Nelson Mandela Metropolitan University

Business School

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ALUMNI PERCEPTION OF THE NMMU COMPUTING SCIENCES DEPARTMENT

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DECLARATION:

In accordance with Rule G5.6.3, I hereby declare that the above-mentioned treatise/ dissertation/ thesis is my own work and that it has not previously been submitted for assessment to another University or for another qualification.

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ABSTRACT

The success of a course offered by a university and the effectiveness of the instructors have commonly been measured by means of student evaluations. The feedback generated is typically used to identify instructors who need additional training, courses that need to be restructured or the need for financial rewards for those who excel. The principal objective of educating students is, knowledge, training and skills they can use and apply after graduating, regardless of the field of study. The perception of the Alumni about the extent of learning and the usefulness of the knowledge is a key measure for universities to assess their success.

A service guarantee is defined as a formal promise made to customers about the service they will receive or it is a written promise made by the company through advertising or company literature that it will provide compensation if promises are broken. In order to ensure customer satisfaction in a service offering, the quality of service performance needs to be guaranteed. Many service industries promise a level of service performance, with or without conditions attached.

Customer value is a complex concept as it is often interpreted with various meanings depending on the point of view adopted. A definition of customer value is the perceived value that the customer gains when purchasing a product or receiving a service. However, customer value can be used in a variety of contexts.

The purpose of this research study is to measure the perception and satisfaction of Alumni of the Department of Computing Sciences and identify areas for improvement by performing a systematic analysis of the determinants of satisfaction. This research is an exploratory, quantitative study consisting of literature- and case-study components used to test proposed hypotheses. The literature study was performed on secondary sources to establish the key concepts related to the topics of Service Guarantee and Marketing, Stakeholder Theory, Customer-perceived Value and Alumni Perceptions.

The empirical study consisted of surveys (questionnaires) completed by Alumni of the Department of Computing Sciences. The questionnaire used in this research consisted of questions regarding demographic data and questions regarding perceived perception of the Department of Computing Sciences and influencing factors.

Descriptive statistics were used to summarise the data into a more compact form which could simplify the identification of patterns in the data. Inferential statistics were used to verify if conclusions made from the sample data could be inferred onto a larger population.

Recommended university and teaching practices based on the statistical analysis of the survey results were identified. A model identified the following factors as having an influence on *Alumni Satisfaction* with the NMMU Department of Computing Sciences: *Customer Satisfaction, Course Contents, Modern Technologies, Academic Staff, Admin. Staff, Departments, University Atmosphere* and *Perceived Value*. The importance of each factor was identified to understand how to improve the Alumni perception.

According to the inferential ranking of Alumni Satisfaction that ranks the factors on the average mean values, a factor that should be improved upon is the *Alumni Network*. Recommended improvements were suggested for the Department of Computing Sciences based on the statistical analysis of the survey results. Two sub-groups were defined by different levels of education and they were found to have different perceptions of the factors that were measured. It was shown that there are small and medium significant differences in only two of the factors of the proposed Alumni satisfaction model, distinguising through different levels of education. The Alumni Satisfaction model developed in this study specified the factors that influence Alumni Satisfaction with the Deptarment of Computing Sciences and the effect that each of these factors has on that satisfaction.

Keywords: Alumni, Service Guarantee, Stakeholder, Shareholder, Customer-Perceived Value, Customer Perception, Customer Satisfaction, Department of Computing Sciences

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LIST OF ABBREVIATIONS

BCom   Bachelor of Commerce

BSc   Bachelor of Science

CESG   Customer Expectations on Service Guarantees

CS   Computing Sciences

CVP   Customer Value Proposition

DBA   Doctor of Business Administration

IS   Information Systems

IT   Information Technology

ICT   Information and Communications Technology

MBA   Master of Business Administration

MBL   Master of Business Leadership

NMMU   Nelson Mandela Metropolitan University

SA   South Africa

SMS   Short Message Service

URL   Universal Resource Link

Chapter One

1   CHAPTER 1: INTRODUCTION AND PROBLEM STATEMENT

1.1   Introduction

The success of courses offered by a university and the effectiveness of the instructors has commonly been measured by student evaluations (Guevara & Stewart, 2011; Khatimin, Wahab & Mohamed, 2011; McDearmon, 2013; Mcgourty, Besterjeld-Sacre, Shuman & Wolfe, 1999). The feedback generated is typically used to identify instructors who need additional training, courses that need to be restructured or the need for financial rewards for those who excel. The principal objective of educating students is the knowledge and skills they can use and apply after graduating, regardless of the field of study. The Alumni perception of the extent of learning and the usefulness of the knowledge is a key measure for universities (Guevara & Stewart, 2011; Khatimin et al., 2011; McDearmon, 2013).

McCollough & Gremler (1999) define a service guarantee as a formal promise made to customers about the service they will receive. Similarly, Kashyap (2001), McColl & Mattsson (2011) and Sum, Lee, Hays & Hill (2002) define a service guarantee as a written promise made by the company through advertising or company literature that will provide compensation if promises are broken. In order to ensure customer satisfaction in a service offering, the quality of service performance needs to be guaranteed (McColl & Mattsson, 2011; Tucci & Talaga, 1997). Many service industries promise a level of service performance, with or without conditions attached.

Stakeholder theory suggests that the purpose of a business is to create as much value as possible for stakeholders and not only for the shareholders. A business should try to meet the needs of everyone that has a stake in both the actions and outcomes of the organisation. In order to be sustainable, the executives must keep in mind the interests of all the stakeholders, such as the customers, suppliers, employees, communities and shareholders, ensuring that is aligned (Caballero, Vázquez & Quintás, 2015; Freeman, 2004; Parmar et al., 2010). An organisational competitive advantage is gained by an organisation by involving the stakeholders, as strategic

resources, in corporate decisions and this is even considered as an ethical requirement (Plaza-úbeda, Burgos-Jiménez & Carmona-Moreno, 2014).

Customer value is a complex concept as it is often interpreted with various meanings depending on the point of view adopted. A definition of customer value is the perceived value that the customer gains when purchasing a product or receiving a service (Dovaliene, Masiulyte & Piligrimiene, 2015; Fraering & Minor, 2013; Landroguez, Castro & Cepeda-Carrión, 2011; Rodrigues, Nappi & Rozenfeld, 2014; Sheehan & Bruni-Bossio, 2015; Song, Cadeaux & Yu, 2015; Wouters & Kirchberger, 2015). However, Martelo Landroguez, Barroso Castro & Cepeda-Carrión (2013) note that customer value can be used in a variety on contexts.

The success of a course offered by a university and the effectiveness of the instructors have commonly been measured by using student evaluations (Guevara & Stewart, 2011; Khatimin et al., 2011; McDearmon, 2013; Mcgourty et al., 1999). The feedback generated is typically used to identify instructors who need additional training, courses that need to be restructured or the need of financial rewards for those who excel. The principal objective of educating students is the inculcation of what they can use and apply after graduating, regardless of the field of study. The Alumni perception of the extent of learning and the usefulness of the knowledge is a key measure for universities (Guevara & Stewart, 2011; Khatimin et al., 2011; McDearmon, 2013).

Alumni are seen as the most important assets of a university. They are important assets as the university is represented in the real world by the Alumni (Chi, Jones & Grandham, 2012; Rattanamethawong, Sinthupinyo & Chandrachai, 2015; Watt, Norton & Jones, 2013). Historically, Alumni networks were created from regional groups brought together for fundraising purposes. Over time these networks developed, both in their own importance and because the university gained benefits from these networks for the development of the university and thus created an enormous outreach potential for current students in their career paths.

In the following section of this chapter, the problem statement will be framed and expanded. Thereafter the Research Objectives and Questions will be defined. The research delimitation and key concepts will be defined. This will be followed by the significance of this research, the research methodology and design, and ethics. The

chapter concludes with an overview of the structure of this treatise. Overview of Chapter One can be seen in Figure 1.1

Chapter 1: Introduction and Problem Statement	
1.1	Introduction
1.2	Problem Statement
1.3	Research Objectives
1.4	Research Questions
1.5	Research Delimitation
1.6	Research Significance
1.7	Research Methodology and Design
1.8	Data Analysis
1.9	Ethics Clearance
1.10	Treatise Structure
1.11	Summary

Chapter 2: Alumni (Literature Study)

Chapter 3: Research Design and Methodology

Chapter 4: Results and Analysis of the Empirical Study

Chapter 5: Findings, Recommendations and Conclusion

Figure 1.1 - Overview of Chapter 1

1.2   Problem Statement

Information Technology (IT) is offered at 26 universities in South Africa by various departments offering IT -related study programmes (Calitz, Greyling, & Glaum, 2016). The universities have various terms for their departments that offer IT -related programmes such as: Information Science, Information Systems (IS), Computing Science (CS), Informatics and Computing Sciences, but all related to the same field of study. There are two distinct departments related to IT, the Economic Sciences Faculty that offers Information Systems and the Science Faculty that offers Computing Science or similar subjects (Calitz, Greyling & Cullen, 2014; Calitz et al., 2016). In this study, these two departments are grouped together as the survey conducted applies to both.

Stakeholders of the university and the Department of Computing Sciences consist of employers, Advisory Boards and Alumni, who can provide valuable information in order to evaluate and improve programme offerings. Alumni are seen as the most important assets of a university. They are important assets as the university is represented in the

real world by the Alumni. Department of Computing Science at NMMU can benefit from information provided by the Alumni. Alumni surveys are not conducted on a regular basis by the Computing Science (CS) and Information systems (IS) departments in South Africa and therefore do not fully understand the postgraduate perception of their studies at the academic institution. The programmes on offer at the Department of Computing Sciences may not be aligned with industry requirements and this misalignment can be identified by Alumni. The effectiveness of the programmes on offer are also not evaluated regularly (Calitz et al., 2014, 2016).

CS and IS programmes are on offer at the Department of Computing Sciences which is part of the Nelson Mandela Metropolitan University. There are various programme levels in the department starting with the undergraduate students who can complete an undergraduate programme. Examples of undergraduate programmes are BSc in Computing Science or a BCom in Information Systems. Postgraduate programmes on offer are BCom Honours, BSc Honours, MCom, MSc or PhD in Computing Science and Information Systems. The Alumni engaged with postgraduate courses have to work with a supervisor for an honours treatise, master's dissertation or PhD thesis (Calitz et al., 2014, 2016). This study focused on both the graduate Alumni and postgraduate Alumni in the Department of Computing Sciences at NMMU.

For the purpose of this study, research will focus on the Department of Computing Sciences at the Nelson Mandela Metropolitan University (NMMU) which groups the various Computing Science-related departments together (Calitz et al., 2014, 2016).

Problem statement: The Department of Computing Sciences at Nelson Mandela Metropolitan University (NMMU) has not considered Alumni perceptions of their study experience at NMMU.

1.3   Research Objectives

The main research objective of this study is as follows:

- **RO$_M$:** To measure the perception and satisfaction of Alumni of the Department of Computing Sciences and identify areas for improvement.

In order to achieve the above stated main research objective the following secondary objectives need to be achieved:

- **RO$_1$:** Establish the importance of customer satisfaction in the Department of Computing Sciences;
- **RO$_2$:** Identify the factors influencing the perception of Alumni in the Department of Computing Sciences and develop a proposed model;
- **RO$_3$:** Justify and explain the research methodology that is used for this treatise with adequate detail for future reproduction;
- **RO$_4$:** Evaluate the proposed model of Alumni satisfaction in the Department of Computing Sciences;
- **RO$_5$:** Establish which factors have a greater effect on Alumni satisfaction in the Department of Computing Sciences; and
- **RO$_6$:** Establish the significance of the difference between Alumni satisfaction of graduate and postgraduate Alumni in the Department of Computing Sciences.

1.4   Research Questions

The Main Research Question (RQ$_M$) was formulated based on the Main Research Objective and is stated as follows:

- **RQ$_M$:** *What are the perceptions of graduate and postgraduate Alumni of the Department of Computing Sciences?*

In order to analyse the above main research problem effectively, the following research questions, based on the secondary research objectives, need to be answered:

- **RQ$_1$:** *What is the importance of Alumni satisfaction with the Department of Computing Sciences?*
- **RQ$_2$:** *Which factors should be included in a proposed model to gauge the perceptions of Alumni in the Department of Computing Sciences?*
- **RQ$_3$:** *How can a detailed description of the research methodology be provided in order to understand and reproduce this research study in future?*
- **RQ$_4$:** *What are the relationships between the independent and dependent variables of Alumni satisfaction in the Department of Computing Sciences?*
- **RQ$_5$:** *Which factors in the proposed model for the Department of Computing Sciences have a higher correlation with Alumni satisfaction than other identified factors?*

- **RQ₆:** *What is the significance of the difference between Alumni satisfaction of graduate and postgraduate Alumni of the Department of Computing Sciences?*

The research questions, research objectives and the various chapters in which they are addressed are linked in the simplified research storyline illustrated in Table 1.1.

Research Question (RQ)	Research Objective (RO)	Chapter
RQ₁: *What is the importance of Alumni satisfaction with the Department of Computing Sciences?*	**RO₁:** Establish the importance of customer satisfaction in the Department of Computing Sciences.	**CHAPTER 2:** ALUMNI PERSPECTIVES
RQ₂: *Which factors should be included in a proposed model to gauge the perceptions of Alumni in the Department of Computing Sciences?*	**RO₂:** Identify the factors influencing the perception of Alumni in the Department of Computing Sciences and develop a proposed model.	**CHAPTER 2:** ALUMNI PERSPECTIVES
RQ₃: *How can a detailed description of the research methodology be provided in order to understand and reproduce this research study in future?*	**RO₃:** Justify and explain the research methodology that is used for this treatise with adequate detail for future reproduction.	**CHAPTER 3:** RESEARCH DESIGN AND METHODOLOGY
RQ₄: *What are the relationships between the independent and dependent variables of Alumni satisfaction in the Department of Computing Sciences?*	**RO₄:** Evaluate the proposed model of Alumni satisfaction in the Department of Computing Sciences.	**CHAPTER 4:** RESULTS AND ANALYSIS OF THE EMPIRICAL STUDY
RQ₅: *Which factors in the proposed model for the Department of Computing Sciences have a higher correlation with Alumni satisfaction than other identified factors?*	**RO₅:** Establish which factors have a greater effect on Alumni satisfaction in the Department of Computing Sciences.	**CHAPTER 4:** RESULTS AND ANALYSIS OF THE EMPIRICAL STUDY
RQ₆: *What is the significance of the difference between Alumni satisfaction in the Department of Computing Sciences by under-graduates and postgraduate Alumni?*	**RO₆:** Establish the significance of the difference between Alumni satisfaction of graduate and postgraduate Alumni in the Department of Computing Sciences.	**CHAPTER 4:** RESULTS AND ANALYSIS OF THE EMPIRICAL STUDY

Table 1.1 - RQ, RO and Chapter Outline.

1.5   Research Delimitation

The research will be limited to the Alumni of the Department of Computing Sciences of NMMU. The Alumni of the Department of Computing Sciences are those who completed their studies at the NMMU and can provide direct feedback of their experiences while studying. The scope of this study is limited to the Alumni of the Department of Computing Sciences. The perception of the Alumni and their experiences while studying will be analysed.

1.5.1   Alumni Perception

The success of a course offered by a university and the effectiveness of the instructors have commonly been measured by means of student evaluations (Guevara & Stewart, 2011; Khatimin et al., 2011; McDearmon, 2013; Mcgourty et al., 1999). The feedback generated is typically used to identify instructors who need additional training, courses that need to be restructured or the availability of financial rewards for those who excel. The principal objective of educating students is the knowledge and skills they can use and apply after graduating, regardless of the field of study. The Alumni perception of the extent of learning and the usefulness of the knowledge is a key measure for universities (Guevara & Stewart, 2011; Khatimin et al., 2011; McDearmon, 2013).

1.5.2   Service Guarantees

McCollough & Gremler (1999) define a service guarantee as a formal promise made to customers about the service they will receive. Similarly, Kashyap (2001), McColl & Mattsson (2011) and Sum, Lee, Hays & Hill (2002) define a service guarantee as a written promise made by the company through advertising or company literature that will provide compensation if promises are broken. In order to ensure customer satisfaction in a service offering, the quality of service performance needs to be guaranteed (McColl & Mattsson, 2011; Tucci & Talaga, 1997). Many service industries promise a level of service performance, with or without conditions attached.

1.5.3   Stakeholder Theory

Stakeholder theory suggests that the purpose of a business is to create as much value as possible for stakeholders and not only for the shareholders. They should try to meet the needs of everyone who has a stake in both the actions and outcomes of the

organisation. In order to be sustainable, the executives must keep in mind the interests of all the stakeholders, such as the customers, suppliers, employees, communities and shareholders, ensuring that everyone gains some degree of satisfaction (Caballero et al., 2015; Freeman, 2004; Parmar et al., 2010). A competitive advantage is gained by an organisation by involving the stakeholders as strategic resources in corporate decisions and this is even considered as an ethical requirement (Plaza-úbeda et al., 2014).

1.5.4 Customer value

Customer value is a complex concept as it is often interpreted with various meanings depending on the point of view adopted. The definition of customer value is the perceived value that the customer gains when purchasing a product or receiving a service (Dovaliene et al., 2015; Fraering & Minor, 2013; Landroguez et al., 2011; Rodrigues et al., 2014; Sheehan & Bruni-Bossio, 2015; Song et al., 2015; Wouters & Kirchberger, 2015). However, Martelo Landroguez, Barroso Castro & Cepeda-Carrión (2013) note that customer value has a variety of meanings depending on the context and can be used in a variety of contexts.

1.6 Research Significance

This research investigation aims to gain insight into Alumni Perception of the NMMU Department of Computing Sciences.

The research will also be useful in identifying:

- Misalignment between service and the product offered by the Department of Computing Sciences and the actual market (student) needs;
- Identifying which of the individual components of the Department of Computing Sciences are valued the most;
- Identifying which of the individual components of the Department of Computing Sciences are not valued by Alumni and need to be corrected;
- Evaluate the courses on offer and their alignment with industry requirements as perceived by Alumni; and
- Prioritise components to improve service offered to students of the Department of Computing Sciences.

1.7 Research Methodology and Design

The research methodology will address the research approach, data collection and data analysis.

1.7.1 Research Approach

A literature review and case study form part of this research that is a quantitative study. A specific characteristic of a phenomenon is the focus area of quantitative research. In order to generalise the findings to the greater population, numeric data are gathered from a sample group which is then analysed (Fox & Bayat, 2010; Leedy & Omrod, 2010; Maree et al., 2012).

1.7.1.1 Literature study

The literature review identifies new perspectives, ideas and approaches that are not apparent to the researcher beforehand (Kumar, 2011; Leedy & Omrod, 2010). Before the researcher can critically review the available literature, insight is required to identify gaps and deficiencies in knowledge and to design research methodology for the study to be performed (Collis & Hussey, 2009). The validity of the research is dependent on the reviews of existing literature and methodology (Thody, 2009).

1.7.2 Data Collection

The primary data were collected from the sample by means of an on-line survey questionnaire (Appendix A) in order to collect responses from the sample group. An email containing a Universal Resource Link (URL) to the questionnaire was sent to the listed email addresses of the Alumni of the Department of Computing Sciences at NMMU who are more than 600 potential respondents.

1.7.3 Population and Response Rate

The sampling method employed in this treatise incorporated non-probability sampling in the form of purpose sampling and snowball sampling as the respondents were chosen from the Alumni database of the Department of Computing Sciences at NMMU. All respondents furthermore had an equal opportunity of being selected for the study. The sampling frame included all Alumni of the Department of Computing Sciences at NMMU. The Alumni are based mainly across South Africa with a small percentage

residing outside of South Africa. A representative sample of 100 respondents from this population was chosen.

1.8 Data Analysis

Accepting or rejecting the hypotheses proposed by using statistical analysis of gathered numeric data is the purpose of this study (Maree et al., 2012). By using statistical analysis, it can be accepted that this is an empirical study and quantitative in nature. The NMMU statistician sorted, categorised and cleaned the quantitative data in order to facilitate the study. A computer software package named STATITICA was used in order to perform quantitative statistical analysis on the data. The analyses performed on the data included descriptive statistics such as measures of central tendency, such as the mean, median and the mode and inferential statistics specifically by using t-tests and Cohen's d analysis.

1.9 Ethics Clearance

In research that involves human or animal subjects it is a generally accepted practice to obtain ethical clearance (Collis & Hussey, 2009). The research process embarked upon should adhere to certain acceptable standards and this is the main purpose of obtaining ethical clearance (Cooper & Schindler, 2014). Some of the aspects addressed by these standards are the rights and welfare of research subjects around issues such as informed consent, confidentiality of data and limitation of possible risks to people involved in the research (Collis & Hussey, 2009).

The Ethics Clearance approval documentation (Appendix B) was submitted to the NMMU Business School. Full ethics clearance was not requested for this study as no vulnerable groups were involved.

1.10 Treatise Structure

The research objectives, questions and the overview of the treatise chapters can be seen in Figure 1.2.

Chapter 1 – Introduction and Problem Statement

Define RO and RQ

Chapter 2 – Alumni Perspectives

RO_1 — Establish the importance of customer satisfaction in the Department of Computing Sciences. — RQ_1

RO_2 — Identify the factors influencing the perception of alumni in the Department of Computing Sciences and develop a proposed model. — RQ_2

Chapter 3 – Research Design and Methodology

RO_3 — Justify and explain the research methodology that is used for this treatise with adequate detail for future reproduction. — RQ_3

Chapter 4 – Analysis of Empirical Study

RO_4 — Evaluate the proposed model of alumni satisfaction in the Department of Computing Sciences. — RQ_4

RO_5 — Establish which factors have a greater effect on alumni satisfaction in the Department of Computing Sciences. — RQ_5

RO_6 — Establish the significance of the difference between alumni satisfaction of graduate and postgraduate alumni in the Department of Computing Sciences. — RQ_6

Chapter 5 – Conclusion and Recomendations

RO_M Conclusion

Figure 1.2 - Chapter Outline and Research Objectives.

The chapters in this treatise will cover the following:

1.10.1 Chapter 1: Introduction, Problem Statement, RO & RQ

Chapter 1 provides the layout of the study and introduces the research subject. The research problem, research questions and research objectives are presented. Key assumptions are made and the research methodology is explained. The delimitations, the significance of the research topic, a research alignment plan and the proposed chapter headings of this treatise are provided.

1.10.2 Chapter 2: Alumni Perspectives

Chapter 2 will address research question RQ_1 which states; "*What is the importance of Alumni satisfaction with the Department of Computing Sciences?*" and RQ_2 which states "*Which factors should be included in a proposed model to gauge the perceptions of Alumni in the Department of Computing Sciences?*". Chapter 2 will achieve the research objectives of performing a literature review in order to establish the importance of customer satisfaction with the Department of Computing Sciences (RO_1); and identify the factors influencing the perception of Alumni in the Department of Computing Sciences and develop a proposed model. (RO_2).

1.10.3 Chapter 3: Research Design and Methodology

Chapter 3 will address research question RQ_3 that states; "*How can a detailed description of the research methodology be provided in order to understand and reproduce this research study in future?*". Chapter 3 will achieve the research objective of justifing and explaining the research methodology that is used for this treatise with adequate detail for future reproduction (RO_3).

1.10.4 Chapter 4: Analysis of Empirical Study

Chapter 4 will address RQ_4 which states; "*What are the relationships between the independent and dependent variables of Alumni satisfaction in the Department of Computing Sciences?", RQ_5 which states; "Which factors in the proposed model for the Department of Computing Sciences have a higher correlation to Alumni satisfaction than other identified factors?" and RQ_6 which states; "What is the significance of the difference between Alumni satisfaction in the Department of Computing Sciences by*

graduate and postgraduate Alumni?". Chapter 4 will discuss the research objective of; *"Evaluate the proposed model of Alumni satisfaction in the Department of Computing Sciences"* (RO_4); *"Establish which factors have a greater effect on Alumni satisfaction in the Department of Computing Sciences"* (RO_5) and; *"Establish the significance of the difference between Alumni satisfaction of graduate and postgraduate Alumni in the Department of Computing Sciences"* (RO_6)*.*

1.10.5 Chapter 5: Conclusion and Recommendations

The final chapter will summarise the findings of this of this treatise by discussing every research question and the outcome thereof. A summary of the contributions and opportunities for future research will be identified and discussed and any possible limitations will be stated. Practical recommendations and suggested corrective actions will be made to the Department of Computing Sciences.

1.11 Summary

This chapter provided the background of the study to be performed, the institution in which the study will be performed and the need for the study with the questions and objectives to be reached. An overview of the paradigm of the research study was presented together with the concepts and key definitions. The research method and approach were discussed together with the method of data collection and data analysis.

Chapter 2 will address RQ_1 which states; "What is the importance of Alumni satisfaction with the Department of Computing Sciences?" and RQ_2 which states; "Which factors should be included in a proposed model to gauge the perceptions of Alumni in the Department of Computing Sciences?" The chapter will achieve the research objectives of performing a literature review in order to establish the importance of customer satisfaction in the Department of Computing Sciences. (RO_1) and identify the factors influencing the perception of Alumni in the Department of Computing Sciences and develop a proposed model (RO_2).

Chapter Two

2   CHAPTER 2: ALUMNI PERSPECTIVES

2.1   Introduction

Chapter 1 introduced the research questions and research objectives which will be investigated as well as the outline of the research that will be conducted. In this chapter the required literature review will be conducted to provide the support and background required for the research.

Many theories have been proposed to explain and develop the impact of Alumni perspectives. Although the literature covers a variety of such theories, this review will focus on three major themes which apply to the research questions and objectives which are being investigated. These themes are: service guarantees and marketing; stakeholder theory, and customer perceived value. Although this literature presents these themes in a variety of contexts, this paper will focus primarily on understanding their application and their influence on Alumni perspectives.

This chapter will address RQ_1 which states; "What is the importance of Alumni satisfaction with the Department of Computing Sciences?" and RQ_2 which states; "Which factors should be included in a proposed model to gauge the perceptions of Alumni in the Department of Computing Sciences?". The chapter will achieve the research objectives of performing a literature review in order to establish the importance of customer satisfaction in the Department of Computing Sciences (RO_1) and identify the factors influencing the perception of Alumni in the Department of Computing Sciences and develop a proposed model. (RO_2). An overview of the RQs and ROs of this chapter can be seen in Figure 2.1.

The layout of this chapter starts with a discussion of service guarantees and marketing and why this is important in the education sector. The literature then focuses on stakeholder theory and how this affects Alumni perspectives. Finally, the literature examines customer perceived value and how this can be applied to education in order to strengthen Alumni. An overview of this chapter can be seen in Figure 2.2.
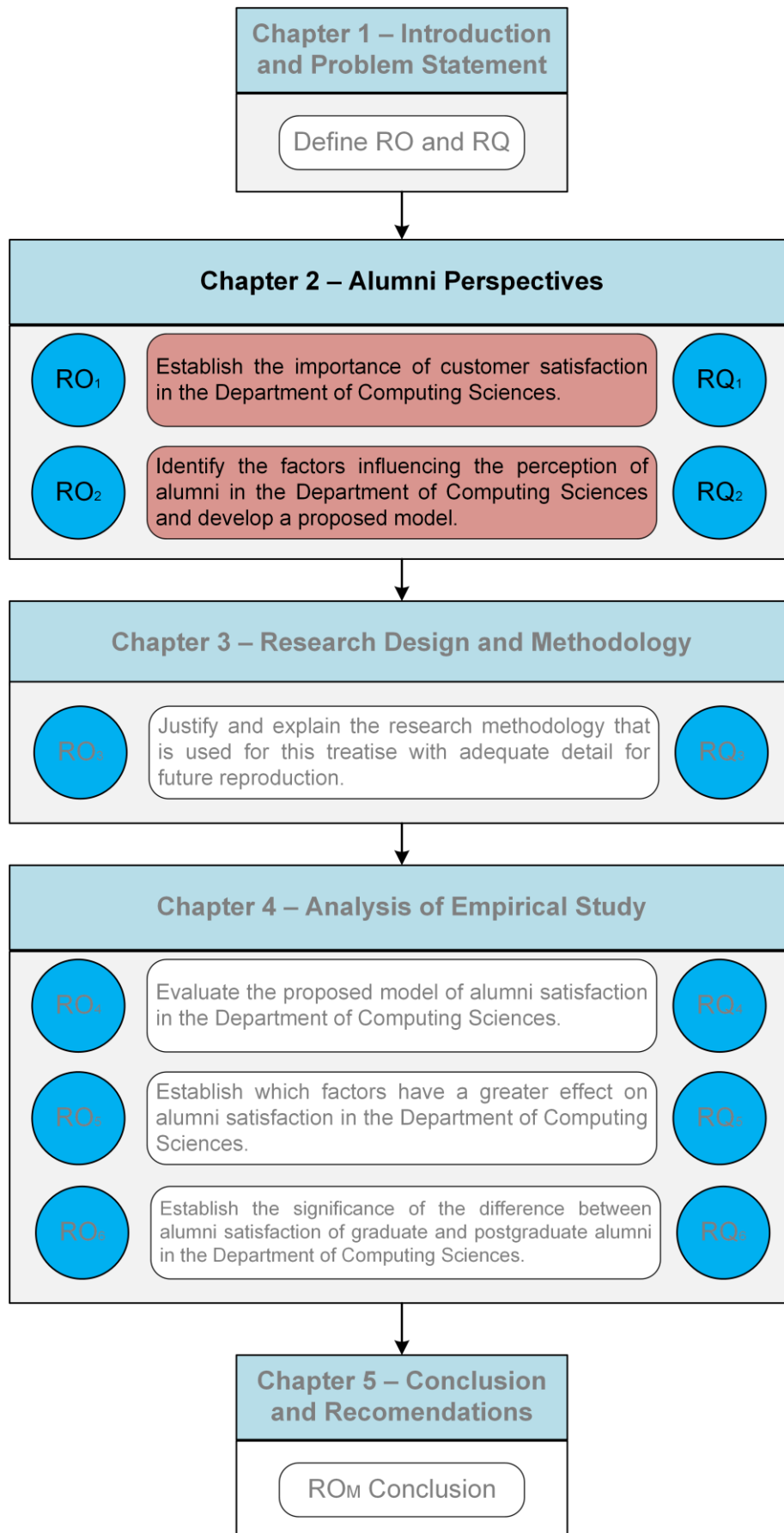
Figure 2.1 - Chapter 2 Research Objectives

Figure 2.2 - Overview of Chapter 2

2.2   Service Guarantee and Marketing

This section will introduce the concepts of service guarantee, customer perception of guarantees, service guarantees in education, market -signalling theory, investment theory, customer focus and building marketing muscle. The importance of understanding how these concepts apply to student satisfaction will be highlighted. The importance of how these concepts can be used to improve the student experience will be discussed.

2.2.1   *Service Guarantee*

McCollough & Gremler (1999) define a service guarantee as a formal promise made to customers about the service they will receive. Similarly, Kashyap (2001), McColl & Mattsson (2011) and Sum, Lee, Hays & Hill (2002) define a service guarantee as a written promise made by the company through advertising or company literature that will provide compensation if promises are broken.

In order to ensure customer satisfaction in a service offering, the quality of service performance needs to be guaranteed (McColl & Mattsson, 2011; Tucci & Talaga, 1997). Many service industries promise a level of service performance, with or without conditions attached. Examples of these service industries are retailing, real estate, fast food, airline, telecommunication, transport and leisure as well as professional and financial services and education (McColl & Mattsson, 2011).

An implicit assumption in the services guarantee literature is that offering a service guarantee will increase consumer satisfaction (Dovaliene et al., 2015; Schofield & Fallon, 2012; Tucci & Talaga, 1997). Service guarantees give rise to increased customer satisfaction in a number of ways (Guevara & Stewart, 2011; McColl & Mattsson, 2011). Businesses that are more focussed on customers by providing guarantees have the following benefits:

- Clear standards are set for the company with guarantees (Tucci & Talaga, 1997);
- Feedback is generated from a guarantee. Dissatisfaction from customers is expressed when guarantees are not met (Chi et al., 2012; Flegg, 2012; Rattanamethawong et al., 2015; Sheehan & Bruni-Bossio, 2015; Wouters & Kirchberger, 2015);
- Failure is measured against a guarantee creating greater understanding (McCollough & Gremler, 1999; Tucci & Talaga, 1997); and
- There are marketing benefits from guarantees as they reduce purchasing risk and enhance the loyalty of existing customers (McCollough & Gremler, 1999).

On the other hand, businesses that are unable to understand customer needs can provide poor guarantees. The effectiveness of a service guarantee is great when the following conditions are met (Tucci & Talaga, 1997):

- Failure of the service will result in severe consequences;
- The customer is not familiar with the service or expertise is low;
- The customers' self-esteem is at risk;
- The service is expensive;
- The general perception in the industry is of poor quality;

- Repeat purchases are important for the service provider; and
- The business depends on word of mouth.

