial Development Organisation
US	United States

1 INTRODUCTION

1.1 PURPOSE OF THE STUDY

This study is seeking to establish whether consulting professionals in the South African construction industry have a common and agreed consistent process of delivering construction projects. This has been influenced by the development of the process protocol in the UK and the worldwide interest it has generated as a means of addressing project delivery problems. It is expected that the study will reveal whether such a project delivery process exists in South Africa and determine if the adoption of a process protocol model, similar to the one developed in the UK, should be considered as one of the approaches to addressing project delivery problems in the South African construction industry. This is in line with industry trends worldwide.

1.2 BACKGROUND AND CONTEXT OF THE STUDY

1.2.1 Problems in the construction industry

The construction industry is at the centre of a country's industrial, technological and commercial base and impacts on almost every aspect of development (du Plessis, 2002). However, the industry in South Africa has experienced long-identified challenges of delayed project completion, poor quality, and cost overruns (Nkado & Mbachu, 2002). These challenges have been raised for some time, and there is no indication that they no longer exist (Windapo & Cattel, 2013).

In 2013, an article by the Business Report newspaper (SAPA, 2013) reported that the then Minister of Public Enterprises, Malusi Gigaba, told the KPMG Global Construction Dialogue gathering in Johannesburg that the construction industry was facing major delivery problems; highlighting challenges of project delays, poor site management, and cost variations. This was also observed back in 1998 by then minister of public works Jeff Radebe who expressed the view that the

construction industry was unpredictable and did not provide value for money, resulting in growing dissatisfaction by industry stakeholders (DPW, 1998).

Among the causes attributed to these challenges are skills shortages, lack of investment in research and development, procurement criteria, and lack of technological advancement (Nkado & Mbachu, 2002; CIDB, 2004; Garbharran, Govender & Msani, 2012; Windapo & Cattel, 2013). Fragmentation in the construction industry has also been identified to be one of the underlying factors behind some of these challenges (*ibid*). Minster Radebe expressed the view that fragmentation in the industry was among the major causes of client dissatisfaction (DPW,1998). Harinarian, Bornman & Botha (2013) also brought up fragmentation as a contributor to the difficulties in the industry.

A report on the website of DVPM, known project management specialists in construction (cited 2015), also agreed that fragmentation in the construction industry was one of the factors affecting project delivery. The report takes into context the existence of the "six stages process" found among the consulting professional councils in the industry.

1.2.2 Problems in the construction industry worldwide and efforts to find solutions

The challenges experienced in the South African construction industry, and the possible underlying causes including fragmentation, are not unique to South Africa. In the UK, Kagioglou *et al.* (2000), cited the 1994 Latham Report as a reaffirmation of previous studies which concluded that fragmentation in the construction industry was the major factor contributing to poor project delivery.

In agreeing with Latham (1994) and the subsequent Egan Report (1998), Kaglioglou, *et al.* (2000) and Cooper *et al.* (2008) further expressed the view that building projects commonly did not meet the baselines of time, cost and quality. They refer to other reports elaborating that fragmentation is a major contributing factor to the poor performance of the construction industry worldwide *(ibid).*

From the Latham (1994) and Egan (1998) reports, the UK identified fragmentation as one of the underlying causes of industry difficulties and proposed changes to the industry process of delivering projects. Kagioglou, *et al.* (1998) agreed and supported the opinion that the design and construction process needed to be changed because of the fragmentation that exists.

It was identified that the fragmentation problem required improvement, through a process change by taking on practices from other industries such as manufacturing (Latham, 1994; Egan, 1998; & Kagioglou, *et al.,* 1998). However, other views were that a change to a process approach in the construction industry would not be implementable because the industry was different from other industries (Sheath *et al.* 1996).

Nonetheless, other strong views were that there are significant similarities between the manufacturing industry and the construction industry that can support the view that the industries can learn from one another; for instance the new product development process (NPD). The processes in manufacturing have been evolving, bringing about significant improvements in terms of time, cost and quality of products. These processes can be adopted in the construction industry with the expectation that project delivery can be improved just like in manufacturing (Kagioglou, Cooper & Aouad, 1999; Cooper *et al*., 2008).

Egan (1998) observed that it was generally agreed that the UK needed to change the construction project delivery process. To address the problem of fragmentation, the UK industry proceeded to adopt the processes in manufacturing and developed a standard process called the “Generic Design and Construction Process Protocol” (GDCPP), which was later termed the “Process Protocol” and referred to as "PP".

The process protocol was expected to bring about an agreed system or procedure, in the design and construction process (Cooper *et al*., 2008; Aouad *et al.* 1998). It is also considered appropriate to emphasise upfront planning and bringing about “fuzzy front end” practices of the manufacturing sector (Kagioglou *et al*., 2000).

In 2000, Ofori stated that the construction industry had 'special problems' by nature and fundamental re-engineering of the construction process was being considered in countries such as Australia, Hong Kong and Singapore, on the basis of the process protocol development in the UK (Ofori, 2000).

In Malaysia, industry complexity and fragmentation were identified as some of the causes of industry problems and it was suggested that the development of a protocol for design and construction similar to the process protocol could be a solution (Hussein, Rahman, & Memon, 2013; Alashwal, Rahman & Beksin, 2011). Panas, Pantouvakis & Edum-Fotwe (2005) expressed the view that process-thinking in the Greek construction industry would be ideal in order to introduce changes to the traditional approach and would improve the performance of the industry.

A process protocol analysis was suggested by Mounika & Anandh (2015) as a way of eliminating stagnation and inefficient construction processes in India. To address the problem of industry fragmentation and lack of innovation in the Australian construction industry, Hampson & Brandon (2004) proposed that a generic process protocol needed to be developed and adopted by major industry participants. This was premised on the belief that a process protocol would bring about integration, upfront planning on projects, improved communication as well as effective and systematic knowledge transfer between projects.

1.2.3 Addressing the construction industry problems in South Africa

The speech by Minister Radebe in 1998 suggested that the construction industry in South Africa required change in the way projects were delivered (DPW, 1998). Numerous remedies have been proposed and tried over time. However, it is not certain whether these efforts have been effective because the information in the industry is not well organised (Altman & Mayer, 2003; Windapo & Cattell, 2013).

One factor that has been observed to be hindering sustainable improvements in the industry is the quick-fix approach revealed by Tuan, Jay & Massyn (2014) where problems are seen to be dealt with in isolation, without taking the holistic view. In

this regard, Aiyetan, Smallwood & Shakantu (2011) suggested a *"systems-thinking approach"* where industry participants developed guidelines and benchmarks that would be adhered to when delivering projects. This idea was putting forward the process-thinking approach in South Africa which Kaatz *et al*. (2005) earlier advocated for when proposing re-arrangements to the construction process modelled around the process protocol.

The government recognised the need for process improvement and introduced the IDMS in 2010 to standardise the process of public infrastructure delivery. However, it is not clear whether the private sector participated in the development of the IDMS. Furthermore, considering that it was intended for the delivery of public infrastructure, the system may not be suitable for private sector application.

This researcher is of the view that effort is required from the private sector to consider a process change in the way projects are delivered in South Africa. Adopting the process protocol or developing a similar protocol built around the process-thinking philosophy could be one solution or starting point. This is in view of the similarities in the difficulties faced by industries worldwide and the global interest in the process-thinking approach as one of the answers to achieve effective project delivery.

To this end, examining the current process particularly among construction industry professionals would be the best starting point (Hampson & Brandon, 2004).

1.3 PROBLEM STATEMENT

The problem statement consequently is as follows:

International experience demonstrates the benefits of a common language and description of the project delivery process. This has been recognised by the public sector in respect of the development and roll-out of the IDMS. However, the existence of a common language and agreed upon description of the design and construction process in South Africa beyond this public sector initiative is not clear. While there is commonality among the various professional councils in the

industry on a six-stage construction process, there is no evidence that there is common understanding of the underlying process of project delivery in terms of common definitions, documentation, and procedures embodied in the application of the six stages. Consequently, there is a need to establish whether such common understanding and definitions exist and whether a common process description, modelled on the process protocol, would assist in overcoming the challenges faced in project delivery in South Africa.

1.4 RESEARCH QUESTION

From the above problem, the following primary research question arises:

> *Would the adoption of a process protocol approach be useful in the attempt to introduce process-thinking and commonly agreed consistent process in the way consulting professionals deliver projects in the South African construction industry?*

Sub-question 1:

> *Is there evidence of a common understanding of the design and construction process among consulting professionals in South Africa beyond the six stages articulated by the professional councils?*

Sub-question 2:

> *What are the views of consulting professionals in the South African construction industry toward the adoption of a process-thinking model for the project delivery process, such as the process protocol and its possible benefits for the South African construction industry?*

1.5 PROPOSITION

The adoption of the process protocol approach by consulting professionals in South Africa would assist in developing a common and agreed process of project delivery, and would enhance efforts to address industry challenges in project delivery.

1.6 STUDY OBJECTIVES

In view of the initiatives and innovations around process-thinking in the construction industry in the UK (Latham (1994), Egan Report (1998), Kaglioglou, *et al.* (2000) and Cooper *et al.* (2008)) that brought about the development of the process protocol, as well as considerations of the process-thinking idea that have been noticed around the world (Ofori, (2000); Hampson & Brandon (2004); Panas, Pantouvakis & Edum-Fotwe (2005); Alashwal, Rahman & Beksin, (2011); Hussein, Rahman, & Memon, (2013); Mounika & Anandh (2015)), it is imperative that the South African construction industry follows the trend. The merit in this consideration is also reinforced by the similarities of some of the major problems in South Africa to those in other countries worldwide.

However, before considering re-thinking of the construction process in South Africa, it is necessary to determine what kinds of processes currently exist and the level at which these processes are commonly understood by industry participants, particularly by the consulting design and management professionals. This is expected to lay a platform for the consolidation of the process-thinking idea (Hampson & Brandon, 2004) and to become a starting point for getting the industry professionals to start thinking of standardising their processes. The objectives of this research, therefore, are:

- To ascertain whether the professional consultants in the construction industry have a shared understanding of the design and construction process;
- To establish whether there are common processes, documentation and understanding of roles for a seamless operation by professional consultants in the construction industry in South Africa; and
- To determine whether the professional consultants in the South African construction industry recognise the potential benefits of a process approach to describing the project-delivery process.

1.7 SIGNIFICANCE OF THE KNOWLEDGE

The findings and conclusions of this research are expected to provide professionals in the industry with evidence for informed decision making on whether to re-think the way they deliver construction projects. The research is expected to outline the current situation of the construction processes that professionals understand and follow and, therefore, provide insight into the improvements that are clearly needed. Should it be established that more standardisation and a common process is desired, then efforts can be initiated to develop such a process. If successful, this will result in benefits such as:

- The industry professionals will have a common and agreed system, structure and documentation that should ensure seamless project planning and delivery;
- There will be adequate project control, which will enable recording of all lessons learned on previous projects. These lessons will then be taken into account in future projects;
- There will be a process suitable for monitoring and controlling project progress and reviewing project objectives;
- It will be possible to draw a clear guideline for project implementation for professional consultants to follow on each specific project, as required by project management principles;
- The industry will have a common and consistent platform to effectively measure the effects and achievement levels of the project targets, and will be able to identify areas that need change in an organised system; and
- The benefits of industry integration, improved communication as well as the transfer of knowledge and / or knowledgeable teams from project to project outlined by the Construction 2020 report could be realised.

1.8 RESEARCH DESIGN

Because this was an investigative study, the methodology of this research was qualitative and included:

- A detailed and comprehensive study of various documents that professional consultants in the construction industry follow in implementing their projects. This covered the literature of the various disciplines, which were compared for similarities, overlaps, and possible conflicts or areas that could be omitted. A review of literature from various academic writings and reports on the performance of the industry was also conducted;
- Extensive study of the Process Protocol, with a view to compare it with the findings on the processes in the South African construction industry in order to enable the determination of potential benefits; and
- Data collection through semi-structured interviews with representatives of professional bodies in the industry. This focused on the Council for the Built Environment (CBE) and its affiliated professional bodies namely ECSA, SACAP, SACPCMP and SACQSP who are considered to be more involved in project delivery. Prominent associations such as ASAQS, CESA and SAIA were also included.

  Unstructured interviews were also incorporated in the data collection process in order to facilitate for in-depth interrogation.

  The interviews were conducted with the heads of the above councils and associations or their delegated officials / representatives.

1.9 ASSUMPTIONS AND LIMITATIONS

The assumptions and limitations were identified as follows:

- It was assumed that the overall process and the stages of construction are generally synchronised among the construction industry consulting professionals;
- There was an assumption that the professionals in the industry are fully aware of, and conversant with, the initiatives-to-think-process and in particular the development of the Process Protocol in the UK;
- Due to time limitations, this research was narrowed down to professional councils in the construction industry;

- The research did not cover the various procurement methods used by the consultants;
- Only relevant CBE professional bodies involved in project delivery in particular were involved in the survey; and
- While the intention was to interview senior practicing professionals, the researcher had little influence on the suitability of the officials or representatives assigned by the councils for the interviews.

1.10 ETHICAL ISSUES IN THE STUDY

For ethical reasons, all respondents were requested to give written consent to voluntarily participate in the interview; including consent to audio recording of the interview. The consent forms are attached as part of Appendix A. The interviews were anonymous. Therefore, effort has been made to ensure that the identities of the participants have been disguised in this report for reasons of anonymity and to keep their views secret.

1.11 STRUCTURE OF THE RESEARCH REPORT

The research report comprises five chapters which are outlined below:

Chapter 1: Introduction

Chapter 1 introduces the subject of process-thinking which is emerging as one of the solutions being considered for addressing problems encountered in the delivery of construction projects worldwide in recent years. In this framework, the chapter provides background to the development of the process protocol in the UK. This is discussed in the context of the lack of knowledge regarding the project delivery process(es) in South Africa as indicated in the problem statement of the research. The chapter outlines the purpose of the study, significance of the study and the research questions covered in the study. The research method as well as the assumptions and limitations of the study are also presented.

The structure of the research report is outlined at the end of the chapter.

Chapter 2: Literature review

Chapter 2 covers the literature around process-thinking in the construction industry and the process protocol in detail. The chapter starts with an outline of the recognition that there are project delivery problems in the construction industry. The similarities of these problems around the world are revealed as well as the development of the process protocol in the UK which other industries have taken cognisance of and are considering the adoption of similar approaches.

The scenario in South Africa regarding the process of project delivery is discussed in detail with particular focus on the IDMS developed by CIDB and the National Treasury for public infrastructure projects as well as the "six stage outline" applied by the various consulting professionals councils and associations.

Chapter 3: Research methodology

Chapter 3 clarifies the choice of semi-structured and open interviews for data collection in the research. An interview topic guide was created to ensure consistency of the interviews. This topic guide is attached as appendix B. The choice of the data collection and data analysis methods are discussed in detail taking into account the nature and level of the research. The sample selection is explained as well as the way the data analysis was performed. Each interview was transcribed and a sample transcription is attached as appendix C.

Chapter 4: Presentation, discussion and analysis of the results

In chapter 4, data from the research is presented in the form of summaries of the relevant information extracted from the transcripts of the interviews with each participant. Some quotations of the participants' statements are provided where possible for emphasis of the participants' opinion. The qualitative data is summarised in categories that relate to the research questions and each participant's views are grouped accordingly in order to identify similarities and contrasts. Appendix D is attached as an extract sample from the data coding sheet.

Chapter 5: Conclusions and recommendations

Based on information presented in chapter 4, chapter 5 draws conclusions in relation to the research questions and the proposition as informed by the research findings. After the conclusions, recommendations are suggested relying on the general understanding of the desires of the interview participants in as far as the need for a common design and construction process is concerned as well as the adoption of the process protocol approach.

2 LITERATURE REVIEW

2.1 INTRODUCTION

The construction industry is a major contributor to economic growth in South Africa compared to many other industries (CIDB, 2004). Referring to statistics South Africa (2010a) and the United Nations Industrial Development Organization (UNIDO)(2009), Windapo and Cattell (2013) articulated that the industry is one of the most significant and critical industries particularly to developing countries because it produces the infrastructure and determines the investments undertaken for development. Ofori (2000) states that the construction industry is vital for all.

However, Nkado and Mbachu (2002) observed that the industry in South Africa, as in many other countries globally, experiences widespread client dissatisfaction resulting from consistent failures to deliver projects within time, and from failure to comply with cost and quality expectations. This is also the case in the UK (Latham, 1994; Egan, 1998; Cooper *et al*., 2008), Australia (Hampson & Brandon, 2004), Malaysia (Hussein, Rahman, & Memon, 2013) as well as Singapore and Hong Kong (Green, 2011); to mention just a few.

The problems of the industry have been attributed to various causes such as complexity (Hussein, Rahman, & Memon, 2013) and fragmentation (Latham, 1994; Egan, 1998; Cooper *et al*, 2008; Hampson & Brandon, 2004; SAPA, 2013). Other factors include insufficient research, technological stagnation and procurement systems (Nkado & Mbachu, 2002; CIDB, 2004).

In South Africa, several attempts have been made to address the causes of these problems. However, Tuan, Jay and Massyn (2014) observe that these attempts have been undertaken in isolation. As a result, it is not clear how effective the efforts to deal with problems in the industry have been, because of the limited information available on the industry (Windapo & Cattell, 2013).

To address the problem of fragmentation, the UK developed the idea of re-engineering their construction process by introducing the process protocol where there are common sets of definitions and processes adopted by all industry participants (Aouad *et al.,* 1998; Cooper *et al.,* 2008; Kagioglou *et al.,* 2000). This was based on adopting the successful practices of the manufacturing industry (Latham, 1994; Egan, 1998) despite some industry experts such as Sheath *et al.* (1996) expressing the view that the construction industry was unique and would not be flexible enough to accommodate techniques from other industries.

Other construction industries around the world (Australia, Hong Kong, India, and Malaysia) have also considered introducing process-thinking in the way they design and deliver projects, including suggesting the adoption of the process protocol approach developed in the UK.

In South Africa, the government, through the CIDB and the National Treasury, introduced the IDMS as a process of delivering public infrastructure projects in order to address project delivery problems. Being a government initiative, it is not clear whether the IDMS could be applied to private sector projects.

In the private sector and the industry in general, the possible existence of a common process in the industry is the six stages used by the professional councils to define their scope of services as a guideline to determine their fees and payment stages.

This literature review discusses the problems of the industry and the efforts to address the causes. Attention is focussed on process-thinking and the development of the process protocol as well as providing insights into the IDMS - developed by government in South Africa. The six stages of the four professional councils (architecture, engineering, project & construction management and quantity surveying) are highlighted as published by the respective government gazettes to determine the possible existence of a common process among professionals in the industry.

2.2 CHALLENGES FACING THE CONSTRUCTION INDUSTRY

Challenges in the construction industry are everywhere worldwide (Ofori, 2000). By nature, the industry is seen to be fragmented, unique and complex resulting in endemic problems of construction projects experiencing cost overruns, time overruns and wasteful use of materials (Hussein, Rahman, & Memon, 2013).

In 2013, the then minister of Public Enterprises Malusi Gigaba stated that the construction sector in South Africa was facing problems. The minister highlighted time and cost variations, disruptions, poor management, unsatisfactory quality and inefficiency as some of the challenges encountered during the execution of construction projects (SAPA, 2013).

The South African Construction Report (CIDB, 2004) highlighted variations in the quality of project delivery in terms of meeting the time and cost requirements on projects as causes of client dissatisfaction. Earlier, Nkado and Mbachu (2002) made reference to Allen (1999) and Smallwood (2000) who had observed that a large number of building projects in South Africa were not completed within the planned baselines of time cost and quality. Bowen *et al.* (2002) also expressed the view that the construction industry endured major shortcomings, considering the excessive delays, cost overruns, poor quality, claims and litigations that arise during project delivery.

Addressing the first International Conference on Total Quality Management (TQM) in construction as far back as 1998, the then Public Works Minister Jeff Radebe stated that the current construction processes have failed dismally (DPW, 1998). The minister observed that there was growing dissatisfaction among clients in South Africa; both in the private and public sectors expressing the opinion that construction projects were seen as unpredictable. Minister Radebe went as far as commenting that it was widely believed that projects in the construction sector do not provide the best value for clients on the majority of occasions.

In the UK, Cooper, *et al.* (1998) expressed the view that the performance of the construction industry was poor, measured against the usual indicators of time, cost

and quality. Egan (1998) observed that there was growing dissatisfaction with the construction industry among the public and private sectors in the UK because of underperformance. Cooper, *et al.* (2008) agreed that the construction industry was not reliable with regard to delivering projects on time and within cost. The profitability and quality of projects usually is unpredictable. This is to the extent that (ibid) these inefficiencies of the industry have become acceptable as a business-as-usual phenomenon.

Hussein, Rahman, and Memon (2013) are of the view that the construction industry in Malaysia is plagued with chronic problems of projects failing to meet their time and cost targets as well as increasing waste generation causing resource consumption to be out of control. Sub-standard construction and other prevailing problems, such as poor performance, were some of the factors highlighted by Green (2011) when advocating for change in the Singapore and Hong Kong construction industries.

Hampson and Brandon (2004) in the construction 2020 report propagate that the Australian construction industry requires improvement in the areas of project delivery to effectively meet the needs of clients. They suggest this can be achieved through the reduction of construction costs and time as well as improving the product quality which are seen as the major constraints.

Similarly, Ofori (2000) observed that construction does not meet the needs of clients in developing countries in as far as providing value for money is concerned. As a result, clients view the industry as a poor investment. Projects are often delivered late, exceed budget and fall short of the expected quality standards. These problems in developing countries have become bigger and more rigorous over the years. This is compounded by the existence of other factors such as inadequate resources, social-economic difficulties, lack of institutional capacity, inefficiency and many others.

