



**A Proposed Strategic Framework for the Survival of the
Quantity Surveying Profession**

by

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PREFACE

The research contained in this dissertation was completed by the candidate while based in the Discipline of Construction Studies, School of Engineering of the College of Agriculture, Engineering and Science, University of KwaZulu-Natal, Howard College Campus, South Africa.

The contents of this work have not been submitted in any form to another university and, except where the work of others is acknowledged in the text, the results reported are due to investigations by the candidate.

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DECLARATION 1: PLAGIARISM

I, Tashmika Ramdav, declare that:

- (i) the research reported in this dissertation, except where otherwise indicated or acknowledged, is my original work;
- (ii) this dissertation has not been submitted in full or in part for any degree or examination to any other university;
- (iii) this dissertation does not contain other persons' data, pictures, graphs or other information, unless specifically acknowledged as being sourced from other persons;
- (iv) this dissertation does not contain other persons' writing, unless specifically acknowledged as being sourced from other researchers. Where other written sources have been quoted, then:
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 - b) where their exact words have been used, their writing has been placed inside quotation marks, and referenced;
- (v) where I have used material for which publications followed, I have indicated in detail my role in the work;
- (vi) this dissertation is primarily a collection of material, prepared by myself, published as journal articles or presented as a poster and oral presentations at conferences. In some cases, additional material has been included;
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ABSTRACT

In response to the ever-increasing changes in the global business environment, professions must evolve. Quantity surveyors are not invulnerable to these changes as an array of challenges threatens the existence of the profession. The quantity surveying profession require urgent and far-reaching strategic transformation that will overcome their threats and weaknesses and embrace the strengths and opportunities of the profession to ensure they survive and remain relevant in the ever-changing construction industry.

The purpose of this study is to analyse the survival of the quantity surveying profession using a SWOT analysis in an attempt to to define the key strengths and weaknesses of the quantity surveying profession based on professional consultants' experience in the profession, determine the key opportunities and threats which are perceived to impact the quantity surveying profession significantly and to develop and apply a strategic framework that could be used by the quantity surveying profession.

The positivist paradigm was used for this study. The researcher chose quantitative research in the form of questionnaires. The questionnaires were given to quantity surveyors who are members of the Association of South African Quantity Surveyors (ASAQS). In addition, data was also collected from secondary sources such as literature reviews. A probability sampling method was chosen for this study. The desired method that will be used is the random sampling method. A total of 58 responses which were all usable (23.02%), were received specifically from members of the Association of South African Quantity Surveyors (ASAQS). Central Limit theorem supported the response rate. The data will be analysed with SPSS using factor analysis and descriptive analysis. Reliability was ensured by using the Cronbach's alpha while validity was tested by ensuring all questions on the questionnaire were identified by the comprehensive literature review which was then validated during the pilot study.

Four categories of strengths of the quantity surveying profession exist. The four categories are the ability to plan and solve problems, core quantity surveying measuring skills, project viability and interpersonal skills. Three categories of weaknesses of the quantity surveying profession exist. The three categories are technical inadequacies of quantity surveyors,

resistance to change and lack of knowledge of and about the profession. Three categories of opportunities of the quantity surveying profession exist. The three categories are alternate positions for quantity surveyors, the need for quantity surveyors and new and existing roles in and out of the profession. Three categories of threats of the quantity surveying profession exist. The three categories are lack of the quantity surveying profession to market itself where new roles require an advancement of core quantity surveying services, external factors that hinder the performance of the profession and the lack of quantity surveying skills in the new generation.

This study categorised the strengths, weaknesses, opportunities and threats with rankings being made within each category. In addition, through a strategic framework, the strengths of the quantity surveying profession can be used to minimise the threats of the profession and the weaknesses of the profession can be improved by taking advantage of the opportunities of the profession. Once the profession eliminates the weaknesses, they can avoid potential threats. Therefore, the profession can achieve sustained growth and remain relevant.

Key Words: Quantity Surveying, Strategic Framework, SWOT Analysis

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CHAPTER 1: INTRODUCTION

1.1. Introduction

Chapter one introduces the topic and discusses the background information to the research problem on the strengths, weaknesses, opportunities and threats of the quantity surveying profession. The research questions and objectives are outlined along with the significance of the study, structure of the study, ethical considerations, assumptions and delimitations.

1.2. Background

A quantity surveyor is the financial and development consultant to the construction and property development industries. A quantity surveyor advises clients on the optimal use of funds and strategies that would maximise resources. Quantity surveyors can be found in the construction, property development, government and finance spheres of the economy. The duties that are required of a quantity surveyor is to essentially prepare budgets, feasibility studies, bills of quantities and other tender documentations, negotiating building contracts, monitoring costs and reporting to clients throughout the project life cycle and determining final costs of projects (Association of South African Quantity Surveyors (ASAQS), 2017).

Quantity surveyors are involved in four main work areas within the construction industry according to Ashworth, Hogg and Higgs (2013) and New Zealand Institute of Quantity Surveyors (NZIQS) (2017).

- **Building Work-** Quantity surveyors are regarded as cost professionals of the construction industry as they give cost advice to the client and ensures that the project remains on budget.
- **Building Engineering Services-** Quantity surveyors employed in this discipline needed to become acquainted with the science, technology and terminology of engineering services in order to understand the engineering drawings appropriately.

- **Civil Engineering-** Quantity surveyors who work on civil engineering industry provides similar services to their counterparts working on building projects. Quantity surveyors advise is often valued by engineers in the construction process.
- **Heavy and Industrial Engineering-** Heavy and industrial engineering requires quantity surveyors to expose themselves to new ways of measuring and producing cost reports.

The professional quantity surveyor is a cost consultant to the client and a cost manager for the building process. According to Mbachu (2015), NZIQS (2017) and Towey (2012), the quantity surveyor is involved in the following stages of the project:

- **Pre-contract**

Pre-contract advice involves estimating construction costs before design for the purposes of building and is one of the services that is offered to the client by the quantity surveyor.

- **Design**

After the pre-contract stage, the quantity surveyor must then monitor the design stage by advising the client and professional team on budget constraints. Thereafter, the quantity surveyor produces the bills of quantities for tendering out the project.

- **Post-contract**

Post-contract services that the quantity surveyor is involved in includes cost management and financial certification required for interim payments to the contractor for the duration of the project, progression reports, variation orders as well as the approval and issue of a final account. Quantity surveyors can further assist clients with project management services including recommending a suitable procurement method, managing the risk, feasibility studies as well as dispute resolution advice.

During the past two decades, the role of quantity surveyors has changed significantly. Quantity surveying, much like with all professions, has progressed and will continue to do so for the

predictable future. The reason for this evolution is due to the changing demands and services anticipated by clients as well as the emergent skills and knowledge of practitioners attached with the implications of information technology (Ashworth, *et. al.*, 2013).

1.2.1. SWOT Analysis

A SWOT analysis is a tool used for identifying important sub characteristics so the best strategy for the organisation. SWOT is an acronym for strengths, weaknesses, opportunities and threats. Strengths and weaknesses are viewed as part of the organisation's point of view while opportunities and threats are considered as external factors. Strengths are what the organisation has or what it can offer. Weaknesses is the opposite of strengths and is considered what the organisation does not have or what it can not offer. Opportunities are advantages in the environment that the organisation can use. Threats are the situations in the organisation's environment that could compromise on their success (Whalley, 2010 and Haile and Krupka, 2016).

1.2.2. Strengths of the quantity surveying profession

Measurement skills is one of the most important roles of a quantity surveyor (Hodgson, Sher and Mak, 2016). The quantity surveyor provides an initial preliminary cost estimate based on sketch designs or drawings produced by the architect. This assists with the projection of the potential costs that will be incurred (Visser, 2009). The quantity surveyor is also responsible to provide the client with the total cost and spend profile for the building on the likely total cost of the building over its life span. The current capital cost options will therefore be reviewed in an attempt to reduce the life cycle cost of the building (RICS, 2018). In addition, quantity surveyors produce a feasibility study which is a document that sets out what the client will need to pay for the project as well as the anticipated return (Visser, 2009).

Quantity surveyors should be critical problem solvers. By thinking logically, quantity surveyors use reasoning consistently to ensure reasonable conclusions are drawn (Stanley, 2016). Accuracy is another important aspect in quantity surveying. A small difference in the calculations can have major effects on the whole presentations of works. Therefore, as a

quantity surveyor, one needs to be careful with calculations so as to avoid careless mistakes (Olanipekun, Abiola-Falemu and Aje, 2014).

1.2.3. Weaknesses of the quantity surveying profession

One of the biggest challenges for qualified and experienced quantity surveyors working in industry is the lack of exposure and experience for young professionals who want to enter the industry as well as for those who have had a few years of experience (Moodley, 2012). The only way to ensure survival as a quantity surveying firm is to actively educate, train and adopt BIM as the traditional means of working and providing services will soon become redundant (Crowley, 2013). Further, to mitigate the risk of cost overruns and unreliable estimates, contingencies are often added to the budget to cope with uncertainties that may occur during construction. Quantity surveyors often cite lack of time within the construction period, inadequate record of documentation and little communication as the main issues of poor estimates produced (Moodley, 2012).

Another problem with quantity surveyors in South Africa is that few candidate quantity surveyors become professional quantity surveyors and therefore they do not grow in the career (van der Westhuizen, 2018). While few candidate quantity surveyors become professional quantity surveyors, not all professional quantity surveyors submit their CPD details on time. This, in turn, creates the possibility of being de-registered and therefore not being allowed to function as a registered professional quantity surveyor (Olwage, Cumberlege and Moss, 2015). Also, quantity surveying as a profession is fairly unknown to the public and many people in the building industry only has a vague idea of what a quantity surveyor really is. Lack of competencies in the industry does not help the profession as practical work experience is a great concern facing the industry. It is worse that many experienced quantity surveyors are reluctant to assist young quantity surveyors as many young quantity surveyors job hop (Venter, 2009).

1.2.4. Opportunities of the quantity surveying profession

Although the traditional services are still one of the main services of a quantity surveyor, a wider spread of services are offered to a wider spread of clients by them. New commercial possibilities for quantity surveyors include working for companies, client groups, contractors

or other advisory and consulting firms (Beukes, 2012). Involvement in newly identified or emerging markets bring in opportunities to quantity surveying firms (Frei, Mbachu and Phipps, 2013). There is a huge demand for quantity surveyors all over the world. This is a great opportunity for skilled quantity surveyors (Kihn, 2013). Technology is central to the future roles of a quantity surveyor (Seah, 2017). Quantity surveyors now have laptops that doesn't limit the work that can be done at their desk therefore being more efficient. With technology, collaboration is also increased as people from all over the world can now collaborate successfully on projects (Davenport, 2017).

The role of a quantity surveyor is often underestimated. There are numerous benefits that quantity surveying provides throughout the project. There is high demand for quantity surveying core services such as planning, estimating and monitoring costs (Venter, 2009). Facilities management is considered as an alternative for quantity surveyors as many buildings that have been built now requires maintenance management. Quantity surveyors need to improve their competencies and their knowledge bases to fulfil the requirements of facilities management. The quantity surveying and facilities management profession therefore have a lot of similarities in terms of competencies that includes contractual, financial and procurement management (Salleh, Khuzzan and Hashim, 2014).

1.2.5. Threats of the quantity surveying profession

Threats to quantity surveying firms originate from a variety of different sources. These sources include technology, economic trends and globalisation. Structural factors of the industry can also have major effects on the profession and be influenced through collective action from the profession. Other threats include devaluing of quantity surveyors through excessive competition, lack of skilled professionals, the undersupply of new entrants to the profession and shortfalls in the qualifications offered by tertiary institutions (Frei, Mbachu and Phipps, 2013). . Tertiary institutions offering quantity surveying are negatively impacted by the current economic conditions (Venter, 2009). Further, to ensure only high-quality students, who earned a significant number of entrance points during matric, are entering quantity surveying programmes, applicants to tertiary institutions should be screened (Moodley, 2012).

Intensive competition is an important factor that influences the current market of quantity surveying. Other professions bring in competition by providing similar services and ‘one-stop shop’. Computer aided software such as CAD (Computer Aided Design) is another highly regarded threat to quantity surveyors as the progress of CAD to automatically produce quantities threaten the technical role of a quantity surveyor. Even though quantity surveyors are not aware, poor marketing can be considered as a threat (Chong, Lee and Lim, 2012).

Quantity surveyors therefore need to ensure that their accomplishment in the profession does not only hinge on their existing capabilities but can adapt to changes in order to preserve and improve competitive advantage and profitability (Chong, *et. al.*, 2012). There are approximately 600 new applicants submitted each year to the South African Council for the Quantity Surveying Profession (SACQSP). However, less than half of these new applications translate into professional quantity surveyors due to inadequate education or lack of employment within the profession. Therefore, lack of formal registration and chartered status is a major threat to the profession (Lyons, 2015).

1.3. Problem Statement

In response to the ever-increasing changes in the global business environment, professions must evolve. Quantity surveyors are not invulnerable to these changes as an array of challenges threatens the existence of the profession. The quantity surveying profession require urgent and far-reaching strategic transformation that will assist by overcoming threats and weaknesses while embracing the strengths and opportunities of the profession to ensure they survive and remain relevant in the ever-changing construction industry.

1.4. Purpose of the Study

The purpose of this study is to analyse the survival of the quantity surveying profession using a SWOT analysis in an attempt to develop a strategic framework for detecting the overall performance of an organisation and to identify areas requiring improvement to enable the organisation to achieve sustained growth and remain relevant.

1.5. Research Questions

1. What are the key strengths and weaknesses of the quantity surveying profession based on professional consultants' experience in the profession?
2. What are the key opportunities and threats that are perceived to impact the quantity surveying profession?
3. How can a strategic framework be used by the quantity surveying profession to plot their strengths and weaknesses against the identified opportunities and threats to reveal the survival of the profession?

1.6. Research Objectives

1. To define the key strengths and weaknesses of the quantity surveying profession based on professional consultants' experience in the profession.
2. To determine the key opportunities and threats which are perceived to impact the quantity surveying profession significantly.
3. To develop and apply a strategic framework that could be used by the quantity surveying profession to plot their strengths and weaknesses against the identified opportunities and threats thereby revealing the survival of the profession.

1.7. Significance of the Study

This study assisted the quantity surveyor profession with implementing the changes required to survive and remain relevant in the industry. The study identified and encouraged the use of a SWOT analysis as a strategic tool for the quantity surveying profession. Opportunities of the quantity surveying profession were identified and assisted the profession to take on more and evolve with the environment.

1.8. Research Methodology

This research was analytical and deductive in nature. A quantitative research philosophy which is a positivist philosophy was therefore adopted to address the research objectives. Structured questionnaires were used to collect the data required.

Quantitative research was selected for the following reasons:

1. The problem statement can be stated in a clearly defined and precise manner;
2. both the dependent and independent variables can be specified clearly and precisely;
3. one may arrive at more than one objective conclusions while following firmly the research goals and determining issues of causality;
4. due to the high number of controlled observations, there are high levels of reliability gathered by the data;
5. the subjectivity of judgement is minimised; and
6. longitudinal measures are allowed for in research subjects (Matveev, 2002).

A literature review was conducted to provide a thorough understanding of the topic, to identify similar work done and to identify gaps that require further investigations. From the literature review, a strategic framework was created. This framework was based on the strengths, weaknesses, opportunities and threats that influence the quantity surveying profession. This framework was then tested via the data collected through questionnaires. Lastly, the framework was analysed and findings presented.

1.9. Research Approach and Design

The research design specified the approach and procedures for collecting and analysing the data required. Quantitative research was selected with the collection of data been done through a questionnaire survey.

1.9.1. Sample and Data Collection

The database from the Association of South African Quantity Surveyors (ASAQS) was the targeted path to gather the relevant data. The questionnaire was hosted on the ASAQS website and sent to respondents via email using a probability random sampling method. This infers that all members registered with the ASAQS were included in this sample.

1.9.2. Data Analysis

The empirical data collected was then analysed using descriptive and inferential statistics. The researcher achieved reliability by using Cronbach's α . Reliability was enhanced by a structured questionnaire that ensured all respondents answered the same questions and Cronbach's α . The strengths, weaknesses, opportunities and threats listed in the questionnaire were identified by a comprehensive review of relevant literature and validated during pilot study where quantity surveyors were asked to give their opinion on the validity of the questionnaire if it covers all areas of the strengths, weaknesses, opportunities and threats of the profession in relation to the objectives of the study.

The analysed data were presented in frequency tables represented by the mean and standard deviation. The results obtained were ranked using relative importance index. Factor analysis - the correlation matrix, the Bartlett's test of sphericity and the Kaiser-Meyer- Olkin (KMO), Cronbach's alpha (α) and descriptive statistics were the data analysis methods used. New variables were computed after dimension reduction in factor analysis as described in chapter four.

1.10. Limitations

The sample of respondents were limited to members of the Association of South African Quantity Surveyors (ASAQS).

1.11. Ethical Considerations

Ethics is the standard of performance that distinguishes between what is acceptable behaviour and what is not (Resnik, 2015). Acknowledgement of the authors whose writing were used throughout the study avoided plagiarism. The participation of the study was voluntary to ensure participants were not forced to participate. Participants were anonymous throughout the study with confidential information only been accessible to those who were directly involved in the study. The researcher applied for and was granted ethical approval from the University of KwaZulu-Natal's ethics committee. The ethical clearance is attached in Appendix A.

1.12. Dissemination of the knowledge of this research

Two conference papers were produced from this research.

Ramdav, T. and Harinarain, N. (2018). Threats to quantity surveying firms- A pilot study. Association of Schools of Construction of Southern Africa (ASOCSA) – The Twelfth Built Environment Conference, Durban. 5-7 August 2018.

Ramdav, T. and Harinarain, N. (2018). Strengths to quantity surveying firms- A pilot study. South African Council for the Quantity Surveying profession (SACQSP) – The Tenth SACQSP International Research Conference, Johannesburg. 30 September-1 October 2018.

1.13. Structure of Study

Chapter 1: Introduction

Chapter one introduced the topic and provided a basic outline of the study. The survival of the quantity surveying profession can be enhanced by using a SWOT analysis which will assist in identifying areas requiring improvement to enable the organisation to achieve sustained growth and remain relevant. The specific research questions and objectives were then stated. A brief background and research methodology was also discussed which were explained in depth in chapters two and three respectively.

Chapter 2: Literature Review

Chapter two will analyse information about the topic obtained from published literature. The chapter will start by explaining quantity surveying, the attributes of a quantity surveyor and how one can become a quantity surveyor. It will then go on to talk about registration and the number of quantity surveying firms in South Africa. Finally, the strengths, weaknesses opportunities and threats will be discussed. The strategic framework will then be illustrated based on the literature review.

Chapter 3: Research Methodology

Chapter three will focus on the research methodology that will be used to collect and analyse the data. It will describe the different types of research methods, display their advantages and disadvantages and explain why the quantitative approach will be chosen over the other methods. The chapter will also display the sampling technique and size.

Chapter 4: Data Analysis and Interpretation

Chapter four will analyse the data from the relevant respondents as mentioned briefly in chapter one and will be explained further in chapter three. Analysis will be made on the questionnaires using Statistical Package for Social Sciences (SPSS) version 25. The interpretation of data was made through background information, factor analysis - the correlation matrix, the Bartlett's test of sphericity and the Kaiser-Meyer- Olkin (KMO), Cronbach's alpha (α) and descriptive statistics. New variables were computed after dimension reduction in factor analysis.

Chapter 5: Discussion of the Strategic Framework and Findings

Chapter five will discuss all the findings and compare them to the findings of the literature review and strategic framework. Any relevant information found in the literature review and during the analysis of data will be discussed.

Chapter 6: Conclusion and Recommendations

Chapter six will conclude this research. It will summarise the points made and provide a synthesis of thought. Conclusions will be made from the findings and recommendations will be made accordingly according to the data analysis and objectives.

1.14. Chapter Summary

Chapter one provided the reader with adequate information to deduce the nature of the study along with the purpose and significance. It discussed what a quantity surveyor is along with what type of projects they are involved in. SWOT analysis was explained and the strengths weaknesses, opportunities and threats were discussed briefly. It then went on to discuss the research questions and objectives. Delimitations and ethical considerations were explained. Lastly, the structure of the study was outlined.

Chapter two discusses the literature review and provides an in-depth study of the field.

CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

This chapter focuses on the literature review related to the study. General information regarding quantity surveying profession is highlighted. The chapter goes on to focus on the duties and personal attributes of quantity surveyors, how to become a quantity surveyor as well as the registration process that quantity surveyors follow. Thereafter, the strengths, weaknesses, opportunities and threats of the quantity surveying profession are discussed. This chapter concludes with a strategic framework of the quantity surveying profession based on the literature.

2.2. Quantity Surveying

Quantity surveying is not an occupation for the faint-hearted. Worldwide, South African quantity surveyors are recognised among the leaders in their profession representing the country on international bodies and serving as presidents of global organisations (Venter, 2009).

Quantity surveyors measure and estimate the cost of resources for construction projects and therefore are the construction cost professionals. The main aim of a quantity surveyor is to keep the project on budget. The title ‘quantity surveyor’ was given due to the fact that they formulate a ‘schedule of quantities’ which is an estimated guess of the construction material and labour costs. There are many names that people employed with a quantity surveying qualification are known by such as cost engineer, cost planner or project coordinator (NZIQS, 2017).

The quantity surveyor is one of the team of professional advisors in the construction industry. As advisors, they estimate and monitor costs of a construction project from feasibility stage through the end of the construction period. Afterwards, they may get involved with the final account and tax depreciation schedules and if required, arbitration and settlement. Quantity surveyors work closely with engineers, architects and the rest of the members of the construction team. Quantity surveyors usually complete an appropriate tertiary degree. they

tend to work is projects where major construction work is carried out such as office blocks, schools, hospitals, factories, railways and so on (Australian Institute of Quantity Surveyors (AIQS), 2017).

Pre-contract role of the quantity surveyor comprises of preliminary cost and procurement advice. Preliminary cost advice includes predicting the initial and life-cycle cost of the project. It also involves assessing the evolving design on the basis of cost advice. Within the procurement role, the tender documentation are prepared by the quantity surveyor to be used by the contractors in competitive tendering, handling and judging the tenders which eventually advises on award (Mbachu, 2015). The construction knowledge acquired by quantity surveyors is often used to produce economically viable advise to the client and end user. The project budget is formulated through experience of similar projects and traits of the current project. The quantity surveyor then gets involved in the design stage and ensures that the design requirements are on budget through cost management. Finally, the detailed estimate is prepared in this stage (AIQS, 2017).

During construction, the quantity surveyor keeps track of costs by providing cash flow data so that the client can efficiently arrange finances for each stage of the project. Cost effects is also assessed when changes to the project occur and agreed variation occurs with the contractors (NZIQS, 2017). Progress payments are valued at regular intervals by the quantity surveyor (AIQS, 2017).

The post contract role of a quantity surveyor involves the contractual administration and cost control. The quantity surveyor prepares and reports on all interim payments as well as financial progress. The quantity surveyor also controls the financial expenditure of the project. Work progress and claim management, preparation of loss adjustment and cost auditing are also duties of a quantity surveyor during this stage. The statement final account is also prepared which records the actual costs for all sections of the project (Mbachu, 2015). Quantity surveyors also use their services in the renovation of old buildings and modifications to existing building. Quantity surveyors can be found in both the public and private sector (AIQS, 2017).

2.3. Duties of quantity surveyors

The traditional way sees the quantity surveyor creating the bills of quantities for tendering purposes, measuring the work for interim payments and preparing the final account. Quantity surveyors have now ventured off into procurement, design cost planning, life cycle costing, value management, risk analysis and management. This work was historically dealt with through prime costs and provisional sums however in modern buildings, it is inadequate to describe the work in that context (Ashworth, Hogg and Higgs, 2013).

The professional quantity surveyor is a cost consultant to the client and a cost manager for the building process. Pre-contract advice involves estimating construction costs before design for the purposes of building and is one of the services that is offered to the client by the quantity surveyor (Towey, 2012).

After the pre-contract stage, the quantity surveyor must then monitor the design stage. Quantity surveyors should advise the client of variations that impacts the budget (Towey, 2012).

Post-contract services that the quantity surveyor is involved in includes financial certification required for payment certificates to the contractor for the duration of the project, progression reports, variation orders and the creation and issue of a final account (Towey, 2012).

The main roles of a quantity surveyor includes:

- ensuring the project is within the budget;
- ensuring the project is on time;
- managing the finances of the project;
- ensuring construction costs and production are managed effectively; and
- resolving disputes between contracting parties (NZIQS, 2017).