McColl & Mattsson (2011) and Tucci & Talaga (1997) agree that improved customer satisfaction is the result of improved managerial performance in order to meet service guarantees. However, Tucci & Talaga (1997) also argue that not all customers desire a service benefit such as a service guarantee or the service might not be consistent with the expectations of the customer.

Empirical research conducted on service guarantees has found that for 87 percent of the time the research is focused on the promotional and marketing effects of service guarantees (Hogreve & Gremler, 2009; McColl & Mattsson, 2011). One of the implicit assumptions of the empirical research that studied service guarantees is that the guarantees have been effectively designed, implemented and communicated to customers by the organisation (Hogreve & Gremler, 2009). However, McColl & Mattsson (2011) argue that this assumption is hopeful at best and that there must be a clear differentiation between conditional and unconditional guarantees. Studies that were done on service guarantees that were incorrectly formulated can result in inconsistent findings.

Therefore, a service guarantee can either be conditional or unconditional, but a good guarantee must be promoted well, have meaning for the customer, be easily understandable, easy to call on, easy to collect and credible. Further improvements to the service guarantees is where the pay-out is specified, the legality of the guarantee is easy to understand and the guarantee can be activated by the customer (McColl & Mattsson, 2011; McDougall, Levesque & VanderPlaat, 1998).

Guaranteeing the quality of service performance in a service offering ensures customer satisfaction. The perception of guarantees is that higher guarantees are signals of higher quality and lower guarantees are signals of lower quality (Björlin Lidén & Edvardsson, 2003; Holttinen, 2014; Kashyap, 2001; McColl & Mattsson, 2011; Tucci & Talaga, 1997). Useful insight into how these service guarantees are perceived by customers is explained in the next section.

2.2.2 Customer perception of guarantees

The perceived risk to the customer is reduced by a service guarantee and this makes the service more valuable. How the expectations of the customer are met by the guarantee depends on how the customer perceives the guarantee (Björlin Lidén & Edvardsson, 2003; Song et al., 2015). Unconditional guarantees give the customer complete peace of mind and are therefore preferred over conditional guarantees (McDougall et al., 1998). However, research done by Björlin Lidén & Edvardsson (2003) has proven the opposite that customers feel vulnerable when invoking a guarantee and want the exact terms and conditions to know when the guarantee applies.

The customers want specific information on whether a guarantee is applicable, specific detail on how much money will be refunded, if there are delays in receiving the refund and if in fact they will receive the refund (Björlin Lidén & Edvardsson, 2003). The deduction made from this research was that customers find it difficult to determine if they should invoke the guarantee. Having a guarantee with conditions for when it is valid is not enough, it must have clearly defined conditions on all aspects of the guarantee (Song et al., 2015). A specific guarantee with clear conditions is the preferred choice for customers over an unconditional guarantee.

As mentioned in the section on service guarantees, the perception of guarantees is that higher guarantees are signals of higher quality and lower guarantees are signals of poorer quality (Björlin Lidén & Edvardsson, 2003; Holttinen, 2014; Kashyap, 2001; McColl & Mattsson, 2011; Tucci & Talaga, 1997). In a study done by Tucci & Talaga (1997) on service guarantees dealing with tangible products or more specifically personal computers they found the subject to be more complex. Highly credible computer firms which were already perceived to offer quality products, benefitted from high guarantees. Computer firms with low credibility which were perceived to offer low quality products did not benefit from offering high guarantees (Tucci & Talaga, 1997). The credibility of the guarantee was questioned and the perception was that it held no value. Unconditional guarantees which are seen as not being credible, cause more damage and lower the perception of quality even further.

Based on customer perception, implementing a service guarantee can either be a positive or negative signal. However, Hogreve & Gremler (2009) suggest that providing

the service guarantee will result in internal changes, which will improve quality and ultimately improve customer perception and the value of the guarantee.

Service providers seeking a solution should not merely focus on service guarantees (Hogreve & Gremler, 2009; Tucci & Talaga, 1997). A competitive advantage over other firms is not necessarily achieved by offering a service guarantee. The response of customers to service guarantees is not uniform, which is in line with expectations of virtually any consumer offering. Research done by Tucci & Talaga (1997) found that a change in the guarantee component of an extended product produced both favourable and unfavourable reactions from various customers.

Caution should be taken when using service guarantees (McColl & Mattsson, 2011; Tucci & Talaga, 1997). The favourable effect on customers caused by setting up and using service guarantees is often not worthwhile due to the cost of offering such a guarantee. Consequently, service guarantees should be properly researched by the service provider to understand how customers will perceive them. In order to successfully implement a service guarantee, the guarantee must match the needs and perceptions of the customers (Kashyap, 2001; Song et al., 2015; Tucci & Talaga, 1997; Wirtz, 1998).

The impact of a well-designed service model is illustrated by Wirtz (1998) in Figure 2.3. The required features of the service guarantee are:

- unconditional;
- easy to invoke;
- easy to communicate with and understand;
- significant regarding the aspects of the service guaranteed and reimbursement on service failure;
- credible; and
- easy to collect on.

Based on this model there are numerous potential benefits in having a well-designed service guarantee (Fabien, 2005; McColl & Mattsson, 2011; Wirtz, 1998). There are two main categories which are the direct benefits:

- impacts on operations and service quality; and
- impacts on consumer behaviour.

Implementing and Running a Well-designed Service Guarantee

Required Features:
- unconditional
- easy to understand and communicate
- meaningful to customers
- easy to invoke
- easy to collect on
- credible
- declaration of trust

Amplifiers
- perceived risk
- uniqueness of guarantee

Operations & Service Quality

Service Design
- focuses firm on customer needs
- prompts firm to understand and improve service processes

Service Failure & Recovery Mgmt
- forces firm to understand and reduce fail points
- encourages firm to seek customer feedback
- encourages firm to formalize service recovery

Personnel Management
- encourages firm to hire and train against guaranteed standards
- sets clear standards for employees

Consumer Behavior

Potential Customers
- reduces perceived risk
- signals quality

Current Customers
- increases brand loyalty
- encourages positive word-of mouth
- allows price premium

Dissatisfied Customer
- encourages feedback when dissatisfied
- lowers dissatisfaction at service failure
- reduces negative word-of-mouth

Business Performance

Increase in Costs   <   Increase in Sales & Market Share
- design and implementation
- operations and quality improvements
- payout costs

= Increase in Profits

Reinforces Commitment

Figure 2.3 - Impact of a well-designed service guarantee (Wirtz, 1998)

One of the direct outcomes of the design and introduction of the guarantee is the impact on operations and service quality. A firm need to focus on the customers' needs and improve the service process. Another subdivision is service failure and recovery management where a firm is forced to examine, understand and reduce the points of failure and put a proper service recovery plan in place. The last subdivision of the section deals with personnel management where the firm is encouraged to recruit and train personnel by using guaranteed standards (Wirtz, 1998).

Customer behaviour is directly affected by the guarantee itself and indirectly by the improvements in operations and service quality. Customer behaviour also affects potential customers, current customers and dissatisfied customers. The impact on potential customers during the decision-making process reduces the perceived risk and signals quality. For current customers it increases brand loyalty, encourages positive word of mouth comment and allows the charging of a price premium. For dissatisfied customers it encourages feedback which gives a firm an opportunity to recover service, (Van Vaerenbergh, De Keyser & Larivière, 2014; Wirtz, 1998), lowers dissatisfaction at service failure which causes a possibility of switching and reduces negative word of mouth comment.

Two features which are part of the model increase the impact of the guarantee on the customer behaviour. These are the perceived risk and how unique the guarantee is. The perceived risk of the guarantee depends on how the customer perceives the guarantee (Björlin Lidén & Edvardsson, 2003; Song et al., 2015). If the risk and the uniqueness of the guarantee are perceived as high by the consumer, the potential appeal of the guarantee increases. These features have an effect on consumer behaviour only and not on the operations and service quality. Consequently there are beneficial results on operations and service quality which can be achieved even when similar guarantees are offered by other firms and when consumers perceive little risk (Wirtz, 1998).

The outcome based on this model suggests improved business performance because of positive effects on consumer behaviour as well as improved operations and service quality. The result of improved business performance is expected to increase profitability and reinforce the commitment of management to the guarantee (Hogreve & Gremler, 2009; Kashyap, 2001).

2.2.3 Service Guarantees in Education

Unlike businesses, Universities rarely guarantee the service they offer to students. One of the reasons identified is because services, especially education, are seen as the most intangible of products (Björlin Lidén & Skålén, 2003; Hogreve & Gremler, 2009; McCollough & Gremler, 1999). This intangible quality of education is seen as riskier and failure is more common than with product failure. Firstly, if failure is more common, then service guarantees is also perceived to be more expensive. Secondly, the design and drafting of a service guarantee is more challenging. Lastly, due to co-production it is difficult to separate the roles and responsibilities of the consumer and service provider (McCollough & Gremler, 1999).

Prospective employers of students from some high schools and colleges have been offered guarantees that students have understood certain concepts. The students of these institutions were essentially treated as products and not as customers. Professor Richard Chase of the University of Southern California was one of the first instructors to offer a broad-based university classroom guarantee that treated students as customers (Guevara & Stewart, 2011; Hogreve & Gremler, 2009; McCollough & Gremler, 1999).

In the research done by McCollough & Gremler (1999), they believe that students should be offered a service guarantee, but are often challenged by their peers and colleagues as to why this is important. In order to understand the significance of offering a service guarantee in education, two theories of guarantees will be reviewed, namely: market signalling theory and investment theory.

2.2.3.1 Market signalling theory

The market signalling theory is used by firms in order to signal to customers the superior quality of their product (Connelly, Certo, Ireland & Reutzel, 2011; Fabien, 2005; McCollough & Gremler, 1999). Signalling theory originates from the study of information economics and it contemplates a situation where buyers and sellers have different views on the quality of a product or a service. The assumption made by the signalling theory is that the seller of the product has a perfect knowledge of the quality of the product, whereas the knowledge of the customer is inadequate (Connelly et al., 2011). An example of this is that the quality of many products and particularly services

are only known to the customer after consumption. Sellers with high -quality products looking for a competitive advantage distinguish themselves from sellers of low-quality products by sending a pre-purchase marketing signal (Connelly et al., 2011; Fabien, 2005; McCollough & Gremler, 1999).

One of the methods used to signal the quality of a product to a customer is by using a guarantee (Fabien, 2005). In education, universities with highly intangible products can use a guarantee to signal to a customer the teaching quality on offer. Students can be signalled about the high quality of the classes by being offered a teaching guarantee. This is even more relevant when offering electives which are dependent on sufficient student enrolments (McCollough & Gremler, 1999).

2.2.3.2 Investment theory

Investment theory interprets a guarantee as an insurance and repair contract that extends the life of a product. The choice lies with the consumer who can purchase a product with or without a guarantee (Björlin Lidén & Edvardsson, 2003). The product that is offered with a guarantee should be sold at a premium to cover the cost of warranty claims. The choice the consumer has to make is to weigh up the benefit of having a product which is covered by a guarantee, or a lower cost product without a guarantee where the customer carries the risk.

The consumer who decides to carry the risk of product failure has more incentive to keep the product maintained and well looked after. On the other hand, the consumer who selects the product with a guarantee is opting to pay higher up-front cost, but may not be incentivised to maintain the product. Erevelles (1993), McCollough & Gremler (1999) have empirical support for the investment theory. The investment theory views a guarantee as a risk management instrument. In a university where a service is provided, the student might perceive risk in enrolling for a class and offering a guarantee might be an effective tool in reducing the risk (Björlin Lidén & Edvardsson, 2003; Flegg, 2012; McCollough & Gremler, 1999).

2.2.3.3 Customer Focus

Customer focus has historically been lacking from a service offering where the orientation was mainly on production. In order for a service provider to guarantee the service on offer the provider must determine what exactly should be guaranteed

(McCollough & Gremler, 1999). By understanding the needs, wants and expectations of the customer through a customer orientation procedure, a service guarantee is developed (Crisafulli & Singh, 2016; Hogreve & Gremler, 2009; Holttinen, 2014; Kashyap, 2001; Song et al., 2015; Wirtz, 1998). Therefore, by viewing students as a customer and focussing on their needs, a suitable guarantee is developed. This view has been gaining support in marketing literature.

As the costs of education increase and, in most cases, students have to pay for a portion or the full amount of their education, the view of treating students like customers is likely to increase. The evaluation of a university and its instructors is carrying increasing weight for students in their selection of tertiary education (Durango-Cohen, Durango-Cohen & Torres, 2013; McCollough & Gremler, 1999). The offer of a lecturing guarantee can entice students to enrol with a specific university and help to adopt a student-as-customer focus.

2.2.3.4 Advantages of Guarantees in Education

As mentioned in the section on service guarantees, using a guarantee *sets clear standards and expectations*. Therefore using a guarantee in an education and teaching environment can set clear standards with financial consequences if not met (McCollough & Gremler, 1999). If these standards are not met and a claim is made against the the guarantee, *feedback is generated and failure understood*.

The causes of customer dissatisfaction provide invaluable feedback and help a firm to understand why and how they fail (Chi et al., 2012; Flegg, 2012; Rattanamethawong et al., 2015; Sheehan & Bruni-Bossio, 2015; Wouters & Kirchberger, 2015). A firm can gain access to superior market intelligence by offering a service guarantee and learn from the customer feedback. Based on the feedback received from dissatisfied customers when a guarantee is invoked, changes can be implemented, thereby preventing future failures.

Similarly, a guarantee offered by a university can generate feedback and provide the necessary insight into the causes of dissatisfaction and failure (McCollough & Gremler, 1999; Song et al., 2015). Instructors can learn from students who invoke guarantees and adapt a programme to better service future students. The increasing focus on

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student evaluations and teaching quality highlights the need to understand student dissatisfaction that can be better understood by offering a service guarantee.

Another advantage for universities using service guarantees is that it builds *marketing muscle* (Hart, 1988; McCollough & Gremler, 1999). This is a rare guarantee that would be difficult to duplicate, valuable for customers and will provide a sustainable competitive advantage. In general, universities have not adopted a competitive strategy, but as funding from government decreases, this may be changing. A service guarantee also provides a competitive advantage by reducing risk and signalling quality (Connelly et al., 2011; Fabien, 2005; Hogreve & Gremler, 2009). A teaching guarantee is an effective tool to compete for students and gain a competitive advantage over rival universities.

In addition to the five main reasons given for offering a service guarantee in education there are also personal and additional, educational reasons to guarantee education and performance during lecturing, these are (McCollough & Gremler, 1999):

- Accountability: The criticism has been levelled that higher education is not always available to students, that academic staff do not teach well, that not all content is covered and staff are focussed on research and publishing instead of teaching. This criticism may be unfounded, but students and the general public capitalise on this. The university that offers a service guarantee can be seen as accountable. In an environment with a high standard of accountability for the lecturer to perform, the same can be demanded from the student as the guarantee is a contact between the lecturer and the student (Egizii, 2015; Guevara & Stewart, 2011; McCollough & Gremler, 1999).

- Extraordinary experience: A message sent to customers that their experience will be unique and exciting is often referred to as a Wow factor. Offering a guarantee to students on their first day of class provides this extraordinary experience by making an important and unforgettable first impression that is related to learning objectives (Björlin Lidén & Edvardsson, 2003; Crisafulli & Singh, 2016; McCollough & Gremler, 1999).

- Learning tool: A precious learning experience for both students and lecturers is provided by a service guarantee, as education is an intangible product. By offering a guarantee, both students and instructor become participant observers (McCollough & Gremler, 1999).

- Behave in a way as it is expected from you: In essence, by offering a service guarantee you have to practise what you preach (McCollough & Gremler, 1999). This is arguably one of the most important aspects of offering a service guarantee. Hart, Schlesinger and Maher (1992) argue that guarantees are often offered because a firm feel that it is the right thing to do and it might even be a moral decision. By implementing a guarantee in education, the most intangible of services, it can be shown to be applicable to other services.

Service Guarantees have been identified and have been proposed to have a relationship with the dependent variable, *Alumni satisfaction*, as depicted in Figure 2.4.

Figure 2.4 - Relationship of Service Guarantees on Alumni perception

Customer Satisfaction has been identified and has been proposed to have a relationship with the dependent variable, *Alumni satisfaction*, as depicted in Figure 2.5.
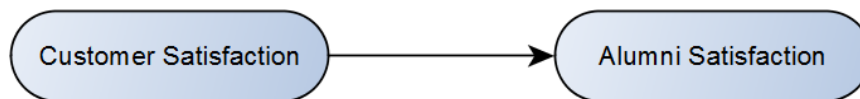
Figure 2.5 - Relationship of Customer Satisfaction to Alumni perception

2.2.4 Conclusion for Service Guarantees

This sub-section introduced the concepts of service guarantees, consumer satisfaction, customer perception of guarantees, conditional and unconditional guarantees, service guarantees in education, market signalling theory, investment theory and customer focus. The benefits of including service guarantees in education and treating students as customers were identified in literature.

The following deliverables were achieved: the importance of understanding the needs, wants and expectations of customers; how to setup a service guarantee with customer focus in mind; how a well-designed guarantee can positively influence business profitability. These partly achieved the research objective of establishing the importance of customer satisfaction in the Department of Computing Sciences (RO1).

In the next section, applicable concepts surrounding shareholder and stakeholder theory, the value of Alumni, various teaching models and the areas of the learning institution that contribute to the Alumni experience will be introduced.

2.3   Stakeholder Theory

In the previous section, the concepts of service guarantees, consumer satisfaction, customer perception of guarantees, conditional and unconditional guarantees, service guarantees in education, market signalling theory, investment theory and customer focus were introduced. The importance of understanding the needs, wants and expectations of customers was highlighted. The importance of setting up a service guarantee with customer focus in mind and how a well-designed guarantee can positively influence business profitability were also highlighted.

This section will introduce the concepts of shareholder and stakeholder theory, the value of Alumni, various teaching models and the areas of the learning institution that contribute to the Alumni experience. The benefits of treating students as stakeholders and using feedback from Alumni will be highlighted. The importance of understanding how these concepts apply to Alumni satisfaction will be highlighted. The importance of how these concepts can be used to improve the Alumni experience will be discussed.

2.3.1 Stakeholder Theory Literature

In the traditional shareholder theory, the main goal was to take care of the shareholders who own shares in the company, by improving their wealth. Society's best interestsare not part of this consideration as the organisation has a binding contract to put the need of the shareholders first, where actions and decisions made in the organisation are purely based on increased value. In contrast, stakeholder theory goes against the shareholder view (Connelly et al., 2011; Freeman, 2004).

The Stakeholder theory suggests that the purpose of a business is to create as much value as possible for stakeholders and not only for the shareholders. A business should try to meet the needs of everyone who has a stake in both the actions and outcomes of the organisation. In order for this to be sustainable, the executives must keep in mind the interest of all the stakeholders, such as the customers, suppliers, employees, communities and shareholders, ensuring that everyone gains some degree of satisfaction (Caballero et al., 2015; Freeman, 2004; Parmar et al., 2010). A competitive advantage is gained by the organisation by involving the stakeholders as strategic resources in corporate decisions. This is even considered as an ethical requirement (Plaza-úbeda et al., 2014).

Stakeholders can be defined as the individuals or groups who are either affected by the activities and consequences of an organisation or those who have an influence on the organisation (Caballero et al., 2015; Parmar et al., 2010). However, this view can be seen to include almost anyone as a stakeholder in the organisation. The stakeholders are therefore narrowed down to the most important, affected individuals or groups. The individuals or groups whose interests are far removed from the operations of organisations are excluded from the stakeholder theory. If these far - removed individuals or groups are considered as stakeholders, they will have differing interests which will place a financial burden on the organisation and it might not survive (Hillman & Keim, 2001; Parmar et al., 2010; Walsh, 2005).

A core concept of the stakeholder theory is that all stakeholders must have decision-making power. The shareholders that traditionally had all the decision-making power have to forego this right and share it with all the stakeholders. The less affluent stakeholders gain power from the wealthy shareholders and Freeman (2004) notes that this refocus can allow abuse by the non- shareholders. The possibility of abuse

can potentially make sharing of power less attractive for shareholders who could be harmed by this redistribution and could affect their financial gains (Parmar et al., 2010; Walsh, 2005).

The organisations that take their stakeholders' interests seriously are regarded as more successful than the organisations that do not. The relationship between the performance of the organisation and stakeholder strategies have been researched and a positive relationship has been found while holding other variables constant. The success of organisations with stakeholder management is stability, growth and profitability (Clarkson, 1995).

Stakeholder theory has been continually developed, by defining areas such as unrestricted or restricted stakeholder strategies and by distinguishing between primary and secondary stakeholders. Research has been carried out into aspects of stakeholder incorporation, in areas such as, what knowledge stakeholders have and what their demands are, how decisions are made based on this these factors and how the company and the stakeholders interact (Clarkson, 1995; Greenwood, 2001).

Having knowledge about stakeholders allows the identification of prominent stakeholders in the organisation and gives their demands a high priority as stakeholders with more power and urgent demands should be prioritised by the firm. In addition to this, however, there must be a mutual agreement and relationship between the stakeholder and the organisation through participation, consultation, cooperation, and information exchange (Green & Hunton-Clarke, 2003; Parmar et al., 2010).

2.3.2 Drawbacks of Stakeholder Theory

A blatant shortcoming of the stakeholder theory is the problem of identifying stakeholders, where who is and who is not a stakeholder are often not clearly defined. (Freeman, 2004). However, researchers and managers increasingly favour the stakeholder theory even if the way stakeholder theory has been put to use does not allow controlled analysis.

As stakeholders include a wide range of individuals and groups, it is not possible for managers to attend to the needs of all the stakeholders and often focus only on the prominent stakeholders (Greenwood, 2001). This is another area of criticism where

only the stakeholders with power, legitimacy and urgency are given attention. There are noteworthy problems when power is used to prioritise stakeholders. Harrison, Bosse & Phillips (2010) state that it is a violation of justice and fairness principles when one stakeholder is chosen over another simply due to power differences.

Shareholders invest in firms in order to get a return on investment and stay in business. In the stakeholder theory, where various needs of stakeholders must be met, corporate profits are often foregone which has been condemned by critics. There are differing views of researchers, where some emphasize having both financial and social performance and others focus only on meeting the needs of all relevant stakeholders, even if that is at the expense of profits.

Lastly, shareholder theory suggests that all individuals and groups with a stake in the organisation should be considered. However, the interests and priorities of one group does not take precedence over those of another group (Donaldson & Preston, 1995).

2.3.3 Stakeholder Theory Impact for Management

The stakeholder theory suggests that, in order for organisations to stay in business, they have to make money, or they will not be able to meet the needs of anybody. Therefore, the theory is not only about only improving shareholder wealth, but also about having a larger set of goals to focus on. However, an organisation should try to balance needs in order to meet the requirements of both shareholders and stakeholders, and in doing so improve both the social performance and the financial performance of the organisation (Clarkson, 1995; Freeman, 2004).

An important consideration for management on the stakeholder theory is the requirement to classify the most important stakeholders. The complexity of the task is often underestimated, where a lot of resources and time are required to identify those stakeholders that have a significant and powerful influence on the organisation. After identifying the key stakeholders, open communication channels must be created in order to fully understand their needs and demands in relation to the organisation (Greenwood, 2001; Harrison et al., 2010).

It is accepted that not all the needs and wants of every stakeholder will be able to be addressed by the organisation. The needs and wants of a stakeholder have to be prioritised and addressed according to prioritisation. This is another challenge that will

be difficult to manage. The amount of decision-making power and authority given to stakeholders is a key decision as this will influence and limit management actions. Decisions made by management to contribute company earnings to social causes can cause some shareholders to voice their dissatisfaction.

2.3.4 Stakeholder Theory in Education

Governments are making substantial cuts in public spending and its contribution to university education declined by 9% from 2000 to 2012 while the burden on students increased by 7% during the same period (PWC, 2015). This is one of the factors that has caused public education institutions to re-evaluate their relationships with stakeholders in order to remain competitive (Plewa & Quester, 2008; Schlesinger, Cervera & Pérez-Cabañero, 2016). Other factors that drive universities to be more competitive are highly demanding students, increasing competition due to globalisation and an awareness of international rankings (Díaz-Méndez & Gummesson, 2012; Schlesinger et al., 2016). In this perspective, Alumni are key university stakeholders and forming a strong bond with them is a priority for management of higher education institutions (Caballero et al., 2015; Calitz, Greyling & Glaum, 2016; Helgesen & Nesset, 2007; Hennig-Thurau, Langer & Hansen, 2001; Schlesinger et al., 2016).

In the literature, students are seen as customers of higher education institutions (Díaz-Méndez & Gummesson, 2012). The bond formed with students endures after students have graduated and become Alumni. The loyalty that was experienced by students both during the period when the student was enrolled as an undergraduate at the institution and in the period after the student had completed his or her formal education (Schlesinger et al., 2016). The benefits of having a strong body of Alumni are additional financial resources through donations to research funding, mentoring and supervising enrolled students (Hennig-Thurau et al., 2001; Schlesinger et al., 2016).

A study done by Calitz, Greyling & Cullen (2014) found that closer collaboration has been established between numerous information and communications- technology (ICT) -related departments and industry. The ICT departments have established Advisory Boards at the higher education institutions with the objective of meeting the ICT graduate skills requirements of industry and forming closer collaboration. A subsequent study found that stakeholder involvement further contributes to computing courses (Calitz et al., 2016).

2.3.5 Value of Alumni as Stakeholders

Alumni are seen as the most important assets of a university. They are important assets as the university is represented in the real world by the Alumni (Chi et al., 2012; Rattanamethawong et al., 2015; Watt et al., 2013). Historically, Alumni networks were created from regional groups brought together for fundraising purposes. Over time these networks developed, both in their importance and benefits and the university gained from these networks in terms of the development of the university and the enormous outreach potential for current students in their career paths. Alumni groups are constantly evolving and have been in existence for decades. Changes have been accelerated in recent years with the development of the internet and social networking that facilitates global communication. This is another reason why the Alumni networks are vital for universities to enhance their growth and development (Chi et al., 2012).

2.3.6 Value Creation Potential of the Stakeholder University

As highlighted in the previous sections, the stakeholders of an organisation are individuals and groups that contribute, willingly or unwillingly, to its wealth-creating capacity and activities. Therefore, the main purpose of the stakeholders is the creation of organisational value.

Creating value through university learning processes contributes at varying levels. According to a study done by Margherita & Secundo (2011), there are three major variables that have to be considered in value creation:

- Focus: this is the strategic width of university learning processes, ranging from provision of a narrow training to broader forms of professional development.
- Scope: This is the level of involvement of internal and external stakeholders. This can vary from learning processes addressing the entire value network of the institution (customers, suppliers, strategic partners, etc.) to purely employee-oriented actions.
- Level of interconnection: This is the level of shared interactions among stakeholders involved and the supporting tools used.

Based on the three major variables that have to be considered in value creation, four models are defined as shown in Figure 2.6. The four teaching models are a training

department, e-learning platform, corporate university and stakeholder university (Margherita & Secundo, 2011).
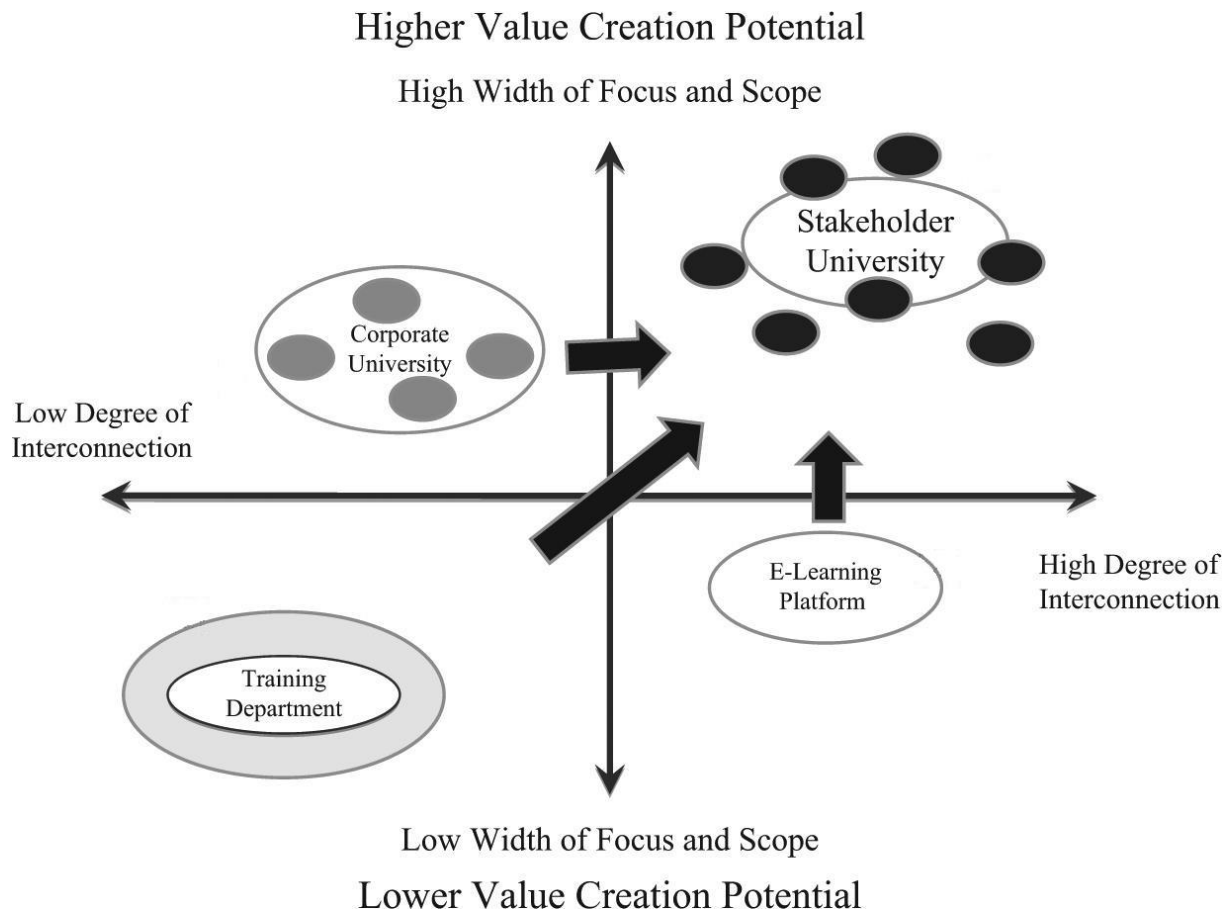
Figure 2.6 - University learning processes and value creation potential (Margherita & Secundo, 2011)

As can be seen in the model in Figure 2.6, traditional training departments have a low focus width, a low scope width and low degree of interconnection. The focus is on specific skills and competencies, on company employees only with limited use of collaborative technologies.

E-learning platforms are based on ICT to provide on-demand learning and reduce logistics. They are popular due to their flexibility and compatibility with work schedules. They have a medium / low focus width, a medium / low focus scope width and medium / high degree of interconnection. The focus is on targeting different skills, located in remote locations with easy participation through collaborative technologies (Male & Pattinson, 2011; Margherita & Secundo, 2011).

A corporate university model is categorised by a medium / high focus width, medium / high scope width and a medium / high degree of interconnection. The focus is on different programmes and courses, employees are located in different campuses and customers, and partners are also involved together with significant use of knowledge management and learning technologies.

Lastly, there is the stakeholder university, which is not an entirely new concept. There has been a shift in the last half century on redefining the purpose of higher education and the key stakeholders. The major stakeholders have been identified and their key roles highlighted. The stakeholder approach in the university has also indicated the need for changes in the structure of the university in order to deal with the transforming environment and education needs (Margherita & Secundo, 2011; Nolltt & Wilkins, 2002; Shanahan & Gerber, 2004).

2.3.7 University Stakeholders

There are various key university stakeholders in the academic enterprise, some of which are listed below (Caballero et al., 2015; Calitz et al., 2016; Margherita & Secundo, 2011; Shanahan & Gerber, 2004):

- faculty;
- academic staff;
- administrative staff;
- students;
- parents;
- careers advisers;
- executive officers of the university;
- advisory board members;
- offshore partners;
- domestic partners;
- employers; and
- Alumni.

Analysing the stakeholders of the university can provide insight into the quality of programmes offered by academic departments, the perceived value of postgraduate supervision and the relevance of the programmes on offer. The Alumni of NMMU can

provide valuable feedback to the Department of Computing Sciences from their experience and perceived value of the courses they completed. The Department of Computing Sciences can use this feedback to assess how relevant the course on offer is and if the experience of the Alumni was positive (Calitz et al., 2016).

2.3.7.1 Course Contents

Potential students are influenced by various factors when selecting a course. Factors that have an influence are; dealings with staff (during application and at open days), university location, clarity and quality of printed materials and the course content (Brown, Varley & Pal, 2009). The course content is considered to be of principal importance as the starting point for new students. Alumni are an excellent source of feedback from industry as their experience in industry can be related directly back to course content, academic courses and assessments (Steele & Cleland, 2014).

Course contents have been identified and it has been proposed that they have a relationship with the dependent variable, *Alumni satisfaction*, as depicted in Figure 2.7.