Back in 1991, Herbsman and Ellis (1991) noted that traditional construction's main failures are excessive delays, projects frequently exceeding budgets, poor quality and increased number of disputes. Bowen, *et al.,* (2002) agreed later.

2.3 UNDERLYING CAUSES OF THE CHALLENGES IN THE CONSTRUCTION INDUSTRY

While the problems of the construction industry are widely known, a comprehensive picture of the actual causes of these problems cannot be easily drawn because of the incoherent and scattered information on the construction sector particularly in South Africa (Altman & Mayer, 2003). Among the causes attributed to these challenges are skills shortages, lack of investment in research and development, procurement criteria, and lack of technological advancement (Nkado & Mbachu, 2002; Garbharran, Govender & Msani, 2012; Windapo & Cattel, 2013). Construction industry fragmentation has also been identified as one of the underlying factors behind some of the challenges (*ibid*).

In 1998, the then minister of Public Works, Jeff Radebe (DPW, 1998), pointed to industry fragmentation as the root cause of failures in the construction industry. The minister expressed the view that the project processes and teams must be well integrated to ensure efficiency and achievement of project targets.

A report by DVPM, specialist project managers in construction, which was published on their website (DVPM, cited 2015), also highlighted industry fragmentation as one of the causes of difficulties in delivering projects. The report states that the construction industry in South Africa is fragmented with design completely separated from construction. This brings about problems such as discontinuity, duplication and discontent. Previously, Harinarian, Bornman and Botha (2013) also cited the dynamic nature and fragmentation of the construction industry as some of the contributors to difficulties related to managing change in culture in the industry in South Africa.

In the UK, Cooper, *et al.* (2004) believed that factors such as industry fragmentation, poor communication and coordination, lack of customer focus, non-formalised learning processes as well as lack of investment into technology and innovation contribute to unsatisfactory industry performance and lack of improvement. Back in 1994, the report by Sir Michael Latham revealed that fragmentation was a major factor that was causing poor performance and

inhibiting change and innovation in the industry (Latham, 1994). Latham expressed the view that fragmentation breeds poor communication between parties resulting in lack of effective collaboration.

Kagioglou *et al.* (2000) acknowledged that the Latham report mentioned above was a reaffirmation of previous studies that concluded that fragmentation in the construction industry was the major factor contributing to poor communication. Kagioglou further makes the assessment that the processes of construction are un-coordinated, inconsistent, and characterised by significant variations (*ibid*). This too is often attributed to fragmentation in the industry and the complex nature of construction projects. Kagioglou further raised problems of poor communication, attributing these to industry fragmentation, while recommending increased integration in the delivery of construction projects (*ibid*). Egan (1998) also agreed with this view concluding that fragmentation is a factor affecting industry performance and improvement.

Referring to the reports of Latham (1994) and Egan (1998), Kagioglou *et al.,* (1999) agreed that the conventional construction process is the underlying cause of poor industry performance and lack of industry improvement, stating that an effective construction process can lead to cost and time savings and may improve performance. The conventional construction process consists of traits such as poor client briefs, insufficient pre-planning and poor design coordination at the front-end phase, causing problems during the construction phase and poor project performance (Miei, 1997).

Furthermore, Cooper *et al.* (2008) reveal that the poor performance of the construction industry globally is attributed, in numerous reports and studies, to the various problems such as fragmentation, lack of consistent coordination processes, insufficient or non-existent front-end activity, and many other factors.

The Construction 2020 report, *"A vision for the Australian property and construction industry"* mentions fragmentation in the industry as a factor affecting innovation, and advocates doing things differently in Australia (Hampson & Brandon, 2004).

While looking at the issues and challenges of sustainable construction in Malaysia, Hussein, Rahman and Memon (2013) observed that the construction industry was complex and fragmented by its nature and had persistent difficulties of overruns on time and cost, as well as other problems such as waste generation. Fragmentation in the Malaysia construction industry was also observed by Alashwal, Rahman and Beksin (2011) as an inhibiting factor in knowledge sharing that contributed to poor project success.

2.4 PROPOSED SOLUTIONS

Several techniques have been tried to minimise factors that cause problems of delays on projects (Aiyetan, Smallwood & Shakantu, 2011). Various other authors also indicate that there have been a number of attempts and suggestions regarding how the problems of the construction industry can be addressed in South Africa (Windapo & Cattell, 2013). However, it is not known how effective these efforts have been, because some of these challenges have existed for a long while and it is not clear whether any of them have been eradicated (*ibid*). Furthermore, Garbharran, Govender and Msani (2012) suggested that the high number of project failures should be a clear indication that there are certain underlying factors that have not been identified and addressed.

In a report looking at the key challenges facing performance and growth in the South African construction industry, Windapo and Cattell (2013) highlighted the scarcity of information on the industry as a factor hindering efforts to clearly ascertain the nature of the challenges and the effect of the various interventions on the problems identified as having existed for a long time.

Discussions on various forums in the industry have looked at the problems of project delays, cost overruns, as well as poor quality and recommended remedies. Studies by academics were also undertaken in these areas where models such as the "systems-thinking approach", formulated by Aiyetan, Smallwood and Shakantu (2011), had been suggested to eliminate delays. However, it is not clear how these remedies and models are implemented in the industry, and what the

impact is on the objective of improving project delivery. This is attributed to a lack of formalised, agreed, and consistent processes *(ibid).*

Commenting on the overview of the construction and building industry in South Africa since 1994, Altman and Mayer (2003) expressed the view that it is difficult to assess the industry, because information about the sector is not in one place and is disorganised. They further point out that there is no standard way of recognising and assessing the industry after determining that information and the way the industry operates are inconsistent.

It appears that the moves toward addressing these problems have been to identify possible causes in isolation and to devise solutions without consideration of a platform or standard process where such interventions would be accommodated in order to introduce change. This approach has been observed to be piecemeal and does not take the whole picture into consideration through the contemplation of the entire project life cycle. In a report on factors affecting sustainability in the South African construction industry, Tuan, Jay and Massyn (2014) found that research in the industry aims at quick solutions, pointing out that, most of the time, hasty solutions prove costly.

Change in the way construction delivers projects, therefore, is a suggestion industry players acknowledge as the way forward. Minister Radebe's speech in 1998 pronounced that the industry *"cannot stick blindly to antiquated work regimes and obsolete methods"* and requires radical change in the way the industry delivers projects (DPW, 1998). Fundamental rationalisation, re-organization and transformation are needed to the extent that the construction processes should be predictable and integrated to achieve efficiency and value-for-money or economics to the client; with participants having a long-term interest in the success of the product - the building.

Advocacy of process-thinking in South Africa can also be seen in the report of Kaatz *et al.* (2005), when they discussed the concept of *"Building Enhancement in South Africa"*, where the re-arrangements of the construction process introduced by the process protocol are cited as a way of introducing construction project

efficiency. Suggesting the *"systems thinking approach"* referred to earlier, to address delays on construction projects, Aiyetan, Smallwood and Shakantu (2011) proposed that industry participants should develop guidelines and benchmarks that everyone involved in project delivery would be obliged to follow. This can also be considered to be advocating for elements of a process approach to construction project design and delivery.

It is known that the government in South Africa recognised the need for process improvement and, through the CIDB and the National Treasury, drafted and introduced the IDMS toolkit with a view to standardising the process of public infrastructure project delivery. This toolkit appears to standardise the project delivery process in the public sector. The IDMS covers the entire spectrum of the project life cycle from need identification, through planning and design, construction, operation, and finally disposal of the construction product. Considering that the IDMS toolkit is structured and intended for public infrastructure projects, and it is not certain whether a wide range of private sector participation occurred in its development, it may not currently be suitably applied in the private sector.

In a report exploring lessons from other countries, while addressing the challenges of construction industries in developing countries, Ofori (2000) observes that a number of countries, including Australia, Hong Kong, Singapore and the UK have put together long-term strategies to improve the performance of their construction industries through fundamental re-engineering of their respective construction processes and procedures. This is at the background of what Ofori (*ibid*) referred to as "many special problems" which the construction industry has by nature.

Worldwide, the background to the efforts to change the way the construction industry drives the construction process is derived from the lessons learned from the manufacturing sector, where process changes have been seen to have resulted in improvements in industry productivity and efficiency in terms of time and cost (Egan, 1998; Panas, Pantouvakis & Edum-Fotwe, 2005).

It is acknowledged that the UK has one of the industries that has made significant efforts to identify possible major areas of improvement to address the problems of the industry as a whole. The Latham Report (1994) identified fragmentation as one of the underlying causes of industry challenges, and advocated changes to the process of project delivery in the UK construction industry. However, Sheath, *et al*. (1996) were of the opinion that the most significant attempt could be the efforts to devise and implement other forms of procurement than the traditional practices. Nonetheless, Kagioglou, *et al.* (1998) agreed with the reports of Latham (1994) and Egan (1998) that pointed to industry fragmentation as one of the fundamental causes of industry difficulties, and identified the need for improvements in the design and construction process.

From that basis, Latham (1994), Egan (1998) and Kagioglou, *et al.* (1998) agreed that the fragmentation problem required improvement of the design and construction process in the UK through adopting processes practised in other industries such as manufacturing. The efforts in the UK proceeded with examining the developments in the manufacturing sector, where process operations have brought significant improvement to production in relation to time, cost, and quality (Kaglioglou *et al.,* 1999). Cooper *et al.* (2008) concur with this approach saying that the construction industry has similarities with other industries' practices such as NPD in manufacturing that can be adopted and utilised to improve the design and construction process. In support of this view, Kagioglou *et al.* (1999) further observed that concerted efforts had been made to gain knowledge of manufacturing principles and to apply these to the construction industry because it was realised that the construction industry was not as unique as was traditionally believed.

The UK construction industry proceeded to develop a standardised process; after learning from the experiences of manufacturing. This process was first referred to as the "Generic Design and Construction Process Protocol" (GDCPP), which was later termed the “Process Protocol” and abbreviated as "PP". This was an attempt to contribute to the efforts of addressing the problems of client dissatisfaction caused by fragmentation, which results in poor communication, lack of integrated

operations, and prevalent shortcomings in meeting, amongst others, the requirements of time, cost, and quality on projects.

It is understood that process protocol introduces the concept of process-thinking with a paradigm of overall project overview that starts from pre-conception to disposal or decommissioning of the product - building. Therefore, the expectation is that the Process Protocol brings about an agreed system or procedure, which participants in the design and construction process agree to follow when doing their work (Cooper *et al.,* 2008). This is supported by Aouad *et al.* (1998) who earlier stated that the process protocol demands more "front-end" activities in construction projects, and highlights the crucial importance of feasibility and design in the process. Kagioglou *et al.* also contended in 2000 that the process protocol is appropriate because it emphasises the initial planning, and advocate that the construction industry learns from the "fuzzy front end" practice in the manufacturing industry.

The Process Protocol Guide (2015) describes the process protocol as *"a common set of definitions, documentation, and procedures that will provide a basis to allow the wide range of organizations involved in a construction project to work together seamlessly."* Kagioglou *et al.* (2000) further elaborate that the process protocol integrates the project stakeholders under a common framework through a thorough endeavour of considering the entire project lifecycle in the delivery process. Therefore, it should be understood that the process protocol is an agreed operating framework and structure upon which the participants in the design and construction process interact from the front end of the project to the disposal of the product. In this life cycle, the process protocol provides a repeatable platform for capturing lessons learned; thus improving the process.

Possibly, as a result of the similarities in some of the major difficulties that construction industries experience globally, the process protocol has attracted attention around the world. Several construction industries or projects outside the UK, where the process protocol was developed, have made an effort to adopt the process protocol in order to address some of the problems in their local industries.

This may also be due to the perceived successes of the process protocol, although there is little documentation to demonstrate the measurement of this success.

While looking at the issues and challenges of sustainable construction in Malaysia, Hussein, Rahman and Memon (2013) observed that the construction industry was complex and fragmented by its nature and had persistent difficulties, such as overruns on time and cost, as well as other problems such as waste generation. Fragmentation in the Malaysia construction industry was also observed by Alashwal, Rahman and Beksin (2011) as an inhibiting factor in knowledge sharing that contributes to poor project success. Amongst other solutions to these problems, they suggested the development of a protocol for the design and construction process, citing Kagioglou *et al.* (2000), as developed in the UK.

Panas, Pantouvakis and Edum-Fotwe (2005), published a report after investigating the potential for using a process approach in construction for one of the largest construction companies in Greece, advocating consideration of the process protocol. Their report recognised that, because manufacturing is founded on the concept of process-thinking, and is observed to have made improvements in manufacturing project delivery, it is rational for process protocol to replicate these methods and adopt them for construction projects. The report points out however, that the basis of advocating process protocol is the perception of successes of this approach in the UK. In Greece, the expectation is that a process approach in the delivery of construction projects would be a suitable platform to re-think the project delivery systems and improve the competitiveness of the industry. Therefore, adopting process protocol would be the right idea.

The International Journal of Business and Management reported that, in India, Mounika and Anandh (2015) were of the view that the Indian construction industry lags behind other industries in realising deadlines, budgets, and quality requirements. They argue that this is as a result of stagnation and inefficient production processes, which are exposing the projects to major risks. To address

this problem, they cite Latham (1994) and propose that a process protocol analysis be applied to all types of construction projects.

The Construction 2020 report (Hampson & Brandon, 2004) also advocates for doing things differently in Australia as well in order to improve project delivery.

2.5 LEARNING FROM OTHER INDUSTRIES

Though different industries may have unique features, they have many problems in common and it is a useful tendency to look at best practice in other industries when trying to develop solutions to solve problems for one industry (Aaronson, 2006). Despite that, there are obvious differences between industries, it is common knowledge that there are lessons to be learnt between industries. In as far as the construction industry is concerned, it has been generally accepted in recent years that the industry can learn from industries such as manufacturing particularly in the automotive sector (A-Site, 2004). Diekmann *et al.* (2004) made the observation that the manufacturing industry, having experienced problems of production delays, cost control problems and unsatisfactory quality control, has made extensive progress in lowering product lead times, increasing productivity and product quality through changes in production principles and processes that were introduced. They then ask the question *"if manufacturing can make such vast improvements in quality and productivity, while reducing costs and lead times, why not construction?" (ibid:* p iii*).*

Koskela (1993) points out that, for many years, manufacturing has been the point of reference when innovative efforts are being developed in construction. Kagioglou, *et al.* (1998) later agreed that there are many similarities between the construction industry and the manufacturing industry. However, the manufacturing industry has made advances in reviewing and developing their process approaches; while the construction industry is lagging behind and can learn from the manufacturing industry experiences.

With a view to learn from the manufacturing industry, the construction industry in the UK made observations in the 1990's in order to determine which

manufacturing practices could be transferred to improve performance (Kagioglou *et al.,* 1999). Latham (1994) identified and advocated that the construction process should be restructured using the ideas introduced in the New Product Development (NPD) processes in the manufacturing industry, which brought about production efficiency. Cooper, *et al.* (1998) also expressed the view that the construction industry should follow the example of the manufacturing industry and adopt a process view to achieve similar improvements in production.

Process change, through learning from other industries, is advocated for in the US (Diekmann, *et al*, 2004), in Greece (Panas, Pantouvakis & Edum-Fotwe*,* 2005), in India (Mounika & Anandh, 2015) in Malaysia (Alashwal, Rahman & Beksin, 2011), in Nigeria (Dada & Akpadiaha, 2012), as well as in South Africa (Bowen, *et al.,* 1997).

In Australia, the Construction 2020 report by Hampson and Brandon (2004) suggests that the industry needs to compare national and international industries to adapt advancements in their approaches to production. Akintoye, Goulding and Zawdie (2012) cite Sidwell *et al.* (2004) who noted that it was important for the Australian construction industry to be re-engineered to improve the delivery process by introducing thorough front-end planning as in the manufacturing industry.

While the transfer of knowledge and practices from other industries to the construction industry is widely supported, some industry practitioners are sceptical of the accomplishment of the goals because they consider the construction industry to be unique (Cooper, *et al,* 2004). Cooper, *et al. (ibid)* made reference to Ball (1988) who listed the major attributes that distinguish the construction industry. Some of those highlighted were:

- Once-off products;
- On-site production;
- Lack of experience by clients;
- Design and construction possibilities affected by land price;
- Labour intensive production;

- Industry fragmentation; and
- Many others.

Ferne *et al.* (2001) also observed that though the adoption of best practice from other industries to improve the processes in construction may be central to achieve the desired improvements in the industry, the actual transfer of knowledge could be difficult because of the unique construction environment. Therefore, the notion of the construction industry learning from other industries is not as straightforward as many might think. A report by A-site (2004) was of the view that the construction industry is complex compared to manufacturing, and it involves many disciplines and participants such as architects, engineers, contractors and subcontractors as well as many government and planning departments. This makes knowledge transfer and process improvements more difficult.

Keraminiyage, Amaraguta and Haigh (2005) acknowledged the unique characteristics of the construction industry and advised that careful consideration should be applied when adopting approaches from other industries.

However, and despite the above views on the unique nature of the construction industry, Tuan, Jay and Massyn (2014) point out that these unique attributes of the industry are also the characteristics of the manufacturing industry. They are of the view that the manufacturing industry also deals with many unique products, different designs and materials, and utilizes different contractors in different environments, while it is able to learn new processes. Jones and Saad (1995) earlier expressed the opinion that other industries are similar to the construction industry, because they are also unique in similar ways. For that reason, the approaches in other could be favourable for adoption and use in the construction industry for advancement.

Adler *et al* (1996) also argued that all projects in all industries are unique, but there are many similar processes and sequences across projects and industries. Those similarities that bring improvements should be exploited by any industry.

Egan (1998) completely dismisses the notion that the construction industry is unique. This is on the basis that the process of construction is a repeat operation, as in manufacturing, though the buildings would be different. The profound similarity of the construction industry with the manufacturing industry is in the design and planning of a new product. Egan concludes that lessons should be learned from manufacturing.

2.6 THE PROCESS PROTOCOL

2.6.1 Background

It has been realised worldwide that deliberate measures to improve the performance of the construction industry are essential (Ofori, 2000). In the UK, these efforts began earlier, spearheaded by the 1994 Latham and 1998 Egan reports, which recommended that the construction process be re-designed to primarily address the problem of fragmentation, which was identified as one of the major underlying factors causing project delivery difficulties in the industry. Latham and Egan suggested that the industry should look at the manufacturing industry for potential transfer of technology and practices that would bring about improvement. This led to the focus on the NPD 'best practice' in manufacturing, based on the belief that this was the area within manufacturing that has close similarities with construction. NPD emphasises development of an idea from the client requirements through to product disposal (Kagioglou, *et al.,*1998). It therefore, followed that construction should be viewed as a product development process.

Using these proven manufacturing principles, a project was initiated by the University of Salford in the UK (*ibid*) in 1995 to formulate a framework which would result in the development of the Generic Design and Construction Process Protocol, which later became known as the Process Protocol (Cooper, *et al.,* 2004).

According to the process protocol guide (2015), the process protocol would be developed on two levels:

Level 1: This was a project between 1995 and 1998 that analysed the processes in the manufacturing industry with a view to improving the design and construction processes. The following were achieved:

- The Generic Design and Construction Process Protocol was developed with activity zones and main processes;
- Models were developed to demonstrate the proposed processes through developing information technology platforms as a support base;
- A common language was developed in the design and construction process, and it was promoted as an industry standard; and
- A top-level map of the design and construction process was established.

Level 2: This level is currently being developed and began in 1998 after level 1 was successful. The objective is to take the original level 1 process protocol further in order to develop and structure sub-processes with a specific technological support system.

The objectives of the level 2 project are summarised as follows:

- Breakdown the process protocol top level and develop sub-processes;
- Develop an organisational platform for continuous improvement of the process;
- Demonstrate the technological requirements that will be required to make full and easy use of the process; and,
- Develop a user-friendly toolkit platform for the process protocol.

The process protocol guide reveals that the two projects were undertaken in the UK with the support of the government, parastatals and prominent private construction companies as well as consulting firms.

2.6.2 Objectives of the Process Protocol

The Process Protocol Guide describes the process protocol as *"a common set of definitions, documentation, and procedures that will provide a basis to allow the wide range of organizations involved in a construction project to work together*

seamlessly." Kagioglou, *et al.* (2000) further elaborate that the process protocol integrates the project stakeholders under a common framework through a thorough endeavour of considering the entire project life cycle in the delivery process. Therefore, it should be understood that the process protocol is an agreed operating framework and structure upon which the participants in the design and construction process interact from the front end of the project to the disposal of the product. In this life cycle, the process protocol provides a repeatable platform for capturing lessons learned; thus improving the process.

Kagioglou *et al.* (1999) summarised the details of the drivers and objectives of the process protocol as follows:

- It was necessary to have a structured system that provides a complete overview of the construction process that represents the varying interests of the dissimilar stakeholders in the industry;
- The need for common and generic set of principles which would be definable, consistent adaptable, repeatable and simple to allow the development of an IT platform to support its management;
- The need to develop standard roles and deliverables commonly understood by industry stakeholders that would allow for a coordinated process review and improvement;
- The need for a "fuzzy-front-end" approach as in manufacturing where there is a requirement for the early entry of the professional contribution at the pre-project phase traditionally undertaken by clients; and
- The need for a post-completion phase where the professionals are involved in the process beyond the project completion.

2.6.3 Principles, Structure and Elements of the Process Protocol

The process protocol model is based on principles and comprises a structure that divides the construction process into stages, elements, sub-processes and activity zones (Kagioglou, *et al.*, 1998). The descriptions below are taken from the process

protocol guideline (2015) as well as other papers and presentations by subject experts over the years.