It is important to note that the skills of quantity surveyors that were important fifty years ago still remains relevant and important although their relative importance declined so that new skills could be replaced by new skills (Ashworth, Hogg and Higgs, 2013).

2.4. The developing role of quantity surveyors

The following important factors are likely to influence the future development of quantity surveying:

- More focus on client satisfaction
- The use of information and communication technology
- Producing a more sustainable project (Ashworth, *et. al.*, 2013)

2.5. Personal attributes of quantity surveyors

The quantity surveyor relates to people of all stages, developers, architects, engineers, lawyers, land surveyors, contractors as well as general workers. The highest level of professionalism needs to be maintained by quantity surveyors towards all parties involved thereby ensuring accurate and fair finalisation of projects. Quantity surveyors' skills are used not only in private professional practice but also in construction, finance, government and property development (ASAQS, 2017).

2.6. How to become a quantity surveyor?

According to ASAQS (2017), there are two routes to enter the quantity surveying profession:

- a four-year full-time or five-year part time BSc Quantity Surveying university degree
- a three-year University of Technology diploma with an additional year of study advancing to a B-Tech degree.

Within both these levels of entry, a route exists for the advancement to full registration as a professional practicing quantity surveyor. To become a quantity surveyor assistant, one needs a two-year correspondence course. There are currently six universities and various universities

of technology in South Africa that provides courses in quantity surveying (ASAQS, 2017). Table 2.1 indicates the accredited tertiary institutions offering quantity surveying degrees.

Table 2.1: Accredited Tertiary Institutions (ASAQS, 2017)

Institution	Programme	Credit
Cape Peninsula University of Technology	National Diploma (Building)	240 / Level 6
	B.Tech (QS)	360 / Level 7
Central University of Technology	National Diploma (Building)	240 / Level 6
	B.Tech (QS)	360 / Level 7
Durban University of Technology	National Diploma (Building)	240 / Level 6
	B.Tech (QS)	360 / Level 7
Mangosothu University of Technology	National Diploma (Building)	240 / Level 6
Tshwane University of Technology	National Diploma (Building)	240 / Level 6
	B.Tech (QS)	360 / Level 7
Walter Sisulu University of Technology	National Diploma (Building)	240 / Level 6
University of Johannesburg	National Diploma (Building)	240 / Level 6
	B.Tech (QS)	360 / Level 7
University of Witwatersrand	BSc Quantity Surveying Studies	360 / Level 7
	BSc Quantity Surveying Honours	480 / Level 8
	BSc Construction Studies	360 / Level 7
	BSc Honours (QS)	480 / Level 8
University of Cape Town	BSc Construction Studies	360 / Level 7
	BSc Honours (QS)	480 / Level 8
University of the Free State	BSc Quantity Surveying	360 / Level 7
	BSc Honours (QS)	480 / Level 8
University of Kwa-Zulu Natal	BSc Property Development	360 / Level 7
	BSc Property Development Honours (QS)	480 / Level 8
University of Pretoria	BSc Quantity Surveying	360 / Level 7
	BSc Honours (QS)	480 / Level 8

Nelson Mandela Metropolitan University	National Diploma (Building)	240 / Level 6
	B.Tech (QS)	360 / Level 7
	BSc Construction Economics	360 / Level 7
	BSc Honours (QS)	480 / Level 8

2.7. Registration

A professional quantity surveyor (PrQS) is a person who is registered as such in terms of the Quantity Surveying Profession Act, 2000. A professional quantity surveyor provides expert, advice and professional services on construction procurement, contracting and costs. Quantity surveyors are trained, experienced professionals who have acquired comprehensive knowledge of construction procurement and contracting methods, economics and finance. Professional quantity surveyors are employed by quantity surveying firms, by industry and national, provincial and local government entities, mining companies, engineering practices, construction companies as well as financial and legal companies (SACQSP, 2017).

According to SACQSP (2017), the functions of a professional quantity surveyor are:

- broadly concerned with procurement strategies, measuring and costing construction projects.
- to advise on the control of construction costs by ensuring work is measured accurately on a regular basis.

2.7.1. Registration Routes

Various registration routes for candidate quantity surveyors exist. The South African Council for the Quantity Surveying Profession (SACQSP) displays the routes according to the academic qualification of the candidate (SACQSP, 2018).

Table 2.2: Registration Routes for Candidate Quantity Surveyors (SACQSP, 2018)

Professional Quantity Surveyor- PrQS		
Accredited 480 credit QS University Degree	3 Years in training	Assessment of Professional Competence Interview
Accredited B Tech (QS)	4 Years in training	Assessment of Professional Competence Interview

Non- Accredited 480 credit QS University Degree	4 Years in training	Assessment of Professional Competence Interview
Accredited 360 credit QS University Degree	5 Years in training	Assessment of Professional Competence Interview
Non- Accredited B Tech (QS)	5 Years in training	Assessment of Professional Competence Interview
Non-Accredited 360 credit QS University Degree	6 Years in training	Assessment of Professional Competence Interview
Cert (QCP) (UFS)	6 Years in training	Assessment of Professional Competence Interview
Accredited National Diploma	6 Years in training	Assessment of Professional Competence Interview
Non-Accredited National Diploma	7 Years in training	Assessment of Professional Competence Interview
Post Grade 12 Qualifications	9 Years in training	Assessment of Professional Competence Interview
No Qualifications	15 Years in training	Assessment of Professional Competence Interview
RICS Membership with Accredited Qualification	1 Year RSA	Professional Interview

2.7.2. Assessment of Professional Competence

The APC is an acronym for Assessment of Professional Competence. It is the practical training and involvement which collectively with the academic qualifications, leads to registration as a professional quantity surveyor. The objective of the APC is to ensure the registered person is competent to practice as a PrQS. The APC consists of:

- A period of structured work-place training,
- Supplementary skills education modules (if prescribed necessary),
- A paper or an electronic assessment of work-place experience and report writing, and
- Final assessment interview of professional competence (SACQSP, 2017).

The route to registration is determined by the highest qualification based on an education programme. The structured work-place training normally takes between 3 to 5 years depending on the education outcome. Depending on the progress at the workplace and the exposure received, it may take longer as the period is based on an 8-hour day and 2400-day year which is 1900 hours. The work place training period is principally competence based and requires a

demonstration of the necessary knowledge and capabilities needed to achieve detailed responsibilities or functions (SACQSP, 2017).

2.7.3. Life Cycle Stages to becoming a professional quantity surveyor

According to the SACQSP (2017), there are three distinct life cycle stages to becoming a professional quantity surveyor:

- a) Applicant- Documentation is compiled and submitted for assessment and the SACQSP registration department agrees on the route to registration along with the registration committee. The online application will be acknowledged after which the registration fee needs to be paid. A processing number is then issued which will enable the applicant to continue submitting the prescribed documentation ie. certified copies of the ID/passport, letter of undertaking, highest qualification certificates and proof of residence.
- b) Candidate- The certificate of registration is then issued by the SACQSP registration department and the person registered starts their route to registration and the time period for candidate training begins. An “IT” number will then be issued which should be used on all documentation submitted as well as on any formal communication with the Council. The title Candidate Quantity Surveyor or CanQS as well as their formal academic qualification and their IT registration number.
- c) PrQS- After the completion of the APC interview, the candidate is issued with a certificate of PrQS registration. PrQS may then use the title Professional Quantity Surveyor or PrQS with their formal academic qualification and registration number.

With the title Professional Quantity Surveyor, one is confident enough in their abilities as a quantity surveyor and may even start a firm. In order to see if the quantity surveying profession will thrive in the future, it is important to do a SWOT analysis and establish the weak areas so a trial of improvement may be established.

2.8. SWOT analysis

SWOT is an acronym for strengths, weaknesses, opportunities and threats. A SWOT analysis framework is therefore used to identify a firm’s strengths, weaknesses, opportunities and threats (Odubiyi and Oke, 2016). In simple terms, SWOT analysis can be understood as the examination of a firm’s internal strengths and weaknesses and the firm’s environments opportunities and threats. A SWOT analysis can be interpreted as a general tool that is designed to be used in preliminary stages of the design-making process. In addition, SWOT analysis can further be interpreted as a precursor to strategic planning in many different applications (Balamuralikrishna and Dugger, 1995). Strengths and weaknesses are controllable while opportunities and threats are factors that the firm does not have direct control over. Therefore, strengths and weaknesses are considered internal factors while opportunities and threats are considered external factors (Odubiyi and Oke, 2016). Table 2.3 depicts the SWOT analysis matrix.

Table 2.3: SWOT Analysis Matrix (Whally, 2010)

	STRENGTHS	WEAKNESSES
OPPORTUNITIES	How do I use these strengths to take advantage of these opportunities?	How do I overcome the weaknesses that prevent me from taking advantage of these opportunities?
THREATS	How do I use my strengths to reduce the impact of these threats?	How do I address the weaknesses that will make these threats a reality?

A SWOT analysis is a tool that can be used to explore different possibilities and make decisions within different organisations. Future possibilities are looked at when doing a SWOT analysis by using a systematic approach of introspection into both positive and negative concerns. A SWOT analysis presents a simple way of communicating ideas, concerns and policies to others. When utilizing a SWOT analysis, it is important to realise that whatever the course of action, decision making should contain four important elements namely building on strengths, minimizing weaknesses, seizing opportunities and counteracting threats (Balamuralikrishna and Dugger, 1995).

2.9. Strengths of the quantity surveying profession

The following are possible strengths that are not expected of the profession however, if possessed, has the ability to demonstrate competence and expertise.

2.9.1. Trust

Quantity surveyors possess a certain degree of trust to their clients which is a great strength to the industry. The dealings of quantity surveyors should be transparent as quantity surveyors are responsible and accountable for all their actions. Quantity surveyors need to always comply with the relevant laws and regulations, know and act within their limitations and competencies and avoid conflicts of interest (Cartlidge, 2011).

2.9.2. Leadership

Quantity surveying firms has a sense of leadership amongst their clients as they have to lead their clients in the right path much like a leader in a team project. Quantity surveyors provide advice on cost implications of both the clients requirements and decisions. They also need to monitor the estimates and contractual obligations regularly. Managing the construction from the design stage through to the operation stage necessitates knowledge on all aspects of construction. Throughout the project lifecycle, the quantity surveyor advises the stakeholders and clients (Olanrewaju and Anahve, 2015).

2.9.3. Creative problem solving

Quantity surveyors require an innovative and creative approach to problem solving because they are required to ensure the client gets what they expect with the resources accessible (Towey, 2012). Creative problem solving is an established technique of approaching a problem in an innovative and imaginative way. The process helps redefine the problem and find innovative responses (Creative Education Foundation, 2018).

Quantity surveyors needs to be problem solvers. By thinking logically, quantity surveyors use reasoning consistently to ensure reasonable conclusions are drawn. When a problem arises,

quantity surveyors should think creatively and innovatively to solve them efficiently. Therefore, quantity surveyors need to be optimistic for the project's life cycle (Stanley, 2016).

2.9.4. Negotiation Skills

Good negotiating skills are important to a quantity surveyor as the quantity surveyor is responsible to negotiate with several different people. This applies that quantity surveyors need to listen to the opinions of others and give in their own input. Quantity surveyors need to ensure they can work well in a team and be able to motivate and lead people. Since a quantity surveyor is involved in the project from conception, he or she knows which activities are not aligning with the project vision. Refocusing the priorities when a situation arises is one of the things quantity surveyors need to do. A skilled quantity surveyor will have no problem in using negotiation skills that they have learned to put their point across while facilitating a solution that suits all stakeholders (RICS, 2017).

2.9.5. Communication Skills

As a quantity surveyor, it is extremely important to have good communication skills to not only express your opinion verbally, but on paper as well. Language skills is also important as it is the quantity surveyor who writes clear and accurate reports that relate to complex information simply to a variety of different people. From the very start of the project, communication is important. Quantity surveyors also need to demonstrate good listening skills. A quantity surveyor may be technically proficient and have a deep understanding of the project needs however if the quantity surveyor is unable to present his or her ideas and understandings to an audience, there is a great chance that the knowledge gained could go to waste. Therefore, public speaking and being able to communicate well are skills that all quantity surveyors should possess (RICS, 2017).

2.9.6. Knowledge Management

Knowledge management in quantity surveying firms can be defined as a methodical approach to assist knowledge and information emerge and flow to the right people at the right time which will create value. For companies to leverage this asset, they must approach knowledge

management to achieve both the mission and vision of the firm. The main contributor to a quantity surveyor's portfolio is knowledge and as a result, their expertise can be improved by effective knowledge management skills (Abdul-Rahman, Alashwal and Jamaludin, 2011).

Effective knowledge management of quantity surveying firms depends greatly on the capacity of the individual to plan, manage, operate, monitor and control for deciding. There are two knowledge management techniques that can be used namely codification and personalisation. The codification approach describes how a specific system can assist to capture the experience and knowledge of specialists within the quantity surveying firms before the team members leave. The personalisation approach expresses that the knowledge, experience and skills can be seized through interviews, observation, simulation, protocol analysis and questionnaire surveys (Abdul-Rahman, *et. al.*, 2011).

A set of actions that are used by project teams to create and share knowledge within a project and across different projects can be defined as project learning practice. The attainment and use of knowledge and expertise within the same project focuses on tasks within that single project and supports the delivery of a successful project by identifying and solving problems during the project life cycle. Inter-project learning includes the transfer of knowledge and experience from one project to other projects within the same time frame or to different projects over a period. The process includes combining and sharing lessons learned across projects to develop new knowledge (Abdul-Rahman, *et. al.*, 2011).

There are two main methods to review project learning namely process-based methods and documentation-based methods. Process-based methods involves the gathering of learned lessons from completed projects and explaining the steps of a project's time line. Process-based methods consist of two types of methods namely Post Project Appraisal (PPA) and After-Action Review (AAR). Post Project Appraisal represent a special type of review that includes a strong learning element while After-Action Review helps team members learn instantly from both faults and achievements. Documentation-based method is about learning from the project's experience as well as the storage of contents within the organisation (Abdul-Rahman, *et. al.*, 2011).

The most critical success factors of implementing project learning in quantity surveying firms are top management support, application of information technology systems, employee active participation and creating knowledge space. The head of department is the key player in implementing learning process successfully. For quantity surveying firms to benefit from project learning methods, they need to practice on-the-job training, problem solving techniques, periodic meetings, debriefing and documentation learning. A portal where quantity surveyors can store knowledge and experience can also be developed. Top management support is one of the highest success factors however it is important to note that without the discipline, participation and commitment of the employees, top management support is not viable. It is therefore critical that the whole firm has the same mindset and work as a team to generate success (Abdul-Rahman, *et. al.*, 2011).

2.9.7. Strategic Planning

Quantity surveying firms must plan strategically to cope with the dynamic construction environment. Strategic planning attempts to adjust a firm's strength in the most effective and efficient way relative to that of its competitors. Strategic planning focuses on the direction of the organisation and actions that are necessary to improve the performance of that organisation. Strategic planning is therefore the process of stipulating a firm's objectives, developing policies and plans to achieve the objectives, assigning resources to implement the policies including evaluation and control to achieve the organisation's objectives (Hassan, Rahmat and Ali, 2007).

Strategy formulation, strategy implementation and evaluation and control make up strategy planning. Strategy formulation includes developing a vision and mission, identifying the firm's external opportunities and threats, determining strengths and weaknesses, establishing objectives, generating alternative strategies and choosing the strategies to follow. Strategy implementation includes creating annual objectives, devising policies, motivating employees and allocating resources to execute formulated strategies, developing strategy-supportive culture, creating an effective structure, redirecting marketing efforts, preparing budgets, developing and using information systems and linking employee compensation to organisational performance. Strategy evaluation is the final stage of strategic management and

includes reviewing external and internal factors that are the root for current strategies, measuring performance and taking corrective actions (Hassan, *et. al.*, 2007).

Developing a strategic plan is vital for the creation of small or medium companies competitive edge. Strategic planning does not only assist with competitiveness but also with the growth of the company. Strategic planning defines what a small and medium firm will be and developing a strategic plan protects businesses (Hassan, *et. al.*, 2007).

2.9.8. Accuracy

Accuracy is extremely important in quantity surveying. Quantity surveyors should therefore possess good accuracy skills. A small difference in the calculations can have major effects on the whole presentations of works. Therefore, as a quantity surveyor, one needs to be careful with calculations so as to avoid careless mistakes (Olanipekun, Abiola-Falemu and Aje, 2014).

2.9.9. Ensuring a suitable organisational structure

The organisational structure of a firm lays a foundation for the organisation, builds and cultivates it, outlines its purpose, sets its path, prioritises its responsibilities, leads its strategies and the behaviour of its people and eventually delivers its results (Pandey, 2014 as cited by Olanipekun, Abiola-Falemu and Aje, 2014). Therefore, organisational structure forms an integral part of the general functioning of the firm. It is important that quantity surveying firms ensure they have a good organisational structure in order to succeed in the industry (Olanipekun, Abiola-Falemu and Aje, 2014).

2.9.10. Team working/ interpersonal skills

Teamwork skills is extremely important to a quantity surveyor as a quantity surveyor works with not only the client but many other professionals involved on the project as well. They therefore need to be able to work with people from different cultural backgrounds and use different approaches to achieve common goals. Graduates should have a good relationship with others, understand the scope of works given and work productively in a group setting (Shafie, Khuzzan and Mohyin, 2014).

2.9.11. Self-confidence, can-do attitude

Quantity surveyors need to be able to work independently and be confident in what they can do and what they can offer to the firm. Self-confidence is important to a quantity surveyor as quantity surveyors work with money and so it becomes critical to ensure they understand what is required of them. It is also important that they do their work as confidently as possible to enable their clients to gain a sense of trust in them. (Shafie, *et. al.*, 2014).

2.9.12. Data Management/Record Keeping

In order to achieve a successful project, it is important to keep written records that is well organised and structured. For a quantity surveyor, it is important to keep records of the brief, client and project team meetings, design team meetings, site meetings, records of site inspections, site instructions as well as all correspondences to ensure everything is recorded so no disputes may arise (Fordham, 2018).

2.9.13. Client Relationship Management

A quantity surveyor is a financial consultant of the construction industry that protects the needs of the client. It is therefore important that quantity surveyors maintain a good relationship with their clients. A quantity surveyors training and expertise qualifies him/her to advise the client on the optimal use of funds, arranges contractual relation between client and contractors and prepares contract documents on all construction projects (Olatunde and Okorie, 2016).

2.9.14. Dispute Resolution/Conflict Management

From time to time, a dispute arises. It is the responsibility of the quantity surveyor to get involved and assist the parties to settle the disputes that arise out of construction work. The quantity surveyor may also advise the parties on legal and contractual issues to do with ongoing projects (Randstad, 2014).

2.9.15. Attention to Detail

A quantity surveyors role requires a high level of attention to detail. It is the role of the quantity surveyor to ensure that costs are kept within budget without sacrificing quality. The relevant building regulations for a project need to be understood to ensure costings are adhered to. They need to keep a close eye on the contractor, the materials that are being used and the costs of the project (Randstad, 2014).

2.9.16. Measurement/Quantification

Measurement skills is one of the most important roles of a quantity surveyor. Measurement stems from a number of various skills such as a good basic numerate education, the ability to read and interpret drawings, experience on site as well as the ability to cope with vast amounts of paper work. Measurement or ‘taking off’ is a process that requires a technical knowledge and understanding of the building and civil engineering technology (Hodgson, Sher and Mak, 2016).

2.9.17. Cost Accounting and Financial Management

Should a quantity surveyor possess skills in cost accounting and financial management, it would benefit the industry as the quantity surveyor evaluates the work executed by the contractor and subcontractors, the materials supplied and services rendered. From the evaluation, a final account is prepared and the quantity surveyor negotiates the final payment with the contractor and subcontractors for the settlement of the final building costs. The provisional sums estimated for and the actual contract prices will be taken in account (Visser, 2009).

2.9.18. Construction Law and Contract Management

The quantity surveyor overlooks the administration of the project. Design costs and materials are considered together with agreements with subcontractors. Tenders submitted by the contractors are considered by the quantity surveyor. The ongoing administration of the project together with estimates and budgets and a broad spectrum of documentation are all administrated by the quantity surveyor. The quantity surveyor also sees to the agreements with the contractors, subcontractors and suppliers (Visser, 2009).

2.9.19. Problem Solving

Problem solving is one of the major skills needed by quantity surveyors. Quantity surveyors need to think logically, creatively, analytically and critically. They are often involved in analysing and solving problems between both the project team as well as the client (Shafie, Khuzzan and Mohyin, 2014).

2.9.20. Cash Flow Forecasting and Budgeting

Prior to the commencement of the project, the quantity surveyor advises the client as to what the preliminary costs can be estimated at together with the running costs of the project. This will provide the client with an idea of what the initial budget for the estimated project will be. The quantity surveyor will further produce a cash flow forecast that will enable the client to see the month to month expenses and budget accordingly. Should the quantity surveyor possess good budgeting skills, it would greatly benefit the industry (Visser, 2009).

2.9.21. Value Management/Construction Economics

The increasing involvement of quantity surveyors in value management provides a great strength for the profession to re-engineer some of its traditional roles in a more positive light by developing more cutting-edge skills that will promote the profession. Value management is part of the services offered by quantity surveyors. The quantity surveying profession having the opportunity to lead this service will reflect their traditional qualities of providing value for money while allowing them to gain competitive advantage over their competitors (Mohamad, Saifulnizam, Vaughan, Coffey and Christopher, 2011).

2.9.22. Estimating and Pricing

The quantity surveyor need to provide an initial preliminary cost estimate based on sketch designs or drawings produced by the architect. They therefore should possess strong estimating and pricing skills. This will assist with the projection of the potential costs that will be incurred. At the commencement of the project, the quantity surveyor presents the client with an estimate. As the project progresses, costs may vary for countless reasons which will result in the quantity

surveyor having to review the initial estimates and pricing thereby submitting an amended cost report (Visser, 2009).

2.9.23. Networking Skills

The ability to communicate fluently with many different people is a key requirement for a quantity surveyor. Quantity surveyors are expected to present information and their line of thinking confidently. Quantity surveyors communicate with clients, contractors and project consultants daily and so being able to network is extremely important (Shafie, Khuzzan and Mohyin, 2014).

2.9.24. Political Skills

According to the executive director of the Association of South African Quantity Surveyors (ASAQS), quantity surveyors are best placed to stop corruption in government projects. For this to be true, the government and taxpayers need to understand the role of a professional quantity surveyor. The quantity surveyor is the person who identify deviations from the original scope and price which makes them able to keep an eye on the price of the project. However, for the quantity surveyor to make the greatest impact, they need to be involved in the planning and feasibility stages in addition to the actual construction phase (Heever, 2017).

2.9.25. Construction Technology Knowledge

The quantity surveyor's role is not only to calculate costs but also includes the financial viability of the project. To calculate the profit and risk in respect of the project, the quantity surveyor needs to be aware of the developments and progress made on the construction site which means that the quantity surveyor is required to have a good understanding of construction technology and understand how construction takes place (Visser, 2009).

2.9.26. Life Cycle Costing

The quantity surveyor is responsible to provide the client with the total cost and spend profile for the building on the likely total cost of the building over its life span. The current capital cost

options will therefore be reviewed in an attempt to reduce the life cycle cost of the building. Life cycle costing typically included a review of the finishes, mechanical, electrical as well as the fabric of the building (RICS, 2018).

2.9.27. Industry Knowledge

Quantity surveyors need to ensure they understand construction and the principles involved thereof. Quantity surveyors liaise with architects, consulting engineers and contractors to safeguard the interest of the client. Due to quantity surveyors being the financial consultants of the construction industry, they require a vast knowledge of construction (ASAQS, 2018).

2.9.28. Feasibility Studies

Many projects are expensive investments and therefore a proper investigation of costs that will be incurred should be considered by the investor and/or client. It is therefore advised that the investor and/or client seek the services of a quantity surveyor who will be able to do a feasibility study of the project. A feasibility study will set out what the investor and/or client will need to pay for the project as well as the anticipated return. This will give the investor and/or client a better understanding of whether the project will be feasible in the long run (Visser, 2009).

2.9.29. Design Economics

Quantity surveyors can not only provide financial advice at the design stage that considers capital costs, risks and value but factors that promote sustainability and impact on the building's lifecycle costs. The quantity surveyor can effectively provide realistic costs on alternative designs and construction methods (Koigi, 2017).

After consultation with previous literature reviews, journal papers and articles and based on the occurrence and importance of possible strengths in each literature review, journal paper and article, twenty nine strengths in the profession were found to be significant as can be seen in figure 2.1 below.



Figure 2.1: Strengths of the Quantity Surveying Profession

2.10. Weaknesses of the quantity surveying profession

The following are possible weaknesses that, if possessed by the quantity surveying firm, has the ability to hinder the firm.