Figure 2.7 - Relationship of Course contents on Alumni perception

2.3.7.2 Modern Technologies

Universities must strategically use technology to support learning in ICT. There are various reasons why universities would increase ICT for curriculum delivery, but quality of teaching is the central concern of lecturers. There must be a specific link between using relevant technology during course work and the technology that will be used in the work environment. More importantly, the choice of ICT used and the way it is designed into study activities will create a positive attitude and efficient, effective performance towards ICT. Newer students may take existing technology for granted and the attitudes towards the usefulness and ease of use will play a strong role on willingness to develop new skills and technology usage (Calitz et al., 2014; Edmunds, Thorpe & Conole, 2012).

Modern technologies have been identified and it has been proposed that they have a relationship with the dependent variable, *Alumni satisfaction*, as depicted in Figure 2.8.

Figure 2.8 - Relationship of Modern technologies on Alumni perception

2.3.7.3 Academic Staff

The success of a course offered by a university and the effectiveness of the instructors have commonly been measured by means of student evaluations (Guevara & Stewart, 2011; Khatimin et al., 2011; McDearmon, 2013; Mcgourty et al., 1999). The feedback generated is typically used to identify instructors who need additional training, courses that need to be restructured or the need for financial rewards for those who excel. The principal objective of educating students is to inculcate what they can use and apply after graduating, regardless of the field of study. The Alumni perception of the extent of learning and the usefulness of the knowledge is a key measure for universities (Guevara & Stewart, 2011; Khatimin et al., 2011; McDearmon, 2013).

Academic Staff have been identified and has been proposed that they have a relationship with the dependent variable, *Alumni satisfaction*, as depicted in Figure 2.9.

Figure 2.9 - Relationship of Academic Staff on Alumni perception

2.3.7.4 Admin. Staff

A wide variety of duties in a university is taken care of by the administrative staff. Some of the people performing the required tasks are data entry clerks, analysts, secretaries, personal assistants and executives. University staff is required to be dedicated, efficient and have the ability to work both in a team and individually. It is difficult to categorise and grade the work as it is both varied and demanding (O'Sullivan, 1994). In terms of the stakeholder model, administrative staff are viewed as secondary

stakeholders. The primary stakeholders are those without whom the organisation cannot exist or those who have an official or contractual relationship with the organisation. Administrative staff is key in the interface to students and contributes to a positive or negative experience at the university (Caballero et al., 2015).

Admin. Staff have been identified and it has been proposed that they have a relationship with the dependent variable, *Alumni satisfaction*, as depicted in Figure 2.10.

Figure 2.10 - Relationship of Admin. Staff on Alumni perception

2.3.7.5 Social Environment

Social Environment has been identified and it has been proposed that it has a relationship with the dependent variable, *Alumni satisfaction*, as depicted in Figure 2.11.
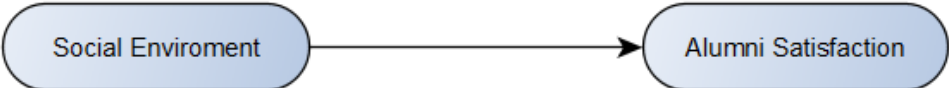
Figure 2.11 - Relationship of Social Environment on Alumni perception

2.3.8 Summary

This sub-section introduced the concepts of shareholder theory, stakeholder theory, value of Alumni, stakeholder university, teaching models, course contents, modern technologies, academic and administrative staff roles, and university atmosphere and supporting departments. The benefits of treating students as stakeholders and using feedback from Alumni were identified in literature. The following deliverables were achieved: the importance of understanding the benefits of a stakeholder approach over a more traditional shareholder approach; the importance of understanding the value of

Alumni; how Alumni can provide insight and valuable feedback to improve university offerings; which factors might influence the perceptions of Alumni of the educational institution. These partly achieved the research objective to identify the factors influencing the perception of Alumni in the Department of Computing Sciences and develop a proposed model (RO2).

In the next section applicable concepts surrounding customer value, the value of the customer, perceived value and Alumni creating value by Alumni for the university will be introduced.

2.4 Customer Perceived Value

This previous section introduced the concepts of the stakeholder theory and the value of Alumni that form part of the stakeholders. The benefits of treating students as stakeholders and using feedback from Alumni were identified in literature.

This section will introduce the concepts of customer value, the value of the customer, perceived value and value created by Alumni for the university. The importance of understanding how these concepts apply to student satisfaction will be highlighted. The importance of how these concepts can be used to improve the student experience will be discussed.

2.4.1 Customer Value

Customer value is a complex concept as it is often interpreted with various meanings depending on the point of view adopted. A definition of customer value is the perceived value that the customer gains when purchasing a product or receiving a service (Dovaliene et al., 2015; Fraering & Minor, 2013; Landroguez et al., 2011; Rodrigues et al., 2014; Sheehan & Bruni-Bossio, 2015; Song et al., 2015; Wouters & Kirchberger, 2015). The customer perceives value in the product or service when the benefits exceed the costs (Buys, 2014). However, Martelo Landroguez, Barroso Castro & Cepeda-Carrión (2013) notes that customer value can be used in a variety on contexts, which include:

- creating and delivering customer value;
- value of the customer; and
- customer-perceived value.

The next sections elaborate on these three contexts.

2.4.1.1 Creating and delivering customer value

Customer value creation focusses on the links between performance of a firm, customer value and competitive advantage. The topic of customer value creation was the focus of much research done during the 1990s (Martelo Landroguez et al., 2013; Payne & Holt, 2001; Rodrigues et al., 2014; Wouters & Kirchberger, 2015). Payne and Holt (2001) argue that the success of a firm is dependent on the extent to which it delivers value to the customers in terms of what matters to them. In order for a firm to survive, it cannot only use quality as a guarantee. The firm's ability to create and deliver superior customer value is a key success factor over its competitors (Payne & Holt, 2001).

2.4.1.2 Value of the customer

Customer value can also be viewed from the perspective of the firm and the value of the customer to the firm has been focussed on by researchers. The value of the customer to the firm is seen as an output of value creation rather that an input. Here the focus is not how to create value to the customer, but rather on the value outcome that can be derived from delivering superior customer value. Payne and Holt (2001) state that one of the concepts which forms part of this perspective is the "customer lifetime value". This concept does not consider the value provided by the firm to the customer, but the value that the firm can obtain from its customers. This view of customer value is often referred to as the firm value appropriation.

2.4.1.3 Customer-perceived value

The conventional method of listening to the customers' needs has been achieved through measuring customer satisfaction (Martelo Landroguez et al., 2013). However, Woodruff (1997) states that there needs to be a shift from measuring satisfaction towards a better understanding of what customers value. Having a better understanding of what customers value will help firms to achieve their organisational purpose and goals. This has resulted in an extended view of customer-perceived value which has drawn the attention of researchers (Dovaliene et al., 2015; Fraering & Minor, 2013; Landroguez et al., 2011; Rodrigues et al., 2014; Sheehan & Bruni-Bossio, 2015;

Song et al., 2015; Wouters & Kirchberger, 2015). Based on this extended view the focus on customer value then changes to a customer-oriented concept. A firm that is customer-oriented must consider the perception of the customer when it defines the value proposition of the firm (Martelo Landroguez et al., 2013).

2.4.2 Perceived Value

In order to achieve a competitive advantage and predict customer behaviour, much attention has been given by both academics and businesses to the value perceived by the customer (Coelho & Henseler, 2012; Martelo Landroguez et al., 2013; Song et al., 2015). The main outcome of marketing activity is to increase the perceived value of the product or service to the customer.

The perceived value of a product or a service will vary from one customer to the next. Tailoring a product or service to a wide audience will result in some customers valuing a certain aspect more when compared to other customers. The value of a product or service will also change over time as customers' needs and wants change. The perceived value by the customer of the product or service on offer is difficult to measure (Buys, 2014; Coelho & Henseler, 2012; Dovaliene et al., 2015; Martelo Landroguez et al., 2013; Song et al., 2015).

2.4.3 Value Perceived by Alumni

From the previous section, Alumni are seen as the most important assets of a university. They are important assets as the university is represented in the real world by the Alumni (Chi et al., 2012; Rattanamethawong et al., 2015; Watt et al., 2013). The achievements of Alumni directly reflect on the university and any improvements to the quality of the education at the university automatically improves the perceived value of the graduate's degree (Egizii, 2015). A synergistic relationship is created by this connection between the Alumni and the university. Alumni are a university's best ambassadors and should be kept informed and involved in the vision and priorities of the university. Alumni bring real-world experience to the modern-day student and increase the perceived value that the university offers (Atkinson, Coleman & Blankenship, 2014; Egizii, 2015; Flegg, 2012).

Perceived Value has been identified and it has been proposed that it has a relationship with the dependent variable, *Alumni satisfaction*, as depicted in Figure 2.12.
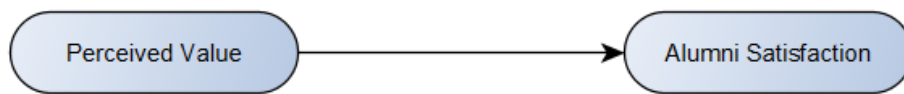
Figure 2.12 - Relationship of Perceived Value on Alumni perception

2.4.4 Summary

This sub-section introduced the concepts of customer value, the value of the customer, perceived value and value created by Alumni for the university. The benefits of delivery value to the customer and increasing the perceived value of the service through the Alumni were identified in literature. The following deliverables were achieved: the importance of the perceived value that the customer gains when purchasing a product or receiving a service; how important the delivery of value to customers is to a firm and how the achievements of Alumni directly reflect on the university. These partly achieved the research objective of identifying the factors influencing the perception of Alumni in the Department of Computing Sciences and develop a proposed model (RO2).

In the next section Alumni perceptions will be discussed. The importance of understanding how student evaluations are beneficial to a university and a department and the influence they have will be discussed. The importance of how these concepts can be used to understand the Alumni perception will be discussed.

2.5 Alumni Perceptions

This section will introduce the concept of Alumni and student evaluations. The importance of understanding how student evaluations are beneficial to a university and a department and the effect they have will be discussed. The difference between student and Alumni evaluations will be discussed highlighting the benefits of an Alumni evaluation over a student evaluation.

2.5.1 Student Evaluations

The success of a course offered by a university and the effectiveness of the instructors have commonly been measured by means of student evaluations (Guevara & Stewart, 2011; Khatimin et al., 2011; McDearmon, 2013; Mcgourty et al., 1999). The feedback generated is typically used to identify instructors who need additional training, courses that need to be restructured or the need for financial rewards for those who excel. The principal objective of educating students is to inculcate what they can use and apply after graduating, regardless of the field of study. The Alumni perception of the extent of learning and the usefulness of knowledge is a key measure for universities (Guevara & Stewart, 2011; Khatimin et al., 2011; McDearmon, 2013).

In a study done by Khatimin et al., (2011) the perception and satisfaction of graduate degree Alumni was measured against the following criteria:

- attainment of the educational objectives and critical programme outcomes;
- evaluation of the curriculum and how it was delivered; and
- evaluation of the facilities and resources on offer.

Student surveys typically measure the extent of learning as well as the instructors' ability to provide and encourage effective learning. However, the value of the learning cannot be perceived correctly until the students have to apply their knowledge and reflect on what was learnt. There are various factors that influence student perception of the teaching received narrated in literature. A strong positive correlation between the student perceptions of learning and the ranking of the instructor was identified by Stapleton and Murkison (2001). However, when examining the actual learning that took place no relationship was found (Heck, Todd & Finn, 2002).

In a study done by Heck et al. (2002) where two instructors who taught the same course were rated, there was no direct correlation found between the rating given to the instructors and the learning that took place. Apart from ratings on learning, the factors that have a positive correlation between student rating and teaching effectives are: correct use of humour in class, the likeability of the instructor and attitude of the professor (Guevara & Stewart, 2011).

Measuring how knowledge and skills required in the workplace are developed through an education programme forms the basis of an Alumni survey (Guevara & Stewart, 2011). Other useful results from Alumni research are:

- Alumni perception of the learning institution (Chi et al., 2012; Guevara & Stewart, 2011; Khatimin et al., 2011; Koushiki Choudhury, 2015; McDearmon, 2013; Mcgourty et al., 1999);
- relationship between satisfaction with the institution and the field of study; and
- forms the basis for examining subsequent work experience.

Compared with student surveys, Alumni surveys offer an objective perspective due to their detachment from the participation with the study programme (Guevara & Stewart, 2011; Schneider & Niederjohn, 1995). This gives Alumni surveys a unique feature above a student surveys in that Alumni can assess, after graduating, the quality of the education received, as it is tempered by their work experience and application of knowledge learnt. Alumni surveys have revealed that the factors which influence the evaluation of a programme and satisfaction thereof are perception of professional growth and the level of intellectual challenges (Guevara & Stewart, 2011).

Alumni Network has been identified it and has been proposed that it has a relationship with the dependent variable, *Alumni satisfaction*, as depicted in Figure 2.13.

Figure 2.13 - Relationship of Alumni Network on Alumni perception

2.5.2 Conclusion for Student Perception

This sub-section introduced the concepts of Alumni and student evaluations. The following deliverables were achieved: the unique features of Alumni surveys compared with student surveys were highlighted; the useful results that can be obtained from an Alumni survey. These concepts partly achieved the research objective of establishing the importance of customer satisfaction in the Department of Computing Sciences. (RO_1). In the next section the conceptualised model for overall Alumni satisfaction will be formulated, based on the literature reviewed in this chapter.

2.6 Alumni Satisfaction Model

The conceptualised model for overall Alumni satisfaction has been formulated based on the literature reviewed in this chapter. This model is depicted in Figure 2.14.
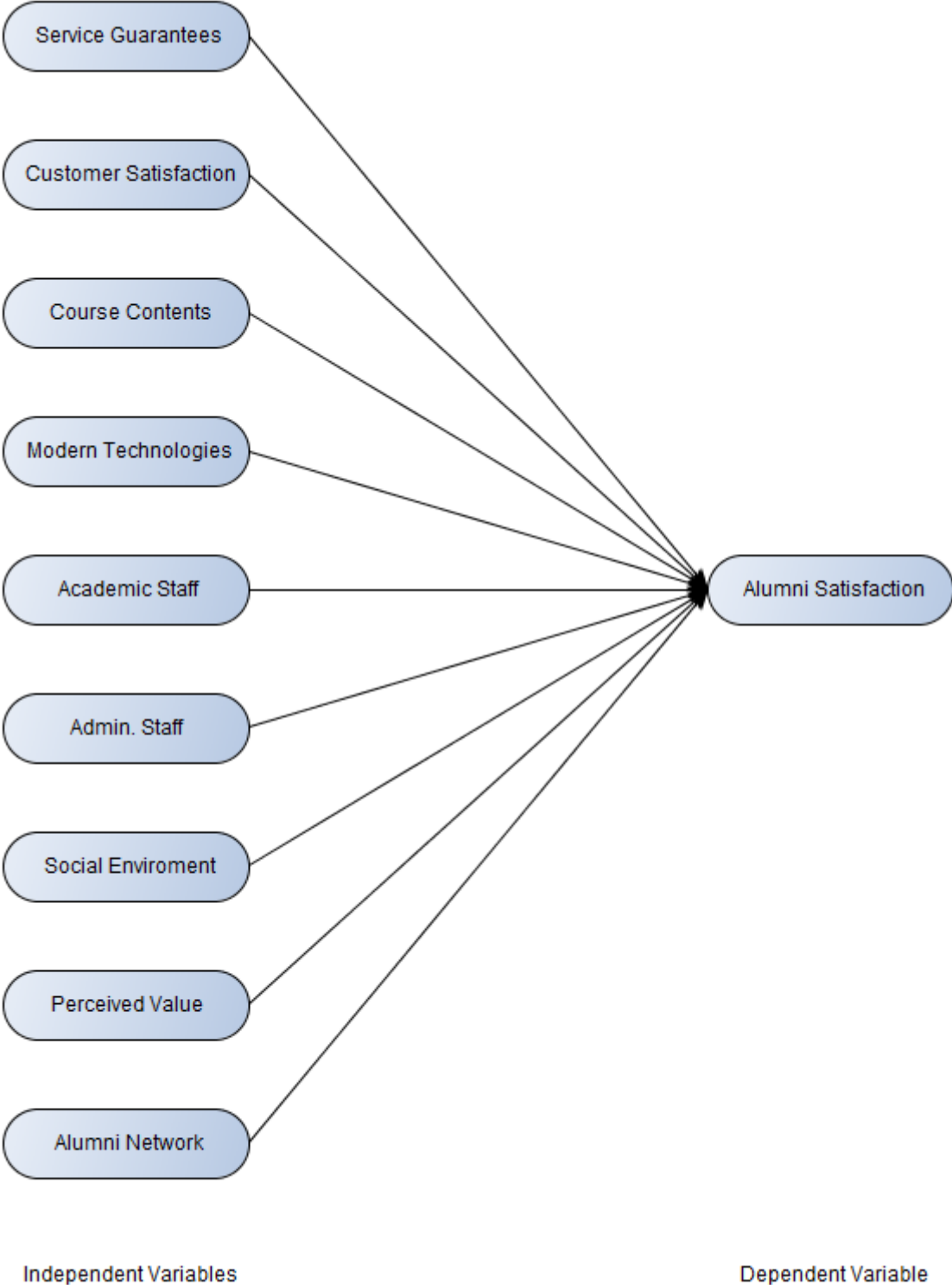
Figure 2.14 - Alumni Satisfaction Model

2.7 Summary

This chapter addressed RQ_1 which states; "What is the importance of Alumni satisfaction with the Department of Computing Sciences?" and RQ_2 which states; "Which factors should be included in a proposed model to gauge the perceptions of Alumni in the Department of Computing Sciences?" The chapter achieved the research objectives of performing a literature review in order to establish the importance of customer satisfaction in the Department of Computing Sciences (RO_1) and of identifying the factors influencing the perception of Alumni in the Department of Computing Sciences and develop a proposed model (RO_2) as seen in Figure 2.14.

The concepts of Alumni and student evaluations were introduced in the first section of the chapter. The unique features of Alumni surveys compared with student surveys were highlighted and the useful results that can be obtained from an Alumni survey were highlighted. The uniqueness of Alumni surveys was shown, which which has more value than student surveys in assessing the quality of the education received after graduating.

The following section introduced the concepts of service guarantees, consumer satisfaction and how customers perceive these guarantees. Guarantees were further broken down into conditional and unconditional guarantees and service guarantees in education. The next section discussed the market signalling theory, investment theory and the importance of being focused on the customer. This section identified the benefits of including service guarantees in education and treating students as customers. This section also highlighted the importance of understanding the needs, wants and expectations of customers. How to establish a service guarantee with customer focus in mind was explained as well as how a well-designed guarantee can positively influence business profitability.

This section was concluded with the investment theory that views a guarantee as a risk -management instrument. In a university where a service is provided, the student might perceive risk in enrolling for a class and offering a guarantee might be an effective tool in reducing the risk.

The concepts of shareholder and stakeholder theory were then discussed. The importance of understanding the benefits of a stakeholder approach over a more

traditional shareholder approach was highlighted brought forward. The benefits of treating students as stakeholders and using feedback from Alumni were then identified from the literature. Then teaching models in a stakeholder university were identified. In the next section, the value of Alumni was highlighted by showing the importance of and understanding the value of Alumni. Alumni provide understanding, valuable insight and valuable feedback to improve university offerings. The factors that might influence the perceptions of Alumni of an educational institution were listed as course contents, modern technologies, academic and administrative staff roles, the university atmosphere and supporting departments.

The last section introduced the concepts of customer value and perceived value. The section continued by identifying perceived value as well as how Alumni create value for the university. The benefits of delivering value to the customer and increasing the perceived value of the service through the Alumni were highlighted. The perceived value that the customer gains when purchasing a product or receiving a service was emphasised. Lastly, from that section, the importance to a firm on the extent to which it delivers value to the customers and how the achievements of Alumni directly reflect on the university was shown.

In the final section of this chapter, the proposed model was shown and the factors that influence Alumni perception are: *Service Guarantees, Customer Perception, Course Contents, Modern Technologies, Academic Staff, Admin. Staff, Departments, University Atmosphere* and *Perceived Value.*

Chapter 3 will address RQ_3 that states; "*How can a detailed description of the research methodology be provided in order to understand and reproduce this research study in future?*" The chapter will achieve the research objective of justifing and explaining the research methodology that is used for this treatise with adequate detail for future reproduction (RO_3).

Chapter Three

3 CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

In the previous chapter, concepts vital to this research such as Alumni and student evaluations, service guarantees, consumer satisfaction, investment theory, shareholder and stakeholder theory, customer value and perceived value were introduced. The chapter addressed RQ_1 which states; "*What is the importance of Alumni satisfaction with the Department of Computing Sciences?*" and RQ_2 which states; "*Which factors should be included in a proposed model to gauge the perceptions of Alumni in the Department of Computing Sciences?*". The chapter achieved the research objectives of performing a literature review in order to establish the importance of customer satisfaction in the Department of Computing Sciences (RO_1) and identify the factors influencing the perception of Alumni in the Department of Computing Sciences and develop a proposed model (RO_2).

This chapter will address RQ_3 that states; "*How can a detailed description of the research methodology be provided in order to understand and reproduce this research study in future?*". This chapter will achieve the research objective of justifing and explaining the research methodology that is used for this treatise with adequate detail for future reproduction (RO_3). An overview of the RQs and ROs of this chapter can be seen in Figure 3.1.

In delivering the above outcomes each sub-section will cover the following topics with an overview of this chapter which can be seen in Figure 3.2.

Section 3.1 provides a brief review of the contents of Chapter 2 and introduces Chapter 3 and the research questions and objectives that will be addressed. The research and the various paradigms will be defined in Section 3.2. The paradigm used in this study will be identified. In Section 3.3 the literature review will be defined. The process followed for this study and the purpose of a literature review will be explained. The various hypotheses from the proposed model for this research will be formulated in Section 3.4. The survey design, pilot study and sampling methods will be discussed in Section 3.5. Data collection and data analysis will be explained in Sections 3.6 and 3.7

respectively. Section 3.8 will cover the concepts of validity, reliability and generalisability. Section 3.9 covers the topic of ethics, the relevance thereof and how this is applied in this study. Section 3.10 concludes with a summary of this chapter emphasising the most important deductions that were highlighted throughout the chapter.
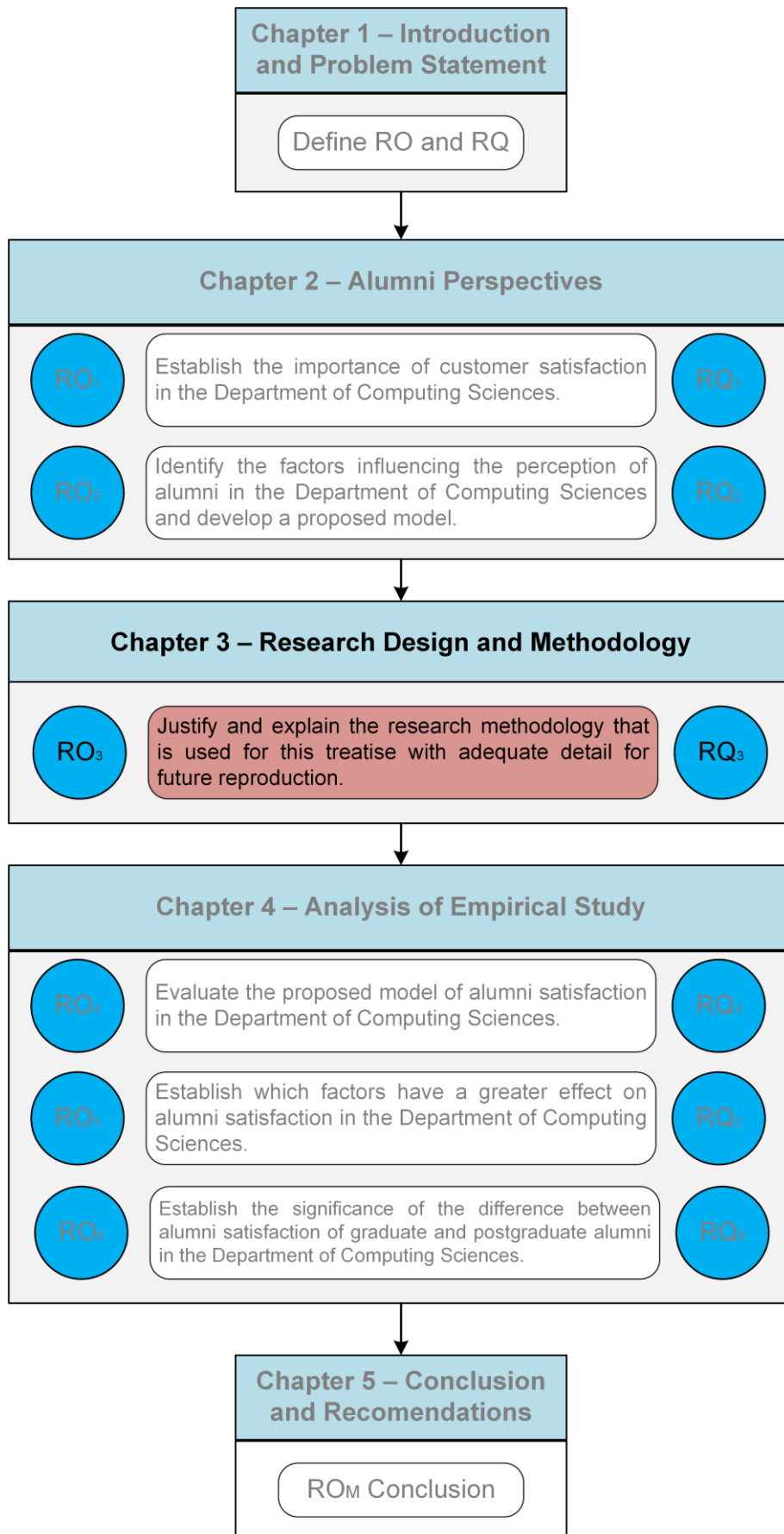
Figure 3.1 - Chapter 3 Research Objectives
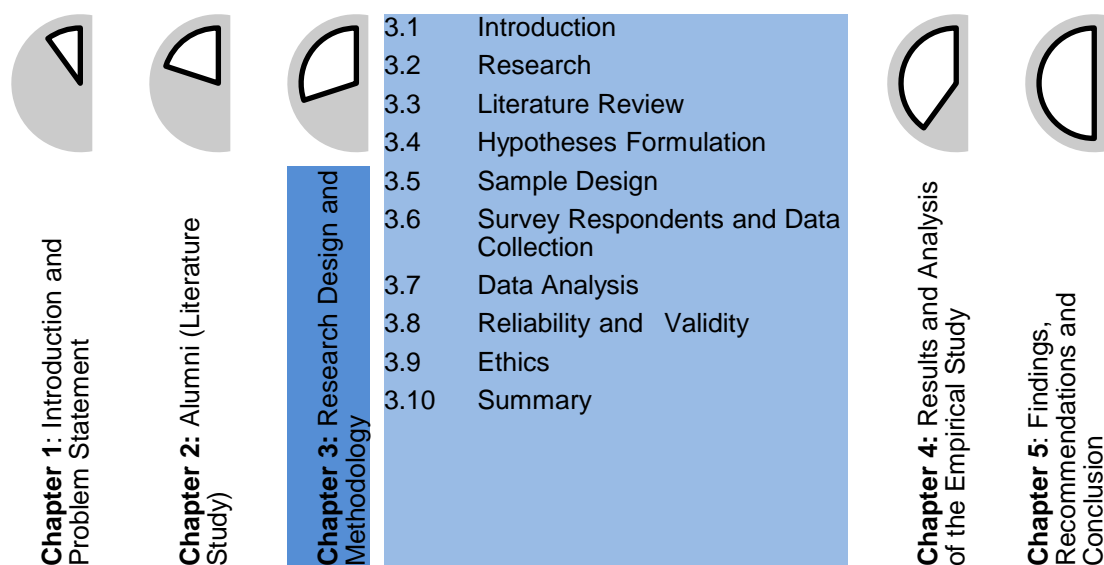
Figure 3.2 - Overview of Chapter 3

3.2 Research

3.2.1 Definition of Research

Research is defined by Leedy & Omrod (2010) as; "the general approach the researcher takes in carrying out the research project". It is a systematic and structured process of collecting, analysing and interpreting information in a suitable, technical manner with the result of increasing the literature about the research project (Kumar, 2011).

Research is further characterised by eight separate aspects which are independent of a specific theme, complexity or length:

- A specific question or problem is where research starts;
- The research objective must be clearly defined in layman's terms;
- There are defined processes to follow in research;
- Research normally consists of the main research question or problem and subdivided also into smaller, more manageable sub-problems or questions;
- The problem that needs to be solved directs the research;
- Certain crucial assumptions are required in order to do the research;

- Research requires collecting, analysing and interpreting information; and

- Research is recurring by nature (Leedy & Omrod, 2010).

A metaphor that is often used is the Research Onion, which illustrates research as the peeling of progressive layers that the researcher must make during the research process (Saunders, Lewis, & Thornhill, 2007). The model, as seen in Figure 3.3, starts from the outside moving inward through each layer of the onion. The researcher starts the research process by choosing a research philosophy from the outer-most layer. The subsequent layers are selected one by one, moving toward the centre of the onion and at each layer the researcher must make selections relating to the research approach, the research strategy, the research choices, time horizons and techniques and procedures to be followed in the study (Saunders et al., 2007).
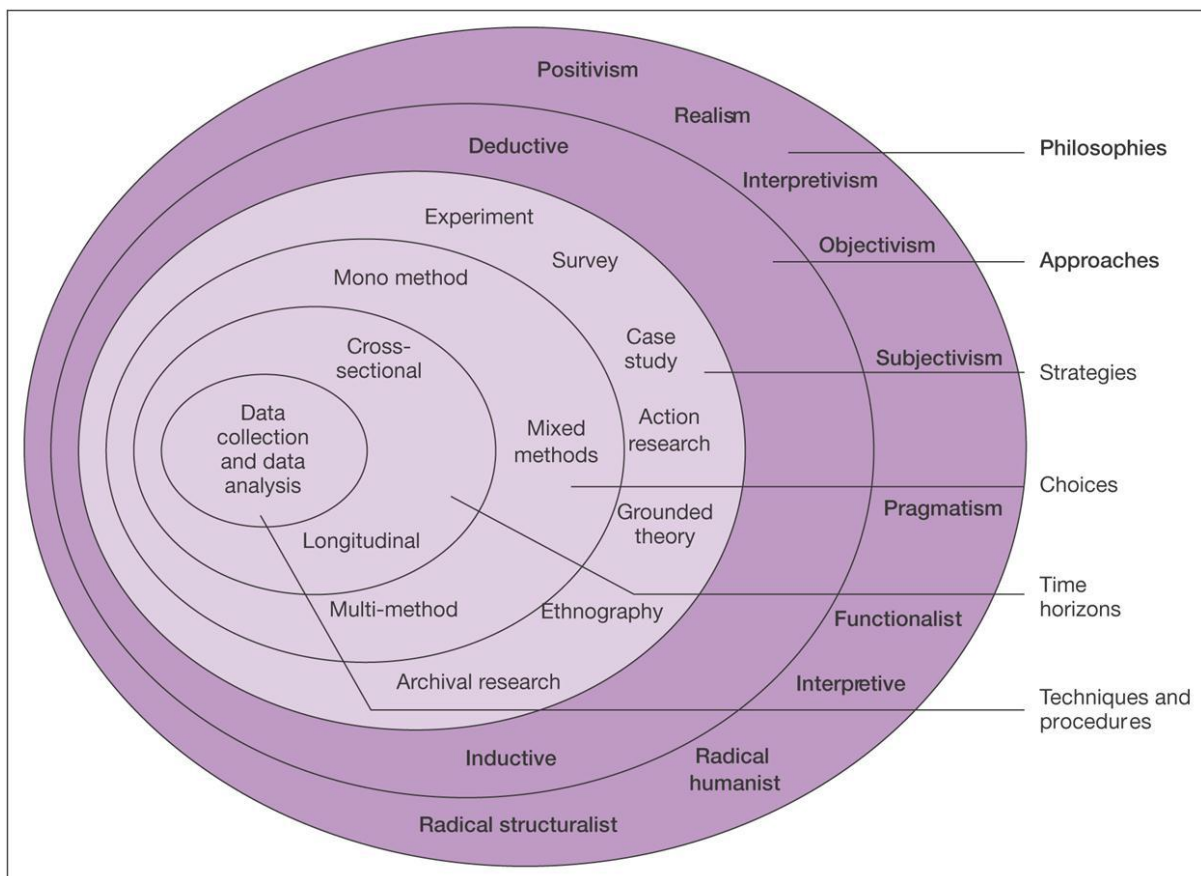
Figure 3.3 - Research Onion (Saunders et al., 2007)

3.2.2 Research Paradigms

The way in which data about a research project should be gathered, analysed and used, is the research paradigm. According to Saunders, et al. (2007) choosing this philosophical framework is the initial step in the research process which comprises the first and outer-most layer of the Research Onion. Historically, there was only one research paradigm used. The research which was done until late in the nineteeth century, was focussed on natural sciences. The research paradigm used was referred to as positivistic research and is rooted in realism. In this paradigm the source of knowledge is based on positive information. To explain the cause and effect relationships between variables is the goal of the research whether social or natural phenomena are being studied. Quantitative Analysis methods are associated with Positivistic research, as variables are believed to be measurable (Collis & Hussey, 2009).