Drawing from the manufacturing industry and the desire to achieve the objectives, six key principles have been identified and considered as a basis for developing process-thinking in the construction industry (Kagioglou, *et al.,* 2000). These principles were formulated from interviews with practitioners in the industry in relation to the recognised areas of difficulties where improvement had been identified. The principles formed the basis of the development of the process protocol model and they are the following:

2.6.3.1 Whole project view

Traditionally, a construction project is understood to be the actual construction which has tended to exclude the pre and post construction activities from the project (ibid). The idea of the whole project view principle is to ensure that construction projects cover the whole life of a project from identification of the need, through the construction and operation to its disposal or demolition. This is to ensure that the "fuzzy-front-end" practice in manufacturing is applied (Kagioglou, *et al.,* 1998).

2.6.3.2 A consistent process

Cooper, *et al.* (1998) observed that existing practices in construction are not consistently applied from project to project. The various industry participants undertake projects as temporary endeavours with multi-organisations working together for that project only. The idea of a consistent process is to eliminate ambiguity and introduce standardisation in the approach to "performance measurement, evaluation and control" (Kagioglou *et al.,* 2000). This is expected to make it possible to continually improve the design and construction process throughout the project life cycle.

2.6.3.3 Progressive design fixity

Referring to the "stage gate" approach (ibid) in manufacturing, it is deemed necessary to apply the technique to construction in order to ensure that there is a consistent planning and review procedure throughout the design and construction

process. The progressive design fixity principle, translated into the process protocol phase gates with classes of soft and hard gates, is to allow concurrency of processes and to ensure that key decision points are respected and observed *(ibid).*

2.6.3.4 Co-ordination

Kagioglou, *et al.* (1998), Cooper, *et al.* (1998) and Kagioglou, *et al.* (2000), agree that the construction industry is known for poor co-ordination on projects, referring to Latham (1994). The co-ordination principle in the process protocol is introduced through the establishment of the process and change management activity zone. This has delegated authority to plan and co-ordinate the participants and activities on the project including controlling and handling of all information related to the project.

2.6.3.5 Stakeholder involvement and teamwork

The stakeholder involvement and teamwork principle is devised to ensure that there is a hands-on approach and that appropriate participants are identified and recruited at the fuzzy-front-end of the project than is the case in the traditional approach (Kagioglou, *et al.,* 1998). Kagioglou, *et al.* (2000) expressed the view that vital project participants are usually introduced late in construction projects. The stakeholder involvement and teamwork principle is expected to bring about effective collaboration of project participants and facilitate project success.

2.6.3.6 Feedback

The feedback principle is intended to introduce a process whereby project experience can be recorded throughout the processes in order to inform the phases that follow as well as create lessons for future projects. This is through the creation of project archives or an information hub in the process protocol model that keeps all records of the project phases and processes (Aouad, *et al.,* 1998).

2.6.4 Process Protocol elements

Figure 1 demonstrates the process protocol model presented by the process protocol guide (2015). The model illustrates that the process protocol is divided into four broad stages of *pre-project, pre-construction, construction and post-*

construction which all form the design and construction process. These stages are divided into a total of 10 distinct phases with each phase belonging to a specific stage as summarised below.

2.6.4.1 Pre-Project stage

The pre-project stage is what could be referred to as the fuzzy-front-end and relates to the establishment of a business need that require the development of a potential project to address a client's ambitions. The following 4 phases are contained within this stage:

Phase Zero - Demonstrating the need

This phase entails identifying and demonstrating the client's business needs and defining the obstacles in detail. A business case is developed with the identification of major stakeholders upfront to iterate the business objectives and how they could be advanced by the project.

Phase One - Conception of the need

Phase one develops the need identified in phase zero and begins to create concepts that will explore the various potential solutions and options and how they could be addressed. This phase creates a platform for feasibility and obtaining financial approval to proceed to the next phase.

Phase Two - Outline feasibility

The purpose of this phase is understood to be the analysis of the project feasibility by examining the different options and narrowing down the options. At this stage, the options from the previous phases that could be followed are selected to proceed to the next phase.

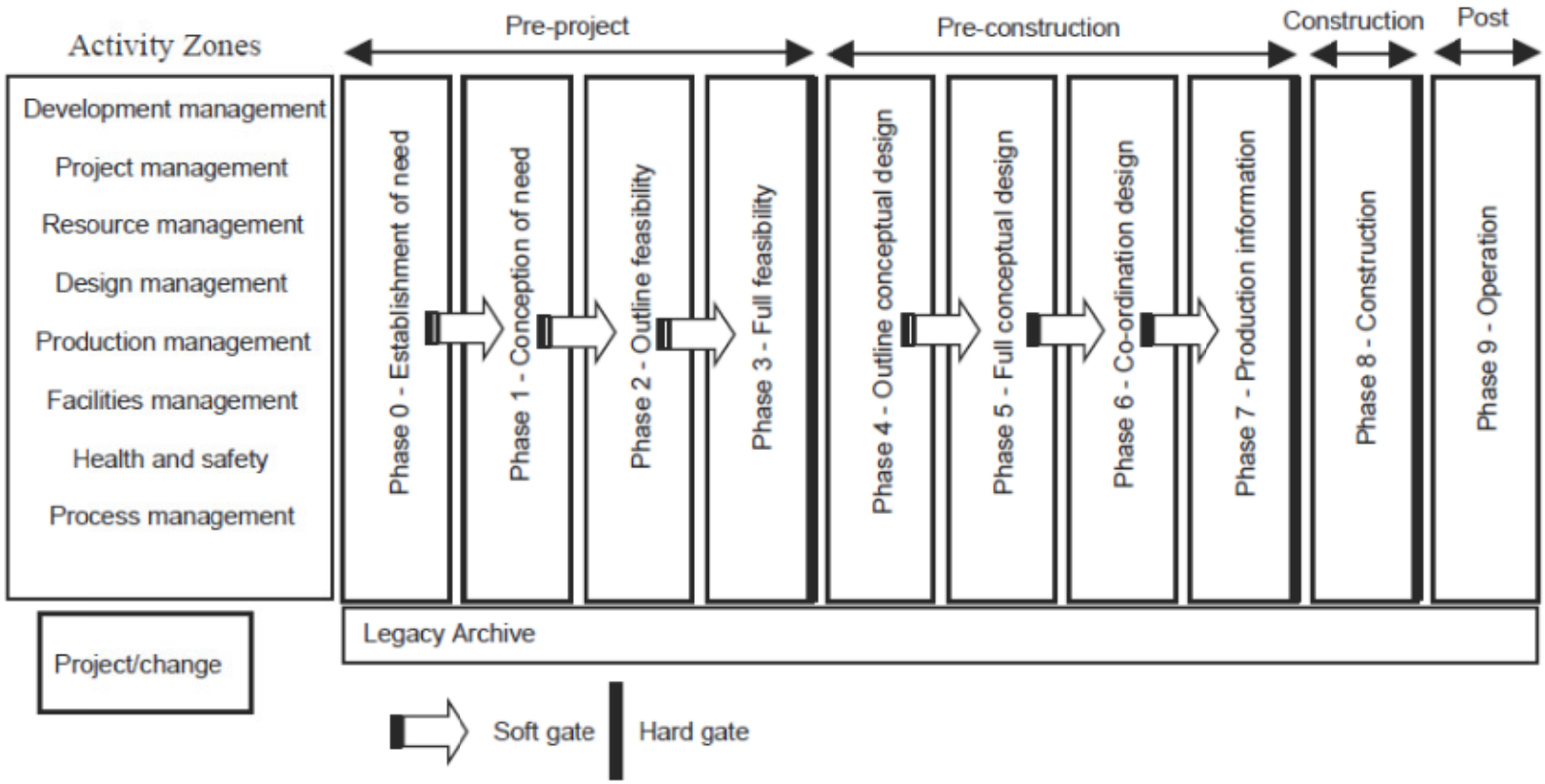

Figure 1: The Process Protocol (Source - The development of a process map for the construction sector (Aouad, *et al.,* 1999)

Phase Three - Substantive feasibility study and outline financial authority

This phase iterates the detail into the solutions selected to identify which solution should be financed for concept design development and approval. A procurement plan is created through the identification of key suppliers and special requirements. The concept-design process is also mapped and a design evaluation criterion is created. Outlined financial approval is obtained.

2.6.4.2 Pre-Construction stage

This stage develops the design with the objective to produce approved production information. At the end, full financial approval to proceed should be secured. The stage consists of the following 3 phases:

Phase Four - Outline conceptual design

After a final option is chosen in phase 3, potential design solutions are developed in phase 4 and presented for selection with some of the major design elements identified at this point. The aim is to gain approval to proceed to phase 5.

Phase Five - Full concept design

This phase prepares the design for the approval of detailed planning. The chosen design is presented in more detail for each respective discipline such as architectural, mechanical, electrical, structural, and others that may be required, and approval is obtained to proceed to phase 6.

Phase Six - Coordinated design, procurement and full financial authority

This phase closes up the pre-construction phase with full co-ordination of the detailed design information that should facilitate reliable cost assessments, construction process, and lifecycle maintenance requirements. Full financial authority is acquired with approval to commence production.

2.6.4.3 Construction stage

The construction stage is concerned with assembling the product based on the co-ordinated and detailed information from the pre-construction stage and its three

phases. At this stage, it is anticipated that there should be minimal changes in the client's requirements considering the coordination and communication that was mandated in the previous phases. There are 2 phases in this stage.

Phase Seven - Production information

This stage is aimed at managing the information for production and ensures that there are no more changes to the design before construction is under way. Every detail and deliverable is checked and finalised to proceed to the construction phase.

Phase Eight - Construction

This is the production phase. The phase is a culmination of the previous phases and the expectation is that the operation should occur without any disruptions or changes with a well-coordinated and integrated team of stakeholders. The aim is to create a product that addresses all client requirements. All records relating to the development of the facility are expected to have been recorded and the building handed to the client according to the plan. In the process of construction, any difficulties encountered are carefully analysed to create records for project archive and lessons learned for future projects and project teams.

2.6.4.4 Post-Construction stage

The process protocol continues after the construction phase to ensure that the maintenance needs of the facility are not abandoned as per traditional practice. It is required that the maintenance management specialists are involved from the beginning and throughout the earlier phases in order to ensure their input is captured at the early stages. The post construction stage only contains 1 phase and it runs up to the disposal of the facility.

Phase Nine - Operations and maintenance

The last phase of the process protocol is concerned with the life of the facility after handover and through the lifecycle. The operations and maintenance of the building are expected to have been incorporated in the design and planning in the

earlier phases. In this phase, documents such as as-built drawings and maintenance manuals are deposited in the legacy archive for future use.

2.6.5 Activity Zones

As illustrated in figure 1, the process protocol comprises the X and Y axes. The horizontal (X) axis represents the process sequence described in the stages and phases above depicting the time sequences of the process roll out. The vertical (Y) axis represents the department or functions involved and required to deliver the processes within the stages and phases (Cooper, *et al.,* 1998). The departments or functions are what are referred to as activity zones and are primarily groups of the participants in the process protocol.

Kagioglou, *et al.* (1999) explain that the activity zones represent the "structured sets of tasks and processes" that provide support to the achievement of the stages and phases. The activity zones are the participants who could be a single firm or multiple organizations performing these roles.

There are 8 activity zones, namely: Development management, Project management, Resource management, Design management, Production management, Facilities management, Health & Safety and statutory & legal management, and Process/Change management. With regard to these activity zones, Kagioglou, *et al.* (2000) expressed the opinion that the role of the development management and process/change-management activity zones distinguish the process protocol from the traditional approach of the design and construction process.

2.6.6 Stage / Gate or Process Review

The process protocol guide (2015) outlines that the participants within the activity zones should ensure that the stages and the phases in the process protocol are managed for the process to achieve the objectives. The approach to this is through the stage / gate or process review actions at the end of each stage and phase.

Cooper, *et al.* (1998) elaborate that this is achieved through the implementation of process reviews of the work conducted in each phase for approval before proceeding to the next phase. However, as illustrated in their diagram presented in figure 1, Cooper, *et al.* point out that these gates require to be classed as 'soft' and 'hard' gates to provide for conditional approvals to facilitate concurrence of phases. This concurrence is made possible by the 'soft' gates. The "hard" gates are applied at the end of each stage and are there to ensure key decision points are not disobeyed and ignored. Aouad, *et al.* (1999) explained the importance of the phase review process when they stated that the practice brings about continuous checking and approval requirements. Though this may be viewed as bureaucratic and disruptive, the procedure eliminates what they termed as "surprise" occurrences that come along with costly risks.

2.6.7 Process Protocol Toolkit

Cooper *et al.* (2004) disclosed that the process protocol level 2 project went further to identify an instrument to assist industry participants in the implementation of the process protocol in view of the interest and acceptance of the initiative by the industry as well as the realisation that the model would be an on-going activity.

To facilitate the adoption of the process protocol, the process protocol guide (2015) reveals that a process protocol toolkit has been developed to assist industry participants accept and implement the process protocol in their project management processes. The process protocol toolkit is an IT prototype software application that can be customised to suit particular project and company requirements.

This development is what Kagioglou, *et al.* (1999) clarified that the process protocol project envisaged that IT will be required to make the design and construction process changes and standardise them effectively. Keraminiyage, Amaraguta and Haigh (2005) supported this endeavour emphasising that IT is a vital element when new ideas and operational processes, such as the process

protocol, are being implemented in organizations; even when the desired process improvement is not technological in nature.

In summary, the process protocol toolkit, described by the process protocol guide (2015), is a two-component instrument with a process map creation tool and a process management tool. Without getting into detail, these are the tools that have been created to standardise the process protocol, as described in this chapter, to ease adoption and implementation, as well as to contribute to future improvements through projects and organization.

2.7 THE INFRASTRUCTURE DELIVERY MANAGEMENT SYSTEM (IDMS)

It has been acknowledged earlier that previously there has been attempts to address the problems of the construction industry in South Africa over the years. However, it is not clear how effective these efforts were, considering that many of the problems have persisted (Aiyetan, Smallwood & Shakantu, 2011; Windapo & Cattell, 2013; Garbharran, Govender & Msani, 2012).

In pursuit of a solution to problems of the industry, the South African government developed and introduced the IDMS in 2010 to be applied for the delivery of government infrastructure projects (CIDB, 2010). The IDMS is a government infrastructure management system developed through collaboration between the CIDB and the National Treasury in order to bring about improvements and consistent public infrastructure delivery (*ibid*). The CIDB and Treasury believe that the IDMS covers the full project cycle from needs identification, planning, construction, handover and maintenance in a systematic way while linking the system to appropriate government policies, laws and regulations that guide the development and maintenance of public infrastructure by government.

The National Treasury (2012) describes the IDMS as a *"government management system for planning, budgeting, delivery, maintenance, operation, monitoring and evaluation of infrastructure"* which is intended to be linked to the Medium Term Expenditure Framework (MTEF). In summary, The National treasury outlines that

the IDMS comprises systems containing processes with a gateway approach which creates a workflow that ensures the process of project initiation, planning, design, procurement, construction, refurbishment, maintenance and disposal cannot happen independently.

The system comprises 9 infrastructure stages and gates, 8 procurement gates, and 3 framework agreement gates. The IDMS is defined in a detailed and extensive document (National Treasury, 202). This chapter summarises the stages and gate descriptions as illustrated in *Figure 2*.

Stage 1 - Infrastructure planning

This stage identifies, in broad terms, the infrastructure needs through the assessment of current infrastructure performance in comparison to requirements. At this stage, options, a broad scope, timelines, and order of magnitude budgets are considered and drawn up. The outcome is a long-term infrastructure plan.

Stage 2 - Procurement planning

The procurement plan at this stage is a high-level strategy on how the whole idea conceived in stage 1 shall be delivered, taking into consideration the resources that will be required. This outlines how procurement will be structured in line with policies and government regulatory framework.

Stage 3 - Package preparation

The package preparation stage defines the business needs, the project scope and the preliminary investigations including consultations. This is to ensure that significant resources are not committed until a meaningful risk assessment and the magnitude of the undertaking is appreciated.

Stage 4 - Package definition

At this stage, the feasibility of achieving the intended objectives is assessed in detail through the involvement of experts and the initial design criteria is determined. Alternative solutions are investigated to finalise detailed briefing, scope and cost. Preliminary development plans are developed taking into account the relevant statutory compliances required.

Stage 5 - Design development

Stage 5 will develop the accepted concept in detail. This includes the selection of materials and specifications that reflects the constraints of the budget as well as the life cycle requirements.

Stage 6 - Design documentation

The design documentation stage comprises 2 sub stages, 6A and 6B, which represent design production under stage 6A, and manufacturing, fabrication and construction information under stage 6B. At this stage, detailed final designs are produced and final approval of production information is obtained.

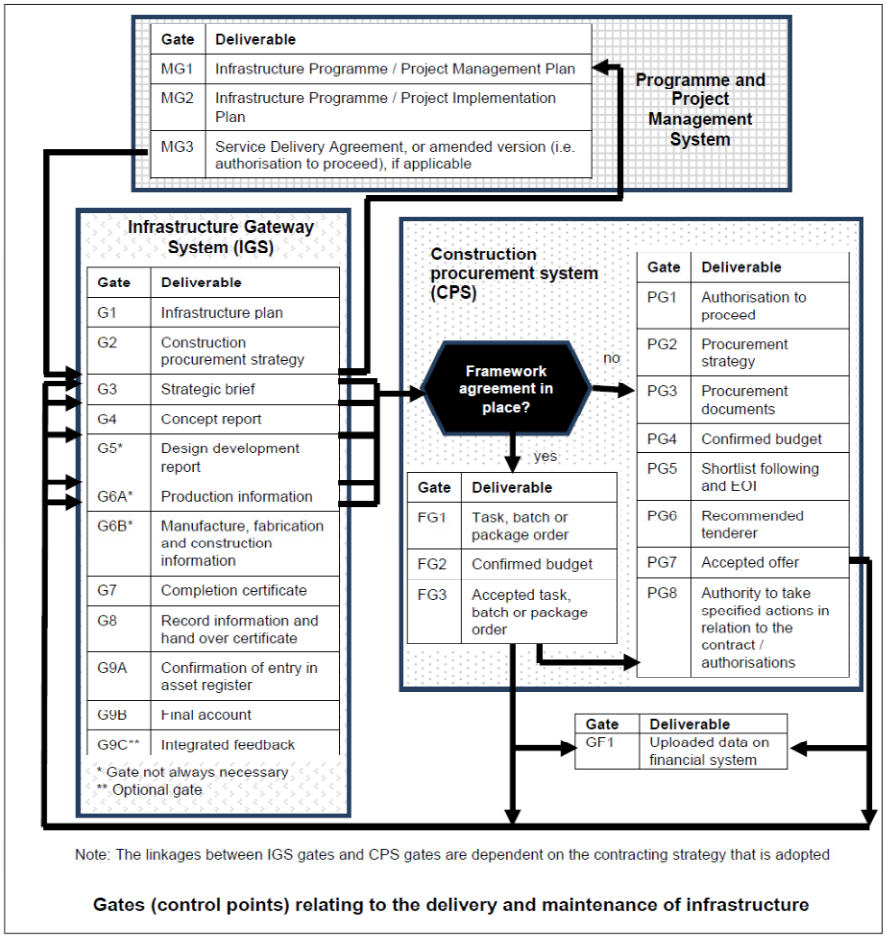

Figure 2: Gates (Control points) relating to the delivery and maintenance of infrastructure. *Source: Standard for an Infrastructure Delivery Management System - National treasury, 2012)*

Stage 7 - Works stage

Stage 7 is the actual construction stage where works are carried out according to the contract agreement and design documentation.

Stage 8 - Handover stage

The handover stage comprises of the activities of recording the information of the infrastructure and handing it over to the end-users including training on the use of the asset. One of the objectives is to ensure information is provided on the maintenance and refurbishments that may be required regularly.

Stage 9 - Closeout stage

The closeout stage is divided into stages 9A, 9B and 9C which are known as "asset data stage", "package completion stage" and "in-use evaluation stage" respectively. Stage 9A is where the archive records are captured to the asset register. Stage 9B involves the rectification of defects and finalization of all contractual obligations. The IDMS indicates that stage 9C should preferably be undertaken one year after handover in order to be able have the opportunity to observe the performance of the infrastructure and produce integrated reports aimed at providing input for continuous improvement of the infrastructure.

As illustrated in *figure 2*, the process is managed by a gate system where decisions are made at gates/control points after each stage to ensure that the planned deliverables are achieved before progressing to another stage. Decisions at these control points are clearly assigned with specific control documents produced.

To implement the IDMS, the CIDB, working in partnership with the National Treasury produced a toolkit which is expected to be a “living system” boosting the knowledge and capacity of the infrastructure-delivery personnel in government institutions.

2.8 THE SIX-STAGE GUIDELINES OF PROFESSIONAL BODIES

This research is concerned with the existence of common design and construction processes among professionals in the South African construction industry. To find

literature in this regard, focus was placed on documentation from the professional bodies recognised by the CBE.

The CBE was established in November 2000 as a statutory body with a mandate to coordinate the operations and activities of six professional councils representing the professions of Architecture, Engineering, Landscaping Architecture, Project and Construction Management, Property Valuation, and Quantity Surveying. The directive of the CBE, as extracted from their website (2016), is as follows:

1. Promote and protect the interest of the public in the built environment;
2. Promote and maintain a sustainable built environment and natural environment;
3. Promote on-going human resource development in the built environment;
4. Facilitate participation by the built environment professions in integrated development in the context of national goals;
5. Promote appropriate standards of health, safety and environmental protection within the built environment;
6. Promote sound governance of the built environment professions;
7. Promote liaison in the field of training in South Africa and elsewhere, and to promote the standards of such training in the country;
8. Serve as a forum where the built environment professions can discuss relevant issues; and
9. Ensure uniform application of norms and guidelines set by the Professional Councils throughout the built environment.

The professional councils under the CBE are also established under respective statutory acts. This research will examine the literature relating to four of these professional councils, namely Architecture, Engineering, Project and Construction Management, and Quantity Surveying.