2.10.1. Inability to Change

The construction industry is generally conservative in nature however the quantity surveying profession is more conservative in terms of information technology utilisation. The directors and senior management of many firms' lack motivation to embark on the information technology path due to short-term profits. Directors and senior management who are nearing retirement are often not prepared to take the plunge into information technology development

that would have longer term benefits either because they do not understand how it works or they don't see a need for it. Many quantity surveying firms focus on the traditional technical role of the quantity surveyor and are therefore not prepared to or capable enough to raise their services. The inability of quantity surveying firms to change and re-engineer their services to take advantage of the technological advances could drag the profession down. Quantity surveying firms should invest in the necessary technology. When the firm considers the potential productivity improvements, the cost of investment in technology may not be negligible but may not be a cost at all in the long-term due to the increased profitability of the firm's operation (Smith, 2002).

2.10.2. The lack of suitably skilled and experienced quantity surveyors

Better jobs and salaries overseas are one of the main reasons for the accelerated outflow. Most of the recently qualified BEE quantity surveyors prefer job-hopping and use job offers and letters of appointment to negotiate better salaries. Firms could decrease their backlogs by appointing the most competent candidates. Several factors cause the deficit of quantity surveyors however loss of competencies is one of the most common cause (Venter, 2009).

The reluctance of many people to delegate pose challenges for skills transfer and mentorship. The retirement of these professional people will leave an alarming skill vacuum to fill (Venter, 2009). One of the biggest challenges for qualified and experienced quantity surveyors working in industry is the lack of exposure and experience for young professionals who want to enter the industry as well as for those who have had a few years of experience (Moodley, 2012).

The persistent promotion and monitoring of a firm alliance between tertiary institutions and the built environment is needed almost immediately to attack the lack of skills. Practical, theoretically substantive and relevant programmes to assist and provide support through the provision of opportunities for structured training. Job shadowing, vacation work opportunities and internships are extremely important for skills development and should be offered to young employees to gain exposure (Moodley, 2012).

2.10.3. Lack of marketing of the quantity surveying profession

The quantity surveying profession is fairly unknown to the public. Many people in the building industry also only have a vague idea of what a quantity surveyor actually is. The function and the necessity of quantity surveyors in the industry should be marketed to professional people such as architects and engineers. The field as a study choice should be aggressively marketed to schools and at career events (Venter, 2009).

A potential student would probably not decide to become a quantity surveyor as they are unaware of the profession. Therefore marketing of the field as a study option and the requirements should be done early at high school so as to allow prospective students to choose the requisite subjects and be prepared. Exposure of the profession along with available bursaries can focus the attention on prospective students (Venter, 2009).

2.10.4. Lack of competencies in the quantity surveying profession

Competencies in any sphere of work can be a difficult concept. Professional occupations are particularly difficult when it relates to professional occupations as roles can be complex. It is therefore important that quantity surveyors possess the required competencies in order to succeed (Said, Shafiel and Omran, 2010).

2.10.5. Inability to adopt Building Information Modelling (BIM) in the profession

The only way to ensure survival as a quantity surveying firm is to actively educate, train and adopt BIM as traditional means of working and providing services will soon become redundant. Quantity surveying firms therefore need to scan their business landscape to adapt to imminent changes to professional practice to remain relevant, globally competitive and successful (Crowley, 2013).

2.10.6. Lack of training experience

Quantity surveying firms should diversify and specialise to gain competitive advantage. Employers should produce enough training experience to their quantity surveyors to ensure

professional knowledge in the core competencies is achieved and continue to help them develop these skills. Enough “on-the-job” training should be in place for inexperienced employees. This will ensure the firm has and maintains a competitive edge (Smith, 2002).

2.10.7. Inaccuracies in cost estimates

To mitigate the risk of cost overruns and unreliable estimates, contingencies are often added to the budget to cope with uncertainties that may occur during construction. Cost estimates is impacted by many factors including the time between the estimate and construction, changes in design, changes in market conditions as well as quality issues. Quantity surveyors often cite lack of time in the construction period, inadequate record of documentation and poor forms of communication as the primary effects of inaccuracies in cost estimates (Moodley, 2012).

2.10.8. Few candidates become professional quantity surveyors

For a candidate quantity surveyor to advance in the profession, it is essential to become a professional quantity surveyor. Professional quantity surveyors sign off documents, lead their own project and take responsibility or work independently. It doesn't really matter about how many years of practical experience but what matters is the title. The problem with quantity surveyors in South Africa is that few candidate quantity surveyors become professional quantity surveyors and therefore they do not grow in the career (van der Westhuizen, 2018).

2.10.9. Overqualified with lack of experience

Many quantity surveyors are overqualified with little or no work experience. This is a weakness for the following reasons: -

- Employers cannot pay the quantity surveyor what the title holds due to the quantity surveyor not knowing what to do practically in the job position,
- The quantity surveyors do not know exactly what the job requires of them,
- The quantity surveyor may not be too happy working for a manager who has a lower qualification than them (Green, 2013).

2.10.10. Lack of IT/Computing Skills

Compared to most other industries, the rate of adoption of information technology and computing skills has been slow in the construction industry. There are many reasons as to why this is so. The main reason is probably due to the extremely fragmented nature of the construction industry. Many firms believe that the cost and time needed to learn new technologies and software are too excessive. However, firms need to realise that the sacrifice of time and cost will most likely result in increased business opportunities (Smith, 2001).

2.10.11. Poor Attitude towards Continuous Professional Development

Continuous Professional Development in the quantity surveying profession intends to ensure professional competence amongst registered professional's past training along and throughout their career. In South Africa, not all professional quantity surveyors submit their CPD details on time. This, in turn, creates the possibility of being de-registered and therefore not being allowed to function as a registered professional quantity surveyor (Olwagen, Cumberlege and Moss, 2015).

2.10.12. Lack of Awareness of Quantity Surveying as a Profession

The quantity surveying profession has been in existence for a long time however there is generally low awareness of the profession. Like architecture, law, engineering, accounting and medicine, quantity surveying has immense prospects for school students looking to attend university. However, there is not only a lack of awareness of the profession amongst school children and parents but also to the public. Greater awareness of the profession is long overdue (Olatunde and Okorie, 2016).

2.10.13. Decline in Measuring Skills

Measurement is a process concerning the converting of drawings into words and numbers in accordance with a set of strict rules. The quantities are compiled into a bill of quantities that is used to establish the estimate for construction cost of the construction work. Decline in measuring skills will cause quantities to be inaccurate thereby affecting the project cost (Nani and Adjei-Kumi, 2007).

2.10.14. Little Attention to Lifelong Learning

Lifelong learning is the acquiring of new skills throughout the life of an employee. More quantity surveyors need to start embracing lifelong learning as it will enable them to continuously support construction throughout their life time through both learning and re-training programmes. Further, the changing and increasing skills required by the profession demands a lifelong learning technique for quantity surveyors to survive in the competitive labour market (Thayaparan, Siriwardena, Amaratunga, Malalgoda and Keraminiyage, 2011).

2.10.15. Low Levels of Innovation

A major growth driver in the productivity of any firm is innovation. Some professional services offered by quantity surveying firms are not necessarily needed by the client, or may be outdated. Therefore, it is important that quantity surveying firms build up the stamina to not only challenge existing unnecessary or unwanted practices and implement new innovative practices (Owusu-Manu, Torku, Pam, Addy and Edwards, 2017).

After consultation with previous literature reviews, journal papers and articles and based on the occurrence and importance of possible weaknesses in each literature review, journal paper and article, fifteen weaknesses in the profession were found to be significant as can be seen in figure 2.2 below.

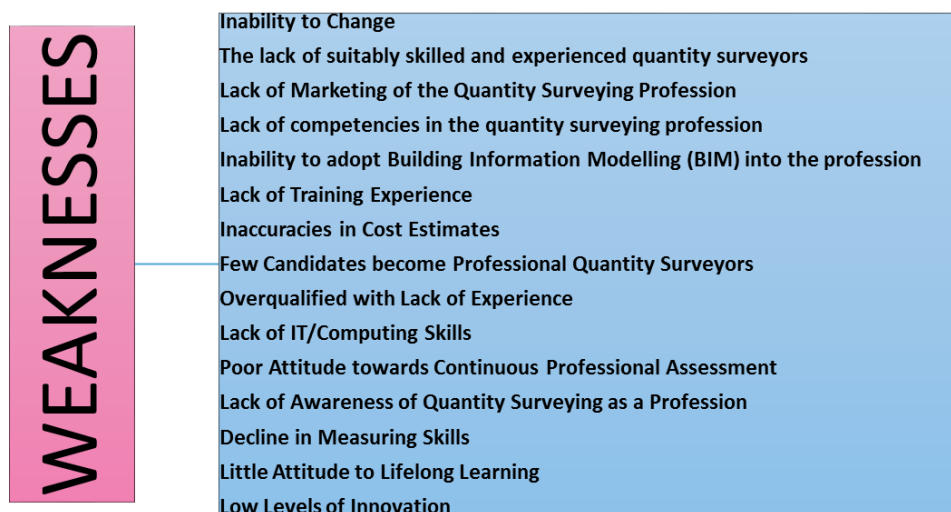


Figure 2.2: Weaknesses of the Quantity Surveying Profession

2.11. Opportunities for the quantity surveying profession

2.11.1. Demand for quantity surveyors

There is a huge demand for quantity surveyors all around the world. There is a severe shortage of and a great demand for quantity surveyors in the industry. If the shortage is not addressed, the construction industry could be negatively affected. South Africa has battled with a shortage of quantity surveyors over the years as are other regions worldwide such as the United Kingdom, Australia and New Zealand (Kihn, 2013).

2.11.2. Efficiency increases brought about by technological advances

Technology is central to the future roles of a quantity surveyor. What once took the firm months to complete can now be done in minutes. Therefore, the quantity surveying profession must evolve with technology to keep up (Seah, 2017). Technological investments as well as automation in technology completely changed the way data is produced and stored. Technological improvements have assisted to increase business, efficiency and productivity leading to increased profitability (Davenport, 2017).

Technology can be used to work remotely. Due to technology, employees can now work almost anywhere in the world. A lot of employees have laptops that doesn't limit work at their desk. People can thus be more efficient and cut down the amount of company time that is not being used productively. Collaboration has also been increased with technology. People from all over the world can now successfully collaborate on projects. With more minds working together on a specific project, everyone can offer their own expertise. The amount of collaboration across industries can therefore allow companies to arrive at the best conclusion quickly and effectively thereby boosting efficiency and productivity. Technology increases accuracy therefore companies can move forward with decisions faster, securing in knowledge and performed correctly (Davenport, 2017).

2.11.3. Building Information Modelling (BIM)

Building Information Modelling (BIM) may offer a solution to deficiencies in the construction industry by tackling widespread and internationally recognised woes through optimising

building design information exchange efficiency and accuracy with a view to creating great delivery of construction projects (Moodley, 2012).

Basic skills of a quantity surveyor include construction expertise, information exchange facilitator, analysis and clarification of the designer concepts; fundamentally quantity surveyors collect all information regarding design into the cost and contract documentation. By adopting and using BIM, these basic skills can interpret into improved skills thereby providing enhanced skills to clients. Quantity surveyors can gain a significant amount of time by using BIM for the quantification and calculation thereby gaining additional time to carry out new and enhanced quantity surveyor's services such as life cycle and carbon costing (Crowley, 2013).

The precise and assessable nature of BIM provides a more dependable source to provide quantity take-off and estimating provides faster cost feedback on design changes (Moodley, 2012).

With the BIM software, quantity surveyors can extract useful information for take-off at any stage of the project. Manual take-off is therefore no longer required and the generation of schedules and cost estimates can be produced more efficiently with the potential for human error being reduced. BIM allows the quantity surveying profession to carry out tasks with more accuracy and less time. Usually, information is manually extracted from paper drawings or computer aided drawings for estimates and the bill to be produced. Costs and prices can be fully united into the model itself with BIM. This allows quantity surveyors to extract prices and generate cost documents directly from the BIM model (Moodley, 2012).

2.11.4. Ability to perform multiple services

Quantity surveyors are now keeping their traditional roles while moving on and adopting the roles of cost engineers. Clients now expect more flexibility and broader professional advice. Quantity surveyors can therefore now provide estimate costs of preliminary designs without drawings by using their experiences, rules of thumbs and data sheets and also offer advice on issues like procurement management and engineering, cost advice, design reviews and facilitation based on risk. The extensive knowledge of a quantity surveyor to understand

construction technology and basic engineering principles along with contract law allows them to fit the role of a cost engineer as well (Seah, 2017).

Quantity surveyors can now produce a lot more actions. Contracting arrangement, construction management, valuations, advice on grants, funding, capital allowances and taxation are all now provided by the quantity surveyor. Quantity surveyors acts as a business advisor, property advisor, sole trader and management consultancy. Quantity surveyors can also assist the government by assisting in making policy decisions affecting land, property and construction. Quantity surveyors usually acts as arbitrators to resolve disputes (Ambak, 2014).

2.11.5. Quantity Surveying Firms- An asset to Public-Private Partnership

Quantity surveyors as professionals within the built environment has the potential of modifying and managing the process in which Public-Private Partnership (PPP) projects are being managed for economic growth. In PPP projects, quantity surveyors offer economic advice and procurement management as well as cost advice on the likely cost of the project. Quantity surveyors also provide services in the areas of risk management, procurement and life cycle costing. The roles of the quantity surveyor in PPP projects when involved as a private sector partner include:

- Advice on procurement;
- General cost advice;
- Review bids and submission;
- Advise on life cycle costs; and
- Specialist services (Mudi, 2016).

Similarly, when a quantity surveyor is involved in public sector partnership, the quantity surveyor provides:

- Procurement advice;
- Advice on facilities management;

- Risk issues; and
- Monitoring construction to ensure compliance (Mudi, 2016).

With their practical background, commercial sense, legal knowledge and cost understanding, quantity surveyors can offer a great deal to PPP delivery by providing accurate and timely cost advice throughout the duration of the PPP concession project (Mudi, 2016).

Some of the tender evaluation methods that are usually implemented in PPP projects by quantity surveyors include the net present value method, the simple scoring method, the multi-attribute analysis and the two-envelope method. The quantity surveyor plays an active role in achieving critical success factors for PPP projects. Some of the factors include competitive financial proposal, extensive feasibility study, effective procurement, cost estimation, preliminary qualification evaluation and tendering phase, partner's selection criteria and a financial package (Mudi, 2016).

2.11.6. Market for facilities management services

Facilities management is considered as an alternative for quantity surveyors as many buildings that have been built now requires maintenance management. Quantity surveyors need to improve their competencies and their knowledge bases to fulfil the requirements of facilities management. The quantity surveying and facilities management profession therefore have a lot of similarities in terms of competencies that includes contractual, financial and procurement management (Salleh, *et. al.*, 2014).

2.11.7. Market for quantity surveyors in civil infrastructure and engineering projects

The cost of infrastructure and engineering projects are different than that of building projects and so the importance of quantity surveyors is much more important. In terms of potential problems that may be encountered during construction, civil engineering and infrastructure projects are more unpredictable. The following are the characteristics which make a quantity surveyor's role important in engineering projects:

- There are often more vulnerable to unpredictable forces due to the often-large area footprint which has varying landscape characteristics.
- A more flexible approach and an increase in contingency allowances for unexpected costs.
- Requires a high level of initial investment by the contractor.
- Requires a high level of technical management expertise.
- Projects often require intensive operations which claims to be costly (Cole, 2013).

2.11.8. Sector Specific Work Experience

In trying to secure a job, work experience is extremely helpful. Dedication and enthusiasm for the field along with working knowledge are what employers look for. Clients can be rest assured that their project is in the right hands and will be able to be done within the objectives of the project (Stanley, 2016).

2.11.9. Proficiency and Information Technology

Information technology develops at an exponential rate. Almost everyone involved in the construction industry has got extensive access to information technology. A qualified quantity surveyor should be computer literate and familiar with the common uses and applications of computers and computer software. Good information technology and numeracy skills coupled with the ability to analyse complicated documents are important facets of being a quantity surveyor. Information technology is therefore important for the success of quantity surveying firms. If building information modelling (BIM) is implemented in quantity surveying firms, quantity surveyors will be able to do their work more accurately and efficiently (Olanipekun, Abiola-Falemu and Aje, 2014).

2.11.10. New Roles for Quantity Surveyors in Alternate Procurement Methods

There are various procurement methods that exist in the construction industry. This reflects the extent to which the client may be willing and able to bear certain levels of risk. Some of the procurement methods are build, develop and operate; novation; management contracting; cost plus contract; build, lease, operate and transfer; joint venture; build, own and operate; build,

own and transfer; turnkey; unit price contract; construction management; prime contracting; fees contracting; traditional design, bid and construct; cost reimbursement; private finance initiative; project management; lump sum contract and design and build (Olanrewaju, Anavhe, Aziz, Chen and Han, 2016).

2.10.16. Market for Core Quantity Surveying Services

The role of a quantity surveyor is often underestimated. There are numerous benefits that quantity surveying provides throughout the project. There is high demand for quantity surveying core services such as planning, estimating and monitoring costs. Quantity surveyors are often considered the economists of the construction industry as they are central to the decision-making process throughout the project’s life cycle. In the high-pressure world of escalating costs and large-scale developments, the role of a quantity surveyor is more important than ever before (Venter, 2009).

After consultation with previous literature reviews, journal papers and articles and based on the occurrence and importance of possible opportunities in each literature review, journal paper and article, eleven opportunities in the profession were found to be significant as can be seen in figure 2.3 below.

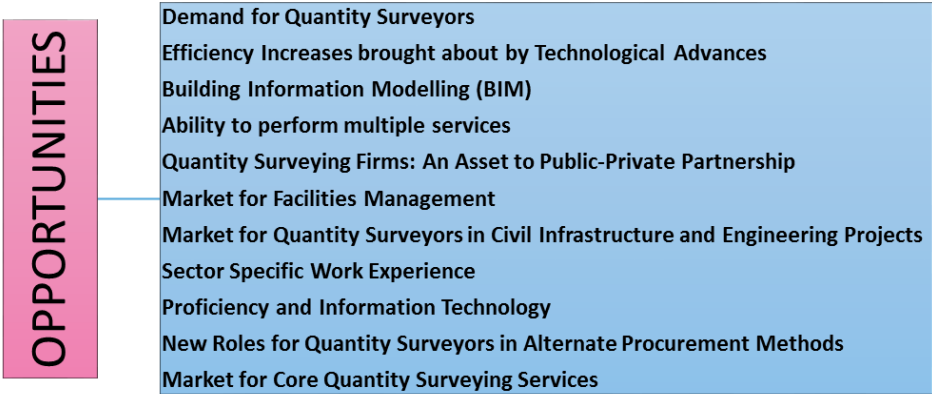


Figure 2.3: Opportunities of the Quantity Surveying Profession

2.12. Threats to the quantity surveying profession

2.12.1. Lack of Knowledge Management

Utilising knowledge management in quantity surveying firms is great however it does not guarantee success. There are probable complications in the quantity surveying profession that are related to knowledge management such as the reluctance to change the current operating system, the confusion and difficulty to evaluate knowledge management and the reluctance of employees to share their knowledge (Abdul-Rahman, *et. al.*, 2011).

2.12.2. Competition amongst quantity surveying firms

The construction industry faces many changes in the workload, work mix and the way in which those changes are managed. Quantity surveying firms are therefore moving closer to clients who are becoming more sophisticated and are now the driving force for improvements in the services offered. This has led to competition amongst quantity surveying firms. Competition stimulates invention, efficiency and development however strategic planning to a great extent, is helpful in suggesting the suitable direction of the firm's objective in the long run affecting the analysis of competition (Hassan, *et. al.*, 2007).

2.12.3. Changes in technology

Advances in both the rapid evolution of graphical user interfaces along with personal computer technology, communications and networking over the last decade have had considerable impact on the industry's performance. New technologies and forms of innovative quantity surveying services such as building information modelling, the preparation of the bills of quantities, estimates and feasibility studies has had major threats to the industry as these technologies may one day make the quantity surveyor redundant (Hassan, *et. al.*, 2007).

2.12.4. Changes in clients' demand

Clients' demands changes over time. The quantity surveyor's only duty was to prepare the bill of quantities. Now, quantity surveyors are needed to do feasibility and viability studies, facility management, risk management etc. The change in the clients' demand can see quantity surveyors who are not prepared to embrace the change, fail. Emphasis is now placed on speed,

accuracy and value-based services from quantity surveyors as clients are becoming more involved in the building processes (Hassan, *et. al.*, 2007).

2.12.5. Fee Cutting

Bidding and fee cutting amongst firms is a major threat facing the industry. During the recession, firms became frantic for work and were therefore prepared to reduce their fees to often unworkable levels. This was not only in the quantity surveying profession but across the consultancy practices. The hangover from this period remains as clients became used to paying lower fees for services. The design profession was predominantly affected causing a decline in the quality of documentation that quantity surveying firms had to use to deliver their services (Smith, 2002).

2.12.6. The use of Computer Aided Design (CAD)

The progress of computer aided design (CAD) to automatically produce quantities is a major threat to firms especially in terms of the technical role of a quantity surveyor. However, it is important to note that the greatest threat is not embracing CAD and CAD measurement therefore evolving with and being integrally involved in the development of CAD and not the actual CAD software. By clinging to the traditional method of measuring on paper, firms are putting themselves in a disadvantage. Quantity surveying firms need to use and gain expertise in using CAD sooner rather than later. In time, professionals will need CAD capabilities and expertise just to be a participant. Instead of being a threat, automated quantities through CAD can provide many opportunities for the profession. Quantity surveyors can now have a lot more time to focus on other duties which will add to their value-added services (Smith, 2002).

2.12.7. Other Professions performing Quantity Surveying Services

There are many other professionals carrying out some of the duties of quantity surveyors such as project cost managers with many other professionals with the potential to do so. The main threats to quantity surveying firms are project management firms as well as large accountancy firms. Some large companies also offer “one-stop shop” approach as well as more “in-house” services are threats to quantity surveying firms. Strategic alliances should be formed with other

professionals in the industry. Alliances with such firms could enable the firm to add value and develop niches in the marketplace (Smith, 2002).

2.12.8. The global financial crisis (GFC)

The global financial crisis (GFC) had had major effects on the international construction market and in the quantity surveyors operating within it. There are many threats that exist because of the GFC (Frei, 2010).

a) Internationalisation

Local organisations are divesting themselves from their partners and re-evaluating themselves in international ties. However, quantity surveying firms should rethink internationalisation. As the organisations consider alternative locations, the relative cost differences in the new geographical regions should be considered. Seeking out local partners that are allied to a firm can assist by deflecting competition from multinational firms while the local partner benefits from international knowledge sharing (Frei, 2010).

b) Human Resources

Quantity surveyors are more susceptible to the effects of the crisis than their professional counterparts. Quantity surveying firms may operate with lower margins or may have higher sensitivity toward the economic forces. The response from firms has been to reduce exposure by downsizing the workforce (Frei, 2010)

c) Dispute resolution services

The rise in insolvency and the tightening of credit led to an increase in disputes amongst contracting parties. Contractors are increasingly looking for recovery payments, claims of variations, latent conditions and delay costs from principals with limited cash (Frei, 2010).

2.12.9. Shortfalls in the quantity surveying qualifications offered at tertiary institutions

Currently, there are 13 tertiary institutions that offer quantity surveying degrees and/or diplomas: 7 being universities and 6 universities of technology as depicted in Table 2.1.

The number of quantity surveying graduates from South Africa needs to quadruple in number to ensure enough pool to draw from. Tertiary institutions offering quantity surveying are negatively impacted by the current economic conditions. Students who enter such programs often lack preparedness and university resources in the form of staff and infrastructure. The ability of tertiary institutions to attract young academics, train them and keep them in the long run is almost impossible (Venter, 2009). To ensure only high-quality students, who earned a significant number of entrance points during matric, are entering quantity surveying programmes, applicants to tertiary institutions should be screened (Moodley, 2012).

Employers have a major role to play by offering experiential training to students as there is a need and high demand for quantity surveying skills (Venter, 2009).

2.12.10. Lack of Suitably Skilled and Experienced Quantity Surveyors

Past president of the Association of South African Quantity Surveyors (ASAQS), Qinisani Mbatha suggests that the public sector fails to attract qualified and mature minded people and therefore settles for less-qualified individuals. The bigger issue according to Mbatha is the lack of properly qualified and experienced quantity surveyors that are currently working in the industry together with the lack of exposure and experience of the young professionals who are entering the profession (Moodley, 2012).