Interpretivism, the second paradigm, is focussed in social sciences and is rooted in idealism. Contrary to positivism which is built on objective beliefs, the underpinning belief of social scientists is that reality is highly subjective as it is formed by perceptions of the individual's view of reality. The social phenomena that are being studied are affected by the researcher and therefore cannot be objective. Statistical methods cannot be used to analyse the phenomenon that is being studied by positivists but can only endeavour to define, interpret or come to terms with the phenomena being studied (Collis & Hussey, 2009).

The purpose of scientific research is, therefore, the process of transforming theories believed into theories known. Two major research philosophies have been identified in the Western tradition of science, namely positivist and interpretivist (Lehaney & Vinten, 1994). The research to be used is dependent on the aim of the study, which leads to the choice between qualitative and quantitative approaches. The aim of the study can either be exploratory, conformational or quantifiable and the planned use of the findings can be policy formulation or process understanding (Kumar, 2011; Newman, Benz, & Newman, 2008).

3.2.2.1 Qualitative Research

In order to communicate meaning in social relationships the only tools available are words and symbols. The words and symbols used are relative to the context in which they are used as well as to the values, assumptions and beliefs of the author and reader. The message within the words or symbols can only be fully understood if all the variables are clearly understood (Maree et al., 2012). Understanding of Qualitative Data can only be done in context (Collis & Hussey, 2009).

Qualitative Research is therefore primarily exploratory research. It provides insights into the problem or helps to develop ideas or hypotheses for potential quantitative research. Greater understanding is gained through underlying reasons, opinions, and motivations. Qualitative research is especially effective in obtaining culturally specific information about the values, opinions, behaviours, and social contexts of particular populations (Collis & Hussey, 2009; Saunders et al., 2007).

As Qualitative Research is subjective, the result is that numerical values cannot be assigned to these conclusions. Social relationships are analysed by using Qualitative research methods.

Common factors in all qualitative research are identified below:

- Qualitative research examines the phenomena and all its complexities;
- Qualitative research is done in the natural settings of the occurrence of the phenomena;
- Qualitative research does not attempt to quantify the variation of the situation, phenomenon or problem.
- Qualitative data of an observed phenomenon is used to identify the characteristics; and
- Qualitative data is gathered and measured through nominal or ordinal, scaled variables (Kumar, 2011; Leedy & Omrod, 2010).

3.2.2.2 Quantitative Research

While Qualitative Research studies the full complexity of a phenomenon, Quantitative research aims to address questions about relationships between variables that are measured numerically with the focus on a specific aspect of the phenomenon (Collis

& Hussey, 2009). Numeric data is gathered systematically and objectively from a selected population in order to extrapolate the findings to the greater population. Quantitative research therefore attempts to establish statistical relationships between variables by determining the amount of variation contained in the quantitative data gathered and measured on quantitative variables. The purpose of the research is to prove or negate a proposed hypothesis by using statistical analysis of gathered numeric data (Fox & Bayat, 2010; Leedy & Omrod, 2010; Maree et al., 2012; Mitchell & Jolley, 2010).

There are common factors in all quantitative research that are identified below:

- Quantitative research quantifies the variation of the phenomenon or problem;
- Quantitative research aims to predict causal relationships;
- Quantitative research aims to describe characteristics of a population;
- Quantitative data is gathered and measured by using primarily quantitative variables; and
- Quantitative analysis is used to determine the amount of the variation (Kumar, 2011).

The need for statistics as a fundamental element of quantitative research is a common misconception. By using quantitative analysis, the researcher can only confirm or negate conclusions based on his understanding of the analysed data (Kumar, 2011).

One of the statistical methods commonly used by researchers to confirm or negate conclusions is Correlation Analysis. Correlation can be defined as relationships among variables or the measure of linear association between two variables. The change in one variable relates to a change in another and the extent of this change is what correlation analysis determines.

A relationship between variables, if a correlation exists, is when one variable increases, another variable either increases (positive correlation) or decreases (negative correlation). This correlation behaves in a predictable fashion (Collis & Hussey, 2009; Fox & Bayat, 2010; Leedy & Omrod, 2010).

The correlation coefficient measures the strength of such correlation (Fox & Bayat, 2010). This correlation coefficient (r) can range from -1 (a perfect negative correlation)

to +1 (a perfect positive correlation). The various strengths of correlation can be seen in Table 3.1 below.

Correlation Coefficient	Interpretation
+1.00	Perfect positive linear association
+0.90 to +0.99	Very high positive correlation
+0.70 to +0.89	High positive correlation;
+0.40 to +0.69	Medium positive correlation
+0.01 to +0.39	Low positive correlation
0	No linear association
-0.01 to -0.39	Low negative correlation
-0.40 to -0.69	Medium negative correlation
-0.70 to -0.89	High negative correlation
-0.90 to -0.99	Very high negative correlation
-1.00	Perfect negative linear association

Table 3.1 - Strengths of Correlation (Collis & Hussey, 2009)

The relationship between the variables that are studied are each classified as either the dependent or independent variable. The value of the dependent variable is influenced by one or more independent variables. Another view of the relationship between these variables is that the independent variable can be seen as the cause and the dependent variable can be seen as the effect (Collis & Hussey, 2009; Fox & Bayat, 2010)

3.2.3 Research paradigm for this study

This sub-section discusses the research methodology to be applied in this study while justifying the reasons for the research methodology selected. The research study of the Department of Computing Sciences falls within the positivistic paradigm and the objective of the research is to explain the cause and effect relationships between the dependent variable, *Alumni Perception*, and the independent variables, *Service Guarantees, Customer Satisfaction, Course Contents, Modern Technologies, Academic Staff, Admin. Staff, Social Environment, Perceived Value* and *Present Opinion* by using quantitative analysis including correlation analysis.

3.3 Literature Review

3.3.1 Literature Review defined

The body of knowledge that has been built up over time due to combined contribution is defined as literature (Collis & Hussey, 2009). Included in literature are all secondary sources consisting of:

- Text books;
- Journal articles;
- Conference papers;
- Film;
- Presentations and lectures;
- Archival sources;
- Legislation;
- Websites; and
- Theses.

The topic that is being researched might not have secondary sources specifically produced for it, but they are still related (Collis & Hussey, 2009; Thody, 2009). The researcher summarises the conclusions of these sources in the literature review (Thody, 2009).

3.3.2 Purpose of literature review

The purpose of the literature review performed in this paper is to learn from the methodologies used by previous studies and to gain insight into the subject to be studied. The literature review identifies new perspectives, ideas and approaches that are not apparent to the researcher beforehand (Kumar, 2011; Leedy & Omrod, 2010). Before the researcher can critically review the available literature, insight is required to identify gaps and deficiencies in knowledge and to design research methodology for the study to be performed (Collis & Hussey, 2009). The validity of the research is dependent on the reviews of existing literature and methodology (Thody, 2009).

3.4 Hypothesised Alumni Satisfaction Model

A conceptual framework was constructed by the researcher based on reviewed literature. The conceptual framework was used to establish relationships between the dependent variable, *Alumni Satisfaction*, and the independent variables, *Service Guarantees*, *Customer Satisfaction, Course Contents, Modern Technologies, Academic Staff, Admin. Staff, Social Environment, Perceived Value* and *Alumni Network.*

The statistical analyses will test the hypotheses developed in this research study to either accept or reject the proposed relationships indicated in the hypothesised model shown in Figure 3.4.

In order to test the relationship between the Dependent and Independent Variable the following hypotheses have been formulated:

H_1 = "*Service Guarantees* are significantly related to *Alumni Satisfaction*";

H_2 = "*Customer Satisfaction* is significantly related to *Alumni Satisfaction*";

H_3 = "*Course Content is* significantly related to *Alumni Satisfaction*";

H_4 = "*Modern Technologies* are significantly related to *Alumni Satisfaction*";

H_5 = "*Academic Staff* are significantly related to *Alumni Satisfaction*";

H_6 = "*Admin. Staff are significantly related to Alumni Satisfaction*";

H_7 = "*Social Environment* is significantly related to *Alumni Satisfaction*";

H_8 = "*Perceived Value* is significantly related to *Alumni Satisfaction*"; and

H_9 = "*Alumni Network* is significantly related to *Alumni Satisfaction*".
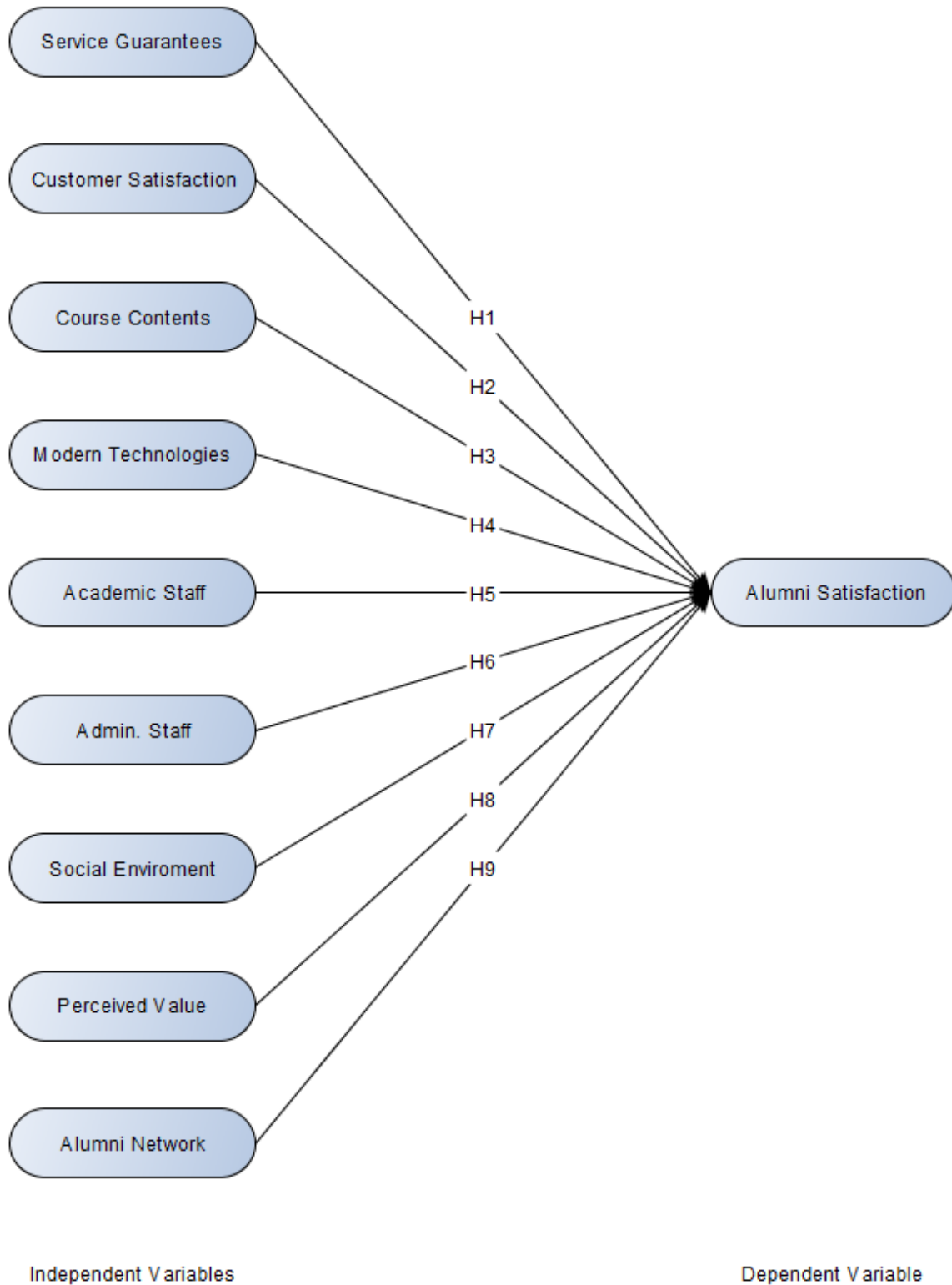
Figure 3.4 - Hypothesised Alumni Satisfaction Model

3.5 Sample design

This section defines and elaborates on sample design with reference to the process of sampling, the concept of a sample frame and the types of available sampling methods. The research design selected for this study is then elaborated upon.

According to the research onion in Figure 3.3, the choices made by the researcher relating to the sample design for the research comprise the sixth layer of the research onion referred to as techniques and procedures (Saunders et al., 2007).

3.5.1 Pilot Study – Alumni Postgraduate Survey

An Alumni Postgraduate survey (n=39) was completed by Nelson Mandela Metropolitan University (NMMU) Computing Sciences and Information Systems postgraduates working in the Information Communication Technology (ICT) industry. Descriptive statistics on the graduate profiles and backgrounds were performed. The questionnaire was completed on-line and the request to participate was done via e-mail and by using social networks (Facebook and LinkedIn) (Calitz et al., 2016).

A primary topic of the study was recommendations for improving the postgraduate programme by having a stronger interaction with industry. This includes more industry guest lectures, industry-related research projects and internships (Calitz et al., 2016).

This paper serves to further comprehend the relationships between the dependent variable, Alumni perception, and the independent variables in order to improve on the quality and relevance of the education which can provide a department with valuable information and assist with continuous improvement and self-evaluation.

A complete copy of the Alumni Postgraduate survey can be found in Appendix D.

3.5.2 Survey Research Defined

Survey research or sampling is the process of collecting desired information from a selected sample group of people by asking questions by means of questionnaires or interviews and then charting responses of the people taking the survey. Topics that survey research can gather from people are habits, opinions, attitudes, beliefs, plans, demographics, values, perceptions, feelings and ideas and it is the most widely used method of gathering information. By surveying a smaller sample of the population, the

objective of learning about a larger population can be reached. The survey research approach can be referred to as a descriptive survey (Leedy & Omrod, 2010; Maree et al., 2012; Wilkinson et al., 2004)

The design of the survey process is rather simple. Willing participants are asked a series of questions by using questionnaires or conducting interviews. A summary of their responses is used to analyse the data collected by using statistical indexes such as percentages, frequency counts, or more sophisticated methods. By using the data from the sample, interpretations are then made about a particular population (Leedy & Omrod, 2010; Maree et al., 2012; Wilkinson et al., 2004). The data collection method used in this research paper is questionnaires.

3.5.3 Types of Sampling Methods

There are two main categories classified for sampling, these are non-random also known as non-probability sampling or random also known as probability sampling (Mitchell & Jolley, 2010).

3.5.3.1 Non-random Sampling

Non-random sampling is where all the participants have the same likelihood of being selected for the sample (Banning, Camstra & Knottnerus, 2012). The types of sampling included in non-random sampling are:

Quota sampling; where quotas are applied for certain types of people who are selected for the sample.

Chain sampling; after the first contact is selected and sampled those contacted suggest other candidates for the same sample.

Purposive sampling; where respondents within predetermined quotas are selected to represent diversity.

Genealogy sampling; where entire families and their relatives may be selected. Matched sampling; where similar pairs of types of respondents are selected for comparison (Cooper & Schindler, 2014).

3.5.3.2 Random Sampling

When a group of people are selected at random from a complete list of a given population this is referred to as simple random sampling. Systematic random sampling on the other hand is when a group of people are selected in a systematically random manner from a complete list of a given population. Other than simple random sampling, is systematic random sampling which includes techniques such as convenience sampling, stratified random sampling, cluster sampling, random walk sampling, staged sampling and snowball sampling (Goddard & Melville, 2004).

3.5.3.3 Other Sampling Methods

Selecting a convenient location to select subjects for sampling who are accessible and within close proximity to the researcher is referred to as convenience sampling (Kumar, 2011). Samples drawn from populations which are divided into subgroups that depend on particular characteristics are referred to as stratified sampling (Lohr, 2010). Cluster sampling is where individuals in particular clusters are selected by randomly choosing clusters and is separated from random walk sampling. Random walk sampling is achieved when an interviewer selects sample respondents whilst following a random route (Banning et al., 2012). Samples can also be selected as inside samples and this is referred to as staged sampling (Lohr, 2010). Lastly, snowball sampling is the method where more samples are recruited through references from existing samples and new samples are continuously used to get future samples. (Kumar, 2011).

3.5.3.4 The sampling methods and sampling frame chosen for this study

The sampling method employed in this treatise incorporated non-probability sampling in the form of purpose sampling and snowball sampling as the respondents were chosen from the Alumni database of the Department of Computing Sciences at NMMU. All respondents furthermore had an equal opportunity of being selected for the study. The sampling frame included all Alumni of the Department of Computing Sciences at NMMU. The Alumni are based mainly across South Africa with a small percentage residing outside of South Africa. A representative sample of 100 respondents from this population was chosen.

3.6   Survey Respondents and Data Collection

The following section expands on the clarification of data collection with reference to its conceptualisation and available methods. This study is then discussed, by elaborating on the specific data collection methods and the measuring instrument used. The data collection methods that the researcher selects for the research comprise the sixth layer of the research onion referred to as techniques and procedures (Saunders et al., 2007).

3.6.1   The concept of data collection

There are various sources of data and the researcher needs to decide which to use. These sources can further be classified as primary data and secondary data (Hox & Boeije, 2005; Wegner, 2012). Original data collected for a study by the researcher is referred to as primary data. The techniques used in order to collect primary data are survey questionnaires, interviews, observations, action research, case studies, ethnographic research and longitudinal studies. Data that already exists prior to the study being conducted is referred to as secondary data. This data is available through resources such as previous research, official statistics and historical data (Malhotra, Birks, & Wills, 2012). The third layer of the research onion, research strategies, specifies the choice by which the above-listed techniques are employed to gather the data (Saunders et al., 2007).

The way in which the research questions are approached by the researcher will normally determine the data collection techniques used in order to gather the necessary data (Goddard & Melville, 2004). The selection of the techniques to be used must be suitable for the research and must also be practical in considering the quality of the data, the costs involved, the possible responses, errors and collection parameters (Hox & Boeije, 2005).

3.6.2   Using a questionnaire to gather data

When data are collected by means of a questionnaire, there are certain general rules that have been established to ensure and preserve the integrity of the data collected (Malhotra et al., 2012). In this context a questionnaire refers to gathering information from a sample of a general population by using specifically designed questions (Collis

& Hussey, 2009). A proper structure in the questionnaire is vital to ensure that it satisfies the rigour required of proper research questionnaires. Apart from the structure, the questionnaire must also provide clear guidelines on how it is to be completed. It must contain closed, objective, relevant, clear and concise questions and must be of a measured length (Kelley, Clark, Brown & Sitzia, 2003).

3.6.3 Data collection and measuring instrument used in this study

3.6.3.1 Data collection

Primary data were used in this study because the data collected did not exist prior to this research being conducted. The sampling method employed in this treatise incorporated non-probability sampling in the form of purpose sampling as the respondents were chosen from the Alumni database of the Department of Computing Sciences at NMMU. The primary data were collected from the sample by means of an on-line survey questionnaire (Appendix A) in order to collect responses from the sample group. An email containing a Universal Resource Link (URL) to the questionnaire was sent to the listed email addresses of the Alumni of the Department of Computing Sciences at NMMU which contain more than 600 potential respondents. The URL was also posted on the Facebook page of the Department of Computing Sciences. The potential respondents were reminded to respond three times after which a total of 100 responses were received.

3.6.3.2 Measuring instrument

Primary research on Alumni perception of the NMMU Department of Computing Sciences was collected by way of an on-line questionnaire. The questionnaire was divided into fourteen subsections consisting of 50 questions in total.

The questionnaire was divided into seven sections. Section 1 of the questionnaire (Appendix A) captured the biographical details of the respondents such *as Gender, Age, Education Level* and *Geographical location.* Section A also captured other variables designed to probe the respondents *level of education* and if they had studied further. Variables pertaining to the respondents' organisation such as the *size of the company* they work for, if they are self-employed or not and the *years in the ICT industry.* This section contained a total of 14 questions.

Section B through to Section G was designed to capture the respondent's perception of *Service Guarantees, Customer Satisfaction, Course Contents, Modern Technologies, Academic Staff, Admin. Staff, Social Environment* and *Perceived Value* all relating to the Alumni perception. These questions were rated with a five point Likert scale (1 = Strongly Disagree and 5 = Strongly Agree), which will be discussed in more detail in the next section, was used. This section measured a total of 9 variables. Each variable was measured using between 4 and 8 items.

3.7 Data Analysis

This sub-section explores the concept of data analysis, validity, reliability and generalisability. In this subsection there is an explanation of what data analysis techniques were carried out in this study as well as how validity, reliability and generalisability are catered for.

3.7.1 The concept of data analysis

The process of evaluating data by using both analytical and logical reasoning is referred to as data analysis and is one of stages in a treatise (Wegner, 2012). This is the sixth layer of the research onion referred to as techniques and procedures, where choices are made by the researcher relating to the-data collection methods employed for the research (Saunders et al., 2007). A description of the types of data being analysed and proper data-preparation processes are essential for successful data analysis. Proper data preparation processes are as sorting, categorising and cleaning research data (Wegner, 2012).

Quantitative data are data expressing a certain quantity, amount or range and when referring to nominal, ordinal, interval and ratio scaled data these data types can be analysed both descriptively and inferentially. The statistical measures that can be used are:

- central tendency;
- measures of variability;
- correlation analysis;
- regression analysis; and
- hypothesis testing.

When referring to categorical non-numerical data not generally capable of extensive statistical analysis in qualitative data, alternative analysis tools are used such as:

- ethnographic analysis;
- narrative analysis;
- phenomenological analysis;
- interpretative analysis; and
- grounded theory analysis (Healy, 2010).

3.7.2 Data analysis methods used in this study

Accepting or rejecting the hypotheses proposed in the study by using statistical analysis of gathered numeric data is the purpose of this study (Maree et al., 2012). By using statistical analysis, it can be accepted that this is an empirical study and quantitative in nature. A statistician sorted, categorised and cleaned the quantitative data in order to facilitate this purpose. A computer software package named STATITICA was used in order to perform quantitative statistical analysis on the data. The analyses performed on the data included descriptive statistics such as measures of central tendency being the mean, median and the mode and inferential statistics specifically using the Pearson's Chi-Square analysis.

There were various questions posed to the respondents which resulted in specific variables being analysed. In order to do so, tables and figures were used interchangeably to analyse the data descriptively. Tables contained various acronyms for ease of reference that must be given a specific meaning and interpretation. Table 3.2 contains a list of the acronyms used and the meaning that must be adopted with each. The processes and findings of the application of these techniques are discussed further in Chapter 4 covering data analysis.

Acronyms	Interpretation
SD	Strongly Disagree
D	Disagree
N	Neutral
A	Agree
SA	Strongly Agree
NE	Never
DA	Daily
W	Weekly
M	Monthly
Y	Once a Year

Table 3.2 - Data analysis acronyms and meanings.

3.8 Reliability and Validity

3.8.1 Reliability

Reliability is an indicator of the level of consistency that can be attached to a measurement instrument in its capability to correctly measure the variables under investigation (Collis & Hussey, 2009; Kumar, 2011; Maree et al., 2012). A measurement is said to be reliable when repeated measurements of an unchanged entity return the same result each time (Leedy & Omrod, 2010). Reliability is vital for positivistic studies. There are two techniques used when measuring reliability namely test and retest reliability. Test reliability is when applying measures of internal consistency; retest reliability is repeating an event to determine if the same or similar results are recorded (Ihantola & Kihn, 2011).

Designing research studies with high reliability but low validity is often possible (Collis & Hussey, 2009). The reason is that although something can be consistently read it does not necessarily mean it is measuring accurately (Leedy & Omrod, 2010).

A statistical technique named the Cronbach Alpha is a common and well-used internal consistency reliability measure in quantitative research. This statistical technique is applied to questions in a questionnaire to statistically determine how reliably they measure predetermined variables (Tavakol & Dennick, 2011). In this study, Cronbach's

Alpha was used to determine the reliability of the measuring instrument that provided measures of internal consistency reliability. The Cronbach's alpha coefficient was used to measure this internal consistency. This coefficient of reliability ranges from 0 to 1 in providing the overall assessment of a measure's reliability. A low coefficient value indicates a low internal consistency while a high value indicates the opposite. For research, the guidelines for reliability coefficient have been defined as seen in Table 3.3.

Reliability Coefficient	Interpretation
Cronbach Alpha ≥ 0.90	high reliability
Cronbach Alpha ≥ 0.80	moderate reliability
Cronbach Alpha ≥ 0.70	low reliability
Cronbach Alpha < 0.70	unacceptable reliability

Table 3.3 - Cronbach's Alpha Coefficient (Collis & Hussey, 2009; Nunnally, 1978)

A Cronbach's Alpha value of between 0.50 and 0.69 has been deemed acceptable for new and experimental research (Collis & Hussey, 2009; Nunnally, 1978).

3.8.2   Validity

In order to contribute to the existing body of knowledge, an important consideration in research conclusions is validity. To be valid, the variables measured must accurately be reflected in a manner that allows applications outside of the research environment (Maree et al., 2012). The findings in a treatise are backed by validity, which refers to the level or the strength of certainty that can be employed when making deductions, inferences or suggestions. There are various types of validity namely internal validity, external validity, construct validity and conclusion validity.

- Causal directions of relationships amongst variables are confirmed by internal validity;
- The ability to generalise the findings of the study to a population is confirmed by external validity;
- Relationships between variables is confirmed by conclusion validity; and
- The scales that are employed should measure the variables in question and they are confirmed by construct validity (Onwuegbuzie, 2000).

3.8.3 Generalisability

Generalisability refers to the extent to which findings from a study, past deduction or suggestions from a treatise on a sample of a population can be generalised to those outside of the study from which it was selected (D. F. Carter & Hurtado, 2007). The requirements of both validity and reliability need to be met in order to generalise accurately along with matching the contextual nuances of the original sample to the generalised population (D. F. Carter & Hurtado, 2007).

The conclusions, inferences and predictions in this treatise are drawn from the 100 respondents from the Alumni of the NMMU Department of Computing Sciences situated predominantly in South Africa and globally. The researcher was able to generalise to the entire Alumni of the NMMU Department of Computing Sciences, as the requirements of validity and reliability, as determined by the above measures, were satisfied.

3.8.4 Descriptive statistics

In order to describe and summarise the data, descriptive statistics were used. Three types of measures of central tendency were used to describe the data namely the mean, median and mode.

3.8.5 Inferential statistics

This study tests the relationships between the independent variables, independent variables Service Guarantees, Customer Satisfaction, Course Contents, Modern Technologies, Academic Staff, Admin. Staff, Social Environment, Perceived Value and Present Opinion and the dependent variable Alumni Perception by applying and analysing the results of the Pearson's Chi-Square test.

3.8.5.1 Pearson's Chi-Square statistic

Investigating whether distributions of categorical variables differ from one another is achieved by using Chi-Square statistics (Satorra & Bentler, 2000). Comparing a set of observed frequencies to a set of expected frequencies is the underlying basis of the Chi-Square test (Wegner, 2012). The intention is to test how likely an observed distribution is due to chance. The Chi-squared test was used in this study to test for a

significant difference between the correlations of independent variables to the dependent variable between two sample data sets.

In order to apply the Chi-squared test, the starting point is the formulation of a null hypothesis (H0: there is no significant difference between observed and expected frequencies) and an alternative hypothesis (H1: there is a significant difference) (Wegner, 2012). The null hypothesis is either rejected or accepted based on the outcome of the Chi-Square test (Wegner, 2012). Since it is not always possible to tell the differences between the observed and expected frequencies by looking at them, the Chi-Square test, when compared objectively, can determine if they are considered statistically significant. Statistical significance in this case implies that the differences are not due to chance alone, but instead may be indicative of other processes at work (Wegner, 2012).

3.9 Ethics

In research that involves human or animal subjects it is a generally accepted practice to obtain ethical clearance (Collis & Hussey, 2009). The research process embarked upon should adhere to certain acceptable standards and this is the main purpose of obtaining ethical clearance (Cooper & Schindler, 2014). Some of the aspects addressed by these standards are the rights and welfare of research subjects around issues such as informed consent, confidentiality of data and limitation of possible risks to people involved in research (Collis & Hussey, 2009).

The Ethics Clearance approval documentation (Appendix B) was submitted to the NMMU Business School. Full ethics clearance was not requested for this study as no vulnerable groups were involved.

3.10 Summary

This chapter addressed RQ3 that states; "*How can a detailed description of the research methodology be provided in order to understand and reproduce this research study in future?*". This chapter achieved the research objective of justifing and explaining the research methodology that is used for this treatise with adequate detail for future reproduction (RO3).

Section 3.1 provided a brief review of the contents in Chapter 2 and introduced Chapter 3 and the research questions and objectives that were addressed. The research and the various paradigms were defined in Section 3.2. The paradigm used in this study was identified. In Section 3.3 the literature review was defined. The process followed for this study and the purpose of literature review were explained. The various hypotheses from the proposed model for this research were formulated in Section 3.4. The survey design, pilot study and sampling methods were discussed in Section 3.5. Data collection and data analysis were explained in Sections 3.6 and 3.7 respectively. Section 3.8 covered the concepts of validity, reliability and generalisability. Section 3.9 covered the topic of ethics, the relevance thereof and how it applied to this study.

Chapter 4 will address RQ_4 which states; "*What are the relationships between the independent and dependent variables of Alumni satisfaction in the Department of Computing Sciences?*" and RQ_5 which states; "*Which factors in the proposed model for the Department of Computing Sciences have a higher correlation to Alumni satisfaction than other identified factors?*". The objective of chapter 4 is to; *"Evaluate the proposed model of Alumni satisfaction in the Department of Computing Sciences"* (RO_4), "*Establish which factors have a greater effect on Alumni satisfaction in the Department of Computing Sciences*" (RO_5) and *"Establish the significance of the difference between Alumni satisfaction of graduate and postgraduate Alumni in the Department of Computing Sciences"* (RO_6).

Chapter Four

4   CHAPTER 4: RESULTS AND ANALYSIS OF THE EMPIRICAL STUDY

4.1   Introduction

In the previous chapter, the research methodology applied in this treatise was discussed, the data collection methods of primary data were explained and the concepts of research, research methodology, research paradigms, sample design and measuring instruments were explained. The chapter answered RQ_3 that states; "*How can a detailed description of the research methodology be provided in order to understand and reproduce this research study in future?*" and achieved RO_3 which states: "*Justify and explain the research methodology that is used for this treatise with adequate detail for future reproduction*".

This chapter will address RQ_4 which states; "*What are the relationships between the independent and dependent variables of Alumni satisfaction in the Department of Computing Sciences?*" and RQ_5 which states; "*Which factors in the proposed model for the Department of Computing Sciences have a higher correlation to Alumni satisfaction than other identified factors?*". The objective of this chapter is to; "*Evaluate the proposed model of Alumni satisfaction in the Department of Computing Sciences*" (RO_4), "*Establish which factors have a greater effect on Alumni satisfaction in the Department of Computing Sciences*" (RO_5) and "*Establish the significance of the difference between Alumni satisfaction of graduate and postgraduate Alumni in the Department of Computing Sciences*" (RO_6).

An overview of the RQs and ROs of this chapter can be seen in Figure 4.2.