Though it is not clear whether there are guidelines for design and construction processes outlined in the respective acts establishing these councils, there are six

common stages that describe the outline scope of services to be provided by each profession at each stage. The stages are as follows:

Stage 1 - This is termed "Inception" by project and construction management, architecture and engineering in their descriptions. Quantity surveying has no name under the descriptions although the stage is referred to as "Inception" in the apportionment of fees table.

Stage 2 - This is termed "Concept and viability" by construction and project management, architecture and engineering. Engineering also calls the stage "preliminary design" while architecture also has the name "concept design". Quantity surveying has no name under the descriptions although the stage is referred to as "Concept and viability" in the apportionment of fees table.

Stage 3 - This is termed "Design and development" by project and construction management, architecture and engineering. Engineering also refers to the stage as "detail design". Quantity surveying has no name under the descriptions although the stage is referred to as "Design development" in the apportionment of fees table.

Stage 4 - This is termed "Documentation and procurement" by project and construction management as well as architecture and engineering. Quantity surveying has no name under the descriptions although the stage is referred to as "Documentation and procurement" in the apportionment of fees table.

Stage 5 - This is termed "Construction" by project and construction management as well as architecture. Engineering refers to this stage as "contract administration and inspection". Quantity surveying has no name under the descriptions although the stage is referred to as "Construction" in the apportionment of fees table.

Stage 6 - This stage is termed "Close-out" by project and construction, architecture and engineering. Quantity surveying has no name under the descriptions although the stage is referred to as "Close-out" in the apportionment of fees table.

The stages are obtained from the following documents:

Architecture - Framework for the professional Fees Guideline in respect of services provided by person(s) registered in terms of the Architectural Professions Act, 2000 (Act No. 44 of 2000).

Engineering - Guideline for Services and Processes for Estimating Fees for Persons Registered in terms of the Engineering Profession Act, 2000, (Act No. 46 of 2000).

Project and Construction Management - Guideline Scope of Services and Recommended Guideline Tariff of Fees for Persons Registered in terms of the Project and Construction Management Professions Act 2000 (Act No. 48 of 2000).

Quantity Surveying - Guideline Tariff of Professional Fees in Respect of Services Rendered in terms of the Quantity Surveying Profession Act 2000, (Act 49 of 2000).

From the above Acts, it is clear that the six stages are mainly for the purpose of disbursing the fees than actually outlining the construction process. Though the six stages are common among the councils, the details within the stages are not synchronised. There are overlaps between the stages and many functions exist within several disciplines without a clear outline or distinction of responsibility. Whilst the areas of service overlap between the professions are recognised, the terminology used differs from one professional discipline to another professional discipline.

The literature available is not clear how these stages are controlled and how approval is obtained to proceed to the next stage. Furthermore, examination of the literature suggests that the intention of the stages is not for the six stages guidelines to be used as a project delivery process that must be equally followed by everyone. Effectively they describe the functions of each profession in the process, not describing the project delivery process itself.

2.9 CONCLUSION

The literature review has revealed that there are problems in the construction industry in South Africa and indeed worldwide. Prevalent problems include late delivery of projects, cost overruns, and unsatisfactory quality of products. The causes of these problems that have been identified in the literature are industry complexity, capacity and fragmentation.

To address the causes of problems in the industry, the idea of changing the project delivery process has been considered globally. The process protocol was developed in the UK from the idea that process-thinking applied in the manufacturing industry, with its apparent benefits, could be useful in the construction industry as well. Many construction industries around the world have considered adopting similar approaches.

However, it is also noted that there are reservations from some industry experts who are of the view that ideas and practices from other industries cannot be applied in construction. This is because of the perception that the construction industry is unique from other industries.

In this research the view is that, though the construction industry may be unique, there are significant similarities with the manufacturing industry and it is a worthwhile idea to learn and adopt practices which have addressed problems that are common in both the manufacturing and construction industries.

The government in South Africa developed the IDMS, with similar attributes to the process protocol, as a standard process of delivering public infrastructure projects. However, the system is not applicable to the private sector. Though there are the six stages used by professionals, process standardisation and consistency of application by the professionals have not been found in the literature.

From the above scenario, introduction of process-thinking in line with trends around the world appears to be a meaningful approach to explore in order to address causes of project delivery problems in the construction industry. The government has already taken the lead with the initiative of developing the IDMS.

3 RESEARCH METHODOLOGY

3.1 INTRODUCTION

It has been established in the literature review that there is little known about the existence of a common and agreed design and construction process among professionals in South Africa beyond the six stages applied for determining the scope of services and stages for disbursement of fees. This research endeavours to explore the current phenomenon among professional councils and professional bodies regarding their views on the design and construction process. This is with the view to establish the general opinion on the problems in the industry and whether there is belief that the design and construction process could be improved as part of the efforts to address the problems in the industry.

With this background, this research is general in nature but, intends to form the starting point for much more specific studies that will bring about proven theory and practices regarding the design and construction process. The research does not seek to collect statistical data but rather articulate an understanding of the ideas of the professional bodies in the industry on the research topic.

Lowhorn (2007) explains that a research that does not seek statistical conclusions which provide a broader and conclusive view of a phenomenon to be generalised should use a qualitative research approach. Atieno (2009) agrees saying quantitative research is generally confirmatory and deductive whereas qualitative research is appropriate for research that is about descriptive results which will define meaning and understanding of perceptions and views. Sutton and Austin (2015) put forward a similar understanding saying qualitative research is more helpful to articulate the views of research participants to understand the meaning of what they ascribe to in contrast to quantitative research which applies more emphasis on numbers and quantities.

This research is high level and only seeks to put together existing information and views about the unknown common and agreed design and construction process. Considering the views of Lowhorn (2007), Atieno (2009), Sutton and Austin

(2015) and many other research experts, a qualitative research approach has been deemed to be the appropriate method to achieve the research objectives. Ben-Eliyahu (2014) also elaborates that qualitative research is suitable for gathering information intended to be used to interpret an unknown situation by comparing and putting together opinions of the research participants. While this is subjective according to the views of Abusabha and Woelfel (2003), it is believed that the qualitative research method will bring about an explanation to the views of the group of the professional councils and associations that have been selected to participate and describe the current situation on the design and construction process.

It is also considered that this is an early stage research where little is known about the subject and therefore qualitative research is ideal (Ben-Eliyahu, 2014) to open up the topic for possible further quantitative research which will derive more conclusive results from a much larger population. In support of this approach, the earlier views of Sellers (1998) emphasise that only qualitative research will provide a much deeper understanding of how the participants think on the subject to facilitate statistical conclusions in follow up quantitative analysis.

3.2 DATA COLLECTION METHOD

Gill, Stewart, Treasure, *et al*. (2008) say that there are various methods of collecting data in qualitative research. These include books and videos (text and visual analysis), observations and interviews which could use individuals or groups. However, they are of the view that the commonly used method is interviews. King (1994), Sellers (1998) and Thomas, Nelson and Silverman (2015) agree that interviews are without doubt the most common data collection method in qualitative research. The interviews can be conducted on a one-on-one basis or in focus groups where the members are able to listen to the views of the other participants.

Gill, Stewart, Treasure, *et al*. (2008) as well as Thomas, Nelson and Silverman (2015) explain that there are three main types of interviews for both focus groups and individuals namely:

- *Structured interviews:* where organised questions are determined before the interview. In structured interviews, there is little variation in the interview with no allowance for follow up or additional questions. Structured interviews are said to be restrictive in participant responses and therefore not helpful if in-depth discussions are required to dig deeper in order to obtain more meaningful insights;

- *Semi-structured interviews:* where key questions are drafted to help define the areas to be looked at. The intention is to give the researcher and the participants guidance on what to discuss. The interviewer has room to bring up other questions to follow up on ideas that are revealed from the participant's responses; and

- *Unstructured interviews:* where there is no format and takes the form of a general discussion which can start with an open-wide question about the topic under consideration. Unstructured interviews are known to be suitable and useful where not much or nothing is known about the subject and in-depth exploration is required.

From the above analysis, the choice of data collection method in this research was a combination of semi-structured and unstructured one-on-one interviews for the following reasons:

i. The participants were to remain anonymous. The views of each participant were to be kept confidential from the other participants. This dictated that focus groups could not be used. Therefore, one-on-one discussions were selected to ensure that each participant's views were not revealed to the other participants;

ii. While there was need to guide the interviews, the participants were not to be restricted with structured questionnaires because their unrestrained views were required. Semi-structured interviews were used to allow topic guidance; and

iii. Very little is known about the subject of process-thinking in project delivery among consulting professionals and therefore in-depth open-ended discussions were necessary. The unstructured interview method was relevant in this regard.

3.2.1 Semi-structured interviews

The semi-structured interviews were undertaken with each respondent using drafted topic guides that were provided to the participant. Tools4dev (2014) explains that semi-structured interviews require some structure provided by an interview guide, which needs to be flexible; only listing the key questions for the purpose of guiding the interview but in no specific order. The topic guide for this research, attached as Appendix B, was structured as follows:

- Problems in the construction industry;
- Solutions in the industry;
- The design and construction process;
- The IDMS from CIDB
- The six stages among consulting professionals; and
- The process protocol.

The topic guide was in line with the areas of literature reviewed in this study which is the basis of information available.

The above topic guide helped in defining the areas explored though the interview comprised open-ended questions as well. The idea was to avoid restricting the respondent to pre-determined answers as the case may be in structured interviews.

This approach was meant to be able to bring out other areas that may not have been revealed in the literature review.

Furthermore, the selected sample of eight participants is small and Laforest (2009) supports the view that semi-structured interviews are ideal for samples of this size because they allow understanding of perceptions and opinions regarding scenarios that are not clearly understood as to what is the status-quo. According to Zhang and Wildemuth (2009), the semi-structured approach provides the researcher with certain freedom to adjust the questions to suite the respondent's responses in a respective context but still focus on the drafted guide. It is believed this liberty was required in this research to be able to explore the subject in a wider context considering that the findings may just be a foundation upon which further research could be commissioned.

The interviews were recorded both as transcripts and audio recordings which were correlated during the analysis.

3.2.2 In-depth unstructured interviews

Unstructured interviews were part of the research data collection methods. The semi-structured interviews were closed with an unstructured discussion in order to further explore the wider views of the respondents with a few broad questions. This discussion provided further insight into the unguided views of the respondents on the matter of process-thinking approach in construction that is gathering growing acceptance worldwide.

Mcleod (2014) explains that unstructured interviews have the strength to allow the respondent to discuss in more depth using their own words through flexible and open questions that can give the respondent even control of the direction of the interview. Zhang and Wildemuth (2009) agree that unstructured interviews are helpful in research that is attempting to explore operation patterns where the researcher has no hypothesis but with the intention to develop theory as opposed to testing.

This is what this research was all about and unstructured interviews were a useful complimentary tool.

3.3 DATA ANALYSIS

According to Patton and Cochran (2002), there are various approaches to analyse qualitative data and the thematic analysis method is applied for most projects. O'Connor and Gibson (2003) agree with this view when they describe the mostly applied steps to analysing qualitative data. The understanding is that thematic analysis is more useful to identify recurring themes in the interviews that are used to summarise the views of the respondents into similar groups and develop a conclusion.

Burnard, Gill, Stewart, *et al.,* (2008) also note that transcribing data from interviews and grouping it into themes is a common and most appropriate way of analysing qualitative research data. Hilal and Alabri (2013) explain that coding text-based data is the cornerstone of analysing qualitative data in research because it makes easy the process of getting similar information together to develop focused opinion from a wide range of unorganised data. These views are supported by Flick (2013) who elaborates that grouping data in themes by coding reduces large sets of data into similar elements to derive groupings that will lead to formulating a finding.

This research took the same approach advocated by these experts (Patton & Cochran (2002), O'Connor & Gibson (2003), Burnard, Gill, Stewart, *et al.,* (2008), Hilal and Saleh (2013) & Flick (2013)) and the process of analysing the data from the interviews was as follows:

3.3.1 Knowing the data

This was the first stage of the data analysis and it involved listening to the audio recordings and transcribing them into a written format. Notes from the interview were also rearranged and written down into a format flowing with the transcribed recordings. Time was taken to read the transcripts in detail. After this exercise, a preliminary sense of the data and the quantity emerged.

3.3.2 Grouping the data

Once familiar with the data, similar kinds of information were grouped together in themes and summarised over and over to distil the message in the recurring themes. After these themes were put together, a coding scheme was developed. The coding scheme was used to group the rest of the data into the schemes. The groups of the data were as follows:

i. Existence of common construction process;
ii. Existence of common language;
iii. Views on the six stages;
iv. Views on the IDMS;
v. Views on the need for a common process;
vi. Views on the process protocol; and
vii. Views on the problems in the industry and cause.

Statements in these groups of data were then colour coded to facilitate structuring and putting common views together to establish agreements in opinion. The colours used were as follows:

- *Green:* for yes or positive views;
- *Blue:* for not sure or neutral views; and
- *Red:* for no or negative views.

A sample data grouping sheet is attached as Appendix D.

4 PRESENTATION, DISCUSSION AND ANALYSIS OF THE RESULTS

4.1 INTRODUCTION

As outlined in Chapter 3, the intention was to conduct the research in the form of semi-structured and unstructured interviews with representatives from the CBE, ASAQS, CESA, ECSA, SACAP, SACPCMP, SACQSP and SAIA. The interview with one of the targeted participants did not take place because there was no one available or selected to represent the organisation. The identity of the organisation is withheld for anonymity reasons. Interviews were conducted with the other seven participants.

While the research is primarily intended to establish the existence of common and agreed design and construction process among professionals, the discussions broadly looked at the following areas:

- The existence of a common process and general understanding thereof by each participant;
- The problems in the industry and views on the possible underlying causes including the design and construction process;
- Awareness of the process protocol developed in the UK and whether it would be worthwhile to adopt a similar process approach in South Africa;
- Views regarding process thinking in the industry;
- Views on the IDMS from CIDB and the National Treasury; and
- The six stages utilised by the various councils.

The summary of the discussion with each participant is outlined below. This is followed by the conclusions on the general viewpoint. For the purpose of anonymity, the identity of the participants have been disguised using participant numbers in place of the names of the councils and associations.

4.2 PARTICIPANT DISCUSSIONS

4.2.1 Participant 1

The views of participant 1 have been summarised as follows:

4.2.1.1 Common process and general understanding

The participant is of the view that a process exists but not encultured to be performed by everyone uniformly and strictly. This is in view of the opinion where the participant expressed that in a traditional sense consultants work with each other in a common way though there are no strict gates applied. The participant believes that it may also be considered that gates exist in some way, considering that certain activities such as commencement with the tender process cannot proceed without completing the tender documents.

However, an observation was made by the participant that though the process may be understood in the same way, some stages or activities are overlooked when anyone deems necessary or not willing to follow the process. This is as a result of lack of discipline and policing of the process. The participant believes the introduction of the project manager / principal agent role in recent years may address this over time.

4.2.1.2 Problems in the industry

The participant is of the view that problems of time delays, cost overruns and poor quality have existed in the industry for a long time. However, the participant noted that high-level projects have been successfully completed, in a way, in the past using the traditional processes. The participant observed that these processes have collapsed in recent years due to eroded capacity and wrong professional teams appointed without requisite experience.

According to the participant, capacity is the major problem affecting the implementation of the design and construction processes that may have existed over the years. In this instance, capacity includes experience and qualifications; not just numbers. Problems of time and quality are prevalent and no one knows

what to do. The participant believes that increasing capacity would improve the delivery of projects through appropriate process application.

4.2.1.3 Awareness of the process protocol

The participant indicated not being familiar with the design and construction process in the UK and the process protocol. However, from the researcher's description of the process protocol, its attributes and application, the view of the participant was that the process protocol was a wonderful development that would be worthwhile to consider in South Africa in order to streamline the existing processes that are not 'formalised'.

The participant expressed the view that creativity is required to look at models around the world and see what we can fit into the South African industry such as the introduction of gates in the process because there is no control. The participant was of the view that introduction of discipline in process implementation is also necessary.

Some of the participant's comments in this regard were *"maybe we need to lift our eyes above the immediate and see what ... look at future horizon and as capacity is improved we can then start to embrace models that are used internationally to our benefit."*

4.2.1.4 Process-thinking in the industry

The participant expressed the view that it would be fantastic if the design and construction process is standardised globally (but wishful thinking). Skipping of traditional ways of doing things causes more risks and happens too often. Process thinking is a ground-breaking idea in the right direction.

The participant believes a process is required and said *"...every time you shift away from a sort of step by step stages you introduce more risk. Getting things understood properly and standardised prevents clients from overriding everybody... Many times clients want something built at speed so he says do whatever you can ... and there are some shifts you know sometimes the gates move a little bit those kinds of thing happen....What we have currently is not doing it."*

4.2.1.5 Views on the IDMS from CIDB and National Treasury

The participant was of the view that the IDMS was a genuine and honest approach by government to organise the process of delivering projects and believes it will improve the situation. But it is not the only solution. Though it is intended for government infrastructure projects, the participant believes the process would work in the private sector because there are overlaps just like other government interventions such as BEE. Just like BEE, the participant proposes that the IDMS should also completely engulf the private sector. The IDMS may be good to be introduced in the private sector as long as it does not introduce bureaucracy and cost more money.

The participant said: *"I think IDMS is a genuine and honest approach to streamline things and improve and I think it will improve it but it may not be the final solution. ... I think it will overlap the private sector ... just like BEE which is completely engulfing the private sector..."*

4.2.1.6 The six stages

The participant was of the view that all the consultants understand the six stages on a project considering they have been in existence for some time. Without providing details, the participant thought that the details of the six stages may not be common and familiar as such. If there was an opportunity to redraft the six stages guidelines in a more user friendly and common document, the details would be commonly understood. Yes, there is no gate process, observed the participant, but in a way there is a system that does not allow you to proceed if certain things are not done. It is common practice. Gates in the process are necessary because there is no control at the moment.

The participant said *"Now we don't speak of gates but I think we do comply with closeouts of those stages ... so there are unspoken gates if that is the right word in the process."*

The participant thought that it would be better if the six stages were applied more to project delivery because currently they were mainly used to determine fees on where they are in those stages not as a construction guideline process.

4.2.2 Participant 2

Participant 2 clarified, at the beginning of the interview, the roles of the organisation being represented. Though the participant outlined the roles which did not include implementation of the construction process, the details have been disguised for the purposes of anonymity. The participant cautioned that his/her knowledge of the design and construction process may not be adequate. The interview proceeded and the views of Participant 2 have been summarised as follows:

4.2.2.1 Common process and general understanding

The participant responded that a common process does not exist because it is not practiced even though there is a non-formalised tradition of delivering projects. A process is required to the extent of the process protocol described by the researcher. However, the participant was of the view that the private sector could be considered to have a process working that seems to be successfully delivering projects. It is not clear if this process is common in the private sector and followed the same way all the time.

Asked if the process exists, the participant responded *"I don't think, well if it exists then it does not exist to that extent (process protocol)."*

4.2.2.2 Problems in the industry

The participant was of the view that problems of the industry such as late delivery and cost overruns on projects may exist but this is from media reports and publications; not from formal reports and therefore cannot be relied on to make conclusions. The participant revealed that, in their oversight role, they do not receive many formal complaints to determine if the problems are prevalent. The participant is of the view that the major cause of project delivery problems is lack of capacity in terms of knowledge and experience since 1994; after the advent of democracy.

4.2.2.3 Awareness of the process protocol

The participant was not aware of the process protocol developed in the UK until the researcher described the model. The view expressed by the participant was that the process protocol would be a good idea in South Africa because currently work is carried out in silos and project managers should be empowered to put things together and oversee a standardised process. The participant was of the opinion that the process protocol is a mature way of doing things and surely the industry should take a closer look and consider taking a similar approach.

The participant said *"I think it (PP) is a very, it is a good way to do it and I think it is a mature way to approach it, you know when industry actually takes that upon themselves to say we are going to regulate..."*

4.2.2.4 Process-thinking in the industry

With regard to process-thinking, the participant referred to a process where they are developing a system called "identification of work" as a process thinking approach to project delivery. A staged process of project delivery is required though the participant was not sure of how it would be implemented. A standard process is very important in the view of the participant and urged that the industry must take it upon themselves and start regulating in a consistent way. Otherwise the government should regulate or a combination of both.

4.2.2.5 Views on the IDMS from CIDB and National Treasury

Though not conversant with the IDMS, the participant was aware that this was a system government was implementing to standardise planning and delivery of public infrastructure projects. The participant believes in standardisation and thinks the IDMS is the right direction which the industry should follow.

4.2.2.6 The six stages

The participant is aware of the six stages though not in detail. However, the participant believes there are overlaps. Details of the overlaps were not provided. The participant was of the view that these overlaps are an indication that the six stages need to be standardised and be used to deliver projects in the same way.

4.2.3 Participant 3

The views of participant 3 have been summarised as follows:

4.2.3.1 Common process and general understanding

Participant 3 was of the view that there were no recognised project delivery structures at the moment. Though common language exists, there are too many grey areas on issues such as the understanding of the levels of accuracy of documentation, types of documents, documents required on projects and many others among different disciplines. The participant believes that the professional disciplines work in silos and they do not even cross consult or rarely do so. Territorial differences are prevalent which prevents disciplines from identifying roles properly or roles end up being duplicated or overlapped.

The participant said *"... the commonality amongst the various professionals is maybe more from an awareness perspective. But I don't think you are going to get them, you know, the process is not applicable to how all of them do things."*

The participant further commented that*"... in South Africa, even in the engineering professions, guys tend to operate in silos...they don't even cross consult or work very well together."*

4.2.3.2 Problems in the industry

Project overruns on time and cost are major problems on major projects, noted the participant. This can be attributed to lack of competency particularly in government departments delivering projects as well as municipalities while the private sector and state- owned entities still appear to be following processes that deliver projects as planned; to some extent. The participant's view is that not many professionals currently understand the project process from start to finish any more or they do things differently each time they start a project. As a result, projects fail.