2.10.17. The Ageing Workforce and the Undersupply of New Entrants

The worry in the South African quantity surveying profession is the lack of production of quantity surveyors. The construction workforce is ageing and there is a loss of interest amongst young people thereby leading to an increase in the proportion of older construction workers. Older workers are thereby valuable source of experience and skills however they are exposed to a wide range of hazards that leads to possible injuries (Eppenberger and Haupt, 2009).

2.10.18. The profession's "lack of voice" due to relatively small number of practitioners compared to other professional groups.

When the construction industry of South Africa experiences a high level of economic growth which is causing a shortage of registered quantity surveyors. The shortage is mainly due to the lack of voice of the profession. The general public do not necessarily know what a quantity surveyor is or the role of a quantity surveyor in the industry (Loader, 2006).

2.10.19. Lack of Formal Registration and Chartered Status

In 2015, there were approximately 1600 candidate quantity surveyors on the official South African Council for the Quantity Surveying Profession (SACQSP) with approximately 600 new applicants submitted each year. However, less than half of these new applications translate into professional quantity surveyors due to inadequate education or lack of employment within the profession (Lyons, 2015).

2.10.20. Lack of Marketing of the Quantity Surveying Profession

The quantity surveying profession is a profession that is not predominantly known or popular amongst the youth on the verge of choosing their career paths. This is due to the reason that quantity surveying is not marketed as well as other professions. This thereby poses an issue when considering the future development and growth of the profession. There may be many potential quantity surveyors that were lost due to the lack of marketing of the profession (Ramodike, 2016).

2.10.21. The perception that quantity surveyors are non-critical to project success

Larry Feinberg, executive director of the voluntary quantity surveying organisation, Association of South African Quantity Surveyors, stated that it is time the South African government and construction stakeholders recognise the value and importance of employing reputable quantity surveyors as they can alleviate corruption and inflated construction costs. Quantity surveyors are often not appointed due to the cost of appointment. However, the without the expertise that a quantity surveyor will bring to any project could result in the project eventually costing a lot more than anticipated (James, 2016).

After consultation with previous literature reviews, journal papers and articles and based on the occurrence and importance of possible threats in each literature review, journal paper and article, fifteen opportunities in the profession were found to be significant as can be seen in figure 2.4 below.



Figure 2.4: Threats of the Quantity Surveying Profession

2.13. Development of the strategic framework

The strategic framework is a systematic approach that identifies the nature of the strategic health of the profession and identifies areas for development.

Thus, based on the review of the literature on the strengths, weaknesses, opportunities and threats, a strategic framework was proposed in Figure 2.1. The strategic framework indicates the SWOT analysis of the profession. There are twenty-nine items under strengths, fifteen items under weaknesses, eleven items under opportunities and fifteen items under threats.

SWOT ANALYSIS OF THE QUANTITY SURVEYING PROFESSION

STRENGTHS

- Trust
- Leadership
- Creative Problem Solving
- Negotiation Skills
- Communication Skills
- Knowledge Management
- Strategic Planning
- Accuracy
- Ensuring a suitable organisational structure
- Team working/Interpersonal Skills
- Self Confidence/Can-do Attitude
- Data Management/Record Keeping
- Client Relationship Management
- Dispute Resolution
- Management/Conflict Management
- Attention to Detail
- Measurement/Quantification
- Cost Accounting and Financial Management
- Construction Law and Contract Management
- Problem Solving
- Cash Flow Forecasting and Budgeting
- Value Management/Construction Economics
- Estimating and Pricing
- Networking Skills
- Political Skills
- Construction Technology Knowledge
- Life Cycle Costing
- Industry Knowledge
- Feasibility Studies
- Design Economics

WEAKNESSES

- Inability to Change
- The lack of suitably skilled and experienced quantity surveyors
- Lack of Marketing of the Quantity Surveying Profession
- Lack of competencies in the quantity surveying profession
- Inability to adopt Building Information Modelling (BIM) into the profession
- Lack of Training Experience
- Inaccuracies in Cost Estimates
- Few Candidates become Professional Quantity Surveyors
- Overqualified with Lack of Experience
- Lack of IT/Computing Skills
- Poor Attitude towards Continuous Professional Assessment
- Lack of Awareness of Quantity Surveying as a Profession
- Decline in Measuring Skills
- Little Attitude to Lifelong Learning
- Low Levels of Innovation

OPPORTUNITIES

- Demand for Quantity Surveyors
- Efficiency Increases brought about by Technological Advances
- Building Information Modelling (BIM)
- Ability to perform multiple services
- Quantity Surveying Firms: An Asset to Public-Private Partnership
- Market for Facilities Management
- Market for Quantity Surveyors in Civil Infrastructure and Engineering Projects
- Sector Specific Work Experience
- Proficiency and Information Technology
- New Roles for Quantity Surveyors in Alternate Procurement Methods
- Market for Core Quantity Surveying Services

THREATS

- Lack of Knowledge Management
- Competition amongst Quantity Surveying Firms
- Changes in Technology
- Changes in Clients' Demands
- Fee Cutting
- The use of Computer Aided Design (CAD)
- Other Professions performing Quantity Surveying Services
- The Global Financial Crises (GFC)
- Shortfalls in the Quantity Surveying Qualifications offered at Tertiary Institutions
- Lack of Suitably Skilled and Experienced Quantity Surveyors
- The Ageing Workforce and the Undersupply of New Entrants
- The profession's "lack of voice" due to relatively small number of practitioners compared to other professional groups
- Lack of formal registration and chartered status
- Lack of marketing of the quantity surveying profession
- The perception that quantity surveyors are non critical to project success.

Figure 2.5: Strategic Framework of the Quantity Surveying Profession

2.11. Chapter Summary

This chapter reviewed quantity surveying as a profession as well as the duties of a quantity surveyor, the personal attributes of a quantity surveyor, how one can become a quantity surveyor and the registration procedure. The researcher then emphasised the strengths, weaknesses, opportunities and threats of the quantity surveying profession.

Chapter three will focus on and describe the research methodology that was adopted for this study.

CHAPTER 3: RESEARCH METHODOLOGY

3.1. Introduction

The purpose of this chapter is to take a deeper look at the research methodology selected for this study. It defines the research method used to conduct the study in order to respond to the research objectives. This study includes research paradigms, research design, questionnaire survey, pilot study, the population and sampling frame along with the sampling method, sample size, reliability and validity. Reasons and justifications for the research design, research instruments, data collection methods and data analysis methods are provided.

3.2. What is Research?

Research is a set of skills together with a way of thinking, inspecting crucially one's professional work, understanding and creating concepts that oversee a specific method and inventing and testing new theories that contribute to one's professional career. Therefore, research is a process of collecting, inspecting and examining information to answer questions (Kumar, 2011). Research always begins with a problem or question. The purpose of research is therefore to find possible answers or solutions to questions or problems by the application of scientific and systematic approaches. Research is therefore the systematic method towards determined investigation. Therefore, hypotheses need to be formulated, data on the relevant variables needs to be collected, the results need to be analysed and interpreted and conclusions need to be reached. Research is considered as an academic activity and can be regarded as a systemised effort for the expansion of new knowledge (Bhattacharyya, 2006).

The objectives of research according to Bhattacharyya, 2006 are to:-

- attain knowledge of a phenomenon.
- determine the independence of an activity.
- determine the features of an individual or group of activities and the rate of its or their occurrence.

Daniel and Sam (2011) states that the main purpose of research is through scientific procedures to gain answers to questions. According to Leedy (2001) as cited by Taylor (2005), seven characteristics of research exist. Table 3.1 discusses the seven characteristics of research and how the researcher applied it to this study.

Table 3.1: Seven characteristics of research that exists (Leedy, 2001 as cited by Taylor, 2005)

Seven characteristics of research that exists according to Leedy (2001) as cited by Taylor (2005)	The way in which the researcher used the seven characteristics in this research.
1. Research starts with a question the researcher wants to answer.	The researcher developed the following research question: - Will undertaking a SWOT analysis of the quantity surveying profession determine the overall performance of the firm thereby identifying areas requiring improvement to enable the profession to achieve sustained growth?
2. Research requires a clear, unambiguous problem statement.	The researcher developed the following problem statement: - The quantity surveying profession require urgent and far-reaching strategic transformation that will overcome their threats and weaknesses and embrace the strengths and opportunities of the profession to ensure they survive and remain relevant in the ever-changing construction industry. By undertaking a SWOT analysis of the quantity surveying profession, the overall performance of the profession can be detected thereby identifying areas requiring improvement to enable the profession to achieve sustained growth by refining on those areas.
3. Research requires a sound and clear plan.	After doing the literature review and research methodology aspects of the research, the researcher conducted questionnaires to gain more knowledge about the topic. Conclusions were drawn from the analysis of the data.
4. Research solves the main problem through a series of smaller problems.	The main problem was solved with the following questions that answered the smaller problems: - 1. What are the key strengths and weaknesses of the quantity surveying profession based on professional consultants' experience in the profession? 2. What are the key opportunities and threats that are perceived to impact the quantity surveying profession?

	3. Can a strategic framework be used by the quantity surveying profession to plot their strengths and weaknesses against the identified opportunities and threats to reveal the survival of the profession?
5. Research is not only based on assumptions and beliefs but requires a sound hypothesis that directs the researcher.	By developing and applying a strategic framework that could be used by the quantity surveying profession to plot their strengths and weaknesses against the identified opportunities and threats, the profession's strategic health can be revealed thereby providing a trail for improvement.
6. Research is involved with facts and definitions and meanings behind those facts.	Strategic management is crucial to survival and competitiveness. A strategic framework proposes firms the instrument to map a strategic path from where they are presently situated toward the desired future state, taking into consideration the firms' strengths and weaknesses in their internal environment as well as the threats and opportunities that exist in the external environment.
7. Research is circular in nature.	The researcher constructed a literature review and a model, gained information about the topic and conducted questionnaires. The responses of the questionnaires were then compared with the literature review and model to determine the results of the study.

3.3. Research Paradigms

A research paradigm is a perception about research that is set and held by a community of researchers. It is based on assumptions, beliefs, concepts, values and practices. A research paradigm is an approach to thinking about and conducting research (Johnson and Christensen, 2012).

There are different types of paradigms such as positivism, the pragmatic approach, transformative, the constructivist approach and interpretivism which are briefly discussed below.

3.3.1 The Positivist Worldview

Positivism is characterised as the knowledge generated from affirmation, modification and contradiction of concurrent comprehension. The ontology of a positivist is a stable or organised reality. Positivism is the objective tracking of understanding based on theory. The epistemology of this approach is knowable objective truth (Ling, 2017).

The positivist assumptions holds true for quantitative research and is sometimes called the scientific method. Positivists hold a deterministic attitude which determines effects or outcomes. The problems studied by positivists therefore replicate the need to identify and assess the causes that influence outcomes. It is also reductionistic as the intent is to reduce the ideas into small, discrete set to test. The knowledge that grows is based on careful observation and measurement of the objective reality that exists in the world (Cresswell, 2014). According to Cresswell (2014), key assumptions of this worldview are the following:

- a) Knowledge is hypothetical which means the absolute truth can never be found. Therefore, evidence is established in research is always imperfect. This is the reason why reseachers do not state they could not prove the hypothesis but rather that the hypothesis has been rejected.
- b) Research is the procedure of making claims and then purifying or deserting some of them for other claims that are more strongly warranted.
- c) Data, evidence and rational considerations shape knowledge. Therefore, the researcher collects information on instruments based on measures completed by the participants.
- d) Research seeks to develop relevant, true statements that one can serve to explain a situation of concern.
- e) A vital part of competent inquiry is being objective. Therefore, researchers should examine methods and conclusions for bias.

3.3.2 The Pragmatic Worldview

Pragmatism arises out of actions, circumstances and consequences rather than antecedent conditions. With pragmatism, there is a concern with applications and solutions to problems.

Thus, there research problem is emphasised as well as all approaches that are available to assist with the problem (Creswell, 2014).

3.3.3 The Transformative Worldview

This worldview came about from individuals who felt that the positivists assumptions imposed structural laws and theories that did not fit marginalised individuals of the society. Transformative research provides a voice for participants by raising their consciousness (Creswell, 2014).

3.3.4 The Constructivist Worldview

The constructivist approach focuses on the studied occurrence more than the methods of studying the occurrence. This type of approach emphasizes on knowing and representing studied life (Ling, 2017).

3.3.5 Research paradigm chosen by the researcher

The positivist worldview was chosen for this study for the following reasons:

- The positivist worldview ensures that the theory can be generalised to a larger degree;
- Future predictions can be made;
- Quantitative data paves a way for further scientific research;
- The precision of the parsimony is useful when studying a large number of people and therefore saves time;
- Reliability is ensured as it maintains consistency, dependence and replicability in the data collection;
- It is free from personal prejudices.

3.4. Types of Research

There are three main types of research namely quantitative research, qualitative research and mixed method research. Pure quantitative data relies on the gathering of numerical data while pure qualitative data relies on the collection of non numerical data such as words or pictures. Mixed method research involves combining the quantitative and qualitative research methods (Johnson and Christensen, 2012).

3.4.1 Quantitative Research

Quantitative research was selected for this study. The quantitative research approach follows the confirmatory scientific method as it focuses on hypothesis and theory testing. Therefore, in quantitative research, it is important to state the hypotheses and then test the hypotheses using empirical data to see if the hypotheses are supported (Johnson and Christensen, 2012).

Quantitative research is an approach used for testing objective theories by examining the relationship among variables. With the use of statistical procedures, these variables can be measured on instruments and so that the numbered data can be analysed. In this case, the final written report has a set structure. Researchers who use this research method believe in testing theories deductively, building in protection against bias, monitoring for alternate clarifications and being able to generalise and duplicate the findings (Creswell, 2014).

The researcher selected quantitative analysis for this study because of the following advantages (Matveev, 2002): -

1. The problem statement can be stated in a clearly defined and precise manner.
2. Both the dependent and independent variables can be specified clearly and precisely.
3. One may arrive at more than one objective conclusions while following firmly the research goals and determining issues of causality.
4. Due to the high number of controlled observations, there are high levels of reliability gathered by the data.
5. The subjectivity of judgement is eliminated or minimised.
6. Longitudinal measures are allowed for in research subjects.

The researcher was however aware of the following disadvantages: -

- Quantitative research fails to provide the background of the situation.
- Quantitative research cannot control the environment where the respondents provide answers to questions.
- Due to closed and structured questions, quantitative research allows for limited outcomes.
- Quantitative research does not encourage continuous investigations of the research phenomenon (Matveev, 2002).

3.5. Research Designs

Research designs are kinds of inquiry within the qualitative, quantitative and mixed methods research approaches. They provide a precise direction for procedures involved in a research process such as data collection, data analysis and report writing. (Creswell, 2014).

The researcher carried out questionnaires with quantity surveyors who are members of the Association of South African Quantity Surveyors (ASAQS).

3.6. Data Collection

Research cannot be accepted without data. Researchers look for data that will achieve their research objectives and answer their research questions. Data collecting methods often affect the superiority, extent, suitability and competence of data (Pawar, 2004). There are several data collection methods that exist (Pawar, 2004). In this study, a literature review and questionnaire schedule were used.

Data was collected from secondary sources such as literature reviews (Pawar, 2004). Books, journals, reports and the internet were used to obtain secondary data.

Quantitative data includes counts and measures (Gibbs, 2007). When data is to be collected by asking questions to people who may have the data desired, a questionnaire which is a

standardised form is prepared. The questionnaires comprised of a list of questions that needed to be answered with spaces provided in which the respondents recorded the answers. According to Bhattacharyya (2006), there are nine steps that must be thought about before the questionnaire is constructed. Table 3.3 depicts the nine steps and shows how the researcher followed each step.

Table 3.2: Nine steps to be followed when constructing a questionnaire schedule (Bhattacharyya, 2006)

Steps to be followed	The way in which the researcher used the steps to draw up the questionnaire
Decide on what information is wanted.	The researcher needed information on the strengths, weaknesses, opportunities and treats of the quantity surveying profession.
Decide on the type of questionnaire to use	The researcher opted for a structured questionnaire. This ensured all respondents answered the same questions.
Decide on the content of the individual questions.	Each question was well thought out as the researcher had to ensure that all the information desired were asked and no two questions included the same or similar content.
Decide on the type of question (open, multiple choice, dichotomous) to use.	The researcher chose open and closed ended questions. The closed ended questions ensured the researcher received the information desired while the open-ended questions gave the respondents freedom to be expressive in their thoughts.
Decide on the wording of the questions.	The wording of each question was well thought out by the researcher as it needed to be easy enough to be understood by the respondents.
Decide on the sequence of the questions.	The questionnaire started with background information as this let the researcher know about the type of respondents. Questions such as gender, age and job position. The strengths, weaknesses, opportunities and threats where then touched on in that order.
Decide on the lay out and method of reproduction of questionnaire.	The researcher broke down the questionnaire into 6 sections. The questionnaire started with section A which included background information whereas section B touched on the strengths, section C the weaknesses, section D the opportunities and section E the threats. Section F allowed the respondent to voice their opinion and allowed them to add what they felt was significant to this study. Sections B to E were mainly closed ended questions with one open ended question in each section while section F was open ended only. The questionnaire can be found in Appendix B.
Make a preliminary draft and pretest it through a pilot study.	Once the researcher had completed the questionnaire schedule, it was pretested in a pilot study so that changes were made before the final questionnaires are handed out.
Revise and prepare final questionnaire.	After the pilot study was conducted, the researcher took into account the feedback given by the participants of the pilot study and improved the final questionnaire by revising each question.

Open-ended questions allow a free-flowing answer whereas closed-ended questions can often be answered with “Yes” or “No” or there is a restricted set of possible answers such as A, B, C, D or E. Closed-ended questions are often good for surveys as it yields a higher response rate due to users not having to type much. Closed-ended questions can also be easily analysed statistically. Open ended questions allow the researcher to find out more than anticipated as people may share motivations that were not expected and mention behaviours and concerns that the researcher may know nothing about (Farrell, 2016).

The questionnaire was divided into six sections. The questions in section A related to the biographical information of the respondent and their experience related to quantity surveying, their gender, age, ethnicity and education qualification. Likewise, in the same section, questions related to quantity surveying and their experience were asked. The questions in section B related to the strengths faced by quantity surveying firms whereas section C focused on the weaknesses, section D the opportunities that quantity surveying firms could take advantage of and section E the treats faced by quantity surveying firms. Section F included a question that allowed the respondent to voice their opinion in terms of what they thought would be beneficial to this study. The questionnaire is attached in Appendix C.

The questionnaires were hosted on the Association of South African Quantity Surveyors (ASAQS) website and emailed to professionals who are members of the association using a cover letter.

3.7. Pilot study

A pilot study is a small study that is used to test research protocols, data collection as well as other research techniques in preparation for the larger study. A pilot study is one of the more important stages in a research project as it identifies potential problem areas prior to the implementation during the full study (Hassan, Schattner and Mazza, 2006). The researcher used 10% of the selected sample to conduct the pilot study which is considered applicable according to Hertzog (2008).

For this study, a random sampling method was chosen by the researcher by distributing the pilot study to 25 pilot subjects (10% of the study's sample size of 252). 25 questionnaires were returned which was adequate for the pilot study.

The feedback required by the participants were to reduce the number of treatment errors on the questionnaire. The subjects of the pilot study confirmed adequacy of the questionnaire as well as the language used. Therefore, there were no problems encountered during filling in the questionnaire. The time taken to complete the questionnaire was within the 10-minute time frame as highlighted in the invitation letter. The range of the responses received for each question was adequate and the replies deduces in terms of the information was essential. All questions were answered correctly and the questions need not be rephrased as the answers were expected.

3.8. Population and sample frame

The population is defined as the entire set of individuals to which the findings of the survey are to be inferred. The sampling frame is a "list" which is available from which the sample can be selected. A sampling frame does not necessarily have to include all the elements of the population (Levy and Lemeshow, 2008). The sampling frame should however be comprehensive, complete and up-to-date (Nirmala and Silvia, 2011).

The selected respondents were instructed by a cover letter which accompanied the questionnaire (See Appendix C) where their subjective opinions with regard to the, strengths, weaknesses, opportunities and threats to quantity surveying firms were recouped.

3.8.1 Sampling method

Sampling is used as a way of gathering important information about a certain population (Thomson, 1992 as cited by Lim and Ting, 2012). Any group that share a common set of characteristics are known as a population. The method of sampling uses a small number of items or parts of a population to strive to draw assumptions about the whole population (Lim

and Ting, 2012). The first task in carrying out a survey is to select a sample (Bhattacharyya, 2006).

Two types of sampling methods exist: probability and non-probability.

3.8.1.1 Probability Sampling Methods

There are different types of probability sampling namely:

- a) Random sampling which ensures that each and every sample of the population is included;
- b) Purposive sampling which allows the researcher to make deliberate choice in the selection of samples; and
- c) Stratified sampling which combines the features of random sampling and purposive sampling. The population is initially defined in different numbers of groups and from that group a certain number of items are taken on a random basis (Bhattacharyya, 2006).

3.8.1.2 Non-probability Sampling Methods

The major non-probability sampling methods are (Bhattacharyya, 2006): -

- a) Convenience sampling- This method relies heavily on the researcher who selects the sample.
- b) Judgement sampling- The judgement or opinion of experts in the field forms the basis of this sampling method.
- c) Quota sampling- This method sees the sampling frame divided into groups or sections and a certain agreed upon number is selected from each group or section.
- d) Snowball sampling- In this case, one case will identify others of the same nature (Banerjee and Chaudhury, 2010).

3.8.1.3 Sampling Method of this Study

A probability sampling method was chosen for this study. The desired method that was used was the random sampling method. This infers that all members registered with the ASAQS were included in this sample.

3.8.2 Sample Size

It is important for researchers to consider sample size when planning a study. By accurately calculating the required sample size, researchers can be assured that both a clinically and statistically noteworthy result. Resources will also be used efficiently (Burmeister and Atiken, 2012). In order to determine an appropriate sample size, three criteria needs to be specified namely the level of accuracy, the level of assurance or risk as well as the degree of unpredictability (Israel, 2003).

The level of precision is often called the sampling error and it is the variety in which the true value of the population is estimated to. The range is expressed in percentage points. For example if the level of precision is ± 5 percent and the researcher finds that 50% of respondents in the sample have adopted a recommended practice then it can be concluded that between 45% and 55% of the respondents have adopted a recommended practice (Israel, 2003).

The confidence level or level of risk is based on the Central Limit Theorem. This theorem suggests that when a population is repeatedly sampled, the average value of the characteristic obtained by those samples equals to the true population value. The figures obtained from these samples is also distributed normally about the true value with some having values higher or lower than the true population value. Approximately 95% of the sample values are within two standard deviations of the mean in a normal distribution. So for example, if the confidence level is 95%, it means that 95 out of 100 samples will have a true population sample (Israel, 2003).

The degree of variability refers to the distribution of attributes in the population. A more heterogeneous population requires a larger sample size to obtain a level of precision whereas the more homogeneous the population, the smaller the sample size needs to be (Israel, 2003).

A simple formula for calculating sample sized as described by Israel (2003) was used: -

$$n = \frac{N}{1 + N(e)^2}$$

$$n = \frac{679}{1 + 679(0.05)^2}$$

$n = 251.71$ therefore 252

Where: n = sample size, N = population size (Firms) and e = level of precision.

From the estimated population of 2018 from the Association of South African Quantity Surveyors (ASAQS), with a ±5% Precision Level (e = ±5%), the Confidence Level is 95%, the calculated sample size for this study is approximately 252.

3.8.3 Sample selection

A total of 252 respondents were randomly sampled the from Association of South African Quantity Surveyors website.

Table 3.3: ASAQS Members (ASAQS, 2017)

Provinces	ASAQS Members	Percentage of Members
KwaZulu-Natal	112	16.5%
Gauteng	242	35.6%
Western Cape	126	18.6%
Eastern Cape	72	10.6%
Limpopo	32	4.7%
Mpumalanga	26	3.8%
North West	18	2.7%
Northern Cape	11	1.6%
Free State	40	5.9%
Total	679	100%

3.8.4 Process of Data Collection

After determining the sample size of the study (252), the process of data collection took approximately three months starting in the beginning of May 2018 to August 2018. The questionnaire was uploaded on the Association of South African Quantity Surveyors (ASAQS) website for the members to answer. The respondents were to complete the questionnaires at their own time for them to respond to the questions appropriately.

A total of 58 responses which were all usable (23.02%), were received specifically from members of the Association of South African Quantity Surveyors (ASAQS). Central Limit theorem supported the response rate and will be further discussed in Chapter 4.

3.8.5 Quantitative Data Analysis

Quantitative studies present data that is quantifiable and easy to interpret.. Quantitative studies ensure that personal bias does not impact the data. The data gained through quantitative studies could be analysed in several ways (Muhamad, 2017).