Chapter 1 – Introduction and Problem Statement

Define RO and RQ

Chapter 2 – Alumni Perspectives

RO_1 — Establish the importance of customer satisfaction in the Department of Computing Sciences. — RQ_1

RO_2 — Identify the factors influencing the perception of alumni in the Department of Computing Sciences and develop a proposed model. — RQ_2

Chapter 3 – Research Design and Methodology

RO_3 — Justify and explain the research methodology that is used for this treatise with adequate detail for future reproduction. — RQ_3

Chapter 4 – Analysis of Empirical Study

RO_4 — Evaluate the proposed model of alumni satisfaction in the Department of Computing Sciences. — RQ_4

RO_5 — Establish which factors have a greater effect on alumni satisfaction in the Department of Computing Sciences. — RQ_5

RO_6 — Establish the significance of the difference between alumni satisfaction of graduate and postgraduate alumni in the Department of Computing Sciences. — RQ_6

Chapter 5 – Conclusion and Recomendations

RO_M Conclusion

Figure 4.1 - Chapter 4 Research Objectives
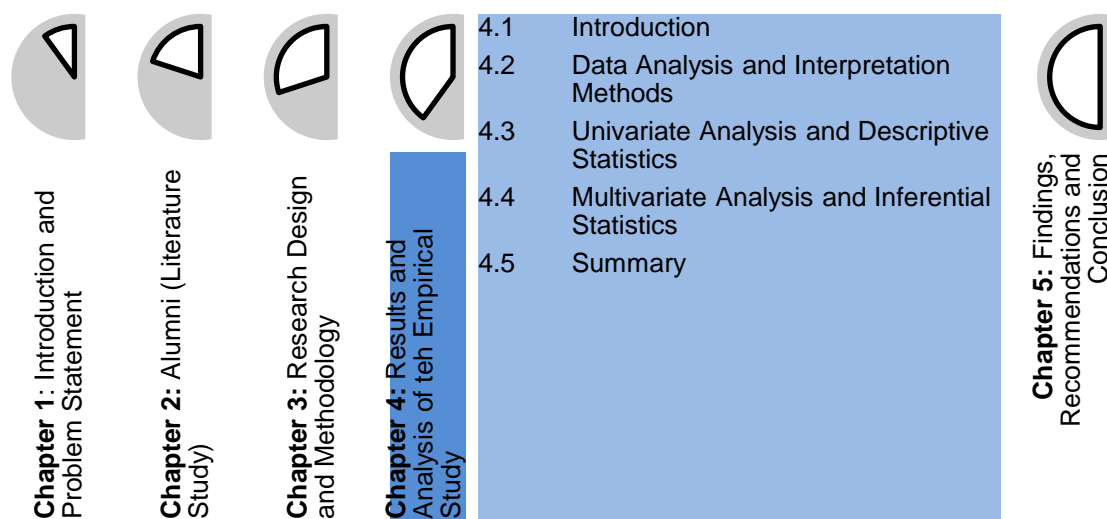
Figure 4.2 - Overview of Chapter 4.

4.2 Data Analysis and Interpretation Methods

The previous chapter described the survey used and how primary raw data were collected. This section will describe how two data- analysis methods were used to analyse the raw data that were collected. The methods used to analyse the data were univariate and multi-variate analysis.

4.2.1 Univariate Analysis

In this section, descriptive statistics will be used which is analysing individual variables without examining how they relate to other variables. For this type of data analysis, there are various statistical measures available. The data type determines what the choices of valid statistical measures to use.

4.2.1.1 Frequency Distribution

A frequency distribution displays the frequency of various outcomes in a sample in a table or pie chart. This table summarises the distribution of values in a sample where each entry in the table contains the frequency or count of the occurrences of values within a particular group or interval. This study uses pie charts to illustrate the frequency distribution in order to simplify analysis and interpretation.

4.2.2 Multivariate Analysis

In this section, inferential statistics will be used to interpret and analyse the complex relationships between two or more variables. Multivariate analysis is fundamentally the statistical process of concurrently analysing multiple, independent variables with one or more dependent variables by using various multivariate analyses, normally correlational (Wegner, 2012). Statistical methods used in this study include numeric frequency distribution, histograms, central tendency measures and measures of association.

4.2.2.1 Pearson's Correlation

One of the statistical methods commonly used by researchers to confirm or negate conclusions is correlation analysis. Correlation can be defined as relationships among variables or measures of linear association between two variables. The change in one variable relates to a change in another and the extent of this change is what correlation analysis determines.

A relationship between variables, if a correlation exists, is when one variable increases, another variable either increases (positive correlation) or decreases (negative correlation). This correlation behaves in a predictable fashion (Collis & Hussey, 2009; Fox & Bayat, 2010; Leedy & Omrod, 2010).

The correlation coefficient measures the strength of such a relationship (Fox & Bayat, 2010). This correlation coefficient (r) can range from -1 (a perfect negative correlation) to +1 (a perfect positive correlation). The various strengths of correlation can be seen in Table 3.1 from Section 3.2.2.2.

4.2.2.2 Cohen's d

In order to indicate the standardised difference between two means, Cohen's d is used as an effect size. The results of ANOVA and t-tests are often accompanied by Cohen's d. The comparison between two means is appropriately done using Cohen's d as an effect size (Magnusson, 2014). Table 4.1 show the Interpretation intervals for Cohen's d.

Cohen's d	Interpretation
<0.20	Not significant
0.20 - 0.49	Small significance
0.50 - 0.79	Medium significance
0.80+	Large significance

Table 4.1 - Interpretation intervals for Cohen's d

4.3 Univariate Analysis and Descriptive Statistics

This subsection presents the descriptive statistics and provides univariate analysis, which is analysing individual variables without examining their relations to other variables. For this type of data analysis, there are various statistical measures available. The data type determines the choices of valid statistical measures to use. Categorical data such as Age, Gender, Job Title and Education Level can only be analysed by using categorical frequency tables, modal category and bar and pie charts which are found in Section 1 of the survey (Collis & Hussey, 2009; Wegner, 2012). This sub-section then concludes with a brief summary of the main findings which includes comparisons with existing literature.

4.3.1 Section 1: Biographical Data

This section will present and discuss the demographic data that were captured in the survey.

Frequency Distribution: Gender

18%

82%
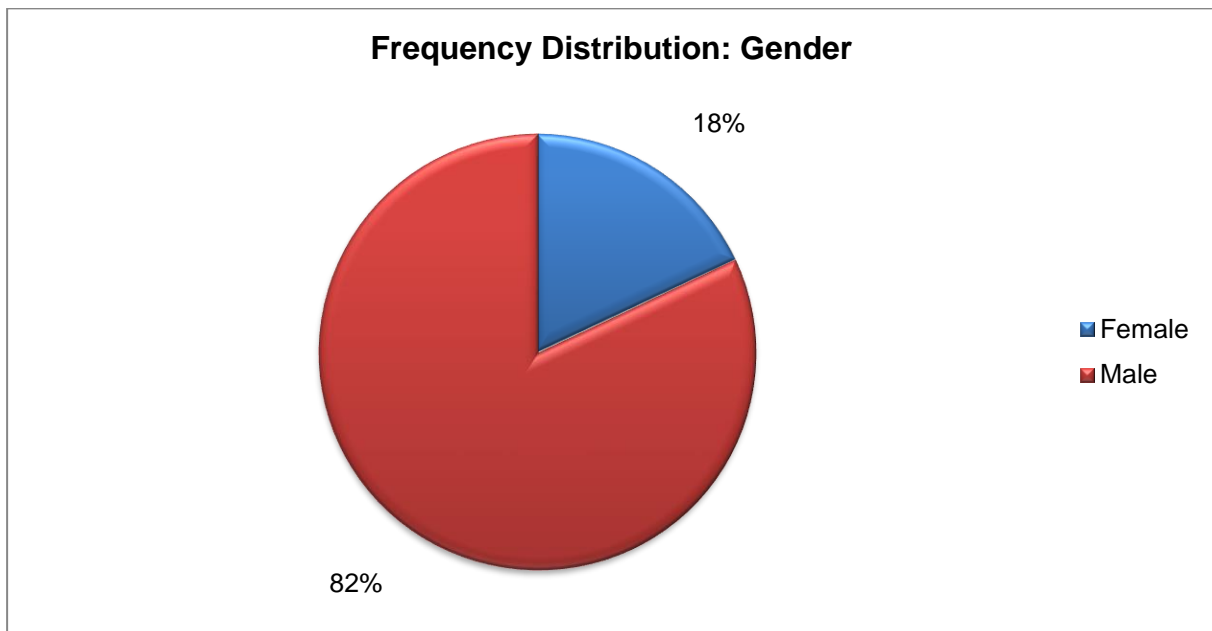
■ Female
■ Male

Figure 4.3 - Frequency Distribution of Gender

The respondents were asked to select their gender by selecting from one the following alternatives: Male and Female. Figure 4.3 illustrates the responses received to this question. As this study focussed on the Alumni of the Department of Computing Sciences it was expected that the vast majority of the respondents would be male. The result indicated that 82% (n=82) of the respondents were male while only 18% (n=18) were female.

It has been well researched and documented that females are underrepresented in Computing Sciences (Larson, 2014). In 2014 only 18% of graduate degrees were awarded to women for Computing Science. This can also be observed in industry where only 18% of Google's technical employees are female (Cueto, 2015). The information collected from the Alumni of the Department of Computing Sciences gave the same ratio as that at NMMU as can be seen in Figure 4.3.

4.3.1.2 What is your graduate qualification?

Frequency Distribution: Graduate Qualification

- BSc CS — 34%
- BSc IS — 14%
- BCom CS & IS — 30%
- BCom IS — 9%
- BCom Rat — 6%
- Other — 7%
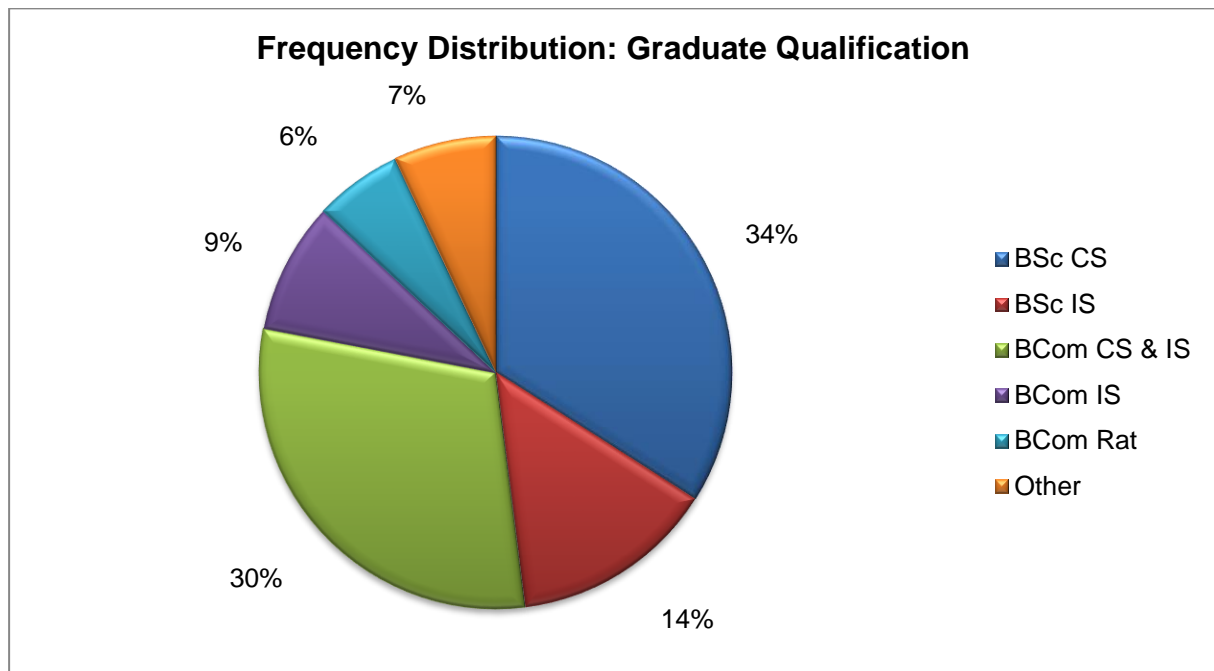
Figure 4.4 - Frequency Distribution of Graduate Qualification

The respondents were asked to select their graduate qualification by selecting from one the following qualifications: BSc CS, BSc IS, BCom CS & IS, BCom IS, BCom Rat and Other. Figure 4.4 illustrates the responses received to this question. The results show that 34% (n = 34) of the respondents qualified in BSc CS, 14% (n = 14) in BSc IS, 30% (n = 30) in BCom CS & IS, 9% (n = 9) in BCom IS, 6% (n = 6) in BCom Rat and 7% (n = 7) selected Other.

The more popular qualifications offered by the Department of Computing Sciences are the BSc CS and BCom CS & IS degrees accounting for 64% in the total responses received. These courses have also been available at the Department of Computing Sciences for the longest period, which will indicate a preference.

4.3.1.3 Year of completion of graduate degree

Frequency Distribution: Graduate Degree Year of Completion
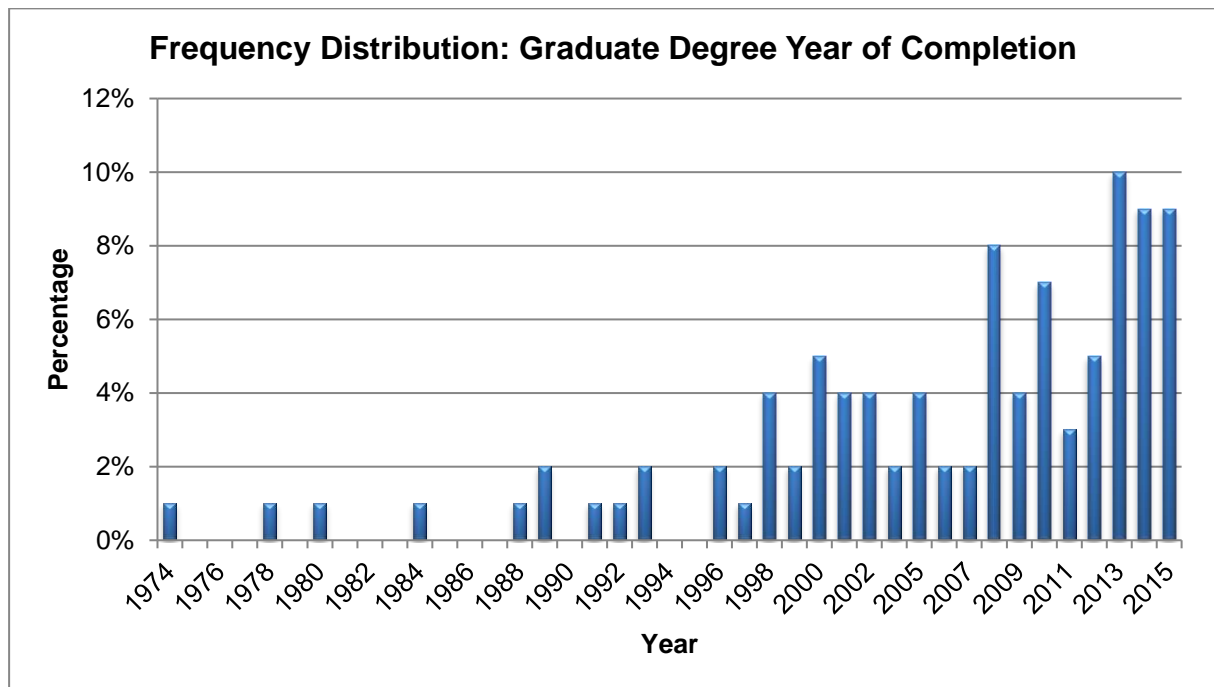
Figure 4.5 - Frequency Distribution of Graduate Degree Year of Completion

The respondents were asked to select the year they graduated by selecting from a drop-down box with a range from 1970 until 2015. Figure 4.5 illustrates the responses received to this question. The results show that 55% (n = 55) of the respondents graduated within the last 8 years and are more engaged in providing Alumni feedback. The respondents that graduated in the last 8 years are also mainly based in South Africa with only 9% residing in other countries. In contrast to this 32% of the respondents who graduated before 2008 live outside South Africa.

4.3.1.4 Optional: Highest qualification of postgraduate degree in the Department of Computing Sciences?
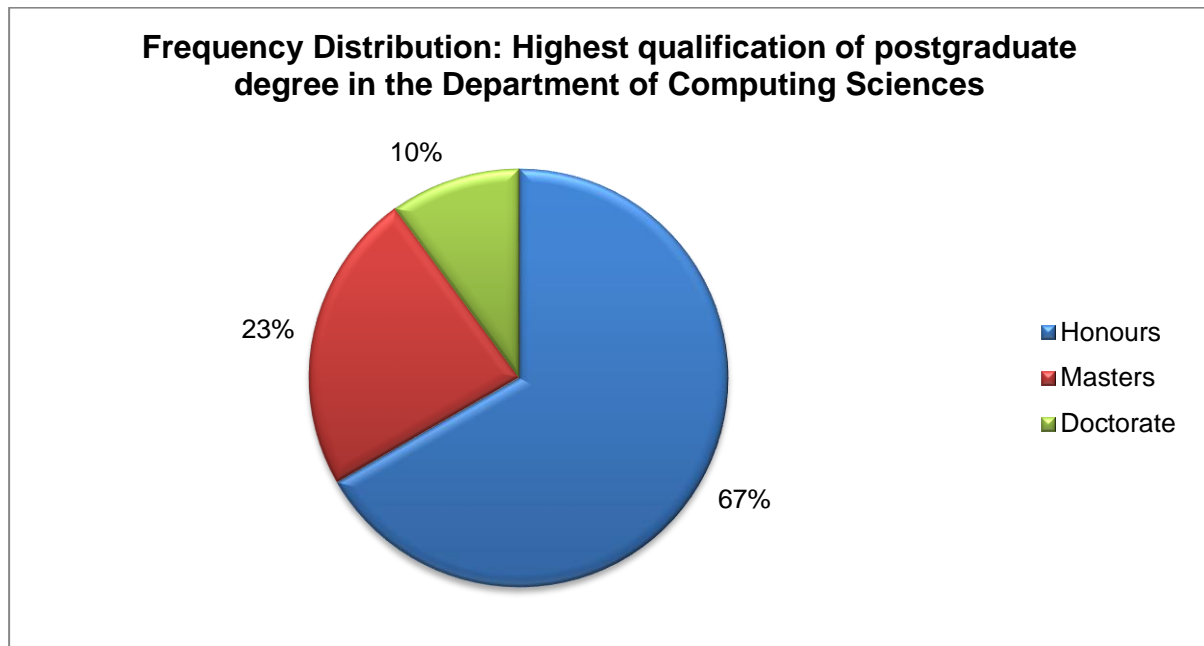
Figure 4.6 - Frequency Distribution of Highest qualification of postgraduate degree in the Department of Computing Sciences

The respondents were asked to select their postgraduate qualification if they studied further, by selecting from one the following qualifications: Honours, Masters and Doctorate. Figure 4.6 illustrates the responses received to this question. The results show that 67% (n = 40) of the respondents that completed a postgraduate degree have an honours qualification, 23% (n = 14) a masters and 10% (n = 6) a doctorate.

The majority, 60% (n = 60), of the respondents completed a postgraduate degree with the Honours degree being the most popular.

4.3.1.5 Year of completion of postgraduate degree

Frequency Distribution: Postgraduate Year of Completion
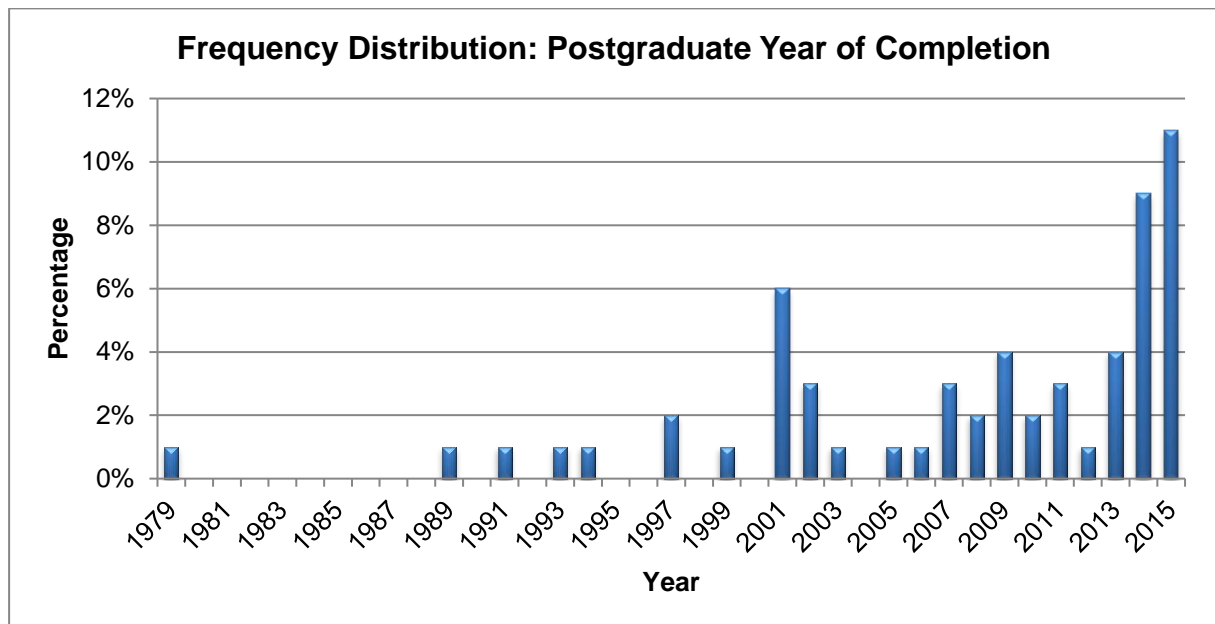
Figure 4.7 - Frequency Distribution of Postgraduate Year of Completion

If the previous optional question was answered, the respondents were then asked to select the year they completed their postgraduate qualification by selecting from a drop down box with a range from 1970 until 2015. Figure 4.7 illustrates the responses received to this question. The results show that 34% (n = 34) of the respondents graduated with a postgraduate degree within the last 7 years. Comparing the year of completion of the graduate degree to the postgraduate degree it can be seen that in most cases the postgraduate degree was completed directly after graduation and in the minority of respondents was there a break in between.

4.3.1.6 Any Other Degrees?

Any Other Degrees	n
BCom Honours	4
BEd	1
BSc	1
DBA	1
MBA	7
MBL (Unisa)	1

Table 4.2 - Any other degrees

The respondents were asked an open-ended question, which is qualitative in nature, to enter any additional degrees completed other than those provided by the Department of Computing Sciences. Table 4.2 illustrates the responses received to this question. The results show that only a small 15% (n = 15) number of the respondents completed a second qualification. The most popular second degree chosen by the respondents was a Master in/of Business Administration (MBA). Comparing this result to the current positions of the respondents with a MBA, it can be seen that they have moved into managment positions at IT firms.

4.3.1.7 Age
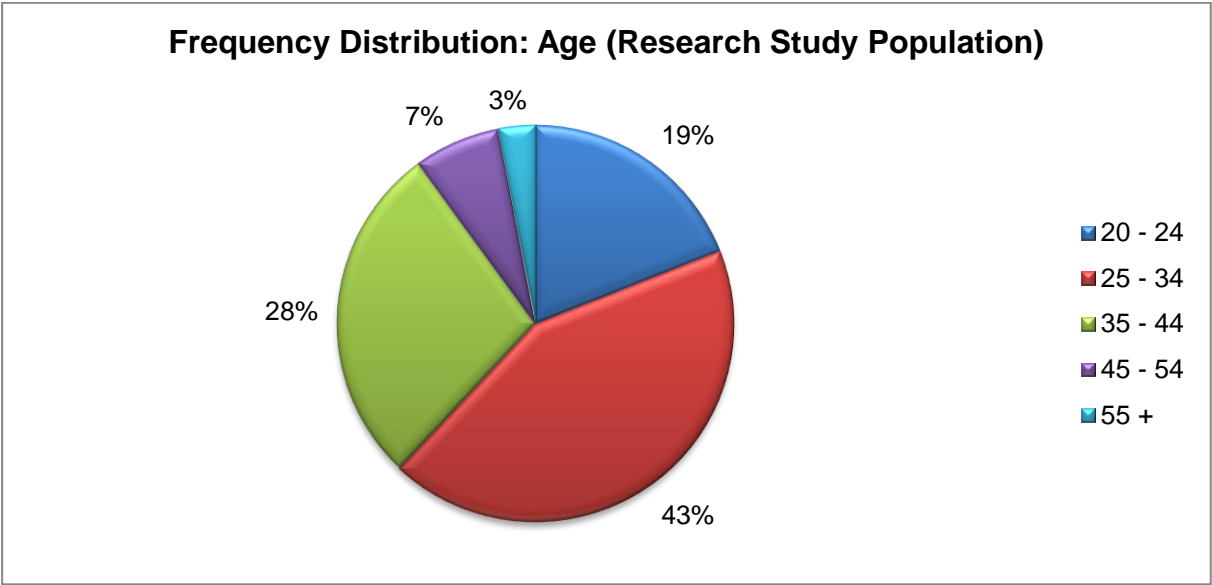
Figure 4.8 - Frequency Distribution of Age (Research Study Population)

The respondents were asked to select their age by selecting from one the following age groups: 20 – 24, 25 – 34, 35 – 44, 45 – 54 and 55+. Figure 4.8 illustrates the responses received to this question. The results show that 19% (n = 19) of the respondents are between the ages of 20 – 24 years of age, 43% (n = 43) between 25 – 34, 28% (n = 28) between 35 – 44, 7% (n = 7) between 45 – 54, and 3% (n = 3) 55+ years of age. As can be seen, there is a relatively prominent age group, 25 – 34 years of age, with the respondents of the study. The South African population in comparison to the study as seen in Figure 4.9 is vastly different in the 45 – 54, and 55+ age groups.

Frequency Distribution: Age (SA Population)

15%
28%
23%
15%
19%

Legend:
- 20-24
- 25-34
- 35-44
- 45-54
- 55+
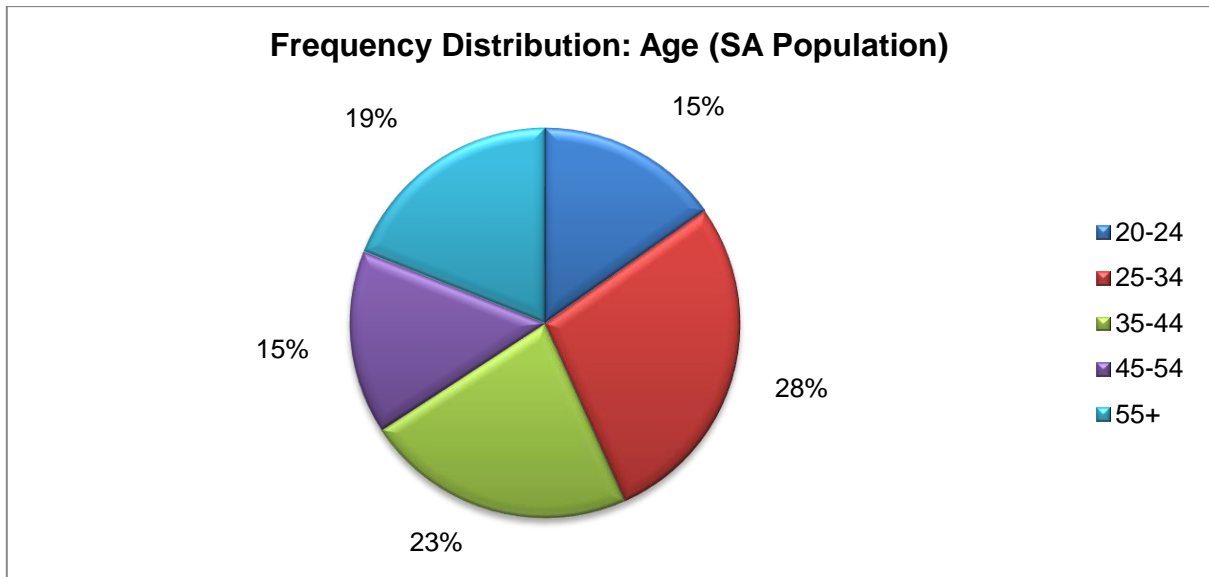
Figure 4.9 - Frequency Distribution of Age (South African Population) (Statistics South Africa, 2015)

4.3.1.8 Where do you reside?

Frequency Distribution: Where do you reside

20%
47%
21%
0%
12%
0%

Legend:
- Eastern Cape
- Free State
- Gauteng
- KwaZulu-Natal
- Limpopo
- Mpumalanga
- Northern Cape
- North West
- Western Cape
- Country Outside SA
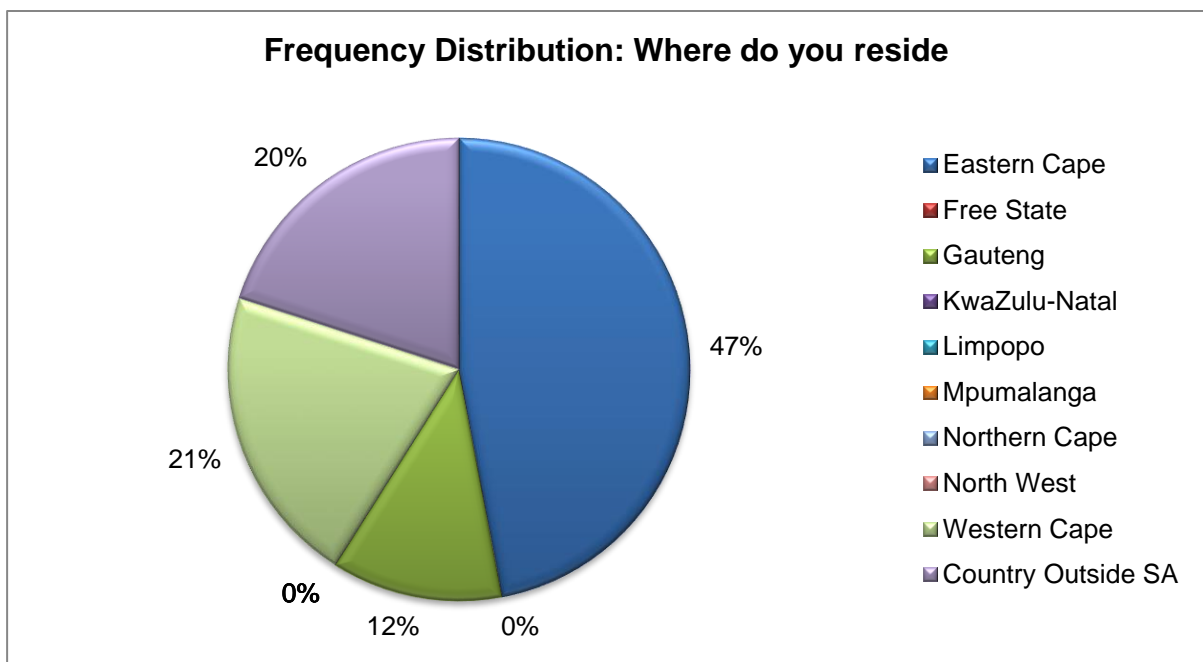
Figure 4.10 - Frequency Distribution of Where do you reside

The respondents were asked to select the place where they reside by selecting from one the following options: Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North West, Western Cape and Country Outside SA. Figure 4.10 illustrates the responses received to this question. The results show that 47% (n = 47) of the respondents reside in the Eastern Cape, 0% (n = 0)

reside in Free State, 12% (n = 12) reside in Gauteng, 0% (n = 0) reside in KwaZulu-Natal, 0% (n = 0) reside in Limpopo, 0% (n = 0) reside in Mpumalanga, 0% (n = 0) reside in Northern Cape, 0% (n = 0) reside in North West, 21% (n = 21) reside in Western Cape and 20% (n = 20) reside in a country outside South Africa.

As seen from Figure 4.10 the Eastern Cape with 47% has the largest number of the respondents which is where the NMMU Department of Computing Sciences is based. There are only three provinces where respondents are based, Eastern Cape, Western Cape and Gauteng. 20% (n=20) of respondents work outside of South Africa. Cities in major provinces such as Gauteng and Western Cape have engaged in Smart City transformation activities in order to improve the quality of life of citizens which attracts professional Computing Science skills (SME South Africa, 2016).

4.3.1.9 Which city do you live in?

City	n	City	N
Atlanta	1	Lilongwe	1
Brisbane, Australia	1	London	2
Cape Town	19	Midrand	1
Chicago	1	Minneapolis	1
East London	1	Oslo	1
Gaborone	1	Paarl	1
George	1	Port Elizabeth	44
Hamburg	1	Pretoria	1
Hamilton	1	Ramat Gan	1
Hong Kong	1	Ramat Hasharon	1
Huntington Beach, California	1	Tokyo	1
Indianapolis, IN	1	Toronto	1
Jeffreys Bay	1	Uitenhage	1
Johannesburg	10	Yateley	1
Kigali	1		

Table 4.3 - What City do you live in?

The respondents were asked an open-ended question, which is qualitative in nature, to enter which city they live in. Table 4.3 illustrates the responses received to this question. The results show that there are three popular cities for Alumni of the Department of Computing Sciences in South Africa: Port Elizabeth, Cape Town and Johannesburg accounted for 73% (n=73) of the responses. According to Moyo (2015)

Johannesburg is viewed as one of the more sophisticated in technology cities in South Africa which supports a strong ICT sector. The Department of Computing Sciences is based in Port Elizabeth which explains why 44% (n=44) of the respondents are working in Port Elizabeth.