The participant observed that, in recent years, emphasis years has increasingly been placed on supply chain due to lack of defined process and technical capacity. Another problem results from clients wanting to be in control of the process when

they are not familiar with it. This causes project delays and other problems. There is also lack of discipline to manage the process properly.

4.2.3.3 Awareness of the process protocol

The participant was not aware of the process protocol developed in the UK despite expressing the view that the model appears to be a useful development based on the introductory description by the researcher. The participant expressed the opinion that this is the right process for projects and each industry should consider such a development.

4.2.3.4 Process-thinking in the industry

Regarding process thinking, the participant was of the view that it is essential to have definite processes particularly in large projects. The participant believes that processes were there before but collapsed due to lack of capacity. Referring to Transnet, a state own entity, the participant talked about vigorous protocols in project delivery that existed in the past throughout the project life cycle with gate reviews at every stage done by independent parties.

The participant believes projects must have structure in the way they are delivered and an efficient project delivery process is necessary to be the driving platform. The participant is of the view that a defined process on a project prevents leaving mistakes behind and scope is well defined upfront which avoids delays in future.

4.2.3.5 Views on the IDMS from CIDB and National Treasury

The participant was very conversant with the IDMS, including a further process called "Standard for infrastructure procurement and delivery management" developed by the National Treasury which is understood to be an improvement on the IDMS. The participant believes the IDMS is similar to the process protocol, as described by the researcher, with detailed definition of various steps in the project process as well as gates. This could be applied in the private sector because it is a good process. However, the participant observed that there might not be much drive for the IDMS in the private sector because projects are profit driven and often with professionals having more accountability on project success. Asked

whether the IDMS would be suitable to the private sector, the participant said *"absolutely!"*

The participant's major concern was implementation capacity in the government departments in view of the failures to implement existing systems such as the Public Finance Management Act (PFMA).

The participant believes the IDMS is not new, saying it is an attempt to get the existing engineering process back into some direction. Because of lack of discipline, the participant was of the view that it would be good to have a law to ensure implementation. Implementation in the private sector is also required to standardise the system for project uniformity across all sectors.

4.2.3.6 The six stages

Regarding the six stages utilised by the councils, the participant expressed the view that there was a standard project phasing for the fees. The project delivery process is not sufficiently defined in this system though it can be used to measure the scope of work for the professional. The participant does not believe the six stages work as a project delivery process. The process is there but definition of applicability is not sufficient to be useful as a project delivery process. Furthermore, the participant does not believe that the expectation of the deliverables at each stage is the same for all professionals.

4.2.4 Participant 4

The views of participant 4 have been summarised as follows:

4.2.4.1 Common process and general understanding

Because of the six stages utilised by the various professional bodies, the participant believes that the process exists but it is understood and implemented differently or accorded different significance by different professionals. This view is based on the observation that the six stages have many overlaps without any real check regarding whether one stage is complete when proceeding to the next stage. The outputs are different from the various disciplines and it is common occurrence that not everyone knows or is made aware that one stage is complete

and it is time to proceed to the next stage. Many times, progression to the next stage occurs knowing there might be need to go back and finalise what happening behind the previous stages. The participant believes disciplines do not run projects the same way. Details were not provided in this regard.

4.2.4.2 Problems in the industry

The participant identified fragmentation as the major cause of poor quality, time delays and many other problems experienced in project delivery. Industry participants do not work using the same process to deliver projects causing managerial difficulties and communication problems.

The participant said *"I think fragmentation is something we experience here in South Africa but I know it is sort of taken from the UK but I think quality is definitely an issue, time is definitely an issue and budget."*

4.2.4.3 Awareness of the process protocol

The participant is not familiar with the process protocol developed in the UK but was of the view that it is the ideal model based on the researcher's description of the process. The participant was of the opinion that the hard gates in the process protocol would certainly resolve many problems in the way things are done currently including the implementation of the six stages.

4.2.4.4 Process-thinking in the industry

The participant believes a working process understood and utilised by all industry professionals was required. This would ensure common understanding of the design and implementation side of the project delivery process particularly by the clients. Gates may be necessary but may make planning process longer though they may shorten the construction process on the other hand thereby addressing quality, time and cost overruns because of the thorough upfront planning. The participant was of the opinion that a common and agreed process would bring predictability and hard gates would certainly resolve many problems.

4.2.4.5 Views on the IDMS from CIDB and National Treasury

The participant is not aware of the IDMS but believes if the public sector has developed the toolkit to streamline project process, the model should be broadened to the private sector for uniformity.

4.2.4.6 The six stages

Regarding the six stages, the participant wonders why projects fail while the six stages are there. The participant observed that professionals opt to ignore the stages quite often during project implementation. The components within the six stages process maybe causing project difficulties because there are no gates, contain numerous overlaps and there is no real requirement to check, on any of the stages, whether the stage is complete. The outputs are also different from the various disciplines. Usually not everyone knows when a stage is complete.

The participant is of the view that the six stages are definitely not understood the same way by all disciplines though no detail backup was provided. The participant expressed awareness that other disciplines in most cases do not have knowledge of what is contained in the stages of other disciplines.

Though the six stages have been used over the years as a guide for payment of fees, the participant is of the opinion that gates would be useful, if introduced, as a design and construction process guide.

The participant commented saying *"...we have got the six stages in terms of consulting. We have got the six stages in terms of how a project must be rolled out and yet it still does not follow. If we follow that procedure but we still don't have projects delivered on time and within budget. So I don't foresee it being that particular process."*

4.2.5 Participant 5

The views of participant 5 have been summarised as follows:

4.2.5.1 Common process and general understanding

The participant expressed the view that a process is there through the six stages but not followed. It is used to estimate fee stages. There is no consistent process of doing things right particularly at the beginning of a project and it is not clear if the stages are the same though the participant believes the majority of the stages are only similar in structure and not the underlying detail.

The participant commented that *"...so they (consultants) have all these different terminologies, you know and things like every contract is unique so you don't really have a standardised approach to your professional team."*

4.2.5.2 Problems in the industry

The participant agrees that problems of projects getting late and cost overruns are prevalent believing that the major causes are poor coordination, lack of experience, inadequate capacity and poor integration. Teams are often disjointed in the way they produce information and run projects.

4.2.5.3 Awareness of the process protocol

The participant expressed lack of knowledge of the process protocol developed in the UK. However, after explanation by the researcher, the participant's view was that the process protocol is the ideal way of delivering projects and revealed that their institution was working with the PROCSA documents and the JBCC to produce a similar model using the six stages.

4.2.5.4 Process-thinking in the industry

The participant believes that the development of the PROCSA suite of documents is an expression of the need for process thinking in the construction industry. Gates are necessary, with known deliverables, before moving to the next stage. The participant revealed that the PROCSA suite of documents is currently trying to introduce stages from inception similar to process protocol. This should define the deliverables for each consultant which will be known and agreed by all. A

rollout of the process throughout the industry would be ideal though there are no intentions to make the delivery model compulsory.

4.2.5.5 Views on the IDMS from CIDB and National Treasury

The participant is not aware of the IDMS though conversant with the SIPDM developed by the National Treasury. The participant expressed excitement about this National Treasury document and believes it will bring order to the construction process. However, the participant raised concern that the SIPDM model may not be applicable to the private sector though a process rollout throughout the industry would be a wonderful development.

The participant has high expectations about the SIPDM and said *"I must say I am very excited about the SIPDM. We think it is a step in the right direction and we have been privileged to have been invited to numerous presentations and roll-out road shows on the SIPDM and I think this is a step in the right direction."*

4.2.5.6 The six stages

Though the six stages exist across the various disciplines, the participant is of the view that the stages require improvement because they are currently disjointed and not synchronised across disciplines to allow equal measurement. Some stages are described longer by one discipline than the others as an example. The participant believes that is the reason why PROCSA initiated the current initiative to align the six stages with the JBCC documents and establish the project manager as the focal point to control the process.

The participant made this statement on the six stages: *"There is no synchronisation (in the six stages between consultants) and also I want to mention that the councils have very, I mean if you describe the six stages it's very limited ... if you look at the architects for instance, the six stages are summarised on two pages."*

4.2.6 Participant 6

The views of participant 6 have been summarised as follows:

4.2.6.1 Common process and general understanding

The participant believes the six stages system is some sort of process understood by everyone. However, a project delivery model does not exist but the six stages system is a guideline for consultants who are experienced to create a process format. There is a guideline and the deliverables for approval to proceed within the six stages. The participant's opinion is that the current process or way of doing things is not effective and quite often, it occurs that some stages and / or activities are conveniently forgotten because there is no standard project delivery process.

Furthermore, the participant expressed the view that there could be some common language but it is not standard. Some disciplines contain detailed comprehensive language in the six stages while others are summarised.

The participant expressed the view that *"The model does not exist ... but the six stages gives you some sort of process ... because the stages themselves are in a series, they form this continuous process."*

4.2.6.2 Problems in the industry

The participant is of the view that time, cost and quality problems have existed over time and they result from a diversity of causes which include the involvement of the wrong participants in wrong places, industry fragmentation and process implementation that is not controlled uniformly. The participant believes that the issue regarding these problems is deteriorating.

Asked about the problems of project delays, quality and budget overruns, the participant responded by saying *"from the consultants' point of view, it is not improving at all. It is getting worse and worse, to be honest I will be blunt, it is getting worse."*

The participant is of the view that fragmentation is a major problem when saying *"The councils, each one of them is fragmented, you know, and each one has their*

own way of doing things... That is why we need this design and construction model or protocol..."

4.2.6.3 Awareness of the process protocol

The participant expressed lack of awareness of the process protocol developed in the UK. However, after explanation by the researcher, the participant expressed the view that the idea that the process protocol be adopted into the South African industry would be supported. Based on the description of the attributes and operation of the model by the researcher, the participant believes the process protocol model is the ideal way to deliver projects and it would be a good beginning to pursue a similar approach.

4.2.6.4 Process-thinking in the industry

The participant expressed support for process thinking by suggesting the need for a design and construction process model which would work better if legislated. Consultants cannot work together seamlessly because of fragmentation and lack of legislation to enforce a process model. The participant's view is that a process would bring everyone together and therefore, a common process like the IDMS is required but must be legislated because the belief is that everyone would be obliged to comply if it comes from government. Government must champion the development of the process.

4.2.6.5 Views on the IDMS from CIDB and National Treasury

The participant is aware of the development of the IDMS and believes this is an effort by government that is close to the kind of standardisation that is desired. This must be brought together into a protocol that is aligned to design, construction and infrastructure delivery process. The participant thinks the IDMS is brilliant and is closer to the process protocol but it has to be integrated with the councils' scope of services in the six stages. It must be standard on any project that anyone undertakes, and not necessarily government only.

The participant was of the view that the IDMS and the six stages should be brought together saying *"The IDMS is very close to standardisation, the standardisation that we are looking for ... but we need to take the guideline scope*

of services and bring this thing together into a protocol that talks to construction, the design processes and the infrastructure delivery processes."

The participant further said *"I have admired the IDMS in everything, even the principle of IDMS is brilliant, you know, because it is closer to what you are looking for (PP) but it has to be integrated with the councils..."*

4.2.6.6 The six stages

The participant expressed the view that while the six stages exist with all the councils, they are a scope of services that do not articulate a project delivery process though the stages are in a series. The stages can be used as an appropriate guideline to create a process model though currently it is a scope of services for fees purposes. The stages are tied to payment of fees and not the project delivery process. Furthermore, they are not legislated and the participant is of the view that not everyone is compelled to follow the stages as a result.

The participant stated that *"the six stages are there but it is not standardised."*

4.2.7 Participant 7

The views of participant 7 have been summarised as follows:

4.2.7.1 Common process and general understanding

The participant is of the view that there is no clear way of delivering projects because there have been instances where scope of work has been left unattended to by all professionals due to lack of clarity on who must undertake it. The processes and deliverables are not clear.

The participant makes an observation that currently everybody can do anybody's job and there is nothing stopping them. There is no definition of roles and processes. This means the industry does not understand things in the same way, there is no common understanding and there are no mechanisms to ensure project delivery practices that are in existence are implemented consistently at all times.

4.2.7.2 Problems in the industry

Problems of time delays, cost overruns, poor quality and many others are experienced on a regular basis on projects in as far as the participant is concerned. These are more prevalent in the public sector but also happen in the private sector. The participant believes that the causes are many and wide ranging from poor consulting teams, contractor performance as well as political interests on projects. The participant was of the view that these causes are usually interrelated.

4.2.7.3 Awareness of the process protocol

The participant only learnt of the process protocol developed in the UK from the introduction and description by the researcher. Thereafter, the participant's view was that the process protocol is quite relevant to South Africa because a common understanding of process is required in the industry.

The participant stated that the process protocol would be ideal by saying *"it would work because then obviously we would have a common understanding, which we do not have, when it comes to the councils we would I mean obviously everyone would be on the same level."*

4.2.7.4 Process-thinking in the industry

The participant described the current situation as chaotic. There is no process at the moment and a process is required that guides everyone on how a project must be started and completed every time.

4.2.7.5 Views on the IDMS from CIDB and National Treasury

The participant believes the process of project delivery must be regulated and the IDMS is the right step by government to start that process. The participant's preference is that the system is rolled out to the private sector because the industry requires one system to be applicable to all projects.

4.2.7.6 The six stages

The views of the participant were that the six stages exist but whether they are a design and construction process is not their main concern. The participant clarified that their organisation's focus was to ensure that communities are

adequately protected. However, the participant was of the view that the six stages are a guideline for fees purposes only.

4.3 DISCUSSION SUMMARY

Table 1 below illustrates what has been derived as responses to the significant questions of the research. These are:

i. Do project delivery problems such as time, cost overruns and poor quality exist?
ii. Does a common agreed design and construction process exist?
iii. Does the industry think a common and agreed consistent process is required?
iv. Does the industry think a process protocol would be useful?
v. Are the six stages commonly and consistently used as a project delivery process?
vi. Does any other process exist aside from the six stages?
vii. Is the IDMS considered a process and should it be adopted for use throughout the industry?

From the findings summarised in *Table 1* below, the following opinions are drawn:

i. The participants, except *Participant 2*, were of the view that the industry problems of late project delivery, cost overruns and poor quality in the industry are prevalent. *Participant 6* emphasised that *"...it is getting worse and worse."*

   This view is consistent with the findings in the literature review where it was established that there were challenges of time delays, cost variations, lack of quality and many others encountered in construction projects. This observation was made by then Public Enterprise Minister Malusi Gigaba in 2013 (SAPA, 2013). Nkado and Mbachu made similar observations back in 2002.

The participants agree with the literature that the causes of poor performances in the industry include fragmentation (SAPA, 2013) and skills shortages (Nkado & Mbachu, 2002; CIDB 2011; Garbharran, Govender & Msani, 2012; Windapo & Cattel, 2013). The participants added that inadequate capacity (which also includes skills) is one of the major factors. Other factors that the research revealed were government policies and political influences such as labour and social environments.

Table 1: Summary of the participants' opinions on the pertinent information relevant to the research questions

NAME OF PARTICIPANT / SUMMARY QUESTIONS	PARTICIPANT 1	PARTICIPANT 2	PARTICIPANT 3	PARTICIPANT 4	PARTICIPANT 5	PARTICIPANT 6	PARTICIPANT 7
Do project delivery problems such time and cost overruns and poor quality exist	Yes	*N/S	Yes	Yes	Yes	Yes	Yes
Does a common and agreed design and construction process exist?	No	No	No	No	No	No	No
Does the industry think a common and agreed consistent process is required?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Does the industry think a process protocol would be useful?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Are the six stages commonly and consistently used as a project delivery process?	No	No	No	No	No	No	No
Does any other process exist aside from the six stages?	No	No	No	No	No	No	No
Is the IDMS considered a process and should be adopted for use throughout the industry?	Yes	Yes	Yes	Yes	Yes	Yes	Yes

**N/S denotes "Not Sure"*

ii. The participants expressed tacit existence of a process through the six stages common among the professional councils. However, there is no consensus that the design and construction process is commonly applied. Many of the participants expressly stated that the system does not exist with *Participant 1* saying *"I don't think, well if it (process) exists then it does not exist to that extent (process protocol)"* when asked if a common

construction process exists. *Participant 6* said *"the six stages are there but it is not standardised."*

The findings with regard to the existence of a process agree with the literature where a process existence was not established. The Minister of the Department of Public Works, in 1998, said the construction processes and teams are not integrated (DPW, 1998). Altman and Mayer (2003) were also of the view that the industry operates in an inconsistent way and was disorganised.

iii. The questions about whether a common and agreed consistent process is required and whether a process protocol would be useful are linked and, therefore, discussed together hereunder.

The views of the participants point towards the perception that the industry needs a standardised process with the process protocol as a model example. For instance, *Participant 1* said *"... every time you shift away from a sort of step by step stages you introduce more risk. Getting things understood properly and standardised prevents clients from overriding everybody"* while *Participant 2* thought that the process protocol was *"... a mature way to approach it... (process-thinking)."*

These views were found in the literature review where Aiyetan, Smallwood and Shakantu (2011) suggested a "systems-thinking-approach" to be obliged by all players in the industry. This was the idea of Kaatz *et al.* earlier in 2005 when they proposed a project delivery system re-arranged and modelled on the process protocol.

iv. Generally, the research is indicating that the participants think there is an unspoken understanding that the six stages found with the councils are a common project delivery process. But it ends there; a tacit set-up. The participants said a genuine commonly and consistently applied process

does not exist with *Participant 6* saying *"The councils, each one of them is fragmented, you know, and each one has their own way of doing things..."*

The literature in this regard is not clear though the finding is that the details in these six stages of the various councils are not the same and are not synchronised. The six stages are in fact meant to be a guideline for the determination of fees at various stages and not a project delivery process.

v. The two questions about whether other processes exist aside from the six stages and if the IDMS is considered a process and should be adopted for use throughout the industry are analysed together because the responses and findings are considered inter-related.

The six stages are not considered an agreed and consistent project delivery process by the participants. It has also been established that there is no process that exists to deliver projects that is applicable industry-wide both in the literature (Kaatz *et al.,* (2005); Aiyetan, Smallwood & Shakantu, (2011)) and in the research participants' responses.

The participants believe that the IDMS is a brilliant idea towards establishing an industry process and should be applied or should engulf the entire industry in the long run. For this idea, and agreeing with the other participants, *Participant 6* expressed the view, which was highlighted earlier, that

"The IDMS is very close to standardisation, the standardisation that we are looking for ... but we need to take the guideline scope of services and bring this thing together into a protocol that talks to construction, the design processes and the infrastructure delivery processes". "...it is closer... (to process protocol)... but it has to be integrated with the councils..."

Therefore, the outcome deductions summarised in *Table 1* compared and contrasted with the literature review indicate that there is general agreement between the research findings and the literature review.

The problems in the industry and their possible causes have been acknowledged by the participants and the information in literature. Exploring a different approach to project delivery, as one of the possible solutions to the problems in the industry, is an idea that is considered to be reasonable.

The participants and the literature share the view that this different approach is the introduction of a common and agreed consistent process in the way projects are delivered. This is in view of the research finding that the details of the six stages are not synchronised across the disciplines and not applied consistently for project delivery.

The IDMS is considered to be a process similar to the process protocol developed in the UK and there is excitement among the participants that it could be the beginning of the introduction of the desired process-thinking in the South African construction industry. The propositions from the participants generally indicate that the IDMS should be broadened to include private sector projects and this can be unified with the six stages guidelines to create one process.

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

It has been found, from the research, that there is a perception which depicts the six stages as a design and construction guideline and a belief that there is a culture of project delivery that has been practiced over the years. However, the conclusive outcome, through unanimous agreement among the interview participants, is that an agreed common and consistently applied design and construction process among professionals does not exist. The six stages are widely known but they are not consistent among the professionals and their application to project delivery has not been acknowledged by any of the research participants. It has nonetheless been acknowledged that the six stages are applied for fees purposes albeit not in a common and consistent manner.

Some of the interview participants have alluded to a culture of project delivery in the industry. They expressed the view that there is a way of project delivery that has been practiced over the years by many project participants and projects have been completed successfully. However, there is no clear outline of this project delivery practice or indications that the culture is followed and monitored for consistency and uniformity of application.

Furthermore, there is also unanimous agreement among the participants that an agreed common and consistent project delivery process must be developed among the consulting professionals. This desire is a clear indication that a common process is not known and does not exist in the South African construction industry.

Despite that all the participants were not aware of the process protocol developed in the UK, the idea of adopting a similar process was plausible to every participant as a way to begin the process-thinking approach in South Africa. The IDMS is viewed as a process attempt by government, which those participants that are aware and conversant with the system are excited about because they believe there is need for standardisation of the process of project delivery; IDMS

is basically the right direction. Industry-wide application of the IDMS to include the private sector is a reasonable idea to all participants and they are encouraging government to lead in this regard.

Based on the above, this investigation has concluded that:

"there is no existence of common and agreed design and construction process among consulting professionals".

5.1.1 Research question outcome

The primary research question was:

> *Would the adoption of a process protocol approach be useful in the attempt to introduce process-thinking and commonly agreed consistent process in the way consulting professionals deliver projects in the South African construction industry?*

The answer to the question is YES.

It is clear from the participants' feedback that the idea of the process protocol developed in the UK can be adopted because there is need for a defined process in the industry and the process protocol is a ground breaking good example. Support for the IDMS to be considered for industry wide application by the participants is revealing this view. *Table 1* in chapter 4 and the summary commentary of the findings in this table demonstrate this.

5.1.1.1 Sub-question 1

> *Is there evidence of a common understanding of the design and construction process among consulting professionals in South Africa beyond the six stages articulated by the professional councils?*

The answer to sub-question 1 is NO.