To analyse quantitative data, the levels or scales of measurement should be identified such as nominal, ordinal, interval or ratio. This will assist the researcher in determining the best way to organise the data. The data can then be entered a spreadsheet and organised in some way that will give the data meaning (Muhamad, 2017).

However, should the research want to utilise the data to make predictions about the population, the reseacher needs to go a step further and use inferential statistics. Inferential statistics scrutinise the changes and relationships between two or more samples of the population. These are more complex analyses and allows for noteworthy changes between variables and the sample group of the population. With inferential statistics, the research is able to test hypotheses and generalise the results to the population as a whole. The following is a list of commonly used descriptive statistics (Muhamad, 2017): -

- Correlation – seeks to decribe the nature of a relationship between two variables, such as for example, strong, weak, negative, positive or statistically significant. The

correlation indicates a relationship or pattern however it does not imply or indicate causation.

- Analysis of Variance – tries to determine if two means of two sampled groups is statistically significant or not due to random chance however it does not speculate why.
- Regression – used to determine if one variable is a predictor of another variable however causation cannot be inferred from the analyses.

Data for this study was collected from the questionnaires and were analysed using Statistical Package for Social Sciences (SPSS) software version 25.0. The results of the analysed data were represented using factor analysis - the correlation matrix, the Bartlett's test of sphericity and the Kaiser-Meyer- Olkin (KMO), Cronbach's alpha (α) and descriptive statistics. New variables were computed after dimension reduction in factor analysis.

- **Factor Analysis**

In order to establish a relationship between the strengths, weaknesses, opportunities and threats, factor analysis was used. For factor analysis, principle components extraction was used with Kaiser normalisation and a Promax rotation with a kappa of 4. Small coefficients were suppressed with an absolute value below 0.5. The factors retained were based on the number of interpretable factors. The eigen-value-greater-than-one criteria yielded the factors. If there were factors having no theoretical interpretation, they were excluded. The results revealed the loadings of each of the items which were extracted through principal axis factoring.

- **Descriptive Statistics**

The mean and standard deviation values were calculated for the data. To determine the mean item scores and the standard deviation values, a five-point Likert scale was used. The items were ranked using relative importance index. The relative importance index for each item will be calculated as follows:

$$RII = \frac{\sum W}{A * N}$$

Where, W is the weighting given to each factor by the respondents, A is the highest weight and N is the total number of respondents (Megha and Rajiv, 2013).

3.9. Reliability

Reliability is the ability of an instrument to measure the attributes of a variable consistently. Reliability is concerned with consistency, stability, accuracy and precision. A reliable measure is a measure that yeilds the same results if the behaviour is measured again on the same scale. Reliability is therefore the proportion of consistency to inconsistency in measurement. A reliable scale consists of three main attributes namely stability, homogeneity and equivalence (LoBiondo-Wood and Haber, 2014).

The researcher achieved reliability by:

- using a structured questionnaire that ensured all respondents answered the same questions and;
- Cronbach’s α . Therefore, the information gained was consistent, dependent and can be replicated to get the same or similar results.

3.10. Validity

Validity is the extent to which an instrument measures the attributes of a concept accurately (LoBiondo-Wood and Haber, 2014). Heale and Twycross (2015) believes that the main attributes are content validity, criterion validity and construct validity.

Table 3.4: Main Attributes of Validity (Heale and Twycross, 2015)

Attributes	Description
Content Validity	The degree to which a research instrument precisely measures all aspects of a construct.
Criterion Validity	The degree to which a research instrument is connected to other instruments that measure the same variables.
Construct Validity	The degree to which a research instrument measures the intended construct.

3.10.1 Content Validity

Content validity exists when a selection instrument like a test sufficiently sample the knowledge as well as skills a person needs to satisfy a job. Content validity relies on the content. The closer the content of the selection instrument is to the actual work, the greater the content validity. It is the most direct and simple type of validity to asses (Bohlander and Snell, 2010). Content validity looks at whether the instrument sufficiently covers the content that it should with respect to the variable (Heale and Twycross, 2015).

3.10.2 Criterion Validity

Criterion-related validity specifies the degree to which the subject's performance on the instrument and the subject's actual behaviour are related. The criterion is usually the second measure which assesses the same concept under study. Predictive validity states the degree of correlation between the measure of the concept and the future measure of the same concept while concurrent validity states the degree of correlation of one test with the values of another more recognised instrument of the same concept (LoBiondo-Wood and Haber, 2014). Criterion Validity is measured in three ways (Heale and Twycross, 2015):

- Convergent validity which displays that the instrument is highly correlated with instruments computing similar variables.
- Divergent validity which displays the instrument that is poorly correlated to instruments that measure different variables. A low correlation between an instrument that measures motivation and one that measures self-efficacy.
- Predictive validity which means that the instrument should have high correlations with future criterions.

3.10.3 Construct Validity

Construct validity is based on the idea that the test measures a theoretical trait. It tries to validate the theory underlying the measurement by testing relationships. Testing approves ir fails to approve the relationships that are predicted between concepts thereby providing more or less support for the construct validity of the instruments measuring those concepts (LoBiondo-

Wood and Haber, 2014). There are three types of evidence that can be used to demonstrate a research instrument that has construct validity (Heale and Twycross, 2015):

- Homogeneity is where the instrument measures one construct.
- Convergence is where the instrument measures concepts similar to that of other instruments. If there are no similar instruments available, this will not be possible to do.
- Theory evidence is evident when behaviour is similar to that of theoretical propositions of the construct measured in the instrument.

The researcher achieved validity by carefully sampling, appropriate instrumentation and appropriate statistical treatments of the data. The strengths, weaknesses, opportunities and threats were identified by a comprehensive literature review and validated during the pilot study where quantity surveyors were asked to give their opinion on the validity of the questionnaire in terms of if the questionnaire covered all the strengths, weaknesses, opportunities and threats in relation to the objectives of the study. Therefore, the questionnaire is believed to have valid content.

3.11. Chapter Summary

This chapter discussed in depth the research methodology. The positivist paradigm was used. The researcher chose quantitative research in the form of questionnaires. The questionnaires were given to quantity surveyors who are members of the Association of South African Quantity Surveyors (ASAQS). Data was also collected from secondary sources such as literature reviews. A probability sampling method was chosen for this study. The desired method that will be used is the random sampling method. The data will be analysed with SPSS using factor analysis and descriptive analysis. Reliability was ensured by using the Cronbach's alpha. Validity was tested by ensuring all questions on the questionnaire were identified by the comprehensive literature review which was then validated during the pilot study. Throughout the chapter, the reader is able to see the researcher's thought process and how the study is going to be structured.

In chapter four, the data analysis and results will be discussed.

CHAPTER 4: RESULTS AND DISCUSSION

4.1. Introduction

The chapter presents the results of the data analysis. The chapter analyses the demographic details of the participants as well as the results of descriptive and inferential statistics that will answer the research questions and objectives. The study adopted a quantitative research approach hence interpretation of data was made through background information, factor analysis - the correlation matrix, the Bartlett's test of sphericity and the Kaiser-Meyer- Olkin (KMO), Cronbach's alpha (α) and descriptive statistics. New variables were computed after dimension reduction in factor analysis. Fifty eight questionnaires were returned. The target respondents were members of the Association of South African Quantity Surveyors (ASAQS).

4.2. Central Limit Theorem

If a population with mean μ and standard deviation σ take appropriately great random samples from the population with replacement then according to central limit theorem, the distribution of the sample means will be approximately normally distributed. This theory holds true irrespective of whether the source population is normal or skewed provided however that the sample size is sufficiently large (usually $n \geq 30$) (LaMorte, 2016).

According to Chang, Huang and Wu (2006), a general rule that have been found by statisticians is the sampling distribution of the mean will be approximately normal if the sample size is at least 30. Further, large sample sizes may have a number of strengths but may be of little value if the large sample size is not representative of the population. Bigger is not necessarily better and so representativeness is more important than the sample size.

For the reasons above, fifty eight participants proved to be a decent sample size for this study as it is well over the recommended sample size of 30.

4.3. Descriptive Analysis and Inferential Analysis

4.3.1. Section A: Background information

4.3.1.1 Background Information of Participants

The background information such as the gender, age group and ethnicity of the participants are depicted in Table 4.1 below. It can be seen that 60.3% of the participants were male. Over half the population were between 21 to 30 years old (55.2%). Twenty four participants were Indian while twenty were White, eleven were Black and only three of the participants were Coloured.

Table 4.1: Background Information of Participants

BACKGROUND INFORMATION		
Gender	Frequency	Percentage
Male	35	60.3%
Female	23	39.7%
Age Group	Frequency	Percentage
21-30	32	55.2%
31-40	10	17.3%
41-50	5	8.6%
51-60	6	10.3%
Over 60	5	8.6%
Ethnicity	Frequency	Percentage
Indian	24	41.4%
White	20	34.4%
Black	11	19.0%
Coloured	3	5.2%

4.3.1.2 Educational Background of Participants

Table 4.2 shows that the predominant educational background of the sample is an honours degree.

Table 4.2: Educational Background of Participants

EDUCATIONAL BACKGROUND		
	Frequency	Percentage
Grade 12	1	1.7%
Diploma	3	5.3%
Bachelor of Technology	9	15.4%
Degree	12	20.8%
Honours Degree	27	45.6%
Master's Degree	6	10.4%
Total	58	100%

4.3.1.3 Professional Background of Participants

Table 4.3 shows the types of quantity surveyors and the years of experience of the participants. 43.1% of the participants were professional quantity surveyors whereas 1.7% were senior quantity surveyors, 15.5% intermediate quantity surveyors, 10.3% junior quantity surveyors and 29.3% candidate quantity surveyors. 6.9% of the participants had less than a year of experience while 32.8% had experience of 1 to 5 years, 27.6% had experience of 6 to 10 years, 5.2% had experience of 11 to 15 years, 8.6% had experience of 16 to 20 years, 3.4% had experience of 26 to 30, 6.9% had experience of 31 to 35 years and 8.6% had experience of over 35 years. It goes on to show that out of 58 participants, 36 were involved in residential projects, 21 in retail projects, 29 in mixed-use developments, 21 in infrastructure, 10 in leisure, 15 in industrial, 37 in education, 15 in healthcare and 7 in other (office, place of worship, maintenance, museum, hotel, petrol station and electrical).

Table 4.3: Professional Background of Participants

TYPES OF QUANTITY SURVEYORS		
	Frequency	Percentage
Candidate Quantity Surveyor	17	29.3%
Junior Quantity Surveyor	6	10.3%
Intermediate Quantity Surveyor	9	15.5%
Senior Quantity Surveyor	1	1.7%
Professional Quantity Surveyor	25	43.1%
YEARS OF EXPERIENCE		
	Frequency	Percentage
Less than a year	4	6.9%
1 year to 5 years	19	32.8%
6 years to 10 years	16	27.6%
11 years to 15 years	3	5.2%
16 years to 20 years	5	8.6%
21 years to 25 years	0	0.0%
26 years to 30 years	2	3.4%
31 years to 35 years	4	6.9%
Over 35 years	5	8.6%
PROJECTS INVOLVED WITH IN THE PAST 2 YEARS		
	Frequency	Percentage
Residential	36	62.1%
Retail	21	36.21%
Mixed-Use Developments	29	50%
Infrastructure	21	36.21%
Leisure	10	17.2%
Industrial	15	25.9%
Education	37	63.8%
Healthcare	15	25.9%
Other	7	12.1%

4.4. Data Analysis

4.4.1 Strengths of the Quantity Surveying Profession

The data were subjected to factor analysis in order to establish the dimensionality of the strengths of the quantity surveying profession. In order to establish if the data were suitable for factor analysis, the Kaiser-Meyer-Olkin measure of sampling adequacy and the Bartlett's test of sphericity were computed (Kaiser, 1970, 1974; Bartlett 1995).

4.4.1.1. KMO-Test and Bartlett's Test of Sphericity for the Strengths of the Quantity Surveying Profession

Table 4.4 indicates that the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO-test) value was 0.837 thereby exceeding the recommended value of 0.6 (Hoque, Siddiqui, Awang, Baharu, 2018) and the Bartlett's test of sphericity (Somaini, Engelhardt, Fumagalli and Ingelmo, 2016) reached statistical significance at $p= 0.000$ ($p<0.05$) thereby supporting the factorability of the correlation matrix (Pallant, 2013).

Table 4.4: KMO and Bartlett's Test for the Strengths of the Quantity Surveying Profession

KMO AND BARTLETT'S TEST		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.837
Bartlett's Test of Sphericity	Approx. Chi-Square	1602.419
	df	406
	Sig.	.000

4.4.1.2. Factor Analysis of the Strengths to the Quantity Surveying Profession

Table 4.5 indicates the factor matrix of the possible strengths of the quantity surveying profession. For factor analysis, principle components extraction was used with Kaiser normalisation and a Promax rotation with a kappa of 4. Small coefficients were suppressed with an absolute value below 0.5. The factors retained were based on the number of interpretable factors. The eigen-value-greater-than-one criteria yielded five factors with one factor having no theoretical interpretation. Therefore, a four-factor solution which comprised of twenty-four of the twenty-nine strengths was favoured yielding eigen values greater than one. The results

revealed the loadings of each of the items which were extracted through principal axis factoring. Out of the twenty-nine items, twenty-four of the items loaded strongly on the component and so they were considered as strengths of the quantity surveying profession (>0.5) (Pallant, 2013).

Table 4.5: Factor Matrix for the Strengths of the Quantity Surveying Profession

		COMPONENT			
		1	2	3	4
1	Creative Problem Solving	.617			
2	Strategic Planning	.599			
3	Ensuring a suitable organisational structure	.939			
4	Team Working/Interpersonal Skills	.935			
5	Self Confidence, Can Do Attitude	.527			
6	Problem Solving	.925			
7	Networking Skills	.799			
8	Political Skills	.706			
9	Accuracy		.740		
10	Attention to Detail		.794		
11	Measurement/Quantification		.903		
12	Cost Accounting and Financial Management		.912		
13	Cash Flow Forecasting and Budgeting		.656		
14	Estimating and Pricing		.819		
15	Leadership			.519	
16	Value Management/Construction Economics			.572	
17	Life Cycle Costing			.761	
18	Feasibility Studies			.771	
19	Design Economics			.847	
20	Negotiation Skills				.711
21	Communication Skills				.814
22	Data Management/Record Keeping				.802

23	Client Relationship Management				.515
24	Dispute Resolution/Conflict Management				.862

Table 4.6 shows how much variance is explained by these factors. PCA technique using principal axis factoring exhibited 13.99, 13.09, 1.75 and 1.58, explaining 48.25%, 10.69%, 6.02% and 5.46% of the variance respectively and 70.41% of the total variance.

Table 4.6: Total Variances Explained for the Strengths of the Quantity Surveying Profession

TOTAL VARIANCE EXPLAINED				
Component	Initial Eigenvalues			Rotation Sums of Squared Loadings ^a
	Total	% of Variance	Cumulative %	Total
1	13.991	48.246	48.246	9.476
2	3.099	10.688	58.934	10.327
3	1.745	6.017	64.950	8.901
4	1.584	5.462	70.412	9.808
5	1.370	4.725	75.137	
6	.971	3.348	78.485	
7	.813	2.802	81.287	
8	.673	2.319	83.606	
9	.616	2.123	85.729	
10	.610	2.105	87.833	
11	.497	1.714	89.547	
12	.402	1.387	90.934	
13	.371	1.281	92.215	
14	.344	1.186	93.401	
15	.302	1.042	94.443	
16	.252	.870	95.313	
17	.224	.772	96.085	
18	.206	.710	96.794	

19	.150	.517	97.311	
20	.138	.477	97.788	
21	.119	.411	98.199	
22	.112	.385	98.584	
23	.100	.346	98.930	
24	.073	.252	99.182	
25	.068	.234	99.415	
26	.057	.198	99.613	
27	.051	.175	99.789	
28	.035	.120	99.909	
29	.026	.091	100.000	

From the data, four different components of strengths exist. The first component consists of creative problem solving, strategic planning, ensuring a suitable organisational structure, team working/interpersonal skills, self-confidence, can do attitude, problem solving, networking skills and political skills. This component can be described as the ability to plan and solve problems both alone and in a team. The Cronbach's Alpha for the first component can be seen in Table 4.7 below. The table shows that the Cronbach's Alpha for the first component is 0.894 which is greater than 0.7. This suggests that the items have high internal consistency in responses. The closer the coefficient is to 1.0, the prominent the internal consistency of the items in the scale. Stemming from the formula $\{rk / [1 + (k-1) r]\}$ where k is the number of items considered and r is the mean of the inter-item correlations (Gliem and Gliem, 2003).

Table 4.7: Cronbach's Alpha for the First Component Strengths of the Quantity Surveying Profession

RELIABILITY STATISTICS	
Cronbach's Alpha	No. of Items
.894	8

The second component consists of accuracy, attention to detail, measurement/quantification, cost accounting and financial management, cash flow forecasting and budgeting and estimating and pricing. This component can therefore be called core quantity surveying costing skills. The Cronbach’s Alpha for the second component can be seen in Table 4.8 below. The table shows that the Cronbach’s Alpha for the second component is 0.933 which is greater than 0.7 thereby suggesting that the items have high internal consistency in responses.

Table 4.8: Cronbach’s Alpha for the Second Component Strengths of the Quantity Surveying Profession

RELIABILITY STATISTICS	
Cronbach's Alpha	No. of Items
.933	6

The third component consists of leadership, value management/construction economics, life cycle costing, feasibility studies and design economics. This component can therefore be described as the ability to produce a viable project. The Cronbach’s Alpha for the third component can be seen in Table 4.9 below. The table shows that the Cronbach’s Alpha for the third component is 0.890 which is greater than 0.7 thereby suggesting that the items have higher internal consistency in responses.

Table 4.9: Cronbach’s Alpha for the Third Component Strengths of the Quantity Surveying Profession

RELIABILITY STATISTICS	
Cronbach's Alpha	No. of Items
.890	5

The forth component consists of negotiation skills, communication skills, data management/record keeping, client relationship management and dispute resolution/conflict management. This component can therefore be called interpersonal skills. The Cronbach’s Alpha for the forth component can be seen in Table 4.10 below. The table shows that the Cronbach’s Alpha for the forth component is 0.887 which is greater than 0.7 thereby suggesting that the items have higher internal consistency in responses.

Table 4.1: Cronbach's Alpha for the Forth Component Strengths of the Quantity Surveying Profession

RELIABILITY STATISTICS	
Cronbach's Alpha	No. of Items
.887	5

4.4.1.3.Descriptive Statistics for the Strengths of the Quantity Surveying Profession

4.4.1.3.1. The ability to plan and solve problems both alone and in a team

Table 4.11 shows the eight strengths under the ability to plan and solve problems both alone and in a team. Creative problem solving was ranked first with an RII of 0.866 whereas teamworking/interpersonal skills was ranked second with an RII of 0.838, problem solving ranked third with an RII of 0.834, strategic planning ranked fourth with an RII of 0.831, self-confidence, can do attitude ranked fifth with an RII of 0.828, networking skills ranked sixth with an RII of 0.783, ensuring a suitable organisational structure ranked seventh with an RII of 0.779 and political skills ranked eighth with an RII of 0.679.

Table 4.11: Descriptive Statistics for the ability to plan and solve problems both alone and in a team

THE ABILITY TO PLAN AND SOLVE PROBLEMS BOTH ALONE AND IN A TEAM					
Strengths	N	Mean	Std. Deviation	Relative Importance Index	Rank
Creative Problem Solving	58	4,33	0,711	0,866	1
Team Working/ Interpersonal Skills	58	4,19	0,945	0,838	2
Problem Solving	58	4,17	1,011	0,834	3
Strategic Planning	58	4,16	0,790	0,831	4
Self Confidence, can do attitude	58	4,14	0,907	0,828	5
Networking Skills	58	3,91	0,923	0,783	6
Ensuring a suitable organisational structure	58	3,90	0,949	0,779	7
Political Skills	58	3,40	1,138	0,679	8

4.4.1.3.2. Core Quantity Surveying Costing Skills

Table 4.12 shows the six strengths under core measuring skills. Accuracy was ranked first with an RII of 0.924 whereas cost accounting and financial management was ranked second with an RII of 0.921, measurement/quantification ranked third with an RII of 0.914, estimating and pricing ranked fourth with an RII of 0.910, cash flow forecasting and budgeting ranked fifth with an RII of 0.890 and attention to detail ranked sixth with an RII of 0.883.

Table 4.2: Descriptive Statistics for core quantity surveying costing skills

CORE QUANTITY SURVEYING MEASURING SKILLS					
Strengths	N	Mean	Std. Deviation	Relative Importance Index	Rank
Accuracy	58	4,62	0,745	0,924	1
Cost Accounting and Financial Management	58	4,60	0,699	0,921	2
Measurement/Quantification	58	4,57	0,797	0,914	3
Estimating and Pricing	58	4,55	0,799	0,910	4
Cash Flow Forecasting and Budgeting	58	4,45	0,820	0,890	5
Attention to Detail	58	4,41	0,838	0,883	6

4.4.1.3.3. The ability to produce a viable project

Table 4.13 shows the five strengths under the ability to produce a viable project. Leadership and feasibility studies are both ranked first with an RII of 0.845 whereas value management/construction economics was ranked second with an RII of 0.834, design economics ranked fourth with an RII of 0.800 and life cycle costing ranked fourth with an RII of 0.786.

Table 4.13: Descriptive Statistics for the ability to produce a viable project

PROJECT VIABILITY					
Strengths	N	Mean	Std. Deviation	Relative Importance Index	Rank
Leadership	58	4,22	0,773	0,845	1
Feasibility Studies	58	4,22	0,992	0,845	1
Value Management/ Construction Economics	58	4,17	0,841	0,834	2
Design Economics	58	4,00	1,155	0,800	3
Life Cycle Costing	58	3,93	0,915	0,786	4

4.4.1.3.4. Interpersonal Skills

Table 4.14 shows the five strengths under interpersonal skills. Communication skills was ranked first with an RII of 0.897 whereas negotiation skills was ranked second with an RII of 0.866, client relationship management ranked third with an RII of 0.852 and dispute resolution/conflict management as well as data management/record keeping both ranked fourth with an RII of 0.834.

Table 4.14: Descriptive Statistics for Interpersonal Skills

INTERPERSONAL SKILLS					
Strengths	N	Mean	Std. Deviation	Relative Importance Index	Rank
Communication Skills	58	4,48	0,599	0,897	1
Negotiation Skills	58	4,33	0,685	0,866	2
Client Relationship Management	58	4,26	0,849	0,852	3
Dispute Resolution/Conflict Management	58	4,17	0,798	0,834	4
Data Management/Record Keeping	58	4,17	0,861	0,834	4

4.4.2 Weaknesses of the Quantity Surveying Profession

4.4.2.1 KMO-Test and Barlett's Test of Sphericity for the Weaknesses of the Quantity Surveying Profession

Table 4.15 indicates that the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO-test) value was 0.835 thereby exceeding the recommended value of 0.6 (Hoque, Siddiqui, Awang, Baharu, 2018) and the Barlett's test of sphericity (Somaini, Engelhardt, Fumagalli and Ingelmo, 2016) reached statistical significance at $p= 0.000$ ($p<0.05$) thereby supporting the factorability of the correlation matrix (Pallant, 2013).

Table 4.3: KMO and Barlett's Test for the Weaknesses of the Quantity Surveying Profession

KMO AND BARTLETT'S TEST		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.835
Bartlett's Test of Sphericity	Approx. Chi-Square	462.017
	df	105
	Sig.	.000

4.4.2.2 Factor Analysis of the Weaknesses to the Quantity Surveying Profession

Table 4.16 indicates the factor matrix of the possible weaknesses of the quantity surveying profession. For factor analysis, principle components extraction was used with Kaiser normalisation and a Promax rotation with a kappa of 4. Small coefficients were suppressed with an absolute value below 0.5. The factors retained were based on the number of interpretable factors. The eigen-value-greater-than-one criteria yielded four factors with one factor having no theoretical interpretation. Therefore, a three-factor solution which included fourteen of the fifteen weaknesses was favoured yielding eigen values greater than one. The results revealed the loadings of each of the items which were extracted through principal axis factoring. Out of the fifteen items, fourteen of the items loaded strongly on the component and so they were considered as weaknesses of the quantity surveying profession (>0.5) (Pallant, 2013).