4.3.1.10   Years in ICT Industry

Frequency Distribution: Years in ICT Industry

- < 5 years
- 5 - 9 years
- 10 - 19 years
- 20+ years

11%
41%
28%
20%
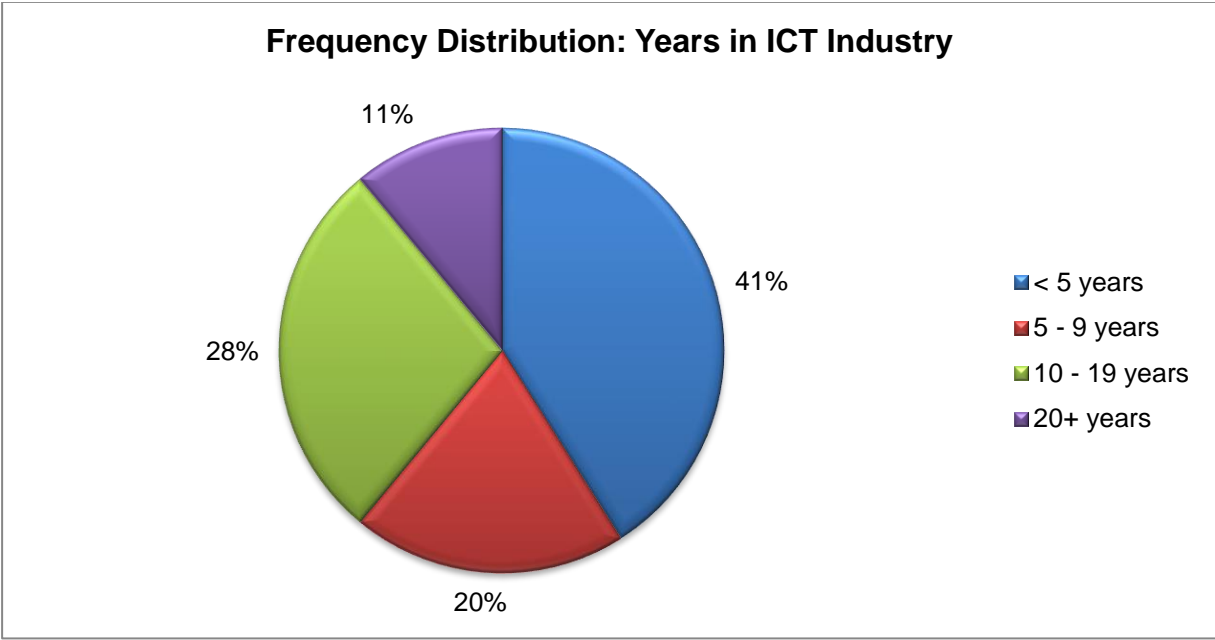
Figure 4.11 - Frequency Distribution of Years in ICT Industry

The respondents were asked to select the years that they had worked in the ICT industry by selecting from one the following age groups: < 5 years, 5 – 9 years, 10 – 19 years and 20+ years. Figure 4.11 illustrates the responses received to this question. The results show that 41% (n = 41) of the respondents have fewer than 5 years' experience in ICT, 20% (n = 20) between 5 – 9 years, 28% (n = 28) between 10 – 19 years and 11% (n = 11) 20 years and more experience in ICT. The responses received covered a wide range of ICT experience that provides valuable feedback on the Alumni of the Department of Computing Sciences and the perception over various generations.

4.3.1.11   Optional: Company where you are employed

Company	n	Company	N
24.com	1	NMMU	3
ACI	2	NxGN	1
Alligatortek	1	Open Box Software	3
Amazon	3	Palladium	1
AMDOCS	1	Quintiles Transnational Inc.	1
Autocar, LLC	1	Robert Bosch	1
Avocado Chocolate	1	Royal Automobile Club of Queensland, Australia	1
BCX	1	S4 Integration	6
Billabong	1	SCAD software (Pty) Ltd	1
BrandsEye	1	Seda NMB ICT Incubator / Intelligent Output Systems	1
CompRSA	2	Self Employed	1
Deloitte	1	Standard Bank	1
Department of Correctional Services	1	Supergroup	1
Eskom	1	SYSPRO	3
FNB	1	The Code Group	1
Glacier	1	Tigers Limited	1
Government, State Information Technology	1	Truworths	1
GrainCo	1	Unemployed	1
Heydenrychs	1	University of Rwanda	1
IDI Technology Solutions (BarnOwl)	1	Vodacom	1
Invictus	1	Volkswagen of South Africa	1
iOsystems	1	WhereIsMyTransport	1
IQ Business	1	wiGroup	1
Korbitec	1	Woodtech Mechatronics	1
Lightstone Consumer	3	Wunder	1
Mobenzi Technologies	1	Zetta Business Solutions	1
moblin.DATOMO	1		1

Table 4.4 - Company where you are employed

The respondents were asked an optional open-ended question, which is qualitative in nature, to answer in which company they are employed. Table 4.4 illustrates the responses received to this question which 71% (n=71) of the respondents answered. There are wide ranges of companies that employ the respondents. These range from multinational corporations to small businesses. The more popular companies to work

for are Amazon, Lightstone Consumer, NMMU, Openbox Software, SYSPRO and S4 Integration.

4.3.1.12   Current Job Title

Starting job title	Current job title	N
Developer	Developer	2
Graduate In Training	Systems Analyst	2
Software Development Engineer	Software Development Engineer	2
Software Developer	Senior Software Developer	3
Junior Software Developer	Software Developer	4
Junior Software Developer	Junior Software Developer	5
Software Developer	Software Developer	6

Table 4.5 - Job Title

The respondents were asked an optional open-ended question, which is qualitative in nature, to answer; 'what is your current job title'. Table 4.5 illustrates some of the grouped responses received to this question. There are more than 70 job titles as these are dynamic and can be defined by the employer and only a few are listed. Some standard job titles can be found and the more standard and popular titles are Software Developer, Senior Software Developer and Software Engineer.

4.3.1.13   Your Job Title when you started?

The respondents were asked an optional open-ended question, which is qualitative in nature, to answer; 'what was your job title when you started'. Table 4.5 illustrates some of the grouped responses received to this question. The respondents that have been employed for a longer period have moved up into different position compared to their job titles when they started.
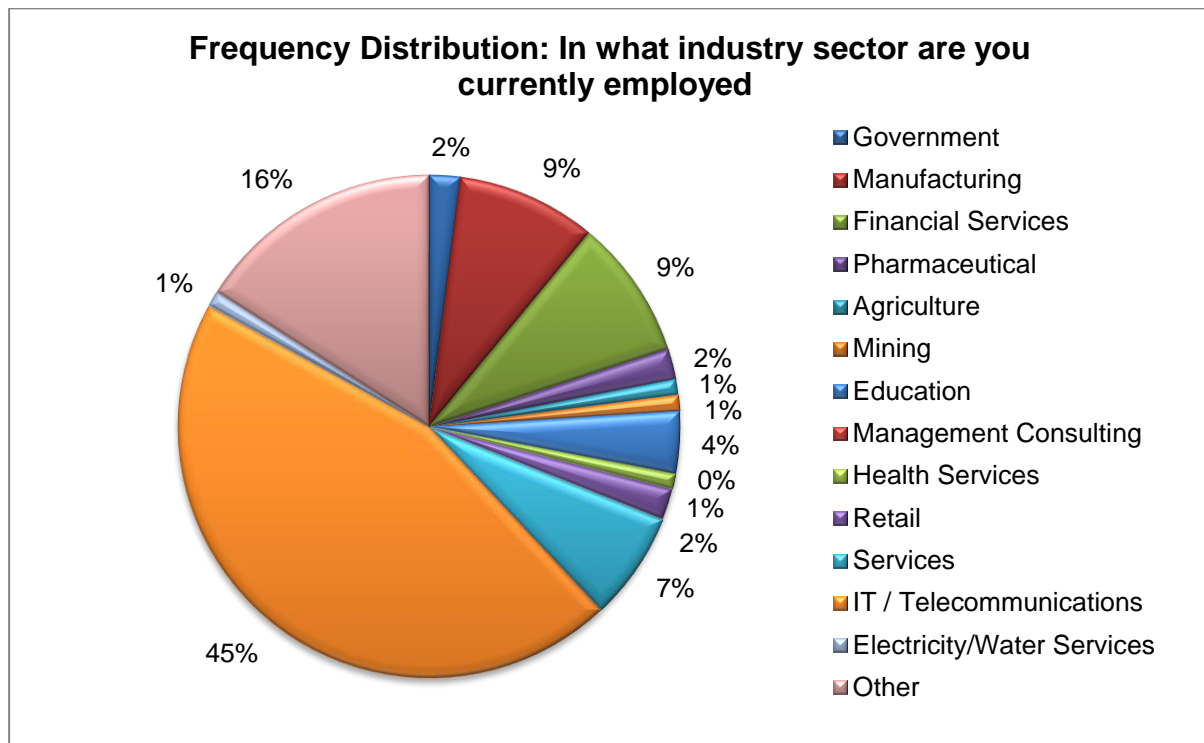
Figure 4.12 - Frequency Distribution of industry sector that you are currently employed

The respondents were asked to select the industry sector where they are currently employed by selecting from one the following options: Government, Manufacturing, Financial Services, Pharmaceutical, Agriculture, Mining, Education, Management Consulting, Health Services, Retail, Services, Information Technology / Telecommunications, Electricity / Water Services and Other. Figure 4.12 illustrates the responses received to this question. The results show that 2% (n = 2) of the respondents are employed in the Government sector, 9% (n = 9) in Manufacturing, 9% (n = 9) in Financial Services, 2% (n = 2) in Pharmaceutical, 1% (n = 1) in Agriculture, 1% (n = 1) in Mining, 4% (n = 4) in Education, 0% (n = 0) in Management Consulting, 1% (n = 1) in Health Services, 2% (n = 2) in Retail, 7% (n = 7) in Services, 45% (n = 45) in Information Technology / Telecommunications, 1% (n = 1) in Electricity / Water Services and 16% (n = 16) reside in Other sector.

45% of the respondents are employed in the Information Technology / Telecommunications sector which is the general expectation of the Computing Sciences Alumni. Manufacturing and Financial Services account for 18% of the respondents which indicates a significant need for ICT skills in these sectors.
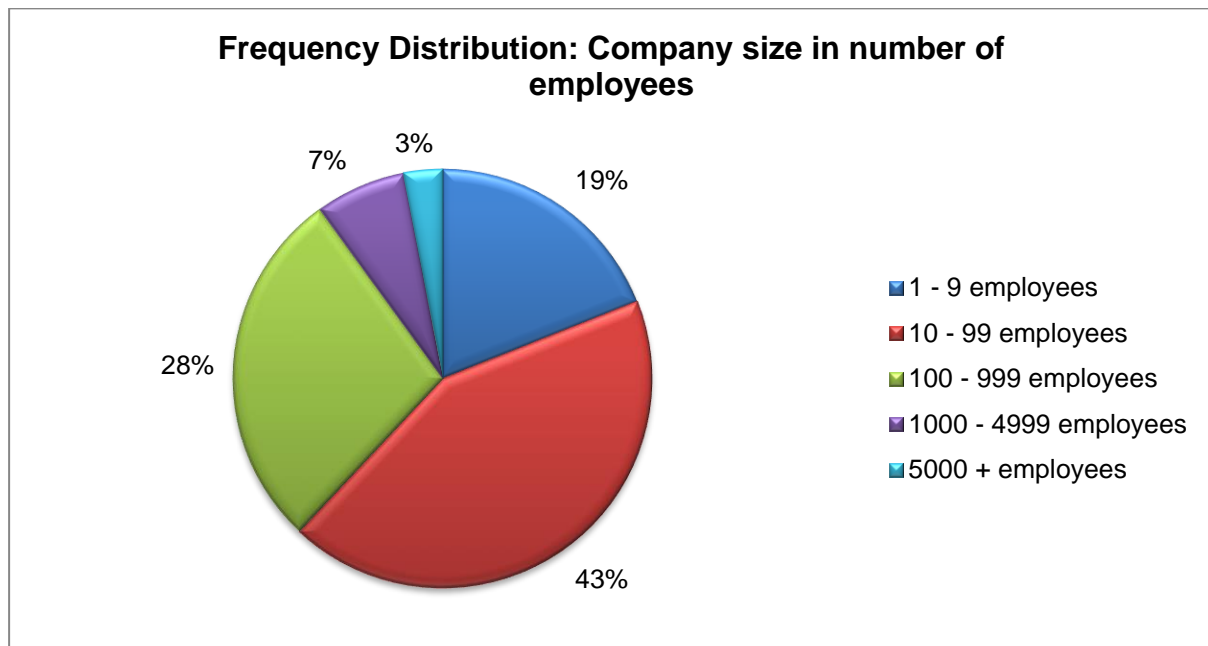
Figure 4.13 - Frequency Distribution of Company size in number of employees

The respondents were asked to select the company size in terms of the number of employees that are working by selecting from one the following groups: 1 – 9 employees, 10 – 99 employees, 100 – 999 employees, 1000 – 4999 employees and 5000+ employees. Figure 4.13 illustrates the responses received to this question. The results show that 19% (n = 19) of the respondents are part of companies with 1 – 9 employees, 43% (n = 43) with between 10 – 99 employees, 28% (n = 28) with between 100 – 999 employees, 7% (n = 7) with between 1000 – 4999 employees and 3% (n = 3) with 5000+ employees.

In 19% of the results, the respondents are part of an organisation with 1 – 9 employees. This is in contrast with international ICT sectors that consist mainly of small companies as can be seen in Figure 4.14. The number of large companies employing over 500 individuals is relatively small, including subsidiaries of foreign multinational corporations.

Companies by Employee Size: Total ICT Sector Canada

- 1-9 Employees
- 10-49 Employees
- 50-100 Employees
- 100+ Employees

11.2% 1.7% 1.5%

85.6%
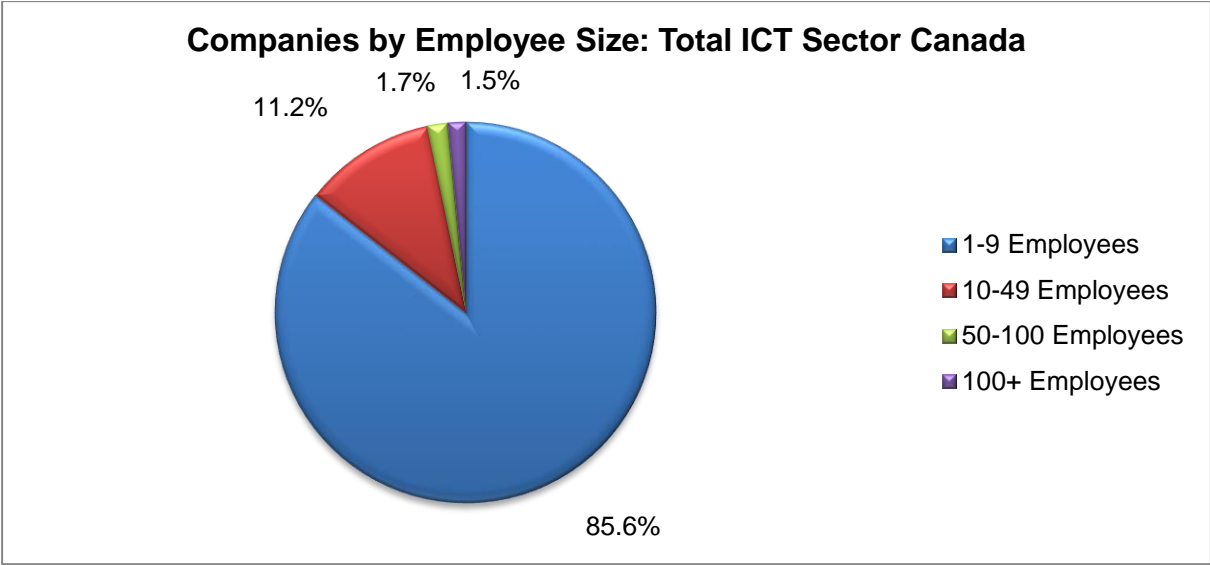
Figure 4.14 - Companies by Employee Size for Total ICT Sector (Canada Government, 2014)

4.3.1.16   Are you self-employed?

Frequency Distribution: Are you self-employed

- No
- Yes

8%

92%
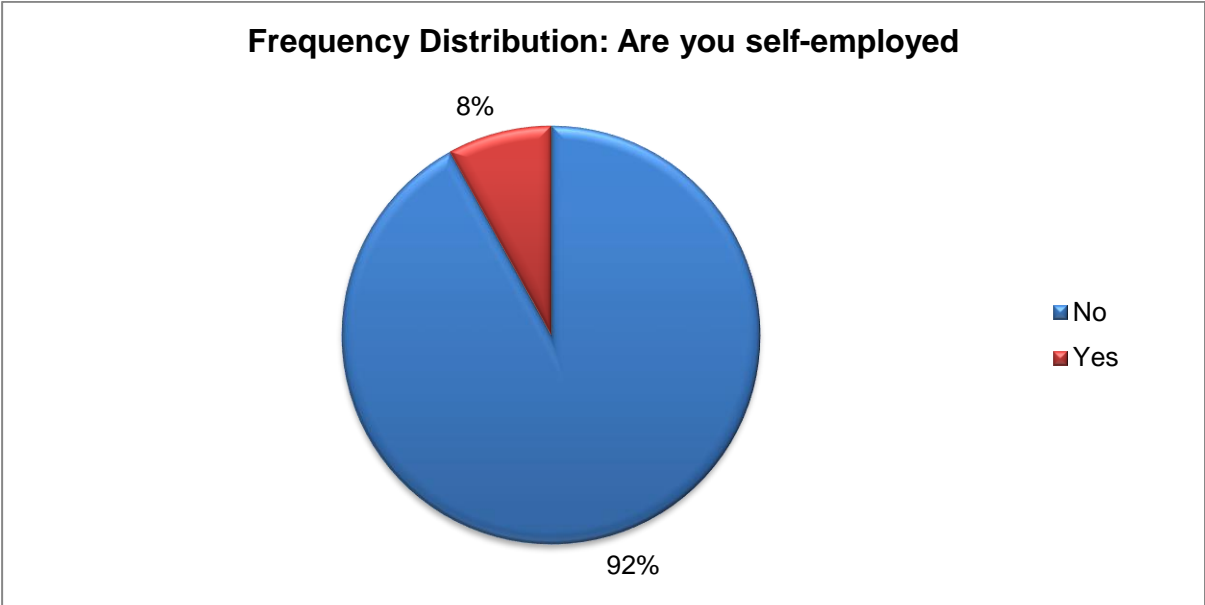
Figure 4.15 - Frequency Distribution of are you self-employed

The respondents were asked if they were self-employed by selecting either Yes or No. Figure 4.15 illustrates the responses received to this question. The result indicates that 92% (n=92) of the respondents are not self-employed while only 8% (n=8) are self-employed.

As seen from the results a small percentage, 8% (n=8) of respondents are self-employed but the majority opt to be employed by medium- sized companies as seen in Figure 4.13. The self-employed respondents could be individuals providing IT consulting services, web design, mobile app development, or technical support services (CompTIA, 2016).

4.3.2   Section 2: Alumni Perception of the Department of Computing Sciences

This section will present and discuss the factors that influence the Alumni perception that was captured in the survey.

4.3.2.1   Question 2: Academic Staff in Department of Computing Sciences

Figure 4.16 - Frequency Distribution of Academic Staff

Figure 4.16 illustrates the total responses received for questions 2.1 to 2.8 which are all related to Academic Staff. The majority of responses were positive with 64% (n=64) strongly agreeing and 26% (n=26) agreeing with statements associated with the Academic Staff in the Department of Computing Sciences. Only 6% (n=6) of the responses were neutral and even a smaller percentage, 2% (n=2), disagreed with the statements in the questionnaire. The responses that strongly disagreed with the statements in the questionnaire accounted for only 2% (n=2).

It can be seen in Table 7.25 in Appendix C that only 4% (n=4) of the responses were negative, 6% (n=6) were neutral and the majority of responses, 90% (n=90), were

positive regarding the statements presented about the Academic Staff at the Department of Computing Sciences. From Table 4.6 in section 4.4.1 of this chapter the Cronbach Alpha for this factor is tabulated and shown to be 0.94, signifying high reliability for this construct.

4.3.2.2 Question 3: Admin. & Technical Staff in Department of Computing Sciences

Figure 4.17 - Frequency Distributions of Admin. Staff

Figure 4.17 illustrates the total responses received for questions 3.1 to 3.5 which all relate to Admin. Staff. The majority of responses were positive with 52% (n=52) strongly agreeing and 38% (n=38) agreeing with statements associated to the Admin. Staff in Department of Computing Sciences. Only 7% (n=7) of the responses were neutral and even a smaller percentage, 2% (n=2), disagreed with the statements in the questionnaire. The responses that strongly disagreed with the statements in the questionnaire accounted for only 1% (n=1).

It can be seen in Table 7.25 in Appendix C that only 3% (n=3) of the responses were negative, 7% (n=7) were neutral and the majority of responses, 90% (n=90), were positive regarding the statements presented about the Admin. Staff at the Department of Computing Sciences. From Table 4.6 in section 4.4.1 of this chapter the Cronbach Alpha for this factor is tabulated and shown to be 0.87, signifying moderate reliability for this construct.

4.3.2.3 Question 4: Technology used in the Department of Computing Sciences

Frequency distribution: Technology Used

- [1.00 to 1.80) Strongly Disagree
- [1.80 to 2.60) Disagree
- [2.60 to 3.40] Neutral
- (3.40 to 4.20] Agree
- (4.20 to 5.00] Strongly Agree

Figure 4.18 - Frequency Distribution of Technology Used

Figure 4.18 illustrates the total responses received for questions 4.1 to 4.6 which all relate to technology used. The majority of responses were positive with 46% (n=46) strongly agreeing and 43% (n=43) agreeing with statements associated to the technology used in the Department of Computing Sciences. Only 6% (n=6) of the responses were neutral and even a smaller percentage, 3% (n=3), disagreed with the statements in the questionnaire. The responses that strongly disagreed with the statements in the questionnaire accounted for only 2% (n=2).

It can be seen in Table 7.25 in Appendix C that only 5% (n=5) of the responses were negative, 6% (n=6) were neutral and the majority of responses, 89% (n=89), were positive regarding the statements presented about the Technology Used at the Department of Computing Sciences. From Table 4.6 in section 4.4.1 of this chapter the Cronbach Alpha for this factor is tabulated and shown to be 0.88, signifying moderate reliability for this construct.

Frequency Distribution: Course Content

- [1.00 to 1.80) Strongly Disagree
- [1.80 to 2.60) Disagree
- [2.60 to 3.40] Neutral
- (3.40 to 4.20] Agree
- (4.20 to 5.00] Strongly Agree
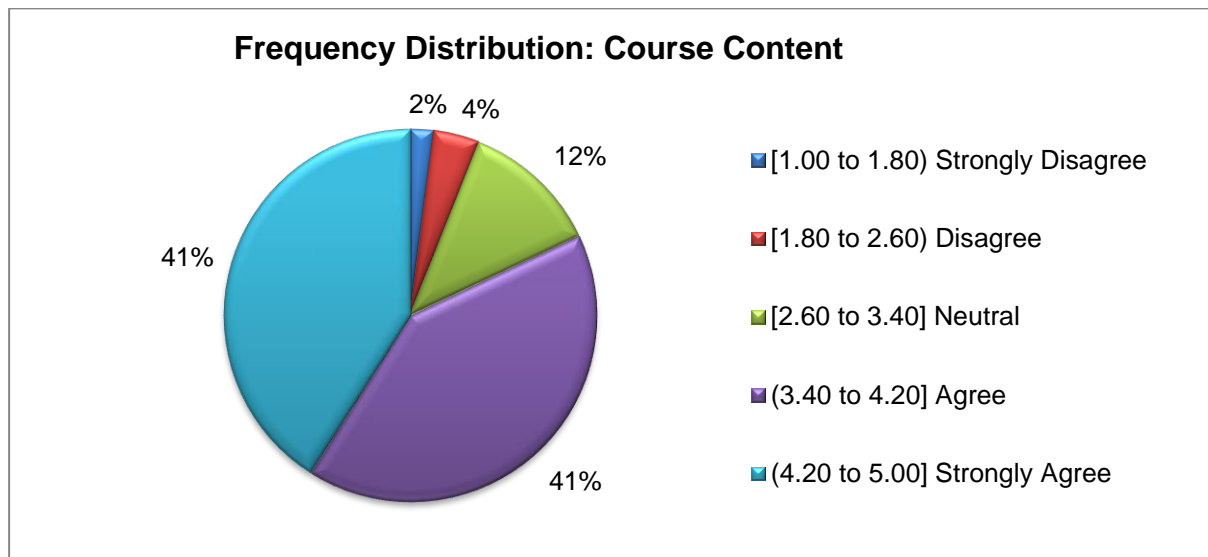
Figure 4.19 - Frequency Distribution of Course Content

Figure 4.19 illustrates the total responses received for questions 5.1 to 5.5 which all relate to Course Content. The majority of responses were positive with 41% (n=41) strongly agreeing and 41% (n=41) agreeing with statements associated to the Course Content in the Department of Computing Sciences. Only 12% (n=12) were neutral and even a smaller percentage, 4% (n=4), disagreed with the statements in the questionnaire. The responses that strongly disagreed with the statements in the questionnaire accounted for only 2% (n=2).

It can be seen Table 7.25 in Appendix C that only 6% (n=6) of the responses were negative, 12% (n=12) were neutral and the majority of responses, 82% (n=82), were positive regarding the statements presented about the Course Content at the Department of Computing Sciences. From Table 4.6 in section 4.4.1 of this chapter the Cronbach Alpha for this factor is tabulated and shown to be 0.92, high reliability for this construct.

4.3.2.5 Question 6: Teaching Guarantee
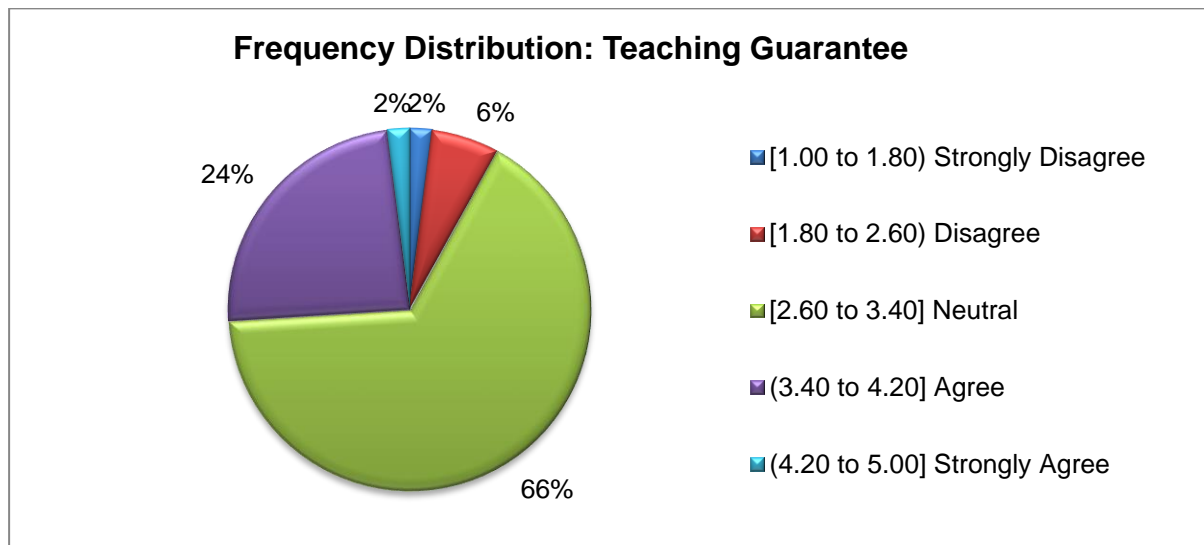
Figure 4.20 - Frequency Distribution of Teaching Guarantee

Figure 4.20 illustrates the frequency of responses received to questions 6.1 to 6.7 which all relate to the Teaching Guarantee. A smaller proportion of responses were positive with 2% (n=2) strongly agreeing and 24% (n=24) agreeing with statements related to the Teaching Guarantee in Department of Computing Sciences. The majority of responses, 66% (n=66), were neutral and a very small proportion, 6% (n=6), disagreed with the statements in the questionnaire. The responses that strongly disagreed with the statements in the questionnaire accounted for only 2% (n=2).

Table 7.25 in Appendix C shows that only 8% (n=8) of the responses were negative, 66% (n=66), the majority of responses were neutral, and a smaller portion, 26% (n=26), were positive regarding the statements presented about the Teaching Guarantee at the Department of Computing Sciences. From Table 4.6 in section 4.4.1 of this chapter the Cronbach Alpha for this factor is tabulated and shown to be 0.69, which is unacceptable reliability for this construct. The reliability for the Teaching Guarantee, however, can still be considered acceptable for exploratory research.
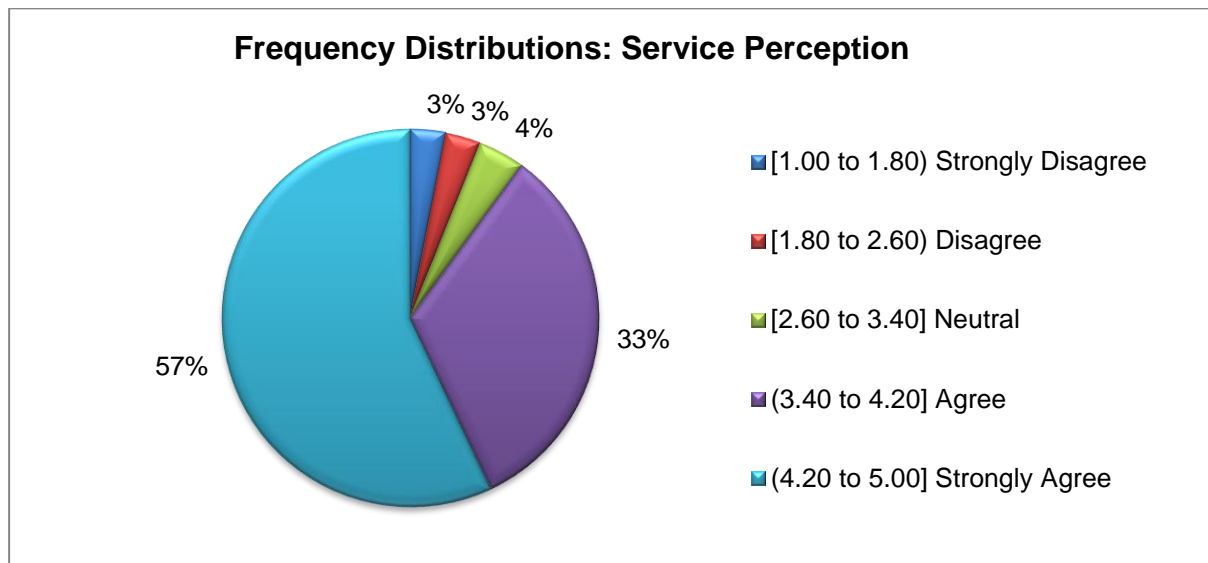
Figure 4.21 - Frequency Distributions of Service Perception

Figure 4.21 illustrates the total responses received for questions 7.1 to 7.5 which all relate to Service Perception. The majority of responses were positive with 57% (n=57) strongly agreeing and 33% (n=33) agreeing with statements associated to Service Perception in Department of Computing Sciences. Only 4% (n=4) of the responses were neutral and even a smaller percentage, 3% (n=3), disagreed with the statements in the questionnaire. The responses that strongly disagreed with the statements in the questionnaire accounted for only 3% (n=3).

Table 7.25, in Appendix C it can be seen that only 6% (n=6) of the responses were negative, 4% (n=4) were neutral and the majority of responses, 90% (n=60), were positive regarding the statements presented about the Service Perception at the Department of Computing Sciences. From Table 4.6 in section 4.4.1 of this chapter the Cronbach Alpha for this factor is tabulated and shown to be 0.97, high reliability for this construct.

4.3.2.7 Question 8: University Culture & Atmosphere
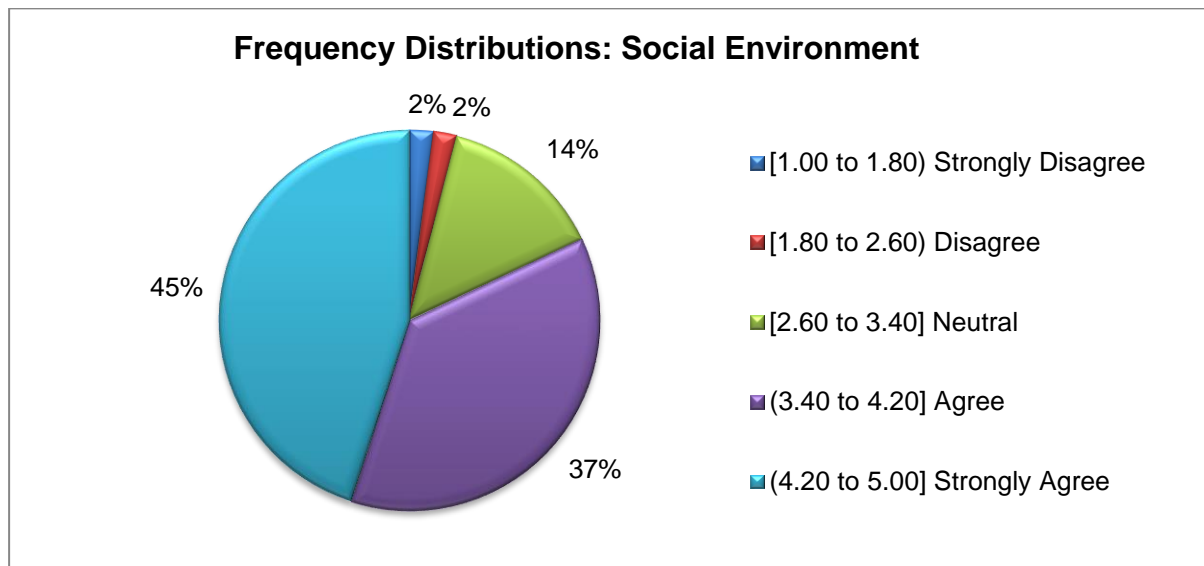
Figure 4.22 - Frequency Distributions of Social Environment

Figure 4.22 illustrates the total responses received for questions 8.1 to 8.6 which all relate to Social Environment. The majority of responses were positive with 45% (n=45) strongly agreeing and 37% (n=37) agreeing with statements associated to the Social Environment in Department of Computing Sciences. Only 14% (n=14) of the responses were neutral and even a smaller percentage, 2% (n=2), disagreed with the statements in the questionnaire. The responses that strongly disagreed with the statements in the questionnaire accounted for only 2% (n=2).