It has been established from the participants discussions that the use of the six stages as a project delivery process is a perception. The six stages have been in existence for some time and some consultants have discerned them as the drivers

of the project delivery process. However, there is no common understanding of the stages and there is no uniform and consistent application apart from the purpose of determining fees.

Furthermore, it has been found that the details within the stages are not the same across the disciplines and it is not clear whether the terminologies used have the same meaning and are understood the same way by everyone. There are overlaps between the stages and across the disciplines creating misunderstanding when it come to determining when a stage has been completed and how to determine the responsibilities of each discipline.

5.1.1.2 Sub-question 2

What are the views of consulting professionals in the South African construction industry toward the adoption of a process-thinking model for the project delivery process, such as the process protocol and its possible benefits for the South African construction industry?

The answer to sub-question 2 is that the consulting professionals desire a standardised project delivery process which every profession would be obliged to follow when delivering projects. It is believed that such a process would eliminate the problems of late project delivery and poor quality which lead to budget overruns by introducing obligatory thorough upfront planning and stage gates.

The research has realised that there is no common and agreed process that is known by all professionals. All participants are of the view that a process model in project delivery is required to create uniformity and address some of the project delivery problems. This could be the driver behind the support for the process protocol and the roll out of the IDMS even to the private sector.

5.1.2 Proposition outcome

The proposition of the research was:

> *The adoption of the process protocol approach by consulting professionals in South Africa would assist in developing a common and agreed process of project delivery, and would enhance efforts to address industry challenges in project delivery.*

The discussions with the participants indicate that a common project delivery process is desired with a belief that this would improve the achievement of project targets during implementation. Therefore, the proposition in this research is ideal and the participants expressed similar welcoming views that such an idea would be appropriate as a starting point. The idea to extend the IDMS process to the private sector indicates that this proposition is reasonable in the given circumstances.

5.2 RECOMMENDATIONS

It has been concluded that the project delivery process requires improvement through the introduction of a clear common and agreed process that is consistently applied by consulting professionals. The process protocol is admired and there is supports for the idea of developing a common project delivery process. The IDMS is recognised as a standard project delivery process developed by government in the public sector. The participants believe this should be applied in the private sector to create uniformity. There is also a perception that the six stages are used to guide the project delivery process while there is no evidence in this regard. Details of the six stages are not similar or the stages are not applied the same way across the professional disciplines.

In view of this scenario, and in order to advance the desired idea of a process model further, the recommendations from this research are as follows:

- Investigating the possibility of a government led effort to establish a common and agreed project delivery process as was the case in the UK;

- Conducting a study to reveal how the IDMS would be useful to the private sector in order to pave the way for a plan to apply the process throughout the industry; and,
- Investigating the possibility of harmonising the six stages across all disciplines and assessing how they could be transformed into a common and agreed project delivery process with firm application guidelines.

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APPENDIX A: PARTICIPANT INFORMATION SHEET

Dear Sir/Madam,

My name is Siapenga Simango. I am currently enrolled for a Master of Science degree in Building (Project Management) at the University of the Witwatersrand. One of the requirements to obtaining the degree is the completion of a research report. In this regard, I would like to conduct a research aiming at "INVESTIGATING THE EXISTENCE OF COMMON AND AGREED DESIGN AND CONSTRUCTION PROCESS AMONG CONSULTING PROFESSIONALS". This is with respect to common understandings and definitions that exist among professionals in the South African construction industry regarding the design and construction process. Furthermore, the study also aims to explore if the idea of a common process description, modelled on the process protocol, would assist in overcoming the challenges faced in project delivery in South Africa. This is drawn from the assertion that international experience demonstrates the benefits of a common language and description of the project-delivery process; with particular reference to the process protocol developed in the UK.

For this purpose, I am hereby inviting you to participate in this study. Data will be collected through audio recorded semi-structured and unstructured interviews of representatives of professional bodies in the industry. This will focus on some of the councils affiliated to the CBE (Council for the Built Environment) and are currently extensively involved in the design and construction process. These are ECSA, SACAP SACPCMP and SACQSP. The purpose is to establish their views on the current processes of design and construction and what contribution it has to the causes of the problems in the industry. The study will further endeavour to find out what these professional bodies think regarding the idea of process-thinking in the construction industry as practiced in manufacturing as well as the appreciation of the process protocol as a means to address the underlying causes of problems in the industry. Prominent professional associations will also be included. These are ASAQS, CESA and SAIA

Participation in this research will entail being interviewed by myself at a place and time that is convenient for you. Participation is voluntary, and no person or institution will be advantaged or disadvantaged in any way for agreeing to participate or not agreeing to participate in the study. The interview will last approximately one to one and half hours. With your permission this interview will be audio recorded, in order to ensure accuracy.

However all of your responses will be kept confidential and destroyed at the end of the study. Thus, no information that could identify you would be included in the research report, such as names or contact details if you prefer to be anonymous. The interview material (tapes and transcripts) will not be seen or heard by any person and will only be accessed by myself and my supervisor. My supervisor is Professor David Root and his email details are **David.Root@wits.ac.za**. You may choose to withdraw from the study at any point. There are no anticipated risks to this study.

If you agree to participate in the study please fill in your details on the form below and I will contact you within two weeks in order to discuss your participation. Alternatively, I can be contacted telephonically on 072 615 2202 or via e-mail at siapenga@gmail.com.

Your participation in this study would be greatly appreciated. With the information expected to be revealed by this research, it is believed that the professionals in the industry will have a basis to make decisions on whether to re-think the way they deliver projects. The research is expected to outline the current situation of the construction processes that professionals understand and follow, and therefore will be able to provide insight into the improvement which is clearly needed. Once it is established that more standardisation and common processes are required, efforts can be initiated to develop such processes that will result in benefits such as clear and common project deliver platform, successful project delivery and client satisfaction.

Yours faithfully,

Siapenga Simango
Cell: 072 615 2202
E-mail: siapenga@gmail.com

CONSENT FORM 1 - INTERVIEW

This consent form confirms that I have read and understood the scope of this study. It also confirms that I have understood the terms of this study.

I _____ (respondent's name) consent to:

Participation in this study, entitled, "Investigating the existence of common and agreed design and construction process among consulting professionals".

I understand that:

- Participation in this interview is voluntary.
- That I can withdraw from the study at any time.
- That I may refrain from answering any questions I do not wish to answer.
- That no risks or benefits are anticipated.

Signature of Respondent_____ Date:_____

Signature of Researcher_____ Date:_____

CONSENT FORM 2 - AUDIO RECORDING OF INTERVIEW

This consent form confirms that I have read and understood the scope of this study. It also confirms that I have understood the terms of this study and that I agree to have the entire interview audio recorded to be listened to by the researcher and the supervisor at a later date. I understand that the interview material and questionnaires will be destroyed after the study.

I _____ (respondent's name) consent to:

Participation in this study, entitled, "Investigating the existence of common and agreed design and construction process among consulting professionals".

I understand that:

- Participation in this interview is voluntary.
- That I can withdraw from the study at any time.
- That I may refrain from answering any questions I do not wish to answer.
- That no risks or benefits are anticipated.

Signature of Respondent_____ Date:_____

Signature of Researcher_____ Date:_____

The interviews proposed are as follows:

1. CBE (Council for the Built Environment)

P.O. Box 91**5, Groenkloof, 0027**
121 Muckleneuk (cnr Middel and Florence Ribeiro Avenue), Nieuw Muckleneuk, Brooklyn, Pretoria
Tel: +27 12 346 3985, Fax: +27 12 346 3986, E-mail: info@cbe.org.za

Interviewees

- Chief Executive Officer or assigned representative

2. ECSA (Engineering Council of South Africa)

Private Bag X691, Bruma 2026
1st Floor, Waterview Corner Building, 2 Ernest Oppenheimer Avenue, Bruma Lake Office Park, Bruma, Johannesburg 2198
Tel: (011) 607 9500, Fax (011) 622 9295, E-mail: engineer@ecsa.co.za

Interviewees

- Council President or assigned representative

3. SACAP (South African Council for the Architectural Profession)

P O Box 408, Bruma, 2026
First Floor, Lakeside Place, Cnr Ernest Oppenheimer Avenue and Queen Streets, Bruma, Johannesburg
Tel: + 27 11 479 5000, Fax: + 27 11 479 5100, email : info@sacapsa.com

Interviewees

- Council President or assigned representative

4. SACPCMP (South African Council for the Project and Construction Management Professions)

P.O. Box 6286 Halfway House 1685
International Business Gateway, 1st Floor, Gateway Creek, Corner New Road & 6th Road, Midrand
Tel: +27-011 318 3402/3/4, Fax: +27-011 318 3405, E-mail: admin@sacpcmp.org.za

Interviewees

- Council President or assigned representative

5. SACQSP (South African Council for the Quantity Surveying Profession)

P.O. Box 654, Halfway House
Unit C27, Block C, Lone Creek, Waterfall Office Park Bekker Road, Vorna Valley Ext 211 Midrand
Tel: +27 11 312 2560/1, Fax: +27 11 312 2562, E-mail: admin@sacqsp.co.za

Interviewees

- Council President or assigned representative

6. ASAQS (Association of South African Quantity Surveyors)

P.O. Box 3527 Halfway House 1685
Suite G6, Building 27, Thornhill Office Park, Bekker Road, Vorna Valley Midrand
Tel: +27 (0) 11 315 4140, Fax: +27 (0) 86 601 7087, E-mail: info@asaqs.co.za

Interviewees

- President or assigned representative

7. CESA (Consulting Engineers South Africa)

P.O. Box 68482 Bryanston 2021
Balvenie Building, Kildrummy Office Park, c/o Witkoppen and Umhlanga Rd, Paulshof Johannesburg
Tel: +27 (011) 463 2022, Fax: +27 (011) 463 7383, Cell: +27 (078) 740 2795, Email: general@cesa.co.za

Interviewees

- President or assigned representative

8. SAIA (South African Institute of Architects)

Private Bag X10063, RANDBURG 2125
Bouhof (Ground Floor), 31 Robin Hood Road, Robindale RANDBURG 2194
Telephone: 011 782 1315, Facsimile: 011 782 8771, E-mail: admin@saia.org.za

Interviewees

- President or assigned representative

APPENDIX B: INTERVIEW TOPIC GUIDE

The construction industry is ascribed to be at the centre of a country's industrial, technological and commercial base and impacts on almost every aspect of development. However, the industry in South Africa has experienced long-identified challenges and it appears that the various strategies to devise solutions do not show evidence of visible success.

The challenges experienced in the South African industry, and the possible underlying causes do not seem unique to South Africa. These problems are being addressed worldwide and one of the solutions identified in the UK is the introduction of the process-thinking with common language and understanding of processes through the development of the process protocol.

Furthermore international experience demonstrates the benefits of a common language and description of the project-delivery process. In South Africa, this has been recognized by the public sector in respect of the development and roll-out of the IDMS. However, the existence of a common language and agreed-upon description of the design and construction process beyond this public sector initiative is not clear. While there is commonality among the various professional councils in the industry on a six-stage construction process, there is no evidence that there is common understanding of the underlying processes of project delivery in terms of common definitions, documentation, and procedures embodied in the application of the six stages.

This research intends to establish whether such common understandings and definitions exist and whether a common process description, modelled on the process protocol, would assist in overcoming the challenges faced in project delivery in South Africa.

Data will be collected through audio recorded semi-structured and unstructured interviews of representatives of professional bodies in the industry. The participant sample focus will be on the CBE (Council for the Built Environment) affiliated professional bodies of the ECSA, SACAP SACPCMP and SACQSP to establish their views on the current processes of design and construction, as well as on what their position could be on the idea of process standardization and on the process protocol. Prominent associations such as ASAQS, CESA and SAIA will also be included.

The semi-structured interviews will have some structure provided by the interview guide which is flexible; only listing the key questions for the purpose of guiding the interview but in no specific order. The idea is to avoid restricting the respondent to pre-determined answers as the case may be in structured interviews. This approach should be able to bring out other areas that may not have been revealed in the literature review. An open ended discussion will follow the interview.

The topic guide is structured as follows:

1. INTODUCTION

a) Self introductions
b) Introduction of the topic
c) Purpose of the interview
d) Structure of the interview
e) Interview protocols

2. MAJOR CHALLENGES IN THE CONSTRUCTION INDUSTRY

a) What is your view on the problems in the construction industry?
b) What in your opinion could the major causes?
c) Do you think there could be anything underlying the problems?
d) Any similarities with other industries around the world could you think of?

3. SOLUTIONS IN THE INDUSTRY

e) Are there any solutions you may think of that have been tried to address the industry problems?
f) Did the solutions work in your opinion?
g) If not what do you think could be the blocking progress?
h) Are any attempts around the world that you know that has been tried and seems to be making progress?
i) Can we try solutions from outside in your view?

4. CONSTRUCTION INDUSTRY LEANING FROM OTHER INDUSTRIES

a) Do you think there are similarities between the construction industry and other industries such as manufacturing?
b) Are there similar problems?

c) Can construction adopt what has been done in other successful industries? Example?

5. THE DESIGN AND CONSTRUCTION PROCESS

d) How do you understand the design and construction process?

e) Can the process be standardised to improve performance?

f) What could be the challenges of standardisation?

g) Are aware of any standardised process around the world?

6. CONSTRUCTION AS A PROCESS - THE PROCESS PROTOCOL

a) Do you think construction is a process?

b) Could the design and construction process be viewed as a problem in the industry? in what way?

c) How do you view the process protocol?

d) Could something similar be useful in South Africa?

7. THE IDMS from CIDB

a) What do you understand about the IDMS?

b) Can it be likened to the process protocol?

c) Is it making a difference in the public sector?

d) Can it be applied in the private sector?

8. THE SIX STAGES OF CONSTRUCTION BY PROFESSIONALS

a) In general what do you think is the purpose of the six stages in the scope of services? - are there any other uses particularly relating to the construction process?

b) Do you think there are similarities in language and meaning of the six stages between the various professions? - are they standardised and applied uniformly?

c) Can the six stages be used as a tool to address the industry problems?

d) If not, what could work?

e) Are the six stages useful for design and construction guidelines - can they be used as gates?

9. CONCLUSION

a) What is your view of the industry from the past to present and the trend in future?

b) Are you comfortable with what is taking place in terms of progress to address the industry problems. What solutions do you suggest?

APPENDIX C: SAMPLE INTERVIEW TRANSCRIPT

Note: Words or statements that could reveal the identity of the participant have been intentionally concealed to maintain anonymity.

INTERVIEWER: Okay, I think it's on now – I need to put it somewhere. I'm not very used to it; it is my second interview with it. So [inaudible 0:10]

INTERVIEWEE: I'm sure it's very sensitive.

INTERVIEWER: [inaudible 0:12]

INTERVIEWEE: Who did you talk to them?

INTERVIEWER: [redacted]

INTERVIEWEE: [redacted]

INTERVIEWER: Yes.

INTERVIEWEE: Okay.

INTERVIEWER: So this is just the second one, I'm not sure how it is going to be.

INTERVIEWEE: And your target audience at the moment is just all the institutions?

INTERVIEWER: It is just all the institutions.

INTERVIEWEE: Okay.

INTERVIEWER: I will try; let me give you background of what I've done or trying to do. I've got just a guideline on how I am going to deal with your questions and all of that. The research is a masters research program and then, I'm doing a masters but I thought, may be the topic can be taken further after this, whatever comes out, and see. They're going to structure it maybe a little bit more factual you know, so to speak.

INTERVIEWEE: Okay.

INTERVIEWER: The background is, the problems in the construction industry you know, project delays, cost over runs, poor quality and all the other issues that we may have as South Africa that have been there for quite a while. And academically I think it has been found that those problems are not very unique to South Africa and they are there

almost everywhere all over the world. And in view of these issues I think from the United Kingdom side, the United Kingdom initiated what they called a process protocol because I think the government in the mid 90's, they tried to find out as to what is the underlying cause of these issues, of projects always being late, projects always overrunning costs and poor quality and so many other issues. So they did a lot of research and found out that one of the major issues was what they called fragmentation in the construction industry in the United Kingdom, which meant that there was no standardised way of doing things in the industry and they came up with a solution that they called process protocol. And the process protocol was developed somewhere towards the end of the 90's, I don't know specially, maybe 1990, somewhere there, to find a way of getting projects getting delivered in more or less a standard way in the United Kingdom. And that has developed a lot and I think they have done their first few major projects that have been finished within the budget, within time lines, using this project protocol. Now that has attracted a lot of attention around the world and Australia, India, New Zealand, including the United States has also tried to look at standardising their systems on how they deliver their projects. Now how did the United Kingdom come up with this idea? This idea came about because they looked at industries like the manufacturing industry, like the car manufacturing industry as to how do they deliver projects because the information was that the manufacturing industry does not, have overcome the issue of cost overruns and overcome the issues of projects running late. Say for example, they want to introduce a new car, you know, that's a project. They planned it from the very beginning and all of that, and they realised that there is a standard way of doing that, even if it is an individual project. So they looked at Toyota and you know, all those other famous examples and they came up with the process protocol to be applicable to the construction industry. There are now other industries around the world, as I've mentioned, Australia, India, Malaysia, they have also looked at their industries and saying can we also try and standardise the way that we deal with projects, using what the United Kingdom has developed, the process protocol? So they are looking at that. Now this research is looking at the South African scenario to say, and that's why we say at the high level, the professionals, let's start with the professionals in the industry, what do they think about the construction process as a whole in the view of a process protocol? You know, starting looking at the process as a project overview from the, let's say from inception all the way up to disposal. So the investigation is to say do we think that there is a standard way of doing things in South Africa as far as construction is concerned? And that is why we said okay, let's start by talking to the CBE for example

and then look at the councils that are sitting with the CBE. So I'm going to talk to [inaudible 5:24] I'm going to talk to SAQS, yes, SCAQS and the four CBE's. Then we also looked at the major associations like CESA, SAIA and SACPCMP as well to say let's look at these and have a view of what they think in terms of the problems in the industry and do they think that there could be some underlying causes on what...

INTERVIEWEE: You should have SAFCEC on your list.

INTERVIEWER: No, we wanted to look at the consultants first.

INTERVIEWEE: You want to start...

INTERVIEWER: Yes.

INTERVIEWEE: Okay, front end.

INTERVIEWER: At the front end first.

INTERVIEWEE: Okay.

INTERVIEWER: And then once we find out what the views of the consulting councils and the associations, the major ones, are then maybe we can drill down to whatever comes out.

INTERVIEWEE: Okay, I understand.

INTERVIEWER: Maybe that's where the problem could be.

INTERVIEWEE: Probably, yes, all right.

INTERVIEWER: You know, to try and see if we can easily narrow it down. So I think basically that's the introduction to the whole topic. I'm not sure whether it's clear?

INTERVIEWEE: No, it's clear. I, yes. Sorry, I don't know how you want me to address that? I certainly can tell you...

INTERVIEWER: No, maybe I can look at my questions, my guidelines [inaudible 6:46] so maybe to start with, from your perspective as [redacted], what do you think are the major challenges in the industry in terms of project delivery, from your side?

INTERVIEWEE: Yes, look, I think if you talk to the other professional about this, I can really talk only about individual. So one has to be careful to confuse because I mean,

maybe that's a good starting point because from the individual perspective we're starting to talk about have we got the right competency?

INTERVIEWER: Yes.

INTERVIEWEE: And that's the starting point. And the problem that we have is if you take between, because we have about five hundred and forty member firms, [redacted]

INTERVIEWER: Five hundred and forty?

INTERVIEWEE: Five hundred and forty and they provide professional consulting [redacted] services to both the public sector and the private sector.

INTERVIEWER: Yes.

INTERVIEWEE: Now in the public sector you've got government entities. The larger state owned entities are still fortunate, they've got engineering capacity or people who know how to start the process and define the scope of work that you want from your service provider. But when you go down to various municipalities, your larger municipalities also still have the luxury of that capacity, I can name them, City of Cape Town, Johannesburg, Ekurhuleni to a certain extent, you know. But if you go down to other smaller municipalities, they don't have the technical capacity. So the starting point ends up being the problem because there's a need but now you get a poorly defined scope of work and somehow too much emphasis then ends up being put on the supply chain process, which if you run it generically doesn't necessarily, it doesn't work for professional services because what they try to do is that if you buy in, when you let a supply chain guy do the process, then everything becomes a commodity. The way you treat buying ball point pens is the same way you're treating professional service providers. And then you look at your business and you simply take the cheapest. Now that is not necessarily correct for professional service providers because you've also got to ask yourself the question now, if there's a range of pricing, why is there that range? Because things should normally, there should be a normal distribution at least. But then again, if you know nothing about infrastructure then you wouldn't be able to identify that. So the procurement guys tend to not take enough advice from the technical evaluation. The technical evaluation guys will simply say to them at the moment these are engineering companies, they're fine, let's put them in. But then the price decision ends

up being made by the procurement guys, which is not necessarily correct. Because in many instances you could find that when the price bids come in, they're either low or it could be very high.

INTERVIEWER: Yes.

INTERVIEWEE: And the procurement guy doesn't know enough to suspect that okay, this guy is cheap, why is he so cheap? Let me go and see in his bid, has he qualified in his bid? Such that when I've appointed him then suddenly there comes...

INTERVIEWER: A change and all of that yes.

INTERVIEWEE: A lot of scope changes or because your scope was so poorly defined to start off with. And I think that's, the starting point is not correct.

INTERVIEWER: Okay.

INTERVIEWEE: The other consequence of course is that you will get a high price because you have to understand that it's about risk. The person in the company who is responding is looking at how do they manage their own risks? Some of them put it in their price, so you price it high and if a client is unsure of what they want and there's going to be a lot of changes then at least you know the scope creed and all of that, you've accommodated that in your pricing structure, whereas the cheap one hasn't put it in the numbers, but they've put it in words. So unless you unpack those words, you can step into a trap.