Table 4.4: Factor Matrix for the Weaknesses of the Quantity Surveying Profession

		COMPONENT		
		1	2	3
1	The Lack of Suitably Skilled and Experienced Quantity Surveyors	.767		
2	Lack of Competencies in the Quantity Surveying Profession	.657		
3	Lack of Training Experience	.817		
4	Inaccuracies in Cost Estimates	.816		
5	Lack of IT/Computing Skills	.695		
6	Poor Attention towards Continuous Professional Development	.628		
7	Inability to Change		.531	
8	Inability to adopt BIM in the Profession		.805	
9	Little Attention to Lifelong Learning		.769	
10	Low Levels of Innovation		.663	
11	Lack of Marketing of the Quantity Surveying Profession			.531
12	Overqualified but Lack of Experience			.564
13	Lack of Awareness of the Quantity Surveying Profession			.614
14	Decline in Measuring Skills			.847

Table 4.17 shows how much variance is explained by these factors. PCA technique using principal axis factoring exhibited 6.61, 1.71 and 1.24, explaining 44.04%, 11.38% and 8.26% of the variance respectively and 63.58% of the total variance.

Table 4.5: Total Variance Explained for the Weaknesses of the Quantity Surveying Profession

TOTAL VARIANCE EXPLAINED				
Component	Initial Eigenvalues			Rotation Sums of Squared Loadings ^a
	Total	% of Variance	Cumulative %	Total
1	6.607	44.044	44.044	5.094
2	1.707	11.380	55.425	4.439
3	1.239	8.259	63.684	4.153
4	1.031	6.872	70.556	
5	.815	5.435	75.991	
6	.687	4.581	80.572	
7	.568	3.787	84.359	
8	.528	3.521	87.880	
9	.412	2.747	90.627	
10	.367	2.445	93.072	
11	.291	1.937	95.010	
12	.237	1.579	96.589	
13	.200	1.330	97.919	
14	.179	1.192	99.111	
15	.133	.889	100.000	

From the data, three different components of weaknesses exist. The first component consists of the lack of suitably skilled and experienced quantity surveyors, the lack of competencies in the quantity surveying profession, lack of training experience, inaccuracies in cost estimates, lack of IT/computing skills and poor attitude towards continuous professional development. This component can therefore be called technical inadequacies of quantity surveyors. The Cronbach's Alpha for the first component can be seen in Table 4.18 below. The table shows that the Cronbach's Alpha for the first component is 0.882 which is greater than 0.7 thereby suggesting that the items have higher internal consistency in responses.

Table 4.6: Cronbach's Alpha for the First Component Weaknesses of the Quantity Surveying Profession

RELIABILITY STATISTICS	
Cronbach's Alpha	No. of Items
.882	6

The second component consists of inability to change, inability to adopt BIM, little attention to lifelong learning and low levels of innovation. This component can therefore be called resistance to change. The Cronbach's Alpha for the second component can be seen in Table 4.19 below. The table shows that the Cronbach's Alpha for the second component is 0.749 which is greater than 0.7 thereby suggesting that the items have higher internal consistency in responses.

Table 4.7: Cronbach's Alpha for the Second Component Weaknesses of the Quantity Surveying Profession

RELIABILITY STATISTICS	
Cronbach's Alpha	No. of Items
.749	4

The third component consists of lack of marketing of the quantity surveying profession, overqualified but lack of experience, lack of awareness of quantity surveying as a profession and decline in measuring skills. This component can therefore be called lack of knowledge of and about the profession. The Cronbach Alpha's for the third component can be seen in Table 4.20 below. The table shows that the Cronbach's Alpha for the third component is 0.793 which is greater than 0.7 thereby suggesting that the items have higher internal consistency in responses.

Table 4.8: Cronbach's Alpha for the Third Component Weaknesses of the Quantity Surveying Profession

RELIABILITY STATISTICS	
Cronbach's Alpha	N of Items
.793	4

4.4.2.3 Descriptive Statistics for the Weaknesses of the Quantity Surveying Profession

4.4.2.3.1 Technical Inadequacies of Quantity Surveyors

Table 4.21 shows the six weaknesses under technical inadequacies of quantity surveyors. Lack of training experience was ranked first with an RII of 0.734 whereas the lack of suitably skilled and experienced quantity surveyors was ranked second with an RII of 0.724, inaccuracies in cost estimates ranked third with an RII of 0.717, lack of competencies in the quantity surveying profession ranked fourth with an RII of 0.700, poor attitude towards continuous professional development ranked fifth with an RII of 0.686 and lack of information technology/computing skills ranked sixth with an RII of 0.659.

Table 4.21: Descriptive Statistics for the Technical Inadequacies of Quantity Surveyors

TECHNICAL INADEQUACIES OF QUANTITY SURVEYORS					
Weaknesses	N	Mean	Std. Deviation	Relative Importance Index	Rank
Lack of Training Experience	58	3,67	1,190	0,734	1
The lack of suitably skilled and experienced Quantity Surveyors	58	3,62	1,254	0,724	2
Inaccuracies in Cost Estimates	58	3,59	1,185	0,717	3
Lack of Competencies in the Quantity Surveying Profession	58	3,50	1,218	0,700	4
Poor Attitude towards Continuous Professional Development	58	3,43	1,078	0,686	5
Lack of Information Technology/Computing Skills	58	3,29	1,076	0,659	6

4.4.2.3.2 Resistance to Change

Table 4.22 shows the four weaknesses under resistance to change. Inability to change was ranked first with an RII of 0.710 whereas inability to adopt BIM was ranked second with an RII of 0.707, low levels of innovation ranked third with an RII of 0.686 and little attention to lifelong learning ranked fourth with an RII of 0.676.

Table 4.22: Descriptive Statistics for Resistance to Change

RESISTANCE TO CHANGE					
Weaknesses	N	Mean	Std. Deviation	Relative Importance Index	Rank
Inability to Change	58	3,55	1,095	0,710	1
Inability to adopt BIM	58	3,53	1,173	0,707	2
Low Levels of Innovation	58	3,43	0,993	0,686	3
Little Attention to Lifelong Learning	58	3,38	1,182	0,676	4

4.4.2.3.3 Lack of knowledge of and about the profession

Table 4.23 shows the four weaknesses under lack of knowledge of and about the profession. Overqualified but lack of experience was ranked first with an RII of 0.745 whereas decline in measuring skills was ranked second with an RII of 0.741, lack of marketing of the quantity surveying profession ranked third with an RII of 0.738 and lack of awareness of quantity surveying as a profession was ranked fourth with an RII of 0.669.

Table 4.23: Descriptive Statistics for the lack of knowledge of and about the profession

LACK OF KNOWLEDGE OF AND ABOUT THE PROFESSION					
Weaknesses	N	Mean	Std. Deviation	Relative Importance Index	Rank
Overqualified but Lack of Experience	58	3,72	1,152	0,745	1
Decline in Measuring Skills	58	3,71	1,228	0,741	2
Lack of Marketing of the Quantity Surveying Profession	58	3,69	1,046	0,738	3
Lack of awareness of quantity surveying as a profession	58	3,34	1,178	0,669	4

4.4.3 Opportunities of the Quantity Surveying Profession

4.4.3.1. KMO-Test and Barlett's Test of Sphericity for the Opportunities of the Quantity Surveying Profession

Table 4.24 indicates that the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO-test) value was 0.746 thereby exceeding the recommended value of 0.6 (Hoque, Siddiqui, Awang, Baharu, 2018) and the Barlett's test of sphericity (Somaini, Engelhardt, Fumagalli and Ingelmo, 2016) reached statistical significance at $p= 0.000$ ($p<0.05$) thereby supporting the factorability of the correlation matrix (Pallant, 2013).

Table 4.24: KMO and Barlett's Test for the Opportunities of the Quantity Surveying Profession

KMO AND BARTLETT'S TEST		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.746
Bartlett's Test of Sphericity	Approx. Chi-Square	202.521
	df	55
	Sig.	.000

4.4.3.2 Factor Analysis of the Opportunities to the Quantity Surveying Profession

Table 4.25 indicates the factor matrix of the possible opportunities of the quantity surveying profession. For factor analysis, principle components extraction was used with Kaiser normalisation and a Promax rotation with a kappa of 4. Small coefficients were suppressed with an absolute value below 0.5. The factors retained were based on the number of interpretable factors. The eigen-value-greater-than-one criteria yielded four factors with one factor having no theoretical interpretation. Therefore, a three-factor solution which incorporated ten of the eleven opportunities was favoured yielding eigen values greater than one. The results revealed the loadings of each of the items which were extracted through principal axis factoring. Out of the eleven items, ten of the items loaded strongly on the component and so they were considered as opportunities of the quantity surveying profession (>0.5) (Pallant, 2013).

Table 4.9: Factor Matrix for the Opportunities of the Quantity Surveying Profession

		COMPONENT		
		1	2	3
1	Building Information Modelling	.604		
2	Ability to perform multiple services	.681		
3	Quantity Surveying Firms- An asset to Public-Private Partnership	.880		
4	Market for Facilities Management Services	.822		
5	Demand for Quantity Surveyors		.830	
6	Efficiency increases brought about by technological advances		.737	
7	Market for Core Quantity Surveying Services		.755	
8	Market for Quantity Surveyors in Civil Infrastructure and Engineering Projects			.562
9	Sector Specific Work Experience			.978
10	New roles for quantity surveyors in alternate procurement methods			.540

Table 4.26 shows how much variance is explained by these factors. PCA technique using principal axis factoring exhibited 4.02, 1.55 and 1.20, explaining 36.51%, 14.09% and 10.89% of the variance respectively and 61.495% of the total variance.

Table 4.10: Total Variance Explained for the Opportunities of the Quantity Surveying Profession

TOTAL VARIANCE EXPLAINED				
Component	Initial Eigenvalues			Rotation Sums of Squared Loadings ^a
	Total	% of Variance	Cumulative %	Total
1	4.017	36.514	36.514	3.459
2	1.550	14.094	50.607	2.523
3	1.198	10.887	61.495	2.625
4	1.026	9.324	70.819	

5	.738	6.711	77.529	
6	.587	5.340	82.869	
7	.520	4.729	87.598	
8	.424	3.852	91.449	
9	.385	3.499	94.948	
10	.324	2.944	97.892	
11	.232	2.108	100.000	

From the data, three different components of opportunities exist. The first component consists of building information modelling, ability to perform multiple services, quantity surveying firms- an asset to public private partnership and market for facilities management. This component can therefore be called greater demand for quantity surveyors. The Cronbach's Alpha for the first component can be seen in Table 4.27 below. The table shows that the Cronbach's Alpha for the first component is 0.734 which is greater than 0.7 thereby suggesting that the items have higher internal consistency in responses.

Table 4.27: Cronbach's Alpha for the First Component Opportunities of the Quantity Surveying Profession

RELIABILITY STATISTICS	
Cronbach's Alpha	No. of Items
.734	4

The second component consists of the demand for quantity surveyors, efficiency increases brought about by technological advances and market for core quantity surveying services. This component can therefore be called the need for quantity surveyors. The Cronbach's Alpha for the second component can be seen in Table 4.28 below. The table shows that the Cronbach's Alpha for the second component is 0.678 which is less than 0.7 thereby suggesting that the items have lower internal consistency in responses. Based on the correlations in Table 4.29, all the items will be retained as factors greater than 0.3 are considered acceptable (Pallant, 2013). Therefore, the lower alpha was accepted.

Table 4.11: Cronbach's Alpha for the Second Component Opportunities of the Quantity Surveying Profession

RELIABILITY STATISTICS	
Cronbach's Alpha	No. of Items
.678	3

Table 4.12: Item-Total Statistics for the Second Component Opportunities for the Quantity Surveying Profession

ITEM-TOTAL STATISTICS				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Demand for Quantity Surveyors	7.72	2.063	.494	.580
Efficiency increases brought about by technological advances	7.14	2.191	.444	.644
Market for core quantity surveying services	7.03	2.069	.537	.525

The third component consists of market for quantity surveyors in civil infrastructure and engineering projects, sector specific work experience and new roles for quantity surveying in alternate procurement methods. This component can therefore be called new and existing roles in and out of the profession. The Cronbach's Alpha for the third component can be seen in Table 4.30 below. The table shows that the Cronbach's Alpha for the third component is 0.666 which is less than 0.7 thereby suggesting that the items have lower internal consistency in responses. However, based on the correlations in Table 4.31, all the items will be retained as factors greater than 0.3 are considered acceptable (Pallant, 2013). Therefore, the lower alpha was accepted.

Table 4.30: Cronbach's Alpha for the Third Component Opportunities of the Quantity Surveying Profession

RELIABILITY STATISTICS	
Cronbach's Alpha	No. of Items
.666	3

Table 4.31: Item-Total Statistics for the Third Component Opportunities for the Quantity Surveying Profession

ITEM-TOTAL STATISTICS				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Market for Quantity Surveyors in Civil Infrastructure and Engineering Projects	7.64	2.340	.533	.493
Sector specific work experience	7.72	2.730	.392	.693
New roles for quantity surveyors in alternate procurement methods	7.57	3.021	.541	.521

4.4.3.3 Descriptive Statistics for the Opportunities of the Quantity Surveying Profession

4.4.3.3.1. Greater Demand for Quantity Surveyors

Table 4.32 shows the four opportunities under alternate positions for quantity surveyors. The ability to perform multiple services was ranked first with an RII of 0.800 whereas quantity surveying firms- an asset to public private partnership was ranked second with an RII of 0.752, building information modelling ranked third with an RII of 0.745 and market for facilities management services ranked fourth with an RII of 0.707.

Table 13: Descriptive Statistics for Greater Demand for Quantity Surveyors

ALTERNATE POSITIONS FOR QUANTITY SURVEYORS					
Opportunities	N	Mean	Std. Deviation	Relative Importance Index	Rank
Ability to Perform Multiple Services	58	4,00	0,898	0,800	1
Quantity Surveying Firms- An asset to Public Private Partnership	58	3,76	1,031	0,752	2
Building Information Modelling	58	3,72	0,933	0,745	3
Market for Facilities Management Services	58	3,53	0,821	0,707	4

4.4.3.3.2. The need for Quantity Surveyors

Table 4.33 shows the three opportunities under the need for quantity surveyors. Market for core quantity surveying methods was ranked first with an RII of 0.783 whereas efficiency increases brought about by technological advances ranked second with an RII of 0.762 and demand for quantity surveyors ranked third with an RII 0.645.

Table 4.33: Descriptive Statistics for the need for Quantity Surveyors

THE NEED FOR QUANTITY SURVEYORS					
Opportunities	N	Mean	Std. Deviation	Relative Importance Index	Rank
Market for Core Quantity Surveying Methods	58	3,91	0,844	0,783	1
Efficiency Increases brought about by Technological Advances	58	3,81	0,868	0,762	2
Demand for Quantity Surveyors	58	3,22	0,879	0,645	3

4.4.3.3.3. New and existing roles in and out of the profession

Table 4.34 shows the three opportunities under new and existing roles in and out of the profession. Market for core quantity surveying methods was ranked first with an RII of 0.783

whereas new roles for quantity surveyors in alternate procurement methods was ranked second with an RII of 0.779 and sector specific work experience was ranked third with an RII of 0.748.

Table 4.34: Descriptive Statistics for new and existing roles in and out of the profession

NEW AND EXISTING ROLES IN AND OUT OF THE PROFESSION					
Opportunities	N	Mean	Std. Deviation	Relative Importance Index	Rank
New Roles for Quantity Surveyors in Alternate Procurement Methods	58	3,90	0,810	0,779	1
Market for quantity surveyors in civil infrastructure and engineering projects	58	3.83	1.062	0.766	2
Sector Specific Work Experience	58	3,74	1,052	0,748	3

4.4.4 Threats of the Quantity Surveying Profession

4.4.4.1. KMO-Test and Barlett's Test of Sphericity for the Threats of the Quantity Surveying Profession

Table 4.35 indicates that the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO-test) value was 0.630 thereby exceeding the recommended value of 0.6 (Hoque, Siddiqui, Awang, Baharu, 2018) and the Barlett's test of sphericity (Somaini, Engelhardt, Fumagalli and Ingelmo, 2016) reached statistical significance at $p= 0.000$ ($p<0.05$) thereby supporting the factorability of the correlation matrix (Pallant, 2013).

Table 4.35: KMO and Barlett's Test for the Threats of the Quantity Surveying Profession

KMO AND BARTLETT'S TEST				
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.				.630
Bartlett's Test of Sphericity	Approx. Chi-Square			284.170
	df			105
	Sig.			.000

4.4.4.2 Factor Analysis of the Threats to the Quantity Surveying Profession

Table 4.36 indicates the factor matrix of the possible opportunities of the quantity surveying profession. For factor analysis, principle components extraction was used with Kaiser normalisation and a Promax rotation with a kappa of 4. Small coefficients were suppressed with an absolute value below 0.5. The factors retained were based on the number of interpretable factors. The eigen-value-greater-than-one criteria yielded six factors with three factors having no theoretical interpretation. Therefore, a three-factor solution which incorporated twelve of the fifteen threats was favoured yielding eigen values greater than one. The results revealed the loadings of each of the items which were extracted through principal axis factoring. Out of the fifteen items, twelve of the items loaded strongly on the component and so they were considered as threats of the quantity surveying profession (>0.5) (Pallant, 2013).

Table 4.14: Factor Matrix for the Threats of the Quantity Surveying Profession

		COMPONENT		
		1	2	3
1	Changes in Clients Demands	.581		
2	Other professions performing quantity surveying services	.558		
3	Shortfalls in the quantity surveying qualifications offered at tertiary institutions	.602		
4	The profession's "lack of voice" due to relatively small number of practitioners compared to other professional groups.	.581		
5	Lack of formal registration and chartered status	.788		
6	Lack of marketing of the quantity surveying profession	.828		
7	Changes in Technology		.567	
8	The Global Financial Crises		.839	
9	The perception that quantity surveyors are non-critical to project success.		.717	
10	Lack of Knowledge Management			.709
11	Lack of Suitable and Experienced Quantity Surveyors			.575
12	The ageing workforce and the undersupply of new entrants			.763

Table 4.37 shows how much variance is explained by these factors. PCA technique using principal axis factoring exhibited three components namely 4.21, 1.95 and 1.39, explaining 28.08%, 13.03% and 9.27% of the variance respectively and 50.378 of the total variance.

Table 4.37: Total Variance Explained for the Threats of the Quantity Surveying Profession

TOTAL VARIANCE EXPLAINED				
Component	Initial Eigenvalues			Rotation Sums of Squared Loadings ^a
	Total	% of Variance	Cumulative %	Total
1	4.212	28.079	28.079	3.676
2	1.954	13.027	41.105	2.815
3	1.391	9.273	50.378	2.108
4	1.223	8.152	58.531	
5	1.063	7.084	65.614	
6	1.026	6.842	72.457	
7	.834	5.557	78.014	
8	.747	4.983	82.997	
9	.697	4.643	87.640	
10	.525	3.501	91.141	
11	.357	2.383	93.524	
12	.320	2.134	95.658	
13	.271	1.805	97.463	
14	.207	1.378	98.842	
15	.174	1.158	100.000	

From the data, three different components of threats exist. The first component consists of changes in clients demands, other professionals performing quantity surveying services, shortfalls in the quantity surveying qualifications offered at tertiary institutions, the professions lack of voice due to relatively small number of practitioners compared to other professional groups, the lack of formal registration and chartered status and the lack of marketing of the

quantity surveying profession. This component can therefore be called lack of the quantity surveying profession to market itself where new roles require an advancement of core quantity surveying services. The Cronbach Alpha for the first component can be seen in Table 4.38 below. The table shows that the Cronbach's Alpha for the first component is 0.783 which is greater than 0.7 thereby suggesting that the items have higher internal consistency in responses.

Table 4.38: Cronbach's Alpha for the First Component Threats of the Quantity Surveying Profession

RELIABILITY STATISTICS	
Cronbach's Alpha	No. of Items
.783	6

The second component consists of changes in technology, the global financial crises and the perception that quantity surveyors are non-critical to project success. This component can therefore be called external factors that hinder the performance of the profession. The Cronbach Alpha for the second component can be seen in Table 4.39 below. The table shows that the Cronbach's Alpha for the second component is 0.596 which is less than 0.7 thereby suggesting that the items have low internal consistency in responses. Based on the correlations in Table 4.40, two of the three items will be retained as factors greater than 0.3 are considered acceptable (Pallant, 2013). Therefore, changes in technology was dropped and the lower alpha was accepted.

Table 4.39: Cronbach's Alpha for the Second Component Threats of the Quantity Surveying Profession

RELIABILITY STATISTICS	
Cronbach's Alpha	No. of Items
.596	3

Table 4.40: Item-Total Statistics for the Second Component Threats for the Quantity Surveying Profession

ITEM-TOTAL STATISTICS				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Changes in Technology	7.29	4.351	.292	.641
The Global Financial Crises	7.29	3.404	.451	.427
The perception that quantity surveyors are non-critical to project success	7.03	2.841	.490	.358

The third component consists of the lack of knowledge management, the lack of suitable and experienced quantity surveyors and the ageing workforce and the undersupply of new entrants. This component can therefore be called the lack of quantity surveying skills in the new generation. The Cronbach Alpha for the third component can be seen in Table 4.41 below. The table shows that the Cronbach's Alpha for the third component is 0.603 which is less than 0.7 thereby suggesting that the items have a lower internal consistency in responses. Based on the correlations in Table 4.42, all the items will be retained as factors greater than 0.3 are considered acceptable (Pallant, 2013). Therefore, the lower alpha was accepted.

Table 4.15: Cronbach's Alpha for the Second Component Threats of the Quantity Surveying Profession

RELIABILITY STATISTICS	
Cronbach's Alpha	No. of Items
.603	3

Table 4.42: Item-Total Statistics for the Second Component Threats for the Quantity Surveying Profession

ITEM-TOTAL STATISTICS				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Lack of Knowledge Management	7.36	2.937	.315	.627
Lack of suitable and experienced quantity surveyors	7.16	2.239	.505	.364
The ageing workforce and the undersupply of new entrants	7.62	1.994	.436	.476

4.4.4.3 Descriptive Statistics for the Threats of the Quantity Surveying Profession

4.4.4.3.1. Lack of the quantity surveying profession to market itself where new roles require an advancement of core quantity surveying services

Table 4.43 shows the six threats under the lack of the quantity surveying profession to market itself where new roles require an advancement of core quantity surveying services. Shortfalls in the quantity surveying qualifications offered at tertiary institutions was ranked first with an RII of 0.783 whereas other professions performing quantity surveying services ranked second with an RII of 0.772, changes in client’s demand ranked third with an RII of 0.745, lack of marketing of the quantity surveying profession ranked fourth with an RII of 0.728, the profession’s “lack of voice” due to small professional groups ranked fifth with an RII of 0.714 and lack of formal registration and chartered status ranked sixth with an RII of 0.683.

Table 4.43: Descriptive Statistics of the lack of the quantity surveying profession to market itself where new roles require an advancement of core quantity surveying services

LACK OF THE QUANTITY SURVEYING PROFESSION TO MARKET ITSELF WHERE NEW ROLES REQUIRE AN ADVANCEMENT OF CORE QUANTITY SURVEYING SERVICES					
Threats	N	Mean	Std. Deviation	Relative Importance Index	Rank
Shortfalls in the Quantity Surveying Qualifications offered at Tertiary Institutions	58	3,91	1,048	0,783	1

Other Professions performing Quantity Surveying Services	58	3,86	0,907	0,772	2
Changes in Client's Demand	58	3,72	0,933	0,745	3
Lack of Marketing of the Quantity Surveying Profession	58	3,64	1,038	0,728	4
The profession's "Lack of Voice" due to Small Professional Groups	58	3,57	0,939	0,714	5
Lack of Formal Registration and Chartered Status	58	3,41	1,155	0,683	6

4.4.4.3.2. External factors that hinder the performance of the profession

Table 4.44 shows the three threats under external factors that hinder the performance of the profession. The perception that quantity surveyors are non-critical to project success was ranked first with an RII of 0.755 whereas changes in technology and the global financial crises were both ranked second with an RII of 0.703.

Table 4.44: Descriptive Statistics external factors that hinder the performance of the profession

EXTERNAL FACTORS THAT HINDER THE PERFORMANCE OF THE PROFESSION					
Threats	N	Mean	Std. Deviation	Relative Importance Index	Rank
The Perception that Quantity Surveyors are Non-Critical to Project Success	58	3,78	1,285	0,755	1
Changes in Technology	58	3,52	1,013	0,703	2
The Global Financial Crises	58	3,52	1,143	0,703	2

4.4.4.3.3. The lack of quantity surveying skills in the new generation

Table 4.45 shows the three threats under the lack of quantity surveying skills in the new generation. The lack of suitable and experienced quantity surveyors ranked first with an RII of 0.783 whereas lack of knowledge management ranked second with an RII of 0.741 and the ageing workforce and the undersupply of new entrants ranked third with an RII of 0.690.