Table 7.25 in Appendix C it can be seen that only 4% (n=4) of the responses were negative, 14% (n=14) were neutral and the majority of responses, 82% (n=82), were positive regarding the statements presented about the Social Environment at the Department of Computing Sciences. From Table 4.6 in section 4.4.1 of this chapter the Cronbach Alpha for this factor is tabulated and shown to be 0.87, moderate reliability for this construct.

4.3.2.8 Question 9: Perceived Value

Frequency Distributions: Perceived Value

- [1.00 to 1.80) Strongly Disagree
- [1.80 to 2.60) Disagree
- [2.60 to 3.40] Neutral
- (3.40 to 4.20] Agree
- (4.20 to 5.00] Strongly Agree
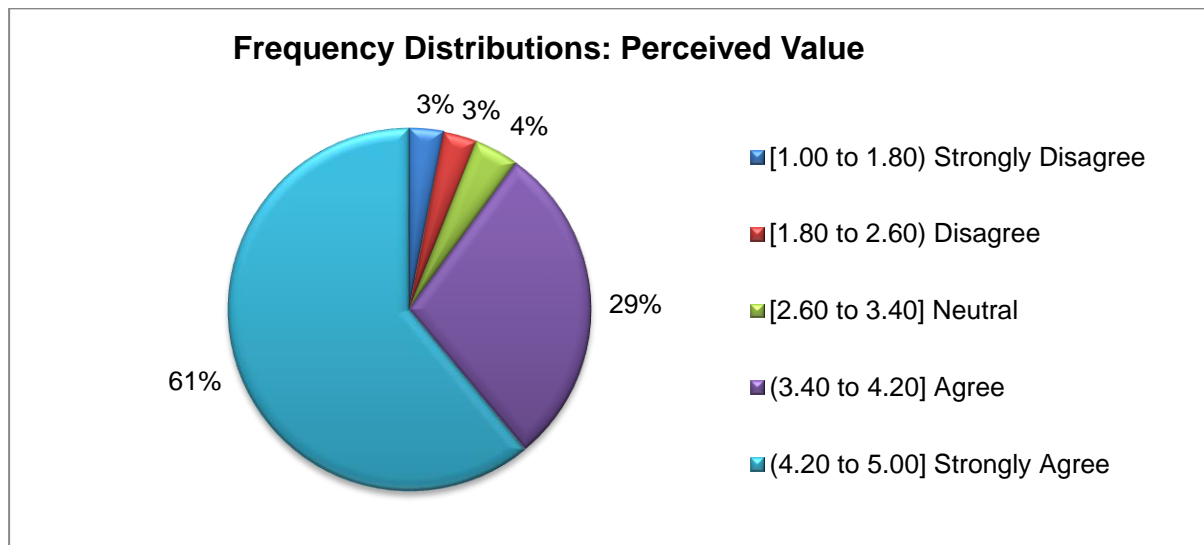
Figure 4.23 - Frequency Distributions of Perceived Value

Figure 4.23 illustrates the total responses received for questions 9.1 to 9.4 which all relate to Perceived Value. The majority of responses were positive with 61% (n=61) strongly agreeing and 29% (n=29) agreeing with statements associated to the Perceived Value in Department of Computing Sciences. Only 4% (n=4) of the responses were neutral and even a smaller percentage, 3% (n=3), disagreed with the statements in the questionnaire. The responses that strongly disagreed with the statements in the questionnaire accounted for only 3% (n=3).

Table 7.25 in Appendix C it can be seen that only 6% (n=6) of the responses were negative, 4% (n=4) were neutral and the majority of responses, 90% (n=90), were positive regarding the statements presented about the Perceived Value at the Department of Computing Sciences. From Table 4.6 in Section 4.4.1 of this chapter the Cronbach Alpha for this factor is tabulated and shown to be 0.84, moderate reliability for this construct.

Frequency Distributions: Alumni Network

- [1.00 to 1.80) Strongly Disagree
- [1.80 to 2.60) Disagree
- [2.60 to 3.40] Neutral
- (3.40 to 4.20] Agree
- (4.20 to 5.00] Strongly Agree
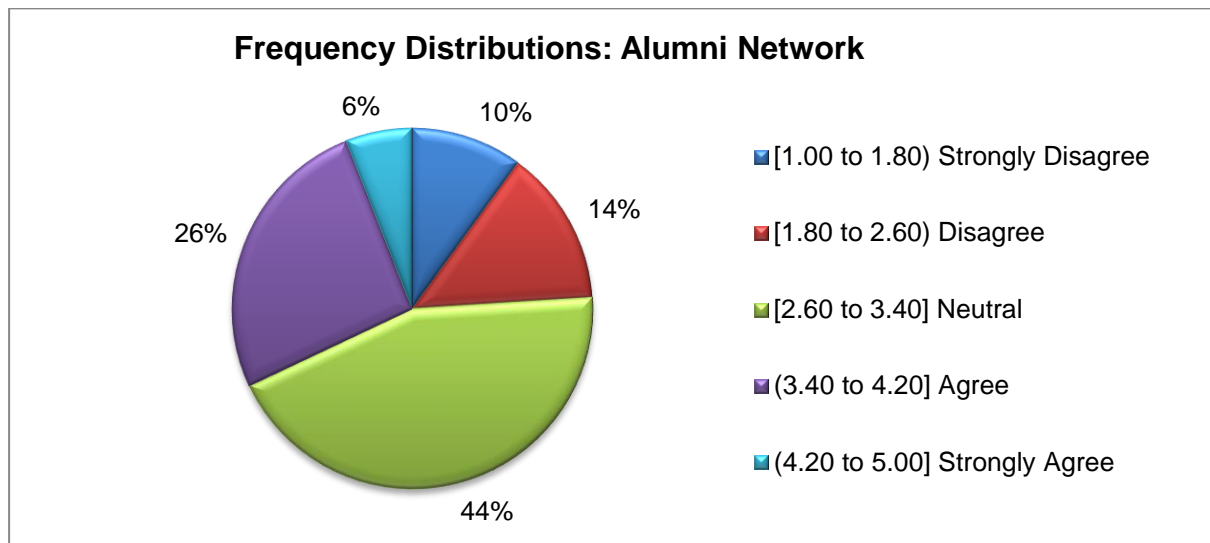
Figure 4.24 - Frequency Distributions of Alumni Network

Figure 4.24 illustrates the frequency of responses received to questions 10.1 to 10.6 which all relate to Alumni Network. A smaller proportion of responses were positive with 6% (n=6) strongly agreeing and 26% (n=26) agreeing with statements related to the Alumni Network of the Department of Computing Sciences. The majority of responses, 44% (n=44), were neutral and a small proportion, 14% (n=14), disagreed with the statements in the questionnaire. The responses that strongly disagreed with the statements in the questionnaire accounted for 10% (n=10).

Table 7.25 in Appendix C shows that 24% (n=24) of the responses were negative, the majority of responses, 44% (n=44) were neutral and 32% (n=32) were positive regarding the statements presented about the Alumni Network of the Department of Computing Sciences. From Table 4.6 in Section 4.4.1 of this chapter the Cronbach Alpha for this factor is tabulated and shown to be 0.91, high reliability for this construct.

Frequency Distributions: Alumni Satisfaction
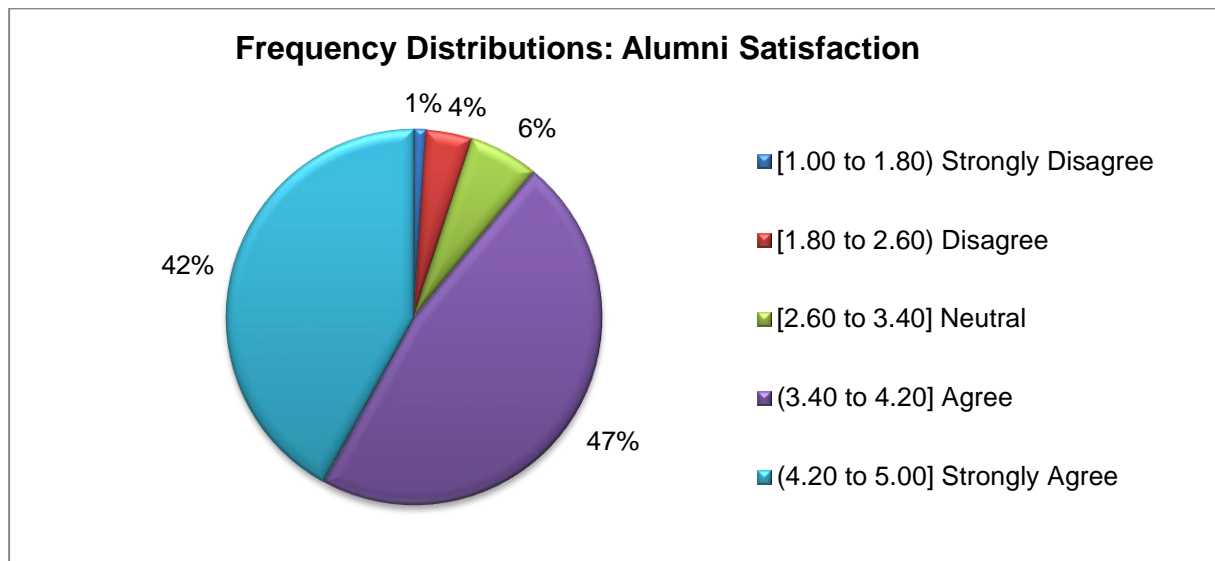
Figure 4.25 - Frequency Distributions of Alumni Satisfaction

Figure 4.25 illustrates the total responses received which all relate to Alumni Satisfaction. Responses were mainly positive with 42% (n=42) strongly agreeing and 47% (n=47) agreeing with statements related to the Alumni Satisfaction of the Department of Computing Sciences. Only 6% (n=6) of the responses were neutral and even a smaller percentage, 4% (n=4), disagreed with the statements in the questionnaire. The responses that strongly disagreed with the statements in the questionnaire accounted for only 1% (n=1).

Table 7.25 in Appendix C shows that only 5% (n=5) of the responses were negative, 6% (n=6) were neutral and the majority of responses, 89% (n=89), were positive regarding the statements presented about the Alumni Satisfaction of the Department of Computing Sciences. From Table 4.6 in Section 4.4.1 of this chapter the Cronbach Alpha for this factor is tabulated and shown to be 0.91, high reliability for this construct.

4.3.3   Section 3: Communication Methods

This section will present and discuss the communication methods and preferences of respondents that were captured in the survey.
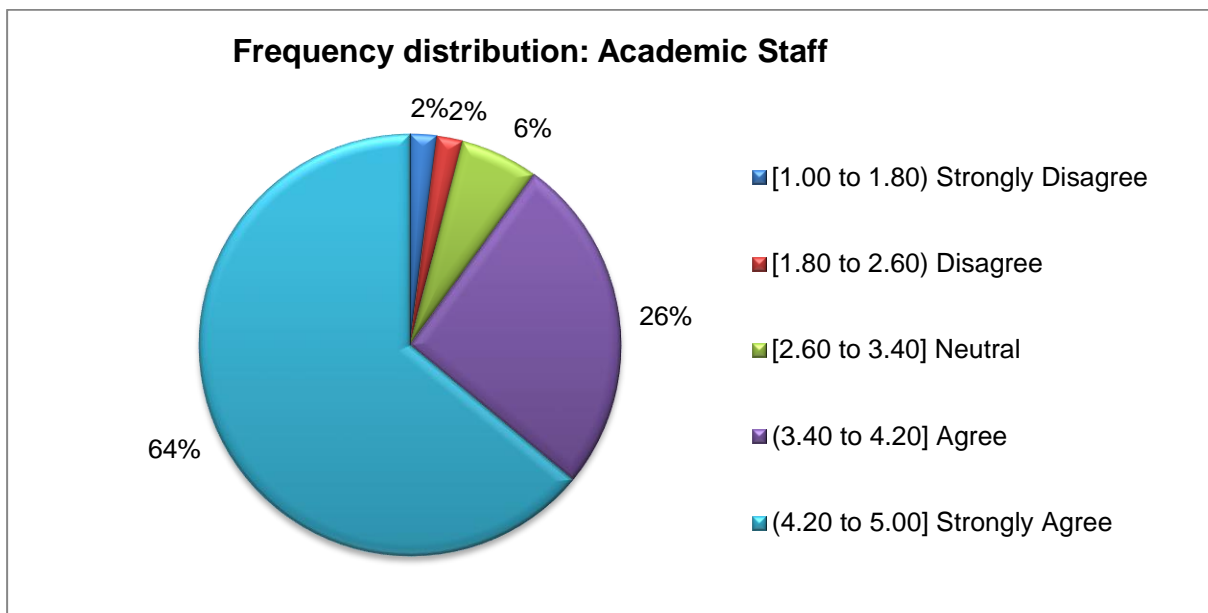
Frequency Distribution: Communication
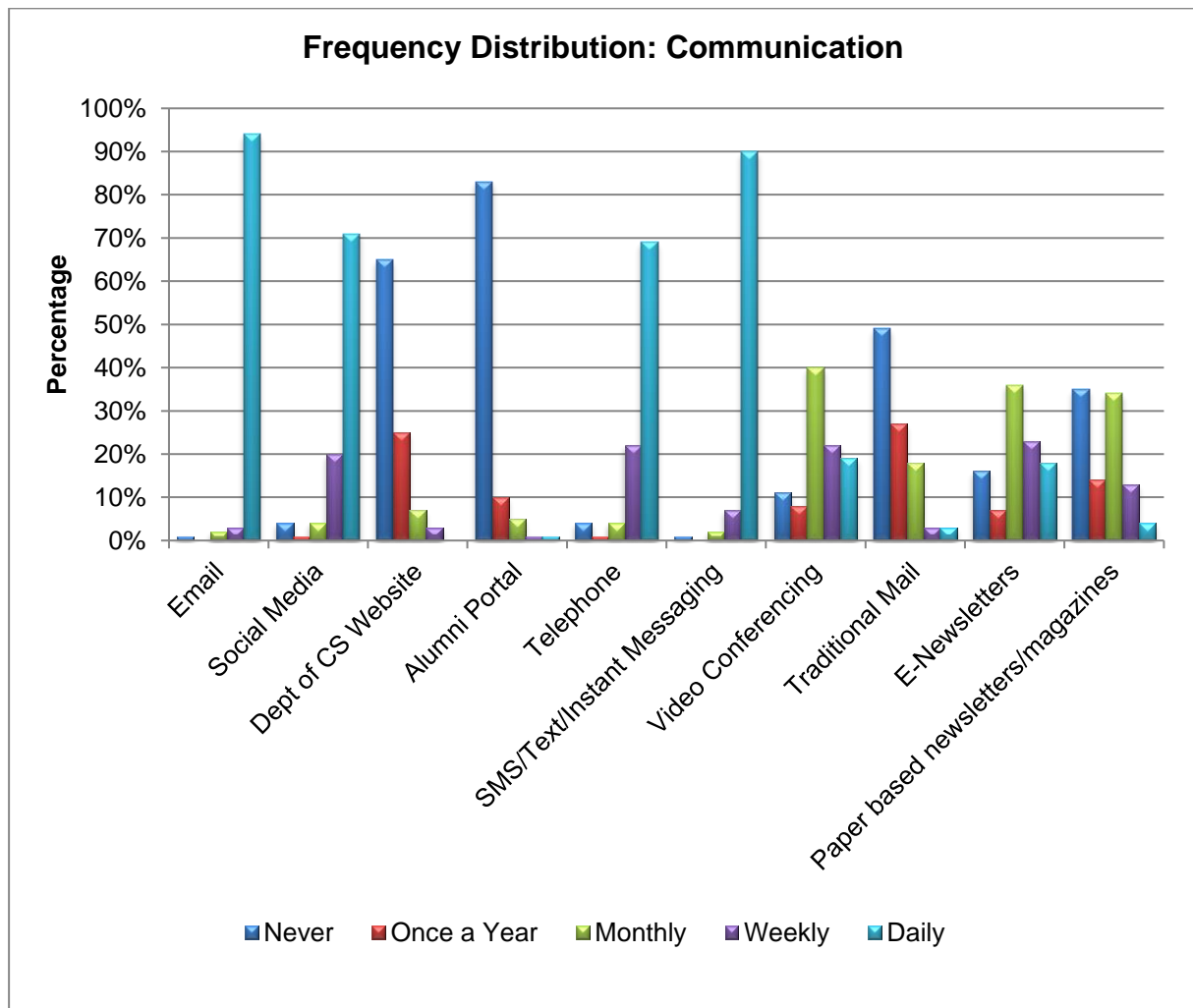
Figure 4.26 - Frequency Distribution of Communication

Figure 4.26 illustrates the total responses received for questions 11.1 to 11.10 which all relate to Communication. The communication methods used most often by respondents on a daily basis are Email (94%, n=94), SMS / Text / Instant Messaging (90%, n=90), Social Media (71%, n=71) and Telephone (69%, n=69). The communication methods that are used on a monthly basis are Video Conferencing (40%, n=40), E-Newsletter (36%, n=36) and Paper Based Newsletters (34%, n=34). The communication methods which are never used by respondents are the Alumni Portal (83%, n=83), Department of Computing Sciences website (65%, n=65) and Traditional Mail (49%, n=49).

4.3.3.2 Question 12: Social Media Platforms

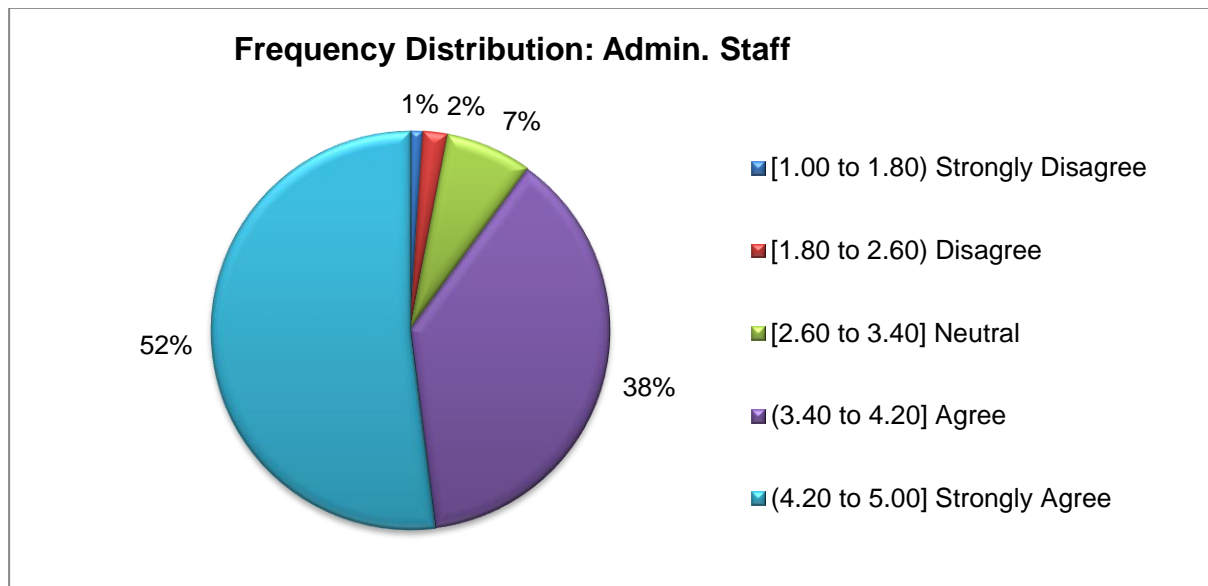

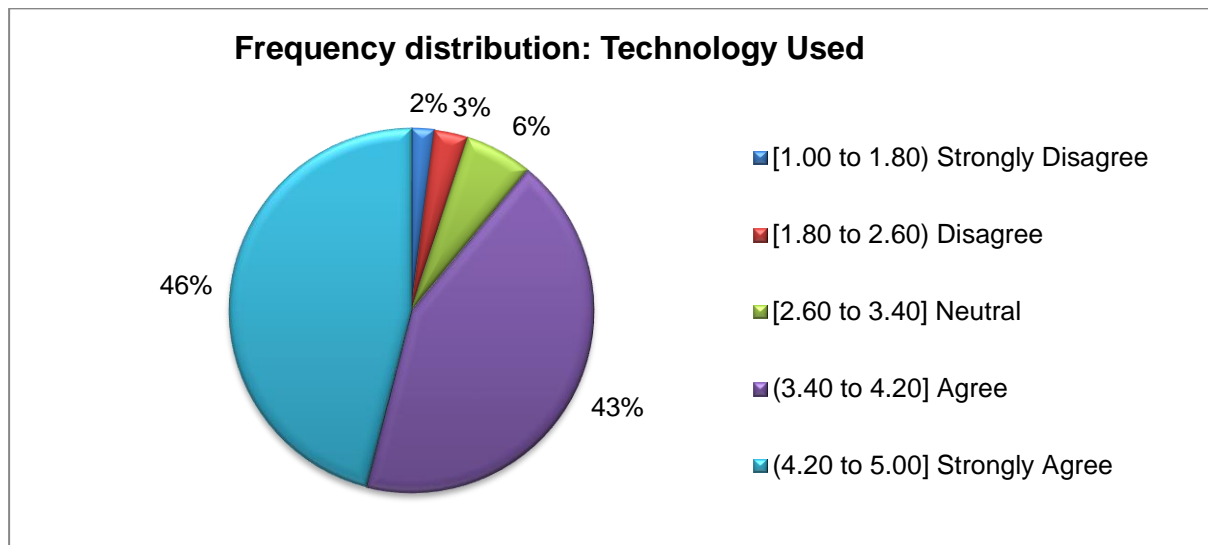**Frequency Distribution: Social Media**
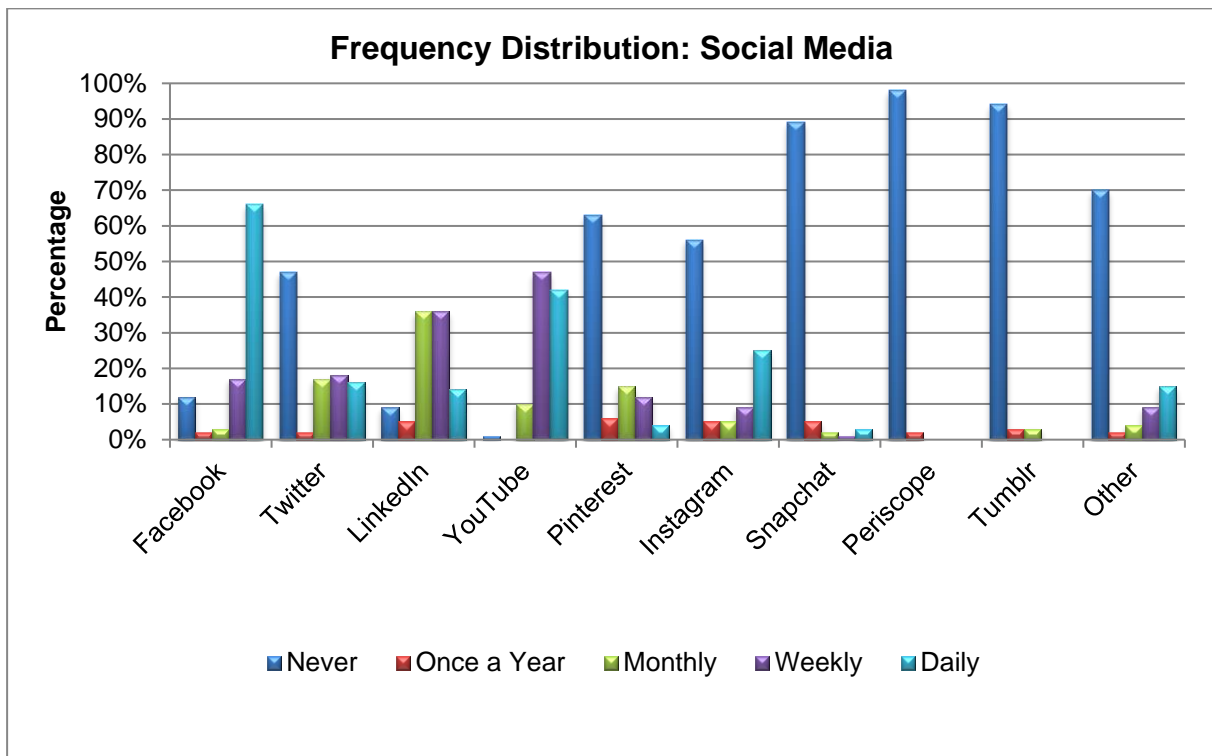
Figure 4.27 - Frequency Distribution of Social Media

Figure 4.27 illustrates the total responses received for questions 12.1 to 12.10 which all relate to Social Media. The most often used social media by respondents on a daily basis are Facebook (66%, n=66), Youtube (42%, n=42) and Instagram (25%, n=25). The social media that are used on a monthly basis are LinkedIn (36%, n=36), and Twitter (17%, n=17). The social media which are never used by respondents are Periscope (98%, n=98), Tumblr (94%, n=94), Snapchat (89%, n=89), Other (70%, n=70) and Pinterest (63%, n=63).

4.3.4 Section 4: Graduate Degree course experience

4.3.4.1 Question 13: Graduate degree

The respondents were asked an open-ended question, which is qualitative in nature, which undergraduate Computing Sciences course(s) did they find most relevant. A wide range of answers was received but the more common responses were Programming, WRAP, Algorithmics and WRA201-202. Respondents also frequently suggested that the Third year courses were the most relevant. It can be assumed that

responses will vary based on the industry the respondents are working in and which courses apply to their current role.

The respondents were asked an open-ended question, which is qualitative in nature, which undergraduate Computing Sciences course(s) did they find least relevant. A wide range of answers was received but the more common responses were Multimedia systems, WRMS and Mathematical Statistics. A large number of respondents answered that they felt that none of the courses was not relevant which is an indication that the Department of Computing Sciences is offering courses that benefit most of the Alumni.

The respondents were asked an open-ended question, which is qualitative in nature, which additional undergraduate Computing Sciences course(s) should bet included in the future. The more popular answers given by respondents were mobile development, big data, databases and Business Analysis. Some respondents acknowledged that the Department of Computing Sciences was constantly evolving and new courses were regularly added to the curriculum.

Respondents were asked to pick three words that they associate with the Department of Computing Sciences and the results of their input are illustrated in Figure 4.28 in the form of a word cloud. The majority of the words chosen were positive with the most often used words being Fun, Friendly, Family, Helpful, Relevant, Professional, Excellence and Quality. Words used to describe their experience also suggest more than just receiving a service, but being part of a social group with an enjoyable learning experience.

Figure 4.28 - Word Cloud of association with the Department of Computing Sciences

4.3.4.2 Question 14: Postgraduate degree

The respondents were asked an optional open-ended question, which is qualitative in nature, which postgraduate Computing Sciences course(s) did they find most relevant. A wide range of answers was received but the more common responses were Project Management, Human Computer Interaction, Mobile development and Evolutionary computing. Some respondents who elaborated on Project Management stated that it helped to put graduate and postgraduate skills into practice in preparation for the working world.

The respondents were asked an optional open-ended question, which is qualitative in nature, which postgraduate Computing Sciences course(s) did they found least relevant. A wide range of answers was received but the more common responses were Electronic Commerce, Graphics and Environmental Systems. A large number of respondents answered that they felt none of the courses was not relevant. One respondent stated that subjects could be selected, unlike undergraduates, which reduced the number of students who were dissatisfied with a course.

The respondents were asked an optional open-ended question, which is qualitative in nature, which additional postgraduate Computing Sciences course(s) should the Department of Computing Sciences include in the future. The more popular answers given by respondents were mobile development, especially in iOS, big data, data management and Cloud Computing.Many respondents suggested security in various fields such as multi-platform, networking, web security and cyber security.

4.4 Multivariate Analysis and Inferential Statistics

4.4.1 Data Reliability

As discussed in section 3.8.1, a statistical technique named the Cronbach Alpha is a common and well-used internal consistency reliability measure in quantitative research. This statistical technique is applied to questions in a questionnaire to statistically determine how reliably they measure predetermined variables (Tavakol & Dennick, 2011). In this study, Cronbach Alpha was used to determine the reliability of the measuring instrument that provided measures of internal consistency reliability. The Cronbach's alpha coefficient is used to measure this internal consistency. This coefficient of reliability ranges from 0 to 1 in providing the overall assessment of a measure's reliability. A low coefficient value indicates a low internal consistency while a high value indicates the opposite. For research, the guidelines for reliability coefficient have been defined as seen in Table 3.3 in Section 3.8.1.

The Cronbach Alpha for each of the variables is shown in Table 4.6. The lowest Cronbach Alpha calculated out of 10 variables was 0.69 for *Teaching Guarantee*. This is the only variable with unacceptable reliability. A Cronbach Alpha value of between 0.50 and 0.69 has been deemed acceptable for new and experimental research (Collis & Hussey, 2009; Nunnally, 1978). The internal reliability for all other measuring instruments is sufficient, ranging from 0.84 to 0.97. These values are higher than the minimum requirement of 0.70.

Factor	Cronbach Alpha
Academic Staff	0.94
Admin. Staff	0.87
Alumni Network	0.91
Course Content	0.92
Perceived Value	0.84
Social Environment	0.87
Technology	0.88
ALUMNI SATISFACTION	0.91
Customer Satisfaction	0.97
Teaching Guarantee	0.69

Table 4.6 - Cronbach's alpha coefficients for the factors (n = 100)

4.4.2 Empirical evaluation of the proposed Alumni Satisfaction Model

4.4.2.1 Introduction to the Research Objective

This section will present and discuss the fourth research objective which is to evaluate the proposed model of Alumni satisfaction in the Department of Computing Sciences.

- **RO$_4$:** Evaluate the proposed model of Alumni satisfaction in the Department of Computing Sciences.

4.4.2.2 Hypotheses Formulation and Testing

A conceptual framework was constructed by the researcher based on reviewed literature. The conceptual framework was used to establish relationships between the Dependent variable, *Alumni Satisfaction*, and the independent variables, *Service Guarantees*, *Customer Satisfaction, Course Contents, Modern Technologies, Academic Staff, Admin. Staff, Social Environment, Perceived Value* and *Alumni Network.* Table 4.7 shows these hypotheses, the relevant Pearson Correlation, the correlation strength as well as whether the hypothesis is accepted or rejected.

Hypothesis	Hypothesis Description	Pearson Correlations	Correlation Strength	Hypothesis Accepted or Rejected
H_1	*Service Guarantees are significantly related to Alumni Satisfaction*	0.204	Low positive correlation	Rejected
H_2	*Customer Satisfaction is significantly related to Alumni Satisfaction*	0.881	High positive	Accepted
H_3	*Course Content is significantly related to Alumni Satisfaction*	0.874	High positive	Accepted
H_4	*Modern Technologies are significantly related to Alumni Satisfaction*	0.828	High positive	Accepted
H_5	*Academic Staff is significantly related to Alumni Satisfaction*	0.880	High positive	Accepted
H_6	*Admin. Staff is significantly related to Alumni Satisfaction*	0.812	High positive	Accepted
H_7	*Social Environment is significantly related to Alumni Satisfaction*	0.773	Medium positive	Accepted
H_8	*Perceived Value is significantly related to Alumni Satisfaction*	0.862	High positive	Accepted
H_9	*Alumni Network is significantly related to Alumni Satisfaction*	0.701	Medium positive	Accepted

Table 4.7 - Hypotheses Testing

The conceptual model with the proposed relationships as shown in Figure 3.4, were tested by using Pearson Correlations. Eight out of the nine hypotheses developed in this research study were accepted by means of statistical analysis through empirical evaluation. The model therefore needs to be adjusted by only removing H_1 as an independent variable of *Alumni Satisfaction*.