INTERVIEWER: That's...

INTERVIEWEE: So if you do reconciliation after the fact, you might find that guy was actually more expensive than the first guy was.

INTERVIEWER: Definitely.

INTERVIEWEE: So it's the capacity and the competence at various client body entities to even start the process around defining the scope. Then there is not enough capacity then to take this process through the various steps. There is at the moment, very similar to this project process protocol that you talk about, the National Treasury has launched affectively July of this year, standard for infrastructure procurement and delivery management.

INTERVIEWER: Yes I've got it.

INTERVIEWEE: You've got the book?

INTERVIEWER: Yes.

INTERVIEWEE: We've got the nice easy read version that we can give you to look at. And I think for the first time we're now getting back to trying to create an understanding amongst the client body because the, your big problem was the process was working fine, it used to work fine, until the capacity in your client bodies was diminished. And then it was purely a sourcing process. Whether you got value for your money or not is a due point, but with National Treasury's new standard, you want to get value for money. So even when you're appointing the company in the evaluation, there's some elements that you've got to look at that says okay, this is value for money. But in that project it also defines the various steps in the project process. I mean, a few years ago, 2006, about 2006/2007, [redacted] And the project life cycle simply introduced a vigorous protocol where you started with a concept stage and then there was a gate review, and when you moved from concept, you moved to feasibly and you would have gate review at each of these. And the gate review is normally done with independent parties to make sure that, I mean you can't check yourself, it's good to make up your mind and have independent review until you get to execution stage or detailed design. So detail design and then just up to project execution, so it went up to that point. And it was a good discipline I think, but unfortunately, okay first of all, not every project needs to necessarily go through all of those steps because otherwise it becomes a bureaucracy. If it's a very small project, then you can move to concept to preliminary design, you don't have to do feasibility briefing. But for a large project, it's essential that you do that. Because what was happening was the people sitting at the top at management level, if there's a problem, they want it fixed immediately and they just grabbed at any solution, which was not necessarily the most optimum solution. And so now with them having accepted that it's better to do these steps, you've got an idea, you want the problem solved, you get to do these phases in a project and it brings you closer and closer to the optimal solution as opposed to a shoot from the hip kind of...

INTERVIEWER: I'm glad you've talked about that because that's what the process protocol is all about and that's what they've developed in the United Kingdom that is now

almost like the industry wide and it's almost exactly like what you have mentioned where they've got what they call pre-project...

INTERVIEWEE: Yes.

INTERVIEWER: And then they've got...

INTERVIEWEE: The terminology would be just different.

INTERVIEWER: It will be different and then they've got...

INTERVIEWEE: The principles are the same.

INTERVIEWER: The principles are the same. So you're saying that there are those ideas already in the industry that recognise that there is need for...

INTERVIEWEE: You must have structure.

INTERVIEWER: Structure and a great process and you're now stating that those structures were there previously, except that capacity in some of these government departments collapsed.

INTERVIEWEE: Yes.

INTERVIEWER: And then it caused problems of procurement and all these other issues. So are you saying that you would want to advocate for say, restructuring this or reintroduction of some of these processes?

INTERVIEWEE: It's already happening, that's why I'm telling you about the standard. Look, if you're a private sector client, then certainly you want a good return on your investment. So you want to make sure that whatever they then deliver is the most efficient.

INTERVIEWER: Yes.

INTERVIEWEE: We need to take a business perspective on public sector procurement and delivery, which is what the standard tried to do. The business perspective is, don't just grab at the first possible solution, have a look at a few of them and then you narrow it down and make sure that when you're implementing, that's about as optimal as you get. Because if you just jump from the one to the other, that explains why you have cost overrun, time overruns and all of that because this thing is so poorly defined, there are so

many uncertainties right from the beginning. You have to try and take out as many uncertainties as possible. So you're going to narrow it down and you then have a greater chance of an on time, on budget. Now let's just also say that on time, on budget is an ideal world on infrastructure. It will never be but at least you've got to come to [inaudible 18:28] yes. 10% maybe as a gut feel, 5% even maybe of...

INTERVIEWER: The budget.

INTERVIEWEE: Of the budget but that will only get to that point if you've gone through this clearly defined process. But where they guys jumped from say feasibility stage if you want to, feasibility right into design, there are so many unknowns and the other evil that has crept in too is that people are now, they're being dismissive of how do you manage these unknowns? You've got to spend some money, you can't make this project cheaper by saying okay, I'm not going to do a site investigation. I don't need a technical engineer yet, I'm going to put up a building. I mean, you're looking for trouble. But they're doing that. Or they're saying to the dual technical engineer okay, here's your site; just do four holes and you hope that you get a nice definition of...

INTERVIEWER: And what is causing that? People dismissing upfront planning you know?

INTERVIEWEE: I think people are, firstly, maybe they have themselves to blame, to start off with because if you plan properly, then you can afford other planning in the process. But now if you wake up late then suddenly there's this great hurry and you want this thing by yesterday, then you're trying to rush the process. Now you can't rush that process because it's time bound, meaning the guy has to do an investigation, he will do it and he will do a report and then you use that report to inform your design. And to assume that that is not so important, is you're inducing firstly a couple of things into the process. Risk and uncertainty. Uncertainty in that by the time that you get to construction phase, if you don't know what's under the ground, then when your contractors come on site where they're digging foundations and stuff like that, your good luck or bad luck is that they're going to hit lots of rock.

INTERVIEWER: Yes.

INTERVIEWEE: So the project becomes more costly.

INTERVIEWER: Yes.

INTERVIEWEE: But then, a converse is true, your design may not factor in adequately what you need to design in terms of your sub-structure. So your building, you could end up with liabilities if your building which you're hoping now, and we're trying to, and that is maybe where institutions, professional institutions needs to keep the practitioners honest. You don't cut corners because the consequence are yours. As a professional, if you're doing a structural design, you have a duty to ensure that when you're designing a certain foundation, it matches what the requirements are below ground. If your client turns around and says to you you know, I'm sorry, I'm not paying for geo-technical investigation, strictly you should say sorry then I can't do the job.

INTERVIEWER: I can't do the job yes.

INTERVIEWEE: Yes, but now it goes about some of them are taking chances. They think that they can go on site, take a GCP, do a few and then based on that, decide what design they want to put in.

INTERVIEWER: That's correct. But now maybe let's look at process again.

INTERVIEWEE: Okay.

INTERVIEWER: You've mentioned a few processes that were used by [redacted] and then you also mentioned the SIPDM

INTERVIEWEE: Standard for Infrastructure Procurement Development Management.

INTERVIEWER: SIPDM. That's the one by treasury?

INTERVIEWEE: SIPDM.

INTERVIEWER: What is that one called? IDMS?

INTERVIEWEE: The IDMS is the Infrastructure Delivery and Management System. The SIPDIM is an evolution of that. I've run out of copies. We've got enough here at the office, I've just got to get [inaudible 23:14]

INTERVIEWER: That's fine.

INTERVIEWEE: So that, you know, so the project process is there.

INTERVIEWER: That's government projects?

INTERVIEWEE: Government projects. SIPDM.

INTERVIEWER: SIPDM.

INTERVIEWEE: Standard for Infrastructure Procurement and Delivery Management. SIPDM.

INTERVIEWER: SIPDM?

INTERVIEWEE: Yes.

INTERVIEWER: So that one is a step ahead of the IDMS [inaudible 23:43]?

INTERVIEWEE: It's an evolution I think. You see, CIDB is only looking at the construction perspective, whereas the SIPDM is looking at from the concept stage of the project and it takes you through the various stages that you would want to expose the project to before you get to execution of construction.

INTERVIEWER: So you're an advocate of having the whole project overview?

INTERVIEWEE: You have to, but then again, one has to be fair. If it's a small project and the solution is simple, then it doesn't need an onerous step by step process.

INTERVIEWER: Yes.

INTERVIEWEE: But you know, a slightly larger project or even more complex, because I mean, you can have multiple options in terms of the solution and you've got to be sure that if you're going for option D and not option E, why are you heading for that? So it's a bit more analysis and refinement.

INTERVIEWER: No, SIPDM, do you think it could be applicable to the private sector if you, because that's...

INTERVIEWEE: Absolutely.

INTERVIEWER: That's a government developed system and my understanding was that it's purely meant for government infrastructure projects or let me say, public infrastructure projects. Now we are trying to look at industry wide, if you're a developer, is there a system that consultants apply, you know, like a gate system that they apply in the private sector?

INTERVIEWEE: You know, a lot depends on again, the capability and capacity inside the client body. Is there somebody with an engineering background that knows? Or would they commission a company to manage that process on their behalf? Because what we're talking about here, it's a project management process.

INTERVIEWER: Yes.

INTERVIEWEE: Just of a different nature. You know, it's sort of the front end of the process before you get to the construction, where the construction program, there are these elements, excavate and before you get to that point in your professional services, it's a similar process. You know, you want to make sure that if I need to get, let's make a silly example. I've got a river; I need to get people across the river. One of the simple solutions is I build a bridge.

INTERVIEWER: Yes.

INTERVIEWEE: Now you need to go through a couple of decision factors around where do I locate this bridge? What type of bridge is it? So there lies the bits of analyses that eventually brings you to the optimal solution which is a normal engineering process of zooming in closer and closer to what may be the optimal solution. I think the private sector certainly, I believe that there is that awareness and competency in the private sector.

INTERVIEWER: But does it happen almost like standardised process, you know? That they have to say okay, like for example get reviews in the system to say okay, we're a private developer [inaudible 29:38] and we want to develop a shopping mall and all of that. Do they have, is it necessary to have almost like a formal system?

INTERVIEWEE: You see, okay, let me first say that I haven't been part of that kind of process, but if I think about it, how did they start their process? Did they make a commercial decision, an investment decision? We want to develop a shopping mall in a location. So they would internally have some, it would have to be an informed decision. So before they even get to the building, the site and location and all of that, you know, certainly there would have to be some kind of interrogation. So I believe there should be a process because if I'm going to buy a building or put up a building in a location, then I need to know even before I put it up, what is this thing going to cost me in total? And am I going to get the, you know, is it in the right location? Because maybe you could find

you're putting up a building, you're putting up a shopping mall in an area and the main source of water, the bulk water supply are thousands or hundreds of kilometres away, how are you going to get water to your building? So [inaudible 29:06] you may explore that as an option, but I don't think you would have enough boreholes to supply your whole building. One may then have to [inaudible 29:19] from a local urban planning development as government or the City of Johannesburg, let's say the City of Johannesburg. Are the city planning on expanding the pipeline any time soon? Or must you make that investment to get it closer to you and then in terms of your rates, try and recover it? So there's a lot of up front footwork and planning that's required even before you start doing the design. So it's a very high level.

INTERVIEWER: But maybe the question should be, the government introduced the SIPDM now because they would want to address what is the underlying problem in terms of project being delayed and cost overruns and all of that. In the private sector, maybe from your knowledge, is that prevalent as well that projects get delayed, projects, you know, overrun costs and all of that? What could be the underlying cause?

INTERVIEWEE: I think in the private sector it's much more tightly managed because you see, the private sector certainly has a different attitude towards their professional service providers. So they will appoint you as the principle agent on a project and then you are held accountable for here's my project program, there is the date I want to open my mall and if we go beyond that date and there isn't sufficient reasons, there's penalties your way. If the delay is on my part then I have to compensate you for that overrun. So it's a very tightly managed process because all the parties are mindful of the commercial impact. Okay, whereas I don't think that there's maybe sufficient consequences on your public sector project in terms of your commercial management. You know, we've got these wonderful laws in this country and municipal finance act and the PFMA and Public Finance Management Act, go and see if anyone of those people in the public entities have been prosecuted. And often what happens is your client may not know enough but he wants to be in control of the process and then he's dictating things and then the process drags on, it takes longer than what it needs to. There's instances where for instances a service provider with the Transnet client, using NEC contracts, gave the client, Transnet that is, enough early warnings which is like, there is probably a better way of managing a process, at least you're giving your client an opportunity to act or rectify whatever is leading to the possible delay. So there are early warnings listed with the client, the client does nothing about it and then according to the NEC contract the next step is

compensation events, which means you now have to pay me because you've now delayed the project process, standing time or whatever it is. Then you have a client whose all powerful and then bullies you or maybe just, he is not competent or professional enough and simply says well, what are you going to do? You've got no recourse because you can't take the guy to court.

INTERVIEWER: No, you can't liquidate him or...

INTERVIEWEE: Exactly. So then at the end of the day all that's happened is, and that is why I think it's more geared towards the ill discipline that exists in public procurement and delivery management, people are not mindful of the fact if you do not manage the process properly, the next time around the service provider is going to escalate their fee. It's going to make the cost of doing business more expensive because you've got a price risk in because you know if this goes pear shaped, this client doesn't want to pay you according to the project, what should we call it, the contracting environment, whether it's the GCC or the NEC or the [inaudible 33:51]

INTERVIEWER: Okay.

INTERVIEWEE: So yes.

INTERVIEWER: Okay.

INTERVIEWEE: Look I think the, and here's the difference, I think the private sector is averse to using any nice discipline system. As long as it gives them money for value at the end of the day...

INTERVIEWER: That's the point.

INTERVIEWEE: And you know, the fact that Treasury came up with it, it's not new. It's processes and stuff that's been, you know, good engineering processes if you want to put it that way, that's fallen by the waste side that they just trying to get back to to get some direction. And where a private sector client thinks that that information would be useful in them running their process without making it too bureaucratic, that is their views. The only difference is their standard is law or not, it becomes a legal compliance then because that's the only way you're going to get the municipalities and the SOE's to tow the line because otherwise each one is doing their own thing.

INTERVIEWER: Now in terms of the consulting professionals, because I think in your earlier discussion you mentioned professionals are cutting corners here and there and not doing you know, their preliminary work properly and all that. Would it be useful to introduce a process that is going to, not a legal process but something that requires them to go through maybe the gate system in the way they do their work? As an organization.

INTERVIEWEE: Well you see, we, okay as an organization, here's what we require from our member firms. We require quality based services and professional services provided in a manner that doesn't compromise the industry. [redacted] We've got a disciplinary committee, we do do investigations if there's complaints and then you know, if there are firms who are really messing up, we actually, we de-register if we need to. So we have a duty to keep our member firms honest, to ensure that they maintain their quality standard and stick to good engineering practice because when they, I mean any professional, when you're going through your studies and you get to do say, design, there's a process that you've got to follow in your, in getting to your solution. [redacted]

INTERVIEWER: Okay, but now that's from [redacted]'s point of view, but now looking at the industry, the whole one, the profession as a whole, in your view, do you think there commonality in the way other professional disciplines look at the construction process? I mean, you as [redacted]. Is that the same as other professionals [redacted] or is there commonalities in the way you operate?

INTERVIEWEE: Not in total. I'll tell where there are commonalities and overlaps, but maybe before I go into that, maybe the other area which I thought I should raise with you

as well is, from our member firms, even with a client doing a design, you need to provide the client with some insurance, risk mitigation. So we have a mandatory requirement that our member firms must have professional indemnity cover for their practitioners. Now we also then have a risk management process for that where it doesn't help for these member companies or putting into a professional indemnity and then they have lots of claims because they're cutting corners because you're going to deplete that fund.

INTERVIEWER: Yes.

INTERVIEWEE: So there's that consciousness as well where you can see okay well, here's a company that seems to be dipping into this professional indemnity fund all the time, we need to see what can we do to help them because clearly there's issues there.

INTERVIEWER: There's a problem.

INTERVIEWEE: Yes. But to come back to the other professions, there is commonality. I think the one thing is, and you know, maybe one can look at the history of the professions, the history of the profession will tell you how it is. If you take how they all came into being, then I don't think I would be incorrect in saying that I think the [redacted]

INTERVIEWER: It came very late.

INTERVIEWEE: So there's a commonality because you can have an engineering practitioner who is now been exposed and experienced to all the phases in a project, then managing the overall thing. He may not be necessarily, he's not let's say, he's not a design engineer, he can manage the process. So that's, the disciplines are the same for project management profession. In the [redacted] also, you need to quantify stuff and at the moment if you want to go and do a degree [inaudible 41:00] degree, it's very strongly financial, in fact my financial manager here is not a CA, she is a [inaudible 41:09]. But she does the full work. Exactly the kind of role that an accountant would do here.

INTERVIEWER: Yes.

INTERVIEWEE: [redacted]

INTERVIEWER: So the overlap...

INTERVIEWEE: But I don't think that that overlap is not necessarily, it's not applicable to this gate review process. Why am I saying that? Because a lot of what they do, a [redacted] role is a portion of what would be required in a phase. So let's say I'm doing a feasibility or preliminary design of a building for instance, and I'm doing the preliminary designs and I want to know how much is this thing going to cost, then the [redacted] I will rely on [redacted] to go into detail to see okay, tell me more or less what is this going to cost? So it's a portion of it. I've got to take this to the next step of the process. Project manager again, I think the project manager's role really kicks in when you're at execution stage. But you could get a project manager that knows more. If he's got an infrastructure background, knows about the project life cycle process up to you know, even before construction, that you could use to get your various multi-disciplinary experts together because you could get a project that is multi-disciplinary. It's not just a [redacted], you need electrical, mechanical, you may need a landscape architect, so yes.

INTERVIEWER: Okay yes, because I think the whole essence of the research is to identify whether the professionals operate in a common way in delivering projects and is there any existent commonalty, and if not, is there any need to have some commonality in the way projects are delivered and the lack of commonalty, does it cause any problems?

INTERVIEWEE: You see, the commonality amongst the various professions is maybe more from an awareness perspective. But I don't think you're going to get them, you know, the process is not applicable to how all of them do things.

INTERVIEWER: Do you think [inaudible 44:43]

INTERVIEWEE: Maybe. If I take, okay let's take them, I'm just trying to think a bit broadly here. So if I take a [redacted] and I say to him okay you've got to, to a certain extent they do it anyway. I just don't think that it's been defined as such in that project life cycle process.

INTERVIEWER: Okay.

INTERVIEWEE: [redacted] You do it at a high level. So it starts with the high level where you say okay, that's the area of the building you know, per square metre that's what it should cost more or less, that's the standard kind of thing. So that's the high level. So in their thinking, that's the high level. Now you want to drill down, you get into a bit more detail and as you increase the level of detail, so your level of accuracy increases in your costing. So what I'm saying is if you compare project process of say the engineering project process concept, feasibility, in the same way if you're using a quantity surveyor in that team, they also start at high level and then drill down so that by the time you get to, so they're doing it anyway. I just don't think that you know, it's not been defined. It's probably part of the process.

INTERVIEWER: Except it's got no gate reviews.

INTERVIEWEE: But it's got no gate reviews. Well let's, I think the gate review process applies then to that where you say okay, I've costed this now, is this still affordable? I mean, do we want to, from Mr Client, this is what this thing is going to cost you, do you want to proceed? So you need the numbers and you need the level of reliability in those numbers. So I think it is applicable in terms of a decision. It's not the only, but one of the decision variables in that gate review.

INTERVIEWER: What I'm getting is there's commonality but there's a lot of grey areas that are not well defined. It really doesn't mean that everybody is following the same process, understood in the same way, but it's happening.

INTERVIEWEE: It's happening yes. And I suppose...

INTERVIEWER: It bares on the fact that, I [inaudible 47:23] I checked that almost all the councils have got the same phases, the six phases of the project.

INTERVIEWEE: Yes, it's a standard project phasing.

INTERVIEWER: It's a standard project phasing, but what I picked out was that the phasing was mainly introduced as a guideline you know, kind of scope, tariff of fees. It's a basis for fees.

INTERVIEWEE: For fees.

INTERVIEWER: Do you think that is also a basis for project process as well?

INTERVIEWEE: Yes, I think it would have to be, otherwise how would you justify a fee basis you know, on one level? I mean a fee basis, if I just take, let's say at a very early stage of a project, you're not using a lot of resources, it's high level so you may end up using very senior practitioners at a higher rate.

INTERVIEWER: Maybe just before, maybe there, how do you formally decide now I'm moving from exception phase, we are going into, what do you call it, initiation or whatever? Is there any formal decision that says we have finished the design development, now we're going into project documentation or any other stages that...?

INTERVIEWEE: I think that would normally be defined by the scope of services defined by the client because the client will say to you look, I'm commissioning you to take it through step 1, 2, 3, to that point. Then once we reach that deliverable we know okay, that's where we're at and that's what I expect at least. For instance your client would say to you need to develop this project from concept up to preliminary design. You don't go from concept to preliminary design immediately. You then have to within that process do a bit of feasibility because concept is just an idea. Then you're feasibility is looking at some factors that would limit the solution. Then your feasibility is looking at your options of dissolution and then you get, by the time you get to preliminary, you're confident that you know, when you get to that stage and you deliberate that, let's say a well thought out solution that you're presenting to your client, because you can well imagine it, if you just jump from the idea to preliminary design, there can be so many...

INTERVIEWER: So many problems.

INTERVIEWEE: Unknowns.

INTERVIEWER: Unknowns. And that's where maybe...

INTERVIEWEE: And that is why I'm saying if you don't follow those other parts of the process, then nobody should be surprised when...

INTERVIEWER: When problems come up.

INTERVIEWEE: When problems come up.

INTERVIEWER: Do you think that is as a result of, it's an insufficient definition of the process? Because [inaudible 50:45]

INTERVIEWEE: Insufficient definition yes.

INTERVIEWER: Because then you've got the issues where people start cutting corners because the process...

INTERVIEWEE: Yes.

INTERVIEWER: The process is there and defined but the definition of applicability is insufficient. Do you think that would be a correct view?