Table 4.45: Descriptive Statistics for the lack of quantity surveying skills in the new generation

THE LACK OF QUANTITY SURVEYING SKILLS IN THE NEW GENERATION					
Threats	N	Mean	Std. Deviation	Relative Importance Index	Rank
Lack of Suitable and Experienced Quantity Surveyors	58	3,91	0,923	0,783	1
Lack of Knowledge Management	58	3,71	0,817	0,741	2
The Ageing Workforce and the Under Supply of New Entrants	58	3,45	1,079	0,690	3

4.5. Chapter Summary

In this chapter, the data generated from the questionnaires was used to establish the major strengths, weaknesses, opportunities and threats of the quantity surveying profession using factor analysis. The strengths, weaknesses, opportunities and threats were then reduced and ranked.

Chapter five will discuss the results of this study with reference to existing literature.

CHAPTER 5: DISCUSSION OF STRATEGIC FRAMEWORK AND FINDINGS

5.1. Introduction

This chapter discusses the results of the data analysis in relation to the evidence from literature. It discusses the strengths, weaknesses, opportunities and threats of the profession and provides a strategic framework for the survival of the profession.

5.2. Discussion

5.2.1. Strengths of the Quantity Surveying Profession

According to the data analysis, there are four categories of strengths of the quantity surveying profession that exist. The four categories are the ability to plan and solve problems, core quantity surveying measuring skills, project viability and interpersonal skills.

5.2.1.1. *The ability to plan and solve problems*

Under the category of the ability to plan and solve problems, there are eight strengths namely creative problem solving, team working/interpersonal skills, problem solving, strategic planning, self confidence, can do attitude, networking skills, ensuring a suitable organisational structure and political skills. With a RII of 0.866, creative problem solving ranked first in this category of strengths. Towey (2012), agrees with this as he states that quantity surveyors are required to innovately and creatively approach problems as they are required to ensure the client gets exactly what they expected with the available resources. Further, Stanley (2016) states that quantity surveyors need to be optimistic throughout the duration of the project as they need to ensure than reasonable conclusions are drawn.

Team working/Interpersonal skills ranked second in this category with a RII of 0.838. Quantity surveyors work with both the client and end user as well as the professional team and so they are required to work well in a team environment (Shafie, Khuzzan and Mohvin, 2014). Shafie,

et. al. (2014) continues to state that quantity surveyors need to be able to work with people from different cultural backgrounds and be able to use different approaches to achieve the common goal of the team. Ranked in third with a RII of 0.834 is problem solving which according to Shaie, *et. al.* (2014), is a major skill needed by quantity surveyors as they need to think logically, analytically and creatively as they solve problems. Quantity surveying firms further need to plan strategically in order to cope with the dynamic construction environment. Quantity surveyors need to be good strategic planners as they need to use their strengths in the most effective way relative to their competitors (Hassan, Rahmat and Ali, 2007). This is reinforced by the data analysis presented as strategic planning was ranked fourth with a RII of 0.831.

Quantity surveyors need to be able to work independently and be confident in what they produce. By being confident, clients gain trust in the quantity surveyor and have ease of mind. Further, self confidence is important as quantity surveyors work with money and it is therefore critical that they know what is required of them (Shafie, *et. al.*, 2014). Self confidence, can do attitude was ranked fifth in this category of strengths with a RII of 0.828. In sixth with a RII of 0.783 was networking skills as quantity surveyors are required to communicate fluently with a variety of people. They are also expected to communicate with clients, the end user, contractors and project consultants on a daily basis (Shafie, *et. al.*, 2014).

Ensuring a suitable organisational structure was ranked seventh with a RII of 0.779. Olanipekun, Abiola-Falemu and Aje (2014) agrees to this as they believe that the organisational structure of a firm not only lays the foundation for the organisation but also builds the firm, cultivates it, outlines its purpose, sets its path and prioritises responsibilities thereby delivering results. Lastly, political skills was ranked eighth with a RII of 0.679. The executive director of the ASAQS agrees to this as he believes that quantity surveyors are best placed to stop corruption in government projects in South Africa as they are the people who identify deviations from the original scope and price (Heever, 2017).

5.2.1.2. Core quantity surveying costing skills

Under the category of core quantity surveying costing skills, there are six strengths namely accuracy, cost accounting and financial management, measurement/quantification, estimating and pricing, cash flow forecasting and budgeting and attention to detail.

Accuracy was ranked first with a RII of 0.924. Olanipekun, *et. al.* (2014), states that accuracy is extremely important as a small difference in the calculations can have major effects on the whole presentation of works. Quantity surveyors need to be careful with calculations to avoid mistakes. With a RII of 0.699, cost accounting and financial management was ranked second. After the project is completed, the quantity surveyor evaluates the work executed and prepares a final account which negotiates the final payment of the contractor. Therefore, it is important for quantity surveyors to have a good understanding of cost accounting and financial management (Visser, 2009).

Measurement/Quantification was ranked third with a RII of 0.914 as it is one of the most important skills of a quantity surveyor. Measurement stems from basic numerate education, the ability to read and interpret drawings, experience on site as well as the ability to cope with vast amounts of paper work. Measurement or 'taking off' is a process that requires a technical knowledge and understanding of the building and civil engineering technology (Hodgson, Sher and Mak, 2016). In addition, Visser (2009), believes that estimating and pricing is another key strength that is required by a quantity surveyor. The initial preliminary cost estimate is produced by the project quantity surveyor and it is important that the quantity surveyor sticks to the budget throughout the project. This holds true as estimating and pricing was ranked fourth with a RII of 0.910.

Cash flow forecasting and budgeting was ranked fifth with a RII of 0.890. Quantity surveyors do need to have good budgeting skills as they have to ensure the project is always on budget. The quantity surveyor will further produce a cash flow forecast that will enable the client to see the month to month expenses and budget accordingly (Visser, 2009). Lastly in this category of strengths, attention to detail is ranked sixth with a RII of 0.883. Randstad (2014) agrees to this as he states that a quantity surveyor's role requires a high level of attention to detail. It is the

role of the quantity surveyor to ensure that costs are kept within budget without sacrificing quality. They also need to keep a close eye on the contractor, the materials that are being used and the costs of the project.

5.2.1.3. *The ability to produce a viable project*

Under the category of the ability to produce a viable project, there are five strengths namely leadership, feasibility studies, value management/construction economics, design economics and life cycle costing.

Leadership and feasibility studies were both ranked first with a RII of 0.845 each. This holds true as Olanrewaju and Anahve (2015) believes that quantity surveying firms has a sense of leadership amongst their clients as they have to lead their clients in the right path much like a leader in a team project. Quantity surveyors provide advice on cost implications of both the clients requirements and decisions and so it is important that they lead their client in the right direction while Visser (2009) believes that it is advisable that the client seek the services of a quantity surveyor who will be able to do a feasibility study of the project as a feasibility study will set out what the client will need to pay for the project as well as the anticipated return. This will in turn give the client a better understanding of whether the project will be feasible in the long run.

Value management/Construction economics was ranked second with a RII of 0.834 whereas design economics was ranked third with a RII of 0.800. The increasing involvement of quantity surveyors in value management provides a great strength for the profession to re-engineer some of its traditional roles in a more positive light by developing more cutting-edge skills that will promote the profession. Value management is part of the services offered by quantity surveyors (Mohamad, Saifulnizam, Vaughan, Coffey and Christopher, 2011). Further, Koigi (2017), states that quantity surveyors can not only provide financial advice at the design stage that considers capital costs, risks and value but factors that promote sustainability and impact on the building's lifecycle costs. Therefore, design economics is also important to a quantity surveyor. Lastly, life cycle costing is ranked fourth in this category with a RII of 0.786. RICS (2018)

agrees as the quantity surveyor is responsible to provide the client with the total cost and spend profile for the building on the likely total cost of the building over its life span.

5.2.1.4. *Interpersonal Skills*

Lastly, under the category of interpersonal skills, there are five strengths namely communication skills, negotiation skills, client relationship management, dispute resolution/conflict management and data management/record keeping.

It is extremely important to have good communication skills as a quantity surveyor to not only express your opinion verbally, but on paper as well. From the very start of the project, communication is important (RICS, 2017). This holds true as communication skills was ranked first with a RII of 0.897. In addition, negotiation skills was ranked second with a RII 0.866. RICS SBE (2017) agrees to negotiation skills being important as the quantity surveyor is responsible to negotiate with a number of different people. This applies that quantity surveyors need to listen to the opinions of others and also give in their own input. Quantity surveyors need to ensure they can work well in a team and be able to motivate and lead people. A skilled quantity surveyor will have no problem in using negotiation skills that they have learned to put their point across while facilitating a solution that suits all stakeholders.

Client relationship management was ranked third with a RII of 0.852. This is true as a quantity surveyor is a financial consultant of the construction industry and protects the needs of the client. It is therefore important that quantity surveyors maintain a good relationship with their clients (Olatunde and Okorie, 2016). Lastly, dispute resolution/conflict management and data management/record keeping were both ranked fourth with a RII of 0.834 each. From time to time, a dispute arises. It is the responsibility of the quantity surveyor to get involved and assist the parties to settle the disputes that arise out of construction work (Randstad, 2014). Further, in order to achieve a successful project, it is important to keep written records that is well organised and structured. For a quantity surveyor, it is important to keep records of the brief, client and project team meetings, design team meetings, site meetings, records of site inspections, site instructions as well as all correspondences to ensure everything is recorded so no disputes may arise (Fordham, 2018).

5.2.1.5. *The strengths that were lost in the data analysis*

There were four strengths that were lost in the data analysis namely trust, knowledge management, construction law and contract management, construction technology knowledge and industry knowledge.

However, according to Cartlidge (2011), quantity surveyors should also be trustworthy as they should never deliberately mislead clients. The dealings of quantity surveyors should be transparent as quantity surveyors are responsible and accountable for all their actions. In addition, Abdul-Rahman, Alashwal and Jamaludin (2011) believes that the main contributor to a quantity surveyor's portfolio is knowledge and as a result, their expertise can be improved by effective knowledge management skills. Further, Visser (2009), believes that the quantity surveyor's role is not only to calculate costs but also includes the financial viability of the project. To calculate the profit and risk in respect of the project, the quantity surveyor needs to be aware of the developments and progress made on the construction site which means that the quantity surveyor is required to have a good understanding of construction technology and understand how construction takes place. Lastly, ASAQs (2018) states that quantity surveyors liaise with other construction professionals to protect the interest of the client. Due to quantity surveyors being the financial consultants of the construction industry, they require a vast knowledge of construction.

5.2.2. Weaknesses of the Quantity Surveying Profession

According to the data analysis, there are three categories of weaknesses of the quantity surveying profession that exist. The three categories are technical inadequacies of quantity surveyors, resistance to change and lack of knowledge of and about the profession.

5.2.2.1. *Technical inadequacies of quantity surveyors*

Under the category of the technical inadequacies of quantity surveyors, there are six weaknesses namely lack of training experience, the lack of suitably skilled and experienced quantity surveyors, inaccuracies in cost estimates, lack of competencies in the quantity surveying

profession, poor attitude towards continuous professional development and lack of information technology/computing skills.

Lack of training experience was ranked first with a RII of 0.734. Quantity surveying firms should diversify and specialise to gain competitive advantage. Sufficient “on-the-job” training should be in place for inexperienced employees. This will ensure the firm has and maintains a competitive edge (Smith, 2002). The lack of suitably skilled and experienced quantity surveyors was ranked second with a RII of 0.724. Better jobs and salaries overseas are one of the main reasons for the accelerated outflow. Most of the recently qualified BEE quantity surveyors prefer job-hopping and use job offers and letters of appointment to negotiate better salaries (Venter, 2009). Further, one of the biggest challenges for qualified and experienced quantity surveyors working in industry is the lack of exposure and experience for young professionals who want to enter the industry as well as for those who have had a few years of experience (Moodley, 2012).

Ranked in third with a RII of 0.717 is inaccuracies in cost estimates. This holds true as Moodley (2012) states that in order to mitigate the risk of cost overruns and unreliable estimates, contingencies are often added to the budget to cope with uncertainties that may occur during construction. The lack of competencies in the quantity surveying profession was ranked fourth with a RII of 0.700. Said, Shafiel and Omran (2010) states that competencies in any sphere of work can be a difficult concept. Professional occupations are particularly difficult when it relates to professional occupations as roles can be complex. It is therefore important that quantity surveyors possess the required competencies in order to succeed.

Continuous professional development in the quantity surveying profession intends to ensure professional competence amongst registered professional’s past training along and throughout their career. However, in South Africa, not all professional quantity surveyors submit their CPD details on time which in turn, creates the possibility of being de-registered and therefore not being allowed to function as a registered professional quantity surveyor (Olwage, Cumberlege and Moss, 2015). This is confirmed as poor attitude towards continuous professional development was ranked fifth with an RII of 0.686. Lastly, the lack of information

technology/computing skills was ranked sixth with a RII of 0.659. Compared to most other industries, the rate of adoption of information technology and computing skills has been slow in the construction industry. The main reason is probably due to the extremely fragmented nature of the construction industry (Smith, 2001).

5.2.2.2. *Resistance to Change*

Under the category of resistance to change, there are four weaknesses namely inability to change, inability to adopt BIM, low levels of innovation and little attention to lifelong learning.

Inability to change was ranked first with a RII of 0.710. Smith (2002) agrees as many quantity surveying firms focus on the traditional technical role of the quantity surveyor and are therefore not prepared to or capable enough to raise their services. The inability of quantity surveying firms to change and re-engineer their services to take advantage of the technological advances could drag the profession down. The ability to adopt BIM was ranked second with a RII of 0.707. The only way to ensure survival as a quantity surveying firm is to actively educate, train and adopt BIM as traditional means of working and providing services will soon become redundant (Crowley, 2013).

In addition, a major growth driver in the productivity of any firm is innovation. Some professional services offered by quantity surveying firms are not necessarily needed by the client, or may be outdated. Therefore, it is important that quantity surveying firms build up the stamina to not only challenge existing unnecessary or unwanted practices and implement new innovative practices (Owusu-Manu, Torku, Pam, Addy and Edwards, 2017). This can be confirmed as low levels of innovation is ranked third in this category with a RII of 0.686. Lastly, little attention to lifelong learning was ranked fourth in this category with a RII of 0.676. Thayaparan, Siriwardena, Amaratunga, Malalgoda and Keraminiyage (2011) believes that more quantity surveyors need to start embracing lifelong learning as it will enable them to continuously support construction throughout their life time through both learning and re-training programmes.

5.2.2.3. *Lack of knowledge of and about the profession*

Under the category of lack of knowledge of and about the profession, there are four weaknesses namely overqualified but lack of experience, decline in measuring skills, lack of marketing of the quantity surveying profession and lack of awareness of quantity surveying as a profession.

Overqualified but lack of experience was ranked first with a RII of 0.745. Green (2013) agrees that many quantity surveyors are overqualified with little or no work experience. This is a weakness because employers cannot pay the quantity surveyor what the title holds due to the quantity surveyor not knowing what to do practically in the job position, the quantity surveyors do not know exactly what the job requires of them and the quantity surveyor may not be too happy working for a manager who has a lower qualification than them. Decline in measuring skills was ranked second with a RII of 0.741. This is true as a decline in measuring skills will cause quantities to be inaccurate thereby affecting the project cost (Nani and Adjei-Kumi, 2007).

Further, the quantity surveying profession is fairly unknown to the public. Many people in the building industry also only have a vague idea of what a quantity surveyor actually is. The function and the necessity of quantity surveyors in the industry should be marketed to professional people such as architects and engineers. The field as a study choice should be aggressively marketed to schools and at career events (Venter, 2009). The data analysis confirms this weakness as the lack of marketing of the quantity surveying profession was ranked third with a RII of 0.738. Lastly, the lack of awareness of quantity surveying as a profession, with a RII of 0.669 was ranked fourth. The quantity surveying profession has been in existence for a long time however there is generally low awareness of the profession. However, there is not only a lack of awareness of the profession amongst school children and parents but also to the public. Therefore, greater awareness of the profession is long overdue (Olatunde and Okorie, 2016).

5.2.2.4. *The weaknesses that were lost in the data analysis*

There was one weakness that was lost in the data analysis namely few candidates become professional quantity surveyors.

However, according to van der Westhuizen (2018), the problem with quantity surveyors in South Africa is that few candidate quantity surveyors become professional quantity surveyors and therefore they do not grow in the career. This however, was not seen as relevant in the survey.

5.2.3. Opportunities of the Quantity Surveying Profession

According to the data analysis, there are three categories of opportunities of the quantity surveying profession that exist. The three categories are alternate positions for quantity surveyors, the need for quantity surveyors and new and existing roles in and out of the profession.

5.2.3.1. *Greater demand for quantity surveyors*

Under the category of greater demand for quantity surveyors there are four opportunities namely ability to perform multiple services, quantity surveying firms- an asset for public private partnership, building information modeling and market for facilities management services.

The ability to perform multiple services was ranked first with a RII of 0.800. Clients now expect more flexibility and broader professional advice therefore quantity surveyors can therefore now provide estimate costs of preliminary designs without drawings by using their experiences, rules of thumbs and data sheets and also offer advice on issues like procurement management and engineering, cost advice, design reviews and facilitation based on risk (Seah, 2017). Quantity surveying firms- an asset to public private partnership was ranked second with a RII of 0.752. Mudi (2016) agrees as quantity surveyors as professionals within the built environment has the potential of modifying and managing the process in which Public-Private Partnership (PPP) projects are being managed for economic growth. In PPP projects, quantity surveyors offer economic advice and procurement management as well as cost advice on the likely cost of the project.

Also, Crowley (2013) believes that by adopting and using BIM, the basic skills of quantity surveyors can be interpreted into improved skills thereby providing enhanced skills to clients.

Quantity surveyors can gain a significant amount of time by using BIM for the quantification and calculation thereby gaining additional time to carry out new and enhanced quantity surveyor's services such as life cycle and carbon costing. Building Information Modelling was ranked third with a RII of 0.745. Lastly, market for facilities management services was ranked fourth with a RII of 0.707. Facilities management is considered as an alternative for quantity surveyors as many buildings that have been built now requires maintenance management. The quantity surveying and facilities management profession therefore have a lot of similarities in terms of competencies that includes contractual, financial and procurement management (Salleh, *et. al.*, 2014).

5.2.3.2. *The need for quantity surveyors*

Under the category for the need for quantity surveyors, there are three opportunities namely market for core quantity surveying methods, efficiency increases brought about by technological advances and demand for quantity surveyors.

The market for core quantity surveying methods was ranked first with a RII of 0.783. There is high demand for quantity surveying core services such as planning, estimating and monitoring costs. Quantity surveyors are often considered the economists of the construction industry as they are central to the decision-making process throughout the project's life cycle. In the high-pressure world of escalating costs and large-scale developments, the role of a quantity surveyor is more important than ever before (Venter, 2009).

Efficiency increases brought about by technological advances was ranked second with a RII of 0.762. Technology is central to the future roles of a quantity surveyor. What once took the firm months to complete can now be done in minutes. Therefore, the quantity surveying profession must evolve with technology to keep up (Seah, 2017). Lastly, the demand for quantity surveyors was ranked third with a RII of 0.645. This holds true as there is a huge demand for quantity surveyors all around the world. the shortage is not addressed, the construction industry could be negatively affected (Kihn, 2013).

5.2.3.3. *New and existing roles in and out of the profession*

Under the category of new and existing roles in and out of the profession, there are three opportunities namely market for core quantity surveying methods, new roles for quantity surveyors in alternate procurement methods and sector specific work experience.

New roles for quantity surveyors in alternate procurement methods was ranked first with a RII of 0.779. There are various procurement methods that exist in the construction industry. This reflects the extent to which the client may be willing and able to bear certain levels of risk (Olanrewaju, Anavhe, Aziz, Chen and Han, 2016). Market for quantity surveyors in civil infrastructure and engineering projects was ranked second with a RII of 0.766. The cost of infrastructure and engineering projects are different than that of building projects and so the importance of quantity surveyors is much more important (Cole, 2013). Further, in trying to secure a job, work experience is extremely helpful. Dedication and enthusiasm for the field along with working knowledge are what employers look for (Stanley, 2016). Sector specific work experience was ranked third with a RII of 0.748.

5.2.3.4. *The opportunities that were lost in the data analysis*

There was one opportunity that was lost in the data analysis namely proficiency and information technology.

However, Olanipekun, Abiola-Falemu and Aje (2014) believes that a qualified quantity surveyor should be computer literate and familiar with the common uses and applications of computers and computer software. Good information technology and numeracy skills coupled with the ability to analyse complicated documents are important facets of being a quantity surveyor. This however, was not seen as relevant in the survey.

5.2.4. Threats of the Quantity Surveying Profession

According to the data analysis, there are three categories of threats of the quantity surveying profession that exist. The three categories are lack of the quantity surveying profession to market itself where new roles require an advancement of core quantity surveying services,

external factors that hinder the performance of the profession and the lack of quantity surveying skills in the new generation.

5.2.4.1. *Lack of the quantity surveying profession to market itself where new roles require an advancement of core quantity surveying services*

Under the category of lack of the quantity surveying profession to market itself where new roles require an advancement of core quantity surveying services, there are six threats namely shortfalls in the quantity surveying qualifications offered at tertiary institutions, other professions performing quantity surveying services, changes in client's demand, lack of marketing of the quantity surveying profession, the profession's "lack of voice" due to small professional groups and lack of formal registration and chartered status.

Shortfalls in the quantity surveying qualifications offered at tertiary institutions was ranked first with a RII of 0.783. Tertiary institutions offering quantity surveying are negatively impacted by the current economic conditions. Students who enter such programs often lack preparedness and university resources in the form of staff and infrastructure. The ability of tertiary institutions to attract young academics, train them and keep them in the long run is almost impossible (Venter, 2009). Further, to ensure only high-quality students, who earned a significant number of entrance points during matric, are entering quantity surveying programmes, applicants to tertiary institutions should be screened (Moodley, 2012).

Other professions performing quantity surveying services was ranked second with a RII of 0.772. There are many other professionals carrying out some of the duties of quantity surveyors such as project cost managers with many other professionals with the potential to do so. The main threats to quantity surveying firms are project management firms as well as large accountancy firms. Some large companies also offer "one-stop shop" approach as well as more "in-house" services are threats to quantity surveying firms (Smith, 2002). Ranked in third with a RII of 0.745 was changes in client's demands. The change in the clients' demand can see quantity surveyors who are not prepared to embrace the change, fail. Emphasis is now placed on speed, accuracy and value-based services from quantity surveyors as clients are becoming more involved in the building processes (Hassan, *et. al.*, 2007).

Lack of marketing of the quantity surveying profession was ranked fourth with a RII of 0.728 while the profession's "lack of voice" due to small professional groups was ranked fifth with a RII of 0.714. Ramodike (2016) believes that the quantity surveying profession is a profession that is not predominantly known or popular amongst the youth on the verge of choosing their career paths. This is due to the reason that quantity surveying is not marketed as well as other professions whereas Loader (2006) believes that when the construction industry of South Africa experiences a high level of economic growth which is causing a shortage of registered quantity surveyors. The shortage is mainly due to the lack of voice of the profession. The general public do not necessarily know what a quantity surveyor is of the role of a quantity surveyor in the industry. Lastly, lack of formal registration and chartered status was ranked sixth with a RII of 0.683. This holds true as less than half of new applications translate into professional quantity surveyors due to inadequate education or lack of employment within the profession (Lyons, 2015).

5.2.4.2. *External factors that hinder the performance of the profession*

Under the category of external factors that hinder the performance of the profession, there are three threats namely the perception that quantity surveyors are non-critical to project success, changes in technology and the global financial crises.

The perception that quantity surveyors are non-critical to project success was ranked first with a RII of 0.755. Quantity surveyors are often not appointed due to the cost of appointment. However, the without the expertise that a quantity surveyor will bring to any project could result in the project eventually costing a lot more than anticipated (James, 2016).

Changes in technology and the global financial crises were both ranked second with a RII of 0.703 each. New technologies and forms of innovative quantity surveying services such as building information modelling, the preparation of the bills of quantities, estimates and feasibility studies has had major threats to the industry as these technologies may one day make the quantity surveyor redundant (Hassan, *et. al.*, 2007). The global financial crisis (GFC) had had major effects on the international construction market and in the quantity surveyors operating within it. There are many threats that exist because of the GFC (Frei, 2010).

5.2.4.3. *The lack of quantity surveying skills in the new generation*

Under the category of the lack of quantity surveying skills in the new generation, there are three threats namely the lack of suitable and experienced quantity surveyors, lack of knowledge management and the ageing workforce and the under supply of new entrants.