4.4.2.3 Conclusion

In this section eight out of the nine hypotheses developed in this research study were accepted. It was shown that there exists a relationship between the Dependent variable *Alumni Satisfaction*, and the independent variables, *Customer Satisfaction, Course Contents, Modern Technologies, Academic Staff, Admin. Staff, Social*

Environment, Perceived Value and *Alumni Network* by using Pearson's product-moment correlation coefficient to measure the linear association between the variables. It was shown that there is no relationship between the Dependent variable *Alumni Satisfaction*, and the independent variable *Service Guarantees.*

4.4.3 Establishing the weighted importance of the identified factors in the Alumni Satisfaction Model.

4.4.3.1 Data Analysis of Correlations to Alumni Satisfaction

The correlations in this study proved to be both statistically and practically significant at a 0.05 confidence level when r_{crit} is bigger or equal to 0.300 for all correlations. As shown in Table 4.8 there are very high positive correlations between *Customer Satisfaction, Course Contents, Modern Technologies, Academic Staff, Admin. Staff and Perceived Value* with *Alumni Satisfaction.* Any positive or negative change in these factors would therefore result in a similar change in *Alumni Satisfaction*. These strong positive correlations are all aligned with the knowledge gained from literature study as discussed in Section 2.5.

There are also medium positive correlations between *Social Environment and Alumni Network* with *Alumni Satisfaction.* These medium positive correlations are also aligned with the knowledge gained from the literature study as discussed in Section 2.5, but changes in these factors have a lesser influence on *Alumni Satisfaction.*

Factor	Pearson Correlations	r_{crit}	Correlation Strength
Customer Satisfaction	0.881	0.300	High positive
Academic Staff	0.880	0.300	High positive
Course Contents	0.874	0.300	High positive
Perceived Value	0.862	0.300	High positive
Modern Technologies	0.828	0.300	High positive
Admin. Staff	0.812	0.300	High positive
Social Environment	0.773	0.300	Medium positive
Alumni Network	0.701	0.300	Medium positive
Service Guarantees	0.204	0.300	Low positive correlation

Table 4.8 - Pearson Product Moment Correlations with Alumni Satisfaction (n = 100) ordered by strength of correlation.

Figure 4.29 illustrates the conceptual framework as described in Figure 3.4, but instead of showing the hypotheses linked with each of the factors, the correlated strengths of relationships between the dependent variable, *Alumni Satisfaction,* and the independent variables, *Service Guarantees*, *Customer Satisfaction, Course Contents, Modern Technologies, Academic Staff, Admin. Staff, Social Environment, Perceived Value* and *Alumni Network are shown.*

An important finding is the strong positive relationship ($r = 0.881$) between *Customer Satisfaction* and *Alumni Satisfaction.* A student, as a satisfied customer, becomes a satisfied alumnus. This relationship is expected to have a strong correlation as both are related to satisfaction. This finding supports the reviewed literature in Section 2.2 on *Customer Satisfaction.*

The *Academic Staff* on offer at the Department of Computing Sciences also has a strong positive relationship ($r = 0.880$) with *Alumni Satisfaction.* This finding supports the reviewed literature where a strong positive correlation between the student perceptions of learning and the ranking of the instructor was identified by Stapleton and Murkison (2001). The success of a course offered by a university and the effectiveness of the instructor has commonly been measured by student evaluations (Guevara & Stewart, 2011; Khatimin et al., 2011; McDearmon, 2013; Mcgourty et al., 1999). The feedback generated is typically used to identify instructors who need additional training, courses that need to be restructured or financial rewards to be made available for those who excel. The principal objective of educating students is to give them what they can use and apply after graduating, regardless of the field of study. The Alumni perception of the extent of learning and the usefulness of the knowledge is a key measure for universities (Guevara & Stewart, 2011; Khatimin et al., 2011; McDearmon, 2013). However, the value of the learning cannot be perceived correctly until the students have to apply their knowledge and reflect on what was learnt. This finding suggests that Alumni place high value on the quality and professional competence of the academic staff at the Department of Computing Sciences.

The *Course Contents* on offer at the Department of Computing Sciences also has a strong positive relationship ($r = 0.874$) with *Alumni Satisfaction.* This finding supports the reviewed literature where students are influenced by various factors when selecting a course. Factors that have an influence are; dealings with staff (during application and

at open days), university location, clarity and quality of printed materials and the course content (Brown, Varley & Pal, 2009). The course content is considered to be of principal importance as the starting point for new students. As the *Course Contents* have a strong relationship with *Alumni Satisfaction*, the Department of Computing Sciences must maintain up-to-date and high-quality courses to positively influence and satisfy Alumni.

The *Perceived Value* on offer at the Department of Computing Sciences also has a strong positive relationship ($r = 0.862$) with *Alumni Satisfaction.* This finding supports the reviewed literature where the achievements of Alumni directly reflect on the university and any improvements to the quality of the education at the university automatically improves the perceived value of the graduate's degree (Egizii, 2015). A synergistic relationship is created by this connection between the Alumni and the university. Alumni bring real- world experience to the modern-day student and increase the perceived value that the university offers (Atkinson, Coleman & Blankenship, 2014; Egizii, 2015; Flegg, 2012).

The *Modern Technologies* on offer at the Department of Computing Sciences also have a strong positive relationship ($r = 0.828$) with *Alumni Satisfaction.* This finding supports the reviewed literature where universities must strategically use technology to support learning in ICT. The choice of ICT used and the way it is designed into study activities will create a positive attitude and efficient effective performance in ICT. Newer students may take existing technology for granted and the attitudes towards the usefulness and ease of use will play a strong role on willingness to develop new skills and technology usage (Calitz et al., 2014; Edmunds, Thorpe & Conole, 2012). The respondents placed a high value on the technology in use at the Department of Computing Sciences and found it to be adequate during their studies. As the *Modern Technologies* have a strong relationship with *Alumni Satisfaction*, the Department of Computing Sciences must frequently update the technology as ICT is a continuously fast-developing sector.

The *Admin. Staff* at the Department of Computing Sciences also has a strong positive relationship ($r = 0.812$) to *Alumni Satisfaction.* This finding supports the reviewed literature where administrative staff is key in the interface with students and contributes to a positive or negative experience at the university (Caballero et al., 2015). A wide

variety of duties in a university is taken care of by the administrative staff. Some of the functions performed are data entry clerks, analysts, secretaries, personal assistants and executives. University staff are required to be dedicated, efficient and have the ability to work both in a team and individually (O'Sullivan, 1994). As the *Admin. Staff* have a strong relationship with *Alumni Satisfaction* new staff recruited by the Department of Computing Sciences should be taught the same values of existing staff to uphold the high quality of service.

The *Social Environment* at the Department of Computing Sciences also has a medium positive relationship ($r = 0.773$) with *Alumni Satisfaction.* This positive correlation supports a well-designed social environment not only at the university, but also with the surrounding facilities. The university experience is often remembered for its social events and interactions and this has an impact on how satisfied Alumni are.

The *Alumni Network* at the Department of Computing Sciences also has a medium positive relationship ($r = 0.701$) to *Alumni Satisfaction.* This positive correlation is supported by the literature where Alumni are seen as the most important assets of a university. They are important assets as the university is represented in the real world by the Alumni (Chi et al., 2012; Rattanamethawong et al., 2015; Watt et al., 2013). Alumni groups are constantly evolving and have been in existence for decades. Changes have been accelerated in recent years with the development of the internet and social networking that facilitates global communication. Alumni networks are vital for universities to enhance their growth and development (Chi et al., 2012). As the *Alumni Network* has a medium positive relationship with *Alumni Satisfaction* the Department of Computing Sciences should develop the network further by frequent communication and involvement with the Alumni.

Service Guarantees have only a low positive correlation ($r = 0.204$) and any change in this factor is unlikely to influence *Alumni Satisfaction.* The low positive correlation is in contrast with the knowledge gained from the literature study as discussed in Section 2.2.3. This concept in education is not well known to the Alumni and many questions were asked during the survey about this concept. The respondents feel that this will add no real value to the *Alumni Satisfaction.* From the literature, *Service Guarantees* offered by a university can still generate feedback if there is dissatisfaction and failure (McCollough & Gremler, 1999; Song et al., 2015). Instructors can learn from students

and adapt the programme to better service future students who invoke guarantees. The increasing focus on student evaluations and teaching quality highlights the need to understand student dissatisfaction that can be better understood by offering a service guarantee.

4.4.3.2 Conclusion

The fourth research objective of this study was achieved in this section. The correlations in this study proved to be both statistically and practically significant. The positive correlations between *Service Guarantees, Customer Satisfaction, Course Contents, Modern Technologies, Academic Staff, Admin. Staff, Social Environment, Alumni Network and Perceived Value* with *Alumni Satisfaction* were shown and sorted according to strength. Based on the correlations measured, recommendations were made to the Department of Computing Sciences.

In the next section the fifth research objective of this study, which is to establish which factors have a greater effect on perceived value in the Department of Computing Sciences, will be discussed.
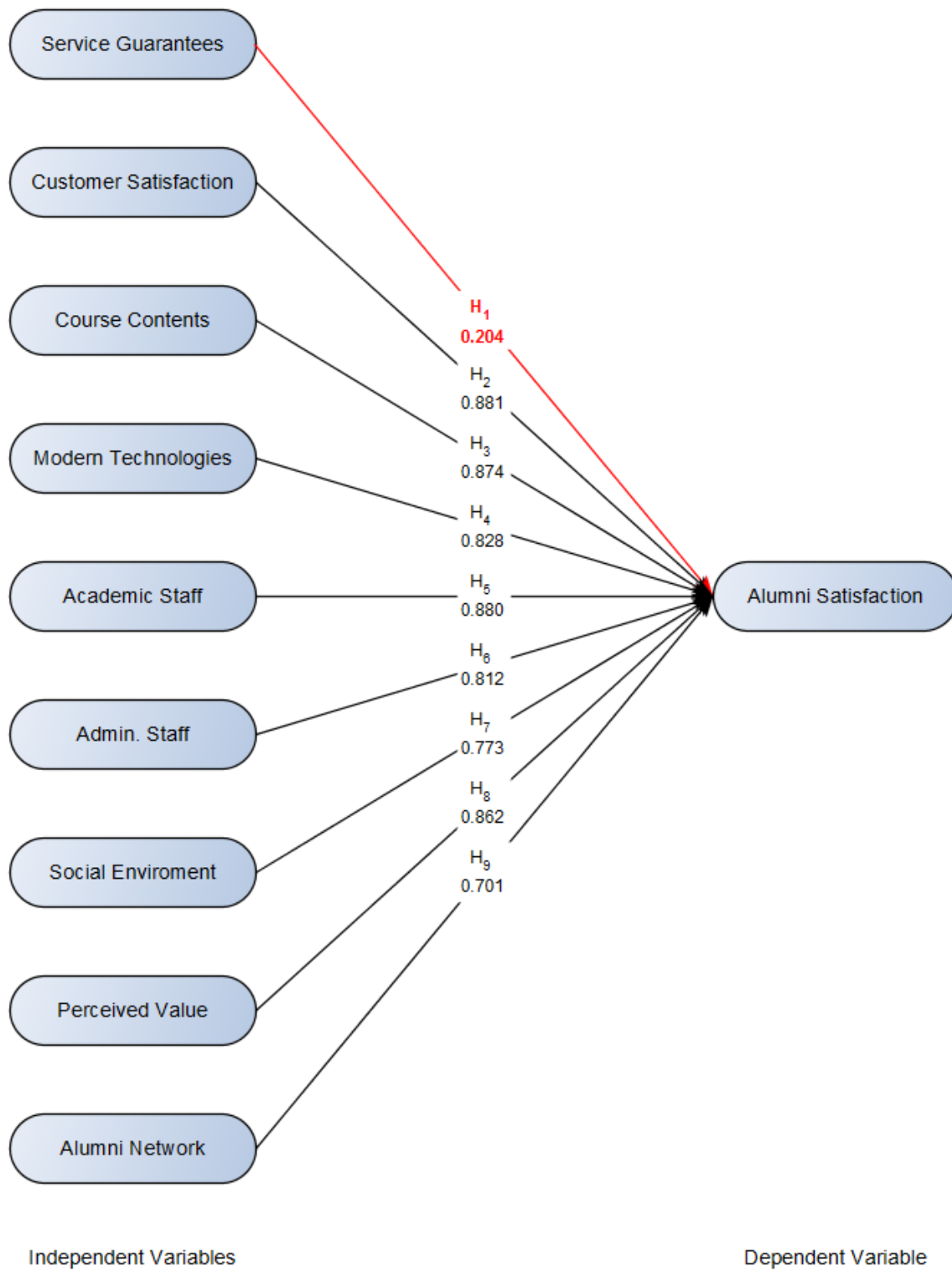
Figure 4.29 - Pearson Product Moment Correlations Factors with Alumni Satisfaction (n = 100).

4.4.4 *Establish which factors have a greater effect on Alumni satisfaction in the Department of Computing Sciences.*

The fifth research objective of this study is to establish which factors have a greater effect on Alumni satisfaction in the Department of Computing Sciences.

- **RO5:** Establish which factors have a greater effect on Alumni satisfaction in the Department of Computing Sciences.

Factors that influence *Alumni Satisfaction* were ranked according to the mean ratings given based by the respondents. A higher rating meant that respondents agreed more strongly with the statements given, where a lower rating meant that respondents disagreed with the statements given.

Variables	Rank	Signif. Group	Mean	SD
Customer Satisfaction	1	1	4.29	0.89
Academic Staff	1	1	4.26	0.73
Admin. Staff	1	1	4.25	0.69
Perceived Value	1	1	4.18	0.81
Technology	5	2	4.12	0.76
Course Content	5	2	4.05	0.87
Social Environment	5	2	4.04	0.76
Alumni Network	8	3	3.06	0.90

Table 4.9 - Inferential Ranking of Alumni Satisfaction variables (n=100)

4.4.4.1 *Data Analysis of Variable Mean Values*

From Table 4.9 the factors *Customer Satisfaction, Academic Staff, Admin. Staff* and *Perceived Value* were all ranked as number one with the means ranging from 4.18 to 4.29 for n=100. Respondents, in general, felt positive about these aspects and the performance of the Department of Computing Sciences. The respondents strongly believe that the Department of Computing Sciences is one of the best in South Africa, the service quality met their standards and they are satisfied with the service received by rating the *Customer Satisfaction* with an average mean score of 4.29.

For the *Academic Staff,* the mean of 4.26 indicate that respondents strongly believe that in the Department of Computing Sciences the academic staff are adequately qualified, gave clear explanations of subject content, had a good command of the subject content and made the Computing Sciences subjects interesting.

For the *Admin. Staff* the mean of 4.25 indicate that respondents strongly believe that in the Department of Computing Sciences the admin. staff are very knowledgeable, provide prompt answers to enquiries, provide great assistance and quickly resolved queries.

For the *Perceived Value,* the mean of 4.18 indicates that respondents believe that the Department of Computing Sciences provides good value. They recommend the department to colleagues, friends and family, choosing the department based on higher perceived value and when compared to other institutions they feel that they are fairly charged.

The factors *Technology, Course Content* and *Social Environment* were all ranked in fifth place with the means ranging from 4.04 to 4.12 for n=100. Respondents, in general, felt positive about these aspects and the performance of the Department of Computing Sciences.

For Technology*,* the mean of 4.12 indicated that respondents believed that the Department of Computing Sciences kept the technology up to date, that the technology in use was relevant to the course content, the technology was easily accessible and the technology available prepared them for industry.

For *Course Content,* the mean of 4.05 indicates that respondents believe that the Department of Computing Sciences creates a learning climate, encourages students to extend their analytical and critical thinking, the course content is aligned with industry requirements and the course content taught them how a concept could be applied to an actual problem or situation.

For the *Social Environment,* the mean of 4.04 indicates that respondents agree that they enjoyed the culture and atmosphere at the Department of Computing Sciences They agreed that learning about different cultures or perspectives was important for them and students assisted each other during their studies that also contributed to the overall social environment.

The factor *Alumni Network* ranked in eight place with a mean value of 3.06 for n=100 which is considerably lower than any of the other factors. Respondents, in general, felt neutral about this aspect of the Department of Computing Sciences. The respondents therefore did not agree or disagree with the statements that the Alumni network is important, that it provides adequate opportunity to meet new people on a professional or social level, that Alumni help each other or that they are satisfied overall with the Alumni network. The standard deviation for this factor was also greater than for any other factors (SD=0.9) indicating that there were greater variances in the responses from Alumni.

In order to improve the offering from the Department of Computing Sciences the lowest ranked factors should be addressed first in order to improve the Alumni Satisfaction and Perception. One of the possible reasons why the *Alumni Network* is ranked the lowest of all the factors is that the Department of Computing Sciences is not communicating with Alumni on the correct channels. From Figure 4.26 the most frequently used methods of communication are email, social media, SMS and telephone. In order to involve the Alumni and improve the *Alumni Network* these channels should be used more frequently to contact Alumni. The Alumni portal is not used often and currently is not an effective way to communicate with the Alumni. The Department of Computing Sciences needs to create greater awareness of this communication method or use it as a secondary communication channel.

This study did not focus on the Alumni events or frequency thereof that the Department of Computing Sciences uses in order to engage with the Alumni. Further research is recommended on this factor to better understand the reasons why the Alumni network is ranked lower.

4.4.4.2 Conclusion

This section established which factors have a greater effect on Alumni satisfaction in the Department of Computing Sciences thereby achieving the fifth research objective of this study. From the inferential ranking of Alumni Satisfaction that ranks the factors based on the average mean values, the factor that should be improved upon is the *Alumni Network*. Recommended improvements were suggested for the Department of Computing Sciences based on the statistical analysis of the survey results.

4.4.5 Establish the significance of the difference between Alumni satisfaction in the Department of Computing Sciences by graduate and postgraduate Alumni.

The sixth research objective of this study is to; 'Establish the significance of the difference between Alumni satisfaction of graduate and postgraduate Alumni in the Department of Computing Sciences'.

- **RO6:** Establish the significance of the difference between Alumni satisfaction of graduate and postgraduate Alumni in the Department of Computing Sciences.

Two sub-groups of the survey respondents were classified, namely graduate and postgraduate Alumni. The result was a relatively even split of the two sub-groups with a frequency distribution of 64% of the respondents having an graduate degree only and 36% with a postgraduate degree. In order to perform statistically significant tests by comparing the two subgroups, there must be enough respondents in each sub-group. The statistician that was consulted confirmed that the respondents in each group was sufficient.

4.4.5.1 Data Analysis of Variable Mean Values

The purpose of this section is to establish if the two sub-groups that are defined by different levels of education have different perceptions of the factors that were measured. If the two educational groups assigned significantly different values to *Admin. Staff* for example, it would practically mean that one group perceived the service received from the administrative staff to be of higher quality than the perception of the other group. In order to improve the service offering of the administrative staff greater efforts and resources can be focussed on the group with the lower perception of service quality.

The significance difference between the two sub-groups was tested by performing a Cohen's d calculation as described in Section 4.2.2.2. In order to conclude that there is a significant difference between sub-groups there must be both a statistical and practical significant difference. The differences found are highlighted in Table 4.10 below.

Variable	Postgraduate qualification	n	Mean	S.D	Difference	t	p(d.f.=98)	Cohen's d
Academic Staff	No	36	4.05	0.86	-0.34	-2.26	.026	0.47
	Yes	64	4.38	0.62				Small
Admin. Staff	No	36	4.22	0.76	-0.05	-0.32	.748	0.07
	Yes	64	4.27	0.65				Not Significant
Alumni Network	No	36	2.93	1.07	-0.20	-1.05	.296	0.21
	Yes	64	3.13	0.79				Small
Course Content	No	36	3.89	1.01	-0.25	-1.36	.177	0.27
	Yes	64	4.13	0.78				Small
Perceived Value	No	36	3.99	0.98	-0.29	-1.74	.085	0.35
	Yes	64	4.29	0.69				Small
Social Environment	No	36	3.93	0.86	-0.18	-1.15	.254	0.23
	Yes	64	4.11	0.70				Small
Technology	No	36	3.98	0.85	-0.21	-1.33	.187	0.27
	Yes	64	4.19	0.70				Small
ALUMNI SATISFACTION	No	36	3.86	0.74	-0.22	-1.62	.109	0.32
	Yes	64	4.07	0.57				Small
Customer Satisfaction	No	36	4.00	1.10	-0.45	-2.50	.014	0.52
	Yes	64	4.45	0.70				Medium
Teaching Guarantee	No	36	3.18	0.49	0.09	0.83	.410	0.18
	Yes	64	3.09	0.55				Not Significant

Table 4.10 - t-Tests: Factors by Postgraduate qualification – Graduate degree (n=36) vs Postgraduate (n=64)

From the data in Table 4.10 it can be seen that there is a significant difference between the perceptions of *Academic Staff* and *Customer Satisfaction* by graduate degree and postgraduate education Alumni. In both of these instances the postgraduate Alumni rated the factors that contribute to Alumni satisfaction higher than the graduate degree Alumni did. From Figure 4.30 it can be seen that two factors have significant differences between their means, these factors are *Academic Staff* and *Customer Satisfaction.* For the *Academic Staff* there is a small significant difference with a Cohen's d of 0.47. *Customer Satisfaction* has a medium significant difference Cohen's d of 0.52.

A possible explanation is that the postgraduate Alumni have been exposed to a wider range of services in the education sector due to their extended studies. Based on the services and teaching they have received elsewhere and the quality thereof their perception of the quality of service received at the Department of Computing Sciences has improved. Another possible explanation is that most of the Alumni with a

postgraduate degree studied during an earlier period at the Department of Computing Sciences and lecturers have changed during recent years.
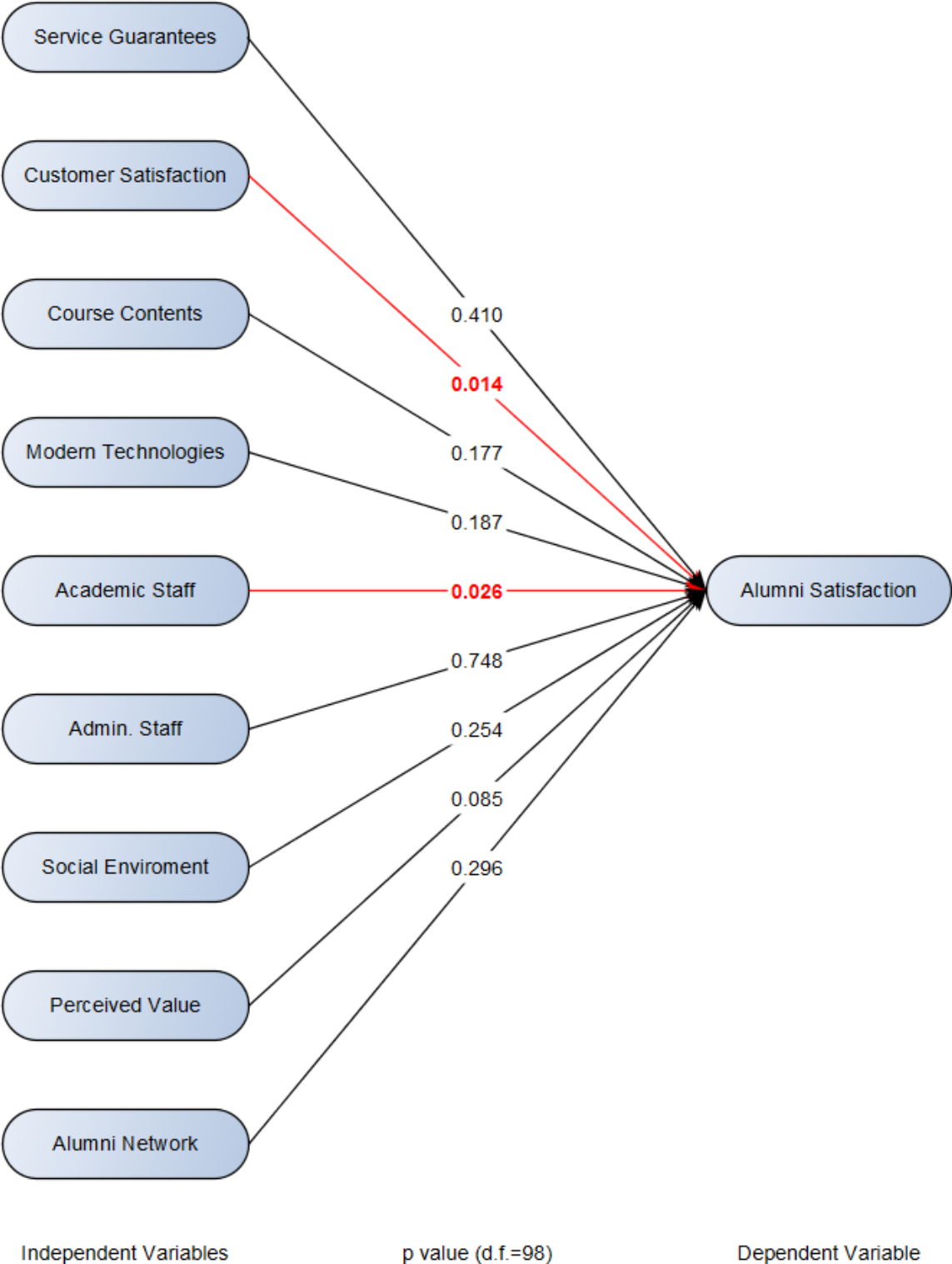
Figure 4.30 - t-Tests: Factors by Postgraduate qualification – Graduate degree (n=36) vs Postgraduate (n=64) on Alumni Satisfaction

By examining the standard deviation of both groups it can be seen that perception of both these factors is more consistent with the postgraduate Alumni than with the graduate degree Alumni. This indicated that the perceptions of the graduate degree Alumni varied to a greater extent than the group. Some graduate degree Alumni had very different experiences during their university experience as compared to the majority of the group. This can contribute to the significant differences between the two groups.

A recommendation that can be made to the Department of Computing Sciences is to develop and implement a regular survey on undergraduate students after completing each subject to measure their perception of the lecturer for each subject completed.

4.4.5.2 Conclusion

This section established that the two sub-groups which are defined by different levels of education have different perceptions of the factors that were measured and thereby achieve the sixth research objective of this study. It was shown that there is a small and medium significant difference in only two of the factors of the proposed Alumni satisfaction model by different levels of education. Recommended improvements were suggested for the Department of Computing Sciences based on the statistical analysis of the survey results.

4.5 Summary

This chapter addressed RQ_4 which states; "*What are the relationships between the independent and dependent variables of Alumni satisfaction in the Department of Computing Sciences?*", RQ_5 which states; "*Which factors in the proposed model for the Department of Computing Sciences have a higher correlation to Alumni satisfaction than other identified factors?*" and RQ_6 which states; "*What is the significance of the difference between the values as perceived by graduate degree and postgraduate Alumni of the Department of Computing Sciences?*". This chapter achieved the research objective of; "*Evaluate the proposed model of Alumni satisfaction in the Department of Computing Sciences*" (RO_4), "*Establish which factors have a greater effect on Alumni satisfaction in the Department of Computing Sciences*" (RO_5) and "*Establish the significance of the difference between Alumni satisfaction of graduate and postgraduate Alumni in the Department of Computing Sciences*" (RO_6).

In the next chapter the main research objective (RO_m) will be discussed. The research questions will be answered by presenting a summary of the main findings. A summary of the contributions will be presented with the knowledge gained from this study. Future research possibilities will be presented and possible limitations listed. Recommendations for the Department of Computing Sciences will be offered which are based on the literature and analysis of this study.

Chapter Five

5   CHAPTER 5: FINDINGS, RECOMMENDATIONS AND CONCLUSIONS

5.1   Introduction

The success of a course offered by a university and the effectiveness of the instructor have commonly been measured by means of student evaluations (Guevara & Stewart, 2011; Khatimin, Wahab & Mohamed, 2011; McDearmon, 2013; Mcgourty, Besterjeld-Sacre, Shuman & Wolfe, 1999). The feedback generated is typically used to identify instructors who need additional training, courses that need to be restructured or financial rewards to be made available for those who excel. The Alumni perception of the extent of learning and the usefulness of the knowledge is a key measure for universities to judge the quality of the service and product on offer(Guevara & Stewart, 2011; Khatimin et al., 2011; McDearmon, 2013).

McCollough & Gremler (1999) define a service guarantee as a formal promise made to customers about the service they will receive. In a service offering, in order to ensure customer satisfaction, the quality of service performance needs to be guaranteed (McColl & Mattsson, 2011; Tucci & Talaga, 1997). Many service industries promise a level of service performance, with or without conditions attached.

The Stakeholder theory suggests that the purpose of a business is to create as much value as possible for stakeholders and not only for the shareholders. Organisations gain a competitive advantage by involving the stakeholders as strategic resources in corporate decisions and this practice is even considered as an ethical requirement (Plaza-úbeda, Burgos-Jiménez & Carmona-Moreno, 2014).

A definition of customer value is the perceived value that the customer gains when purchasing a product or receiving a service (Dovaliene, Masiulyte & Piligrimiene, 2015; Fraering & Minor, 2013; Landroguez, Castro & Cepeda-Carrión, 2011; Rodrigues, Nappi & Rozenfeld, 2014; Sheehan & Bruni-Bossio, 2015; Song, Cadeaux & Yu, 2015; Wouters & Kirchberger, 2015). However, Martelo Landroguez, Barroso Castro & Cepeda-Carrión (2013) note that customer value can be used in a variety of contexts.

The success of a course offered by a university and the effectiveness of an instructor have commonly been measured by means of student evaluations (Guevara & Stewart, 2011; Khatimin et al., 2011; McDearmon, 2013; Mcgourty et al., 1999). The feedback generated is typically used to identify instructors who need additional training, courses that need to be restructured or financial rewards to be available for those who excel. The Alumni perception of the extent of learning and the usefulness of the knowledge purveyed is a key measure for universities (Guevara & Stewart, 2011; Khatimin et al., 2011; McDearmon, 2013).

Alumni are seen as the most important assets of a university. They are important assets as the university is represented in the real world by the Alumni (Chi, Jones & Grandham, 2012; Rattanamethawong, Sinthupinyo & Chandrachai, 2015; Watt, Norton & Jones, 2013).

This study's main research objective (RO_m) was to measure the perception and satisfaction of Alumni of the Department of Computing Sciences and identify areas for improvement. In Section 5.2 the research questions are each answered presenting a summary of the main findings. A summary of the contributions is presented in Section 5.3 with the knowledge gained from this study. Future research possibilities are presented in Section 5.4 and possible limitations are listed in Section 5.5. Recommendations for the Department of Computing Sciences are offered in Section 5.6 which are based on the literature and analysis of this study. The chapter concludes with Section 5.7. Figure 5.1 shows the overview of this chapter.
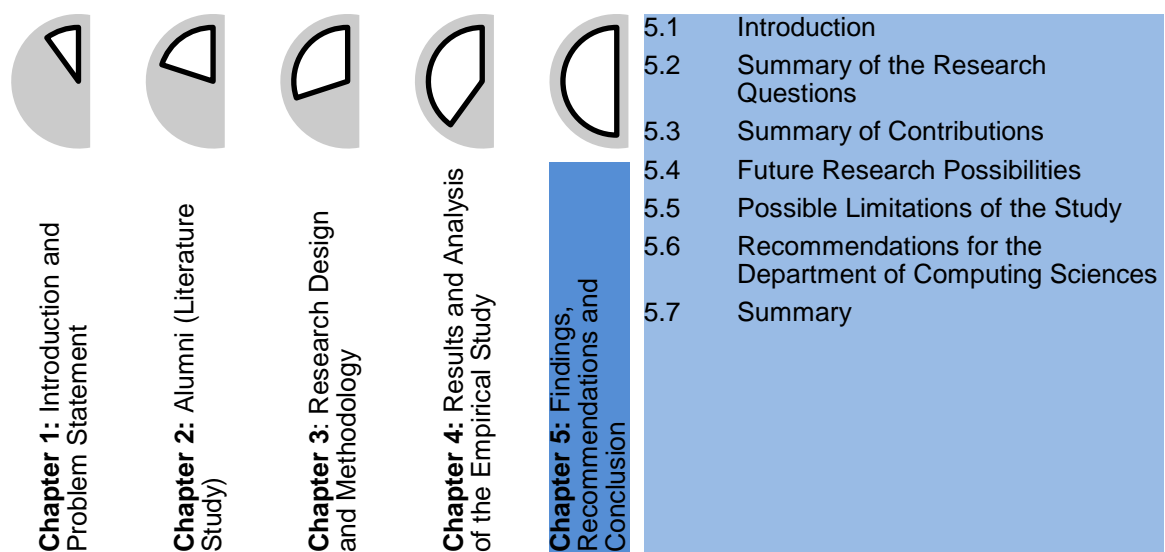
Figure 5.1 - Overview of Chapter 5

5.2 Summary of the Research Questions

In order to analyse the main research problem effectively, five questions were identified and investigated in this research study. The following section provides a summary of the findings.

The Main Research Question (RQ_M) was formulated based on the Main Research Objective and was stated as; "*What are the perceptions of graduate and postgraduate Alumni of the Department of Computing Sciences