INTERVIEWEE: It probably is, and I'll tell you what causes that. What causes that is if you have somebody who is the decision-maker and you wants to be in control but you're not really knowledgeable in all of it and you don't consult enough to get good professional advise, then you put yourself in a position of you don't know what you don't know, but you're making the decisions. And if you ignore that good advice, and we see it happening in the public sector, good advice from consulting engineers, but because you have mistrust, some level of mistrust, the guys tend not to trust the opinion and think this is just your biased view of this and you just want to make money out of this. But in the meantime maybe it's sound advise because you know, professionals will supremacy themselves on ethical business practice you know, like a doctor. I'm not going to tell you to take this medication when this is wrong...

INTERVIEWER: Or an operation.

INTERVIEWEE: Yes, or go for that operation because I just want to make, although I do see the medical profession sometimes, they want to do surgery very quickly.

INTERVIEWER: Yes, they want to do a Caesar [inaudible 52:28]

INTERVIEWEE: ...natural birth.

INTERVIEWER: Yes.

INTERVIEWEE: So you know, there are those elements and they exist in all the professions. It's just a case of I think there needs to be more oversight and maybe what you're saying is, and that's what National Treasury is trying to do as well because they will have oversight. I don't know where they're going to get the capacity from but that's their desire, to have the oversight so that an entity like Transnet or Eskom, they can't embark on these multimillion rand projects only for us to find out, way down the line that you know...

INTERVIEWER: The train is too big.

INTERVIEWEE: The train is too big. Exactly. You know, a simple example like that.

INTERVIEWER: Yes.

INTERVIEWEE: Or you know, project overruns of hundreds of millions, you know not ten million or so, hundreds and hundreds of millions and five years later than what it should have. And that's where the custodian of our National Treasury is looking at playing that oversight role and enforcing the requirement because it will be audited. Private sector is not going to be audited and then you've got to hope that your clients, the developer, wants the best outcome. He doesn't just want to cut corners. But you know, therein lies a bit...

INTERVIEWER: A bit of a grey area. Because we need to link the processes that the consultants follow as a team. Not as engineers alone...

INTERVIEWEE: As a team.

INTERVIEWER: As a team.

INTERVIEWEE: The whole project, correct.

INTERVIEWER: The whole project. We need to find out does that, is that in sync at the moment or is there too much grey areas to the extent that it's causing future problems of cost overruns and you know, time overruns because the processes, as much as they've got all the stages, but how do those work together from the QS to the project manager to the engineers?

INTERVIEWEE: Even the architect.

INTERVIEWER: Do those processes work in sync? Do they work together? Do they consult each other as to, how does that get integrated?

INTERVIEWEE: You see, that's enforced more strongly by your private sector clients because he will, and I think it comes down to them in the private sector, making sure that they have the most capable person, competent person managing that process. So it's not the CFO that's managing it. It would probably be head of technical who has an engineering or technical background. So at least the person understands what is required, then puts together the team and says right, Mr Project Manager, I'm appointing you as principle of this project. We need to identify all the other areas of expertise we need to bring on board as a multi-disciplinary team, but you will be the coordinator and you will then bring on the architect, your QS, your engineer, mechanical and civil and electrical, whichever you're, you will probably need them all, and then you manage the project process in terms of the deliverables in each of these and we do it step by step. So the thing that discipline is, it's almost self-enforced in the private sector whereas, because of the capacity constraints in the public sector, it's probably what makes it a more difficult process to manage. I mean, if you take a lot of the projects that they do, hospitals, schools, many instances you may find that there's a knowledgeable person but you know, in previous years public works used to manage all those programs for the schools and hospitals. Now they've got no capacity. Now the Department of Health, in fact we're sitting with a situation now where the Department of Health has approached us and asked us to help them with a project management training course in infrastructure for the technical people they're hiring because they want to manage the process themselves because public works doesn't have the capacity. So it comes down to competency and capacity. Because I mean, even if you use an agency like IDT or whatever, they don't have enough people either.

INTERVIEWER: They don't have the capacity or skills at all.

INTERVIEWEE: Correct.

INTERVIEWER: There is a shortage there.

INTERVIEWEE: Yes.

INTERVIEWER: Okay yes, I was trying to look at processes and, in your view do the various disciplines get interested in what the other processes are in the other disciplines?

INTERVIEWEE: I would imagine they don't have a choice because these things are integrated. So you can't say, I mean I'm the quantity surveyor, I have to cost this thing, you're the mechanical engineer, your choice of equipment is expensive, cheap, has an impact on my costing. So these are intertwined. You may not necessarily make the call because that's the professional in that area. He will say look, this is the most ideal equipment choice for my elevators because they're reliable and that's what's going to serve the client's purpose as well. Then the quantity surveyor will just have to say okay, you've got three good options there, which one should we go for and that might affect the costing. So they're intertwined.

INTERVIEWER: Okay. And now from a, maybe from talking generally and maybe moving away from the construction industry, do you think that the industry has anything to learn from other industries in South Africa? To improve the way they deliver projects? Because I mean, I don't know, you are saying the problems of poor delivery are still there and it's not like anything has changed.

INTERVIEWEE: No, it's going to take time.

INTERVIEWER: So what, you've mentioned the issue of capacity and you mentioned the issue of skills, for example in government sectors, what solutions do you think, aside from realigning the process of project delivery?

INTERVIEWEE: I think the, you've got, I mentioned the capacity, I mentioned the skills, I think the other element that one needs to put into there is the, in the public sector you've got to depoliticise these sectors. So you depoliticise it and you trust the integrity of your technical practitioners because that's one of your biggest frustrations. Your technical practitioner is sitting in a public entity, municipality A. This guy has sat down, he has thought out what the solutions are for service delivery, what's the optimal and then municipal manager, no engineering knowledge will override the guy and say no, I want you to go for that option. And the question here is what's the basis for you making that decision? You have invested time in giving various options and you're just shooting from the hip and I've got to follow, and that happens. And you may find then that the guy is saying you know, instead of [inaudible 1:00:46] in a project delivery or a service, I don't want to mix it up with service delivery because that can be completely political [inaudible 1:00:56] change their priorities for political reasons. Instead of putting the tar road there, put it past my house.

INTERVIEWER: Yes.

INTERVIEWEE: But you also, you find that sometimes, and I've seen it in Transnet, some of my colleagues who were there who have left out of sheer frustration, because you're given a project to interrogate and you follow an engineering process and it was an investment decision, I'll give you, let me just give you an idea, you know there's always this, and it's a business decision which, if you use an engineering thought process, is supposed to give you a decent or at least reliable answer. Individuals requested to look at maintenance machines, should we be hiring them in with the contractor or should we buy our own? It's a simple rent versus buying. And he goes through the whole process there and so on, and does the analyses and presents the solution and manages executive managers that hasn't really interrogated or understood that decently and then simply say shoot from the hip. Just go for that.

INTERVIEWER: Go and buy it.

INTERVIEWEE: Yes, we're just going to buy it, even if it doesn't make sense. You know, it then make a mockery of the process and then you, it erodes the trust that the parties have of each other. So I think the trust element in the expertise that I bring to the table, so there's the other element that may affect the efficiency of the project delivery process. So if you don't trust my engineering judgement or my professional judgement as one of the parties and you just want to make management decisions around it, I mean, I'm a manager but I'm an engineer as well. I can be unreasonable as a manager and I can say to you look, I want this thing and I want it tomorrow or I want it in two hours time. Now I know you can't produce it, but you get people who think that that can happen that way and they put you under that kind of pressure you know.

INTERVIEWER: Okay, so then, do you think the industry is doing well? Past, present, future? In terms of, let's just talk about just delivery. Just dealing with project delivery. Is there an improvement in dealing with project delivery, as in achieving the milestones that they wanted to do? The deliverables you know? Time, cost, quality and all of that. Now you've got issues of BEE, getting around it and job creation and all of that.

INTERVIEWEE: Yes, I think the question here; it's a very difficult question to answer as a yes or no. It's not a yes or no.

INTERVIEWER: Yes.

INTERVIEWEE: It's, I think that the project, the process is not as simple as it might've been because there are many non-engineering factors that now have to feature in your, let's say your bid. Because we have these multiple challenges in South Africa. So you know, because you have to, if you think about it, it defies logic, yet it's necessary where you say company A, you're putting in a bid, we want to see how many other companies you're empowering to do exactly what you do. It defies logic because you know, you actually are now, and it's necessary, I agree because we do need to broaden the landscape and so on, but in the normal business environment you're telling somebody grow your own competition.

INTERVIEWER: Yes.

INTERVIEWEE: It's not logical but it's necessary.

INTERVIEWER: [inaudible 1:05:00]

INTERVIEWEE: Correct. So you know, the question here is how committed would you actually be to that process? Or are you actually going to go through the motions, and how are we going to make sure that you get some success factor out of that? So how you approach the engineering project delivery management is a bit more complex. It's not just get in, start your design and proceed to the next step. You've got to look at your partners that you're assisting, that you're supporting. You now have to be conscious of which suppliers you're using because you know, because...

INTERVIEWER: Supply chain wants [inaudible 1:05:47] statistics ...

INTERVIEWEE: ...out of that. You've got to get your BEE score so that if you don't tick those boxes, you may not get sufficient enough score to be able to get future work because your overall score may be low. So now you've got to navigate a whole lot of other areas...

INTERVIEWER: It's a bit more complex.

INTERVIEWEE: It's a lot more complex than just the technical part. The technical is the easy part. That's what I've found.

INTERVIEWER: It's the very easy part.

INTERVIEWEE: Most of the professionals, the technical part is the easy part.

INTERVIEWER: I agree 100%. Maybe just to conclude on the process issue, how would you describe, just in conclusion, the commenanilites in the design and construction process among the professionals or the councils? From a [redacted] perspective, you have mentioned already that the processes are there but it overlaps, there are so much grey areas and all of that. So is there an improvement that can happen there? Do you think that we much change the process that exists or should we formalise it? In the United Kingdom they haven't formalised it but it's been adopted as a process. And it's not a law but everyone uses it as a process protocol. It bears on what they had before, and you said we had it as well before. Can we...?

INTERVIEWEE: You can. And maybe, I suppose in the whole professional services environment in infrastructure you can have those processes because every party who is party to the process will understand that at this phase, the level of reliability or my information that I'm presenting is 50%.

INTERVIEWER: Yes.

INTERVIEWEE: When I get to the next stage, it increases to 60%. And so by the time I get to my preliminary detail design, I should at least be at say 95% reliability. So those would be good indicators of the degree of accuracy each of you should be bringing from your own professions to get closer to that answer so that by the time you get to the point of okay, now we need to deliver, you've got a greater chance of being so close to the budget and so close to the time lines that you hope to achieve [inaudible 1:08:34] because your expectation of the deliverable of each of the parties is then uniformed.

INTERVIEWER: It's uniformed?

INTERVIEWEE: It's uniformed.

INTERVIEWER: Okay, all right. So, but the uniformity at the moment is not very clear.

INTERVIEWEE: No, I, you know what, I think [inaudible 1:08:57] professions, sometimes we talk different languages. So you know, what may be an interpretation by the QS in terms of level of accuracy of the engineer or the architect, there may be some differences.

INTERVIEWER: Yes, the level of accuracy, that is what is key. Yes I think that's where the United Kingdom went to say guys, can we, we're not going to make it a rule but when you get to this level, there must be an accuracy.

INTERVIEWEE: It's going to be difficult and I will tell you why. You know, in South Africa, even in the engineering professions, guys tend to operate in silo's. You know, they don't even cross consult or work very well together. So you find each institution of civil engineering, that's one silo, the mechanical engineers, see their domain and the electrical engineers, they're all engineers and they all have specific disciplines, but you know, I don't think that you know, to try and bring them closer to each other is hard. Now to try and say okay, let's take the engineering family, let's bring the architects and bring the QS's, [inaudible 1:10:09] this is my turf here. You will be surprised. I was involved in the identification of engineering work because I was with the engineering council at that stage, and so I was also then on the council for the environment and I chaired the committee for the identification of work which was the tweaking of the legislation for the six built environment professionals which would then make registration mandatory. At the moment it's not mandatory.

INTERVIEWER: To be registered with CBE?

INTERVIEWEE: To be registered with each council. So if you're an architect, you must be registered with SACAP, if you're an engineer, you must be registered. At the moment it's not mandatory.

INTERVIEWER: Is that the case?

INTERVIEWEE: Each of the acts, none of the acts actually call for that and that's, in 2000 those acts were promulgated. Sixteen years down the line you still can't dictate that everybody doing that work must be registered. So we had to go through a process of okay, how are you going to defend this in a court of law? Because that was the requirement. So you have to define what do you mean by engineering work? What do you mean by project management? Describe it in detail. And so from that identification of work, you will be surprised how territorial each of these professions tend to be. I mean, I ask myself a question, here you've got a profession called a landscape architect's profession, but you've got the architectural profession. Why should they be separate? Why should they not be one? And all it is, it is a specialised area of architecture. It's not a separate profession of one.

INTERVIEWER: It's true. It's one profession, and I agree.

INTERVIEWEE: But the guys are territorial. So now they don't talk to each other more frequently.

INTERVIEWER: So do we have a landscaping council?

INTERVIEWEE: Yes.

INTERVIEWER: Yes and it's one of the six?

INTERVIEWEE: [inaudible 1:12:13]

INTERVIEWER: Okay.

INTERVIEWEE: It's the smallest one.

INTERVIEWER: All right, because I chose the four because I left out the properties and...

INTERVIEWEE: Yes, the property values don't even belong there in the council of the environment. In fact, there is a fundamental flaw in our approach in the country and that's why we, and it's brought on by the fact that we haven't really looked at some of the historical placements of these professional bodies. It just so happens that land surveyors fall under the ministry of land affairs, not under public works. So suddenly they're not in the CBE, but yet, think about it.

INTERVIEWER: [inaudible 1:12:55]

INTERVIEWEE: They are part of that. And then the property valuers shouldn't be there. They should be by land affairs because it's more a property evaluation issue. It's not a professional service in that sense where your output becomes a tangible...

INTERVIEWER: Your output becomes a [inaudible 1:13:18]

INTERVIEWEE: Yes.

INTERVIEWER: A property.

INTERVIEWEE: And so even these various, because you've got you know, so we've never interrogated you know, how do you bring the professions, the built environment professions, how do you bring them all together under one roof? And you make it even

worse when you leave some of them out there and you're not bringing them into this family here. So, it's a very difficult task to get architects, quantity surveyors and engineers around a table and get them to agree on, I mean, and what I was describing to you, this identification of engineering, or identification of work process...

INTERVIEWER: Work processes.

INTERVIEWEE: We actually found that in that analyses there are commonalities and then we had to concede in that process that okay, that cannot be the exclusive domain of an engineer. A project manager has competencies in that as well, so that's fine. It will not be illegal for somebody registered as a project manager to do that. Like, to give you an example, a simple example, a civil engineer can do the quantifying of a roads project.

INTERVIEWER: Yes.

INTERVIEWEE: What's the output? Or the overall activity is quantities.

INTERVIEWER: Quantity.

INTERVIEWEE: Right, it's quantity surveying. But it's not classical quantity surveying. So quantity surveyor or that profession can't say that engineer must be registered with their council as well. So there's these commonalities that became big arguments, but eventually the guys, rational thought took...

INTERVIEWER: So the languages, the language also is a problem?

INTERVIEWEE: Yes.

INTERVIEWER: The common language, much as we might, we might have a common process but the common language also is a bit confusing. It is not very clear as to what it means, say with [redacted], does it mean the same thing with the quantity surveyors?

INTERVIEWEE: Yes. I think that there is, you know, debates around that thing. But the surveyors will actually tell you that engineers can't do quantities, yet they can go do any fundamental engineering because they do quantities.

INTERVIEWER: When it is a road or [inaudible 1:15:43]

INTERVIEWEE: ...you get taught that any way in the process. Now the quantity surveyors frown on that because it is their opinion that you shouldn't be doing that. What

they're forgetting is the evolution of these things. You know, which of these professions has probably been around the longest? And then which became specialist off shoots?

INTERVIEWER: Specialist off shoots because now work is getting more and more complicated.

INTERVIEWEE: Correct yes.

INTERVIEWER: So you get specialist off shoots that come around, I mean even quantity surveyors; you find that there are those that are specialists in [inaudible 1:16:15]

INTERVIEWEE: Yes.

INTERVIEWER: There are some that are specialists, they have become specialists, a very few, doing electrical and all of that.

INTERVIEWEE: Yes.

INTERVIEWER: So you might get all of these off shoots as the profession develops.

INTERVIEWEE: Correct, as it develops over time. I mean, yes. I mean a simple one is electrical engineering. It's generic. But now you've got heavy current and you've got light current. Now you've got your IT guys as well and you know, they're not necessarily the same.

INTERVIEWER: Yes, they're quite different.

INTERVIEWEE: Their roots are the same maybe, it's electrical current and zero's and one's, but if you unpack it...

INTERVIEWER: [inaudible 1:16:55] it's very interesting. All right, no I think thank you very much. Unless you've got some questions?

INTERVIEWEE: No.

INTERVIEWER: And anything you would like to say?

INTERVIEWEE: Unfortunately I maybe made discussions and explanations...

INTERVIEWER: No, it's been very informative. It will, I will filter the information.

INTERVIEWEE: It's good that you've got the recording so that you can go back to it.

INTERVIEWER: I'm going to transcribe it and then give it to my [inaudible 1:17:22] as well just to, because then we want to get the correct information. We don't want to come up with information that is not accurate perse, because after this, what comes out? We might say no, it's not necessary to go the process protocol route as in the United Kingdom because the councils agree on this [inaudible 1:17:47] actual practitioners and say look, this is what the councils believe, now can we get impericle data, as in statistics?

INTERVIEWEE: But you see, I think one must be careful. It would not be up to the councils to dictate that. The council's role, these professional councils, their role is simply to make sure that as a practitioner, you're competent. So all they want to see is, and I know the engineering landscape best in the engineering environment, all they want to see is have you had, because now their new evaluation system is really outcomes based, they want to see is there evidence of you having been involved in developing a solution to an engineering problem. Okay? The next step is have you been involved in implementing that solution? And then the last part of that stage is then have you been involved in managing the overall process of the development and delivery of that engineering solution? Which in the old evaluation terminology used to be have you done design work? Have you been involved in construction, be it supervision level? And have you managed now an overall project process? So they're making it more generic now because there's now a realization that it's not always possible for people to jump from a design consulting firm, to a contractor [inaudible 1:19:36] in public sector, it's even more difficult because most often they don't do the design whereas in days gone by they did have internal capacity so they did do some of the design work. They also then had a construction division and they only outsourced when they didn't have enough capacity. Now it's the other way around, now they outsource most of the time.

INTERVIEWER: Now they outsource.

INTERVIEWEE: So it's almost, it's very difficult for people to say well okay, I have spent time on a construction site, but the evaluation process, what I'm trying to describe to you is that it won't dictate that in terms of the project delivery, there's these stages that are required. Their mandate and their act merely allows them to and what they do is to look at what do you as an individual need to reflect in terms of your competency for us to endorse the fact that you're now competent to be registered? So they look at that and then they do accreditation of tertiary institutions. So in other words they will come to the University of WITS and you've got a project management program or construction

management. They will come and see okay, what is the course material you cover? Is it at the requisite standard and, I don't know, I don't think that the project managers have a similar environment as the engineers. Why I am saying that is there is some international agreements that exist for engineers and technicians and technologists in terms of the educational requirements. The Washington accord where there's various countries signatories to that. So you do an engineering degree, what they do is they set a standard for what are the course offerings, at which levels should this be pitched so that when a person gets their four year degree you can safely say that my degree from WITS is equivalent to my degree somewhere in the [inaudible 1:21:53]. Yes. To maintain that. And a similar thing exists for technologists which is the, I think it's the Dublin accord, and then there's for technicians as well, it's the Sydney accord. So those, I don't know, and what that is, so South Africa locally in the engineering landscape, the professional body, [redacted] has got teams of people who are trained that will go to these institutions, accredit them and make sure that they're sticking to that standard. So that is basically all they do. So what I'm saying is in terms of good project process, that is not in their mandate and you're probably not going to get it from, you may get it from volunteer practitioners that do work for [redacted] but not from, it's an administrative body really.

INTERVIEWER: Yes. Let's see what comes out and...

INTERVIEWEE: So I'm not discouraging you, I'm just saying that...

INTERVIEWER: The things that will come out and then going forward we will change our approach to say okay fine; this is what is there now from the councils. I think let's look at it from a different level now, what happens there like you have mentioned, the practitioners might have a different view because they are in a feud on daily basis.

INTERVIEWEE: Yes.

INTERVIEWER: But because this was, I think for this particular subject, I think this is one exercise that is the very first one.

INTERVIEWEE: Sure.

INTERVIEWER: We thought of looking at the councils first and then we hear what, like your views now is very important.

INTERVIEWEE: [inaudible 1:23:32] but I mean I also, yes, I can't really say that I, I can't speak authoritatively on the other...

INTERVIEWER: Councils.

INTERVIEWEE: Councils.

INTERVIEWER: Yes.

INTERVIEWEE: I would not do that. At least on the engineering side I know a lot more.

INTERVIEWER: No, you have given me a lot and in fact, it's a lot for me to sift through and make sure that we get the, if you need the report, the final report, we can make it available.

INTERVIEWEE: No, it would be very interesting to see. I'd be interested to see so, having now consulted various parties, how have you been able to make sense of all of this sufficient to come up with some kind of a thread.

INTERVIEWER: Yes, some kind of a thread going forward.

INTERVIEWEE: A thread and then something at the end that says okay, you know.

INTERVIEWER: So the interview is anonymous. I think once we are done the recording is going to be discarded and all the transcribed material will be discarded once we are done.

INTERVIEWEE: Okay.

INTERVIEWER: The only thing that is going to be there is the report.

INTERVIEWEE: Okay, I mean, that's according to that agreement any way as you've indicated.

INTERVIEWER: Yes. So I think we can switch this off.

INTERVIEWEE: Yes.

INTERVIEWER: All right.