The lack of suitable and experienced quantity surveyors was ranked first with a RII of 0.783. Past president of the Association of South African Quantity Surveyors (ASAQS), Qinisani Mbatha suggests that the public sector fails to attract qualified and mature minded people and therefore settles for less-qualified individuals. The bigger issue according to Mbatha is the lack of properly qualified and experienced quantity surveyors that are currently working in the industry together with the lack of exposure and experience of the young professionals who are entering the profession (Moodley, 2012).

Lack of knowledge management was ranked second with a RII of 0.741. There are probable complications in the quantity surveying profession that are related to knowledge management such as the reluctance to change the current operating system, the confusion and difficulty to evaluate knowledge management and the reluctance of employees to share their knowledge (Abdul-Rahman, *et. al.*, 2011). Lastly, the ageing workforce and the undersupply of new entrants was ranked third with a RII of 0.690. The construction workforce is ageing and there is a loss of interest amongst young people thereby leading to an increase in the proportion of older construction workers. Older workers are thereby valuable source of experience and skills however they are exposed to a wide range of hazards that leads to possible injuries (Eppenberger and Haupt, 2009).

5.2.4.4. *The threats that were lost in the data analysis*

There were three threats that were lost in the data analysis namely competition amongst quantity surveying firms, fee cutting and the use of computer aided design (CAD).

Hassen, *et. al.* (2007) believes that the construction industry faces many changes in the workload, work mix and the way in which those changes are managed. Quantity surveying firms are therefore moving closer to clients who are becoming more sophisticated. This has led

to competition amongst quantity surveying firms. Further, he goes on to state that competition stimulates invention, efficiency and development. In addition, Smith (2002), believes that bidding and fee cutting amongst firms is a major threat facing the industry. During the recession, firms became frantic for work and were therefore prepared to reduce their fees to often unworkable levels. Lastly, Smith (2002) also believes that quantity surveyors can now have a lot more time to focus on other duties which will add to their value-added services by embracing computer aided design (CAD)

5.3. Redefined Strategic Framework for the Quantity Surveying Profession

The profession needs to recognise and know their strengths, acknowledge their weaknesses and spot their opportunities. The profession can then, through a strategic framework, use their strengths to minimise their threats and improve their weaknesses by taking advantage of potential opportunities. Once the profession works to eliminate their weaknesses, they will be able to avoid threats.

Figure 5.1 shows the redefined strategic framework for the survival of the quantity surveying profession

SWOT ANALYSIS OF THE QUANTITY SURVEYING PROFESSION



Figure 5.1: Redefined Strategic Framework for the Quantity Surveying Profession

Figure 5.2 below shows the strengths and threats of the quantity surveying profession. The strengths can minimise the threats faced by the profession. As can be seen below, interpersonal skills and core measuring skills can minimise the effect of the lack of the quantity surveying profession to market itself where new and existing roles require an advancement of core quantity surveying services. The strength of interpersonal skills about the profession can be used to combat the lack of the profession to market itself while core quantity surveying measuring skills can be used to combat the requirements of the advancement of core quantity surveying services. Quantity surveyors can therefore spread the word on the profession and assist by marketing itself and quantity surveyors who have good core measuring skills can attend workshops and or seminars that will assist in advancing these skills. Similarly, the weakness of external factors that hinder the performance of quantity surveyors can be solved by the strength of quantity surveyors to plan and solve problems. Lastly, the strength of core quantity surveying measuring skills can be used to minimise the weakness of the lack of quantity surveying skills in the new generation as the older generations can assist and train the new generation both in tertiary institutions as well as in the office

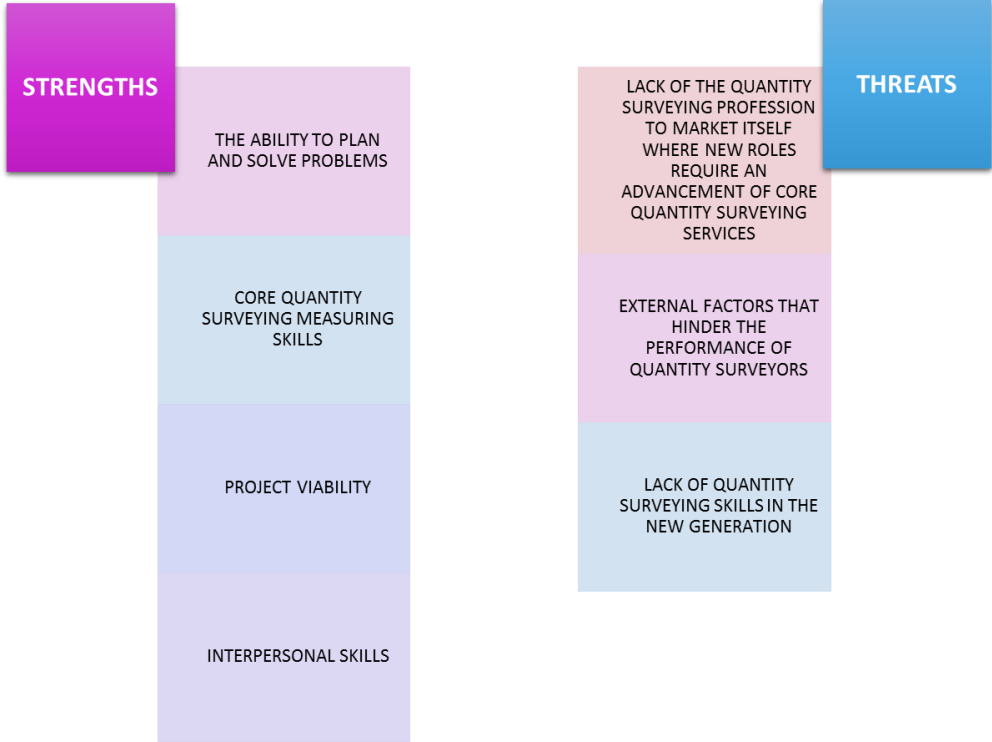


Figure 5.2: Strengths and Threats of the Quantity Surveying Profession

Figure 5.3 below shows the opportunities and weaknesses of the quantity surveying profession. The weaknesses of the profession can be improved by taking advantage of the potential opportunities. Alternate positions for quantity surveyors and new and existing roles in and out of the profession can be used as a motivating factor for the weakness of the resistance to change. So, if the profession is open to change, they can gain work in alternate positions for quantity surveyors and new and existing roles in and out of the profession. The need for quantity surveyors can be a motivating factor to advertise and make people aware of the profession so the weakness of the lack of knowledge of and about the profession can be improved. Lastly, the need for quantity surveyors can be a motivating factor to teach and attend workshops so as to improve on the technical inadequacies of quantity surveyors.



Figure 5.3: Opportunities and Weaknesses of the Quantity Surveying Profession

By overcoming the threats and weaknesses of the profession, the profession can focus on the strengths and take on more opportunities. This ensures that the profession survives and remains relevant in this ever-changing construction industry.

5.4. Chapter Summary

This chapter discussed the main strengths, weaknesses, opportunities and threats of the quantity surveying profession as well as those strengths, weaknesses, opportunities and threats that the participants feel are not actually affecting the profession. In addition, a redefined strategic framework was produced with recommendations on how to overcome weaknesses and threats while taking advantage of strengths and opportunities.

Chapter six presents the summary, conclusion and recommendations based on the findings as discussed in chapter five.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1. Introduction

The overriding purpose of this study was to produce a strategic framework for the survival of the quantity surveying profession. To accomplish that goal, it became necessary to reach some prerequisite goals. By taking a deeper look at the profession, a greater understanding of the strengths, weaknesses, opportunities and threats that face the profession was determined.

This chapter starts by giving the reader a summary of the dissertation. It then goes on to discuss the results of the objectives in relation to the evidence from literature. Further, recommendations for future research are presented.

6.2. Summary of Dissertation

In response to the ever-increasing changes in the global business environment, professions must evolve. Quantity surveyors are not invulnerable to these changes and therefore an array of challenges threatens the existence of the profession. Quantity surveying firms require urgent and far-reaching strategic transformation that will overcome their threats and weaknesses and embrace the strengths and opportunities of the profession to ensure they survive and remain relevant in the ever-changing construction industry.

The purpose of this study was to analyse the survival of the quantity surveying profession using a SWOT analysis in an attempt to develop a strategic framework for detecting the overall performance of an organisation and to identify areas requiring improvement to enable the organisation to achieve sustained growth and remain relevant.

General information regarding quantity surveying was highlighted along with the duties and personal attributes of quantity surveyors, how to become a quantity surveyor as well as the registration process that quantity surveyors follow. Thereafter, the strengths, weaknesses, opportunities and threats of the quantity surveying profession were discussed. A strategic framework of the quantity surveying profession based on the literature was discussed. From the

literature review, twenty-nine strengths, fifteen weaknesses, eleven opportunities and fifteen threats were found. This was tested via a questionnaire administered to the quantity surveying profession.

The positivist paradigm was used in this study. The researcher chose quantitative research in the form of questionnaires which were given to quantity surveyors who are members of the Association of South African Quantity Surveyors (ASAQS). A probability sampling method was chosen for this study. The desired method that was used is the random sampling method. The data was analysed with SPSS using factor analysis and descriptive analysis. Reliability was ensured by using the Cronbach's alpha whereas validity was tested by ensuring all questions on the questionnaire were identified by the comprehensive literature review which was then validated during the pilot study.

6.3. Discussion

Research Question and Research Objective 1

Displayed in Table 6.1 is research question and research objective 1 of this study.

Table 6.1: Research Question and Research Objective 1

Research Question 1	Research Objective 1
What are the key strengths and weaknesses of the quantity surveying profession according to professional consultants' experience in the profession?	To define the key strengths and weaknesses of the quantity surveying profession based on professional consultants' experience in the profession.

6.3.1. Strengths of the Quantity surveying profession

Out of the twenty nine strengths, only twenty four were relevant according to the data analysis. The twenty four strengths are divided into four categories namely the ability to plan and solve problems, core quantity surveying costing skills, the ability to produce a viable project and interpersonal skills. Under the category of the ability to plan and solve problems, there are eight strengths namely creative problem solving, team working/interpersonal skills, problem solving, strategic planning, self confidence, can do attitude, networking skills, ensuring a suitable organisational structure and political skills whereas core quantity surveying costing skills

consist of six strengths namely accuracy, cost accounting and financial management, measurement/quantification, estimating and pricing, cash flow forecasting and budgeting and attention to detail. Under the category of the ability to produce a viable project, there are five strengths namely leadership, feasibility studies, value management/construction economics, design economics and life cycle costing. Lastly, under the category of interpersonal skills, there are five strengths namely communication skills, negotiation skills, client relationship management, dispute resolution/conflict management and data management/record keeping.

6.3.2. Weaknesses of the Quantity surveying profession

Out of the fifteen weaknesses, fourteen were relevant according to the data analysis. The fourteen weaknesses are divided into three categories namely technical inadequacies of quantity surveyors, resistance to change and lack of knowledge of and about the profession. Under the category of the technical inadequacies of quantity surveyors, there are six weaknesses namely lack of training experience, the lack of suitably skilled and experienced quantity surveyors, inaccuracies in cost estimates, lack of competencies in the quantity surveying profession, poor attitude towards continuous professional development and lack of information technology/computing skills. The category, resistance to change, consists of four weaknesses namely inability to change, inability to adopt BIM, low levels of innovation and little attention to lifelong learning whereas in the category of lack of knowledge of and about the profession, there are four weaknesses namely overqualified but lack of experience, decline in measuring skills, lack of marketing of the quantity surveying profession and lack of awareness of quantity surveying as a profession.

Research Question and Research Objective 2

Displayed in Table 6.2 is research question and research objective 2 of this study.

Table 6.2: Research Question and Research Objective 2

Research Question 2	Research Objective 2
What are the key opportunities and threats that are perceived to impact the quantity surveying profession?	To determine the key opportunities and threats which are perceived to impact the quantity surveying profession significantly.

6.3.3. Opportunities of the Quantity surveying profession

Out of the eleven opportunities, ten were relevant according to the data analysis. The ten opportunities are divided into three categories namely greater demand for quantity surveyors, the need for quantity surveyors and new and existing roles in and out of the profession. Greater demand for quantity surveyors consists of four opportunities namely ability to perform multiple services, quantity surveying firms- an asset for public private partnership, building information modeling and market for facilities management services. The need for quantity surveyors consists of three opportunities namely market for core quantity surveying methods, efficiency increases brought about by technological advances and demand for quantity surveyors. Lastly, under the category of new and existing roles in and out of the profession, there are three opportunities namely market for quantity surveyors in civil infrastructure and engineering projects, new roles for quantity surveyors in alternate procurement methods and sector specific work experience.

6.3.4. Threats of the Quantity surveying profession

Out of the fifteen threats, twelve actually exist according to the data analysis. The twelve threats are divided into three categories namely lack of the quantity surveying profession to market itself where new roles require an advancement of core quantity surveying services, external factors that hinder the performance of the profession and the lack of quantity surveying skills in the new generation. Under the category of lack of the quantity surveying profession to market itself where new roles require an advancement of core quantity surveying services, there are six threats namely shortfalls in the quantity surveying qualifications offered at tertiary institutions, other professions performing quantity surveying services, changes in client's demand, lack of marketing of the quantity surveying profession, the profession's "lack of voice" due to small professional groups and lack of formal registration and chartered status. External factors that hinder the performance of the profession consists of three threats namely the perception that quantity surveyors are non-critical to project success, changes in technology and the global financial crises. Lastly, under the category of the lack of quantity surveying skills in the new generation, there are three threats namely the lack of suitable and experienced quantity

surveyors, lack of knowledge management and the ageing workforce and the under supply of new entrants.

Research Question and Research Objective 3

Displayed in Table 6.1 is research question and research objective 3 of this study.

Table 6.3: Research Question and Research Objective 3

Research Question 3	Research Objective 3
Can a strategic framework be used by the quantity surveying profession to plot their strengths and weaknesses against the identified opportunities and threats to reveal the survival of the profession?	To develop and apply a strategic framework that could be used by the quantity surveying profession to plot their strengths and weaknesses against the identified opportunities and threats thereby revealing the survival of the profession.

The profession needs to recognise and know their strengths, acknowledge their weaknesses and spot their opportunities. The profession can then, through a strategic framework, use their strengths to minimise their threats and improve their weaknesses by taking advantage of potential opportunities. Once the profession works to eliminate their weaknesses, they will be able to avoid threats.

The framework developed in chapter 5 shows that the strengths of the profession can minimise the threats faced by the profession. Interpersonal skills and core quantity surveying measuring skills can minimise the lack of the quantity surveying profession to market itself where new and existing roles require an advancement of core quantity surveying services while interpersonal skills can combat the lack of the profession to market itself while core quantity surveying measuring skills can be used to combat the requirements of the advancement of core quantity surveying services. The ability to plan and solve problems can combat external factors that hinder the performance of quantity surveyors. Lastly, core quantity surveying measuring skills can be used to minimise the lack of quantity surveying skills in the new generation.

The framework developed in chapter 5 shows the opportunities and weaknesses of the quantity surveying profession. The weaknesses of the profession can be improved by taking advantage

of the potential opportunities. Resistance to change can be improved with alternate positions for quantity surveyors and new and existing roles in and out of the profession whereas the lack of knowledge of and about the profession can be improved by the need for quantity surveyors and the technical inadequacies of quantity surveyors can be improved by the need for quantity surveyors.

6.4. Recommendations

The following are recommendations for further research: -

- The future role of the quantity surveyor
- The skills deficit between quantity surveying programmes offered at tertiary institutions and quantity surveying skills required in the workplace
- The changing role of the quantity surveyor

6.5. Chapter Summary

This study highlighted the weaknesses and threats of quantity surveying profession which they need to overcome in order to be successful and remain relevant in the industry. This study thereby aided the quantity surveying profession by identifying the strengths and opportunities and determining the weaknesses and threats faced by the profession. It then categorised the strengths, weaknesses, opportunities and threats and rankings were made within each category.

Four categories of strengths exist in the quantity surveying profession namely the ability to plan and solve problems, core quantity surveying measuring skills, project viability and interpersonal skills. Three categories of weaknesses exist in the quantity surveying profession namely technical inadequacies of quantity surveyors, resistance to change and lack of knowledge of and about the profession. Three categories of opportunities exist in the quantity surveying profession namely alternate positions for quantity surveyors, the need for quantity surveyors and new and existing roles in and out of the profession. Three categories of threats exist in the quantity surveying profession namely the lack of the quantity surveying profession to market itself where new roles require an advancement of core quantity surveying services,

external factors that hinder the performance of the profession and the lack of quantity surveying skills in the new generation.

In addition, through a strategic framework, the strengths of the quantity surveying profession can be used to minimise the threats of the profession and the weaknesses of the profession can be improved by taking advantage of the opportunities of the profession. Once the profession eliminates the weaknesses, they can avoid potential threats. Therefore, the profession can achieve sustained growth and remain relevant.

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APPENDIX A: ETHICAL CLEARANCE

APPENDIX B: QUESTIONNAIRE

Engineering, College of Agriculture, Engineering and Science,
University of KwaZulu-Natal,
Howard College Campus,

Greetings

INFORMED CONSENT LETTER

I, Tashmika Ramdav, currently enrolled for a Master of Science in Quantity Surveying in the School of Engineering at the University of KwaZulu-Natal, am undertaking a research project to determine the survival of the quantity surveying profession. I kindly request that you complete this short questionnaire regarding your views on the strengths, weaknesses, opportunities and treats of quantity surveying firms. It should take no longer than 10 minutes of your time. Your response is of utmost importance for this research to be complete.

Please do not write your name or contact details on the questionnaire. It remains anonymous.

Kindly return the completed questionnaire to me on or before 31st of August 2018.

Please note that:

- Your confidentiality is guaranteed as your inputs will not be attributed to you in person, but reported only as a population member opinion.
- The questionnaire may last for about 10 minutes.
- Any information given by you cannot be used against you, and the collected data will be used for purposes of this research only.
- Data will be stored in secure storage and destroyed after 5 years.
- You have a choice to participate, not participate or stop participating in the research. You will not be penalized for taking such an action.
- Your involvement is purely for academic purposes only, and there are no financial benefits involved.

I can be contacted at:

Email: tashmika.12@gmail.com/ 214530457@stu.ukzn.ac.za

Cell: 084 789 1344

My supervisor is Dr. Nishani Harinarain who is located at the School of Engineering, Howard College campus of the University of KwaZulu-Natal.

Contact details: Email: harinarain@ukzn.ac.za Phone number: 031 260 2687

You may also contact the Research Office through:

P. Mohun, HSSREC Research Office,

Tel: 031 260 4557 E-mail: mohunp@ukzn.ac.za

Thank you for your contribution to this research.

QUESTIONNAIRE SCHEDULE

Kindly complete the questionnaire by crossing (x) the relevant block or answering the question in the space provided.

Section A – Background Information

This section of the questionnaire refers to the background or biographical information of the respondent. I assure you that your response will remain anonymous at all times. Your co-operation is appreciated.

1. What is your gender?

Male	
Female	

2. What is your age? _____

3. What is your ethnicity?

Black	
White	
Coloured	
Indian/Asian	

4. What is your education qualification level?

Grade 11 or lower (Std 9 or lower)	
Grade 12 (Std 10)	
Post Matric Certificate	
Diploma	
Degree (s)	

Honours Degree (s)	
Master's Degree (s)	
PhD	
Other (Please State)	

5. What best describes you currently?

Candidate Quantity Surveyor	
Junior Quantity Surveyor	
Intermediate Quantity Surveyor	
Senior Quantity Surveyor	
Professional Quantity Surveyor	

6. What type of projects have you been involved in the past 2 years? (Mark all that is applicable)

Residential	
Retail	
Mixed-use Developments	
Infrastructure	
Leisure	
Industrial	
Education	
Healthcare	
Other	

7. What are your years of experience as a quantity surveyor? _____

For the following sections (B, C, D, E and F), please indicate your answers by crossing the appropriate number in the 5- point Likert type scale under the appropriate section: 1= Strongly Disagree (SD), 2 = Disagree (D), 3 = Neutral (N), 4 = Agree (A), 5 =Strongly Agree (SA).

Section B – Strengths of Quantity Surveying Firms

This section of the questionnaire explores your point of view on the strengths of quantity surveying firms.

8. To what extent do you agree with each of the following strengths of quantity surveying firms?

No	Strengths of quantity surveying firms	SD	D	N	A	SA
S1	Trust					
S2	Leadership					
S3	Creative problem solving					
S4	Negotiation Skills					
S5	Communication Skills					
S6	Knowledge Management					
S7	Strategic Planning					
S8	Accuracy					
S9	Ensuring a suitable organisational structure					
S10	Team working/Interpersonal skills					
S11	Self Confidence, can-do attitude					
S12	Data management/Record keeping					
S13	Client relationship management					
S14	Dispute resolution/conflict management					
S15	Attention to detail					
S16	Measurement/quantification					

S17	Cost accounting and financial management					
S18	Construction law and contract management					
S19	Problem solving and analytical					
S20	Cash flow forecasting and budgeting					
S21	Value management/Construction economics					
S22	Estimating and pricing					
S23	Networking skills					
S24	Political skills					
S25	Construction technology knowledge					
S26	Life cycle costing					
S27	Industry knowledge					
S28	Feasibility studies					
S29	Design economics					

9. Are there any other strengths that quantity surveying firms have? If so, on a scale of 1-5 (5 being strongly agree), how much do you agree with it? (Please provide answer below in the space provided.)

Section C – Weaknesses of Quantity Surveying Firms

This section of the questionnaire explores your point of view on the weaknesses of quantity surveying firms.

10. To what extent do you agree with each of the following weaknesses of quantity surveying firms?

No	Weaknesses of quantity surveying firms	SD	D	N	A	SA
W1	Inability to change					
W2	The lack of suitably skilled and experiences quantity surveyors					
W3	Lack of marketing of the quantity surveying profession					
W4	Lack of competencies in the quantity surveying profession					
W5	Inability to adopt Building Information Modelling (BIM) in the profession					
W6	Lack of training experience					
W7	Inaccuracies in cost estimates					
W8	Few candidates become professional quantity surveyors					
W9	Overqualified with lack of experience					
W10	Lack of IT/Computing skills					
W11	Poor attitude towards continuous professional development					
W12	Lack of awareness of quantity surveying as a profession					
W13	Decline in measuring skills					
W14	Little attention to lifelong learning					
W15	Low levels of innovation					

11. Are there any other weaknesses that quantity surveying firms have? If so, on a scale of 1-5 (5 being strongly agree), how much do you agree with it? (Please provide answer below in the space provided.)

Section D – Opportunities to Quantity Surveying Firms

This section of the questionnaire explores your point of view on the possible opportunities open to quantity surveying firms.

12. To what extent do you agree with each of the following opportunities open to quantity surveying firms?

No	Opportunities to quantity surveying firms	SD	D	N	A	SA
O1	Demand for quantity surveyors					
O2	Efficiency increases brought about by technological advances					
O3	Building Information Modelling (BIM)					
O4	Ability to perform multiple services					
O5	Quantity surveying firms- An asset to public-private partnership					
O6	Market for facilities management services					
O7	Market for quantity surveyor in civil infrastructure and engineering projects					

O8	Sector specific work experience					
O9	Proficiency and information technology					
O10	New roles for quantity surveyors in alternate procurement methods					
O11	Market for core quantity surveying services					

13. Are there any other opportunities that quantity surveying firms can take advantage of? If so, on a scale of 1-5 (5 being strongly agree), how much do you agree with it? (Please provide answer below in the space provided.)

Section E – Threats to Quantity Surveying Firms

This section of the questionnaire explores your point of view on the possible threats that face quantity surveying firms.

14. To what extent do you agree with each of the following threats that face quantity surveying firms?

No	Threats to quantity surveying firms	SD	D	N	A	SA
T1	Lack of knowledge management					
T2	Competition among quantity surveying firms					
T3	Changes in technology					
T4	Changes in Clients' Demand					

T5	Fee cutting					
T6	The use of computer aided design (CAD)					
T7	Other professions performing quantity surveying services					
T8	The global financial crises (GFC)					
T9	Shortfalls in the quantity surveying qualifications offered at tertiary institutions					
T10	Lack of suitably and experienced quantity surveyors					
T11	The ageing workforce and the under supply of new entrants					
T12	The profession's "lack of voice" due to relatively small number of practitioners compared to other professional groups.					
T13	Lack of formal registration and chartered status					
T14	Lack of marketing of the quantity surveying profession					
T15	The perception that quantity surveyors are non-critical to project success.					

15. Are there any other threats to quantity surveying firms? If so, on a scale of 1-5 (5 being strongly agree), how much do you agree with it? (Please provide answer below in the space provided.)

16. Is there anything else you would like to add that you feel will be of interest to this study?
(Please provide answer below in the space provided.)

Thank-you for your co-operation in participating to this survey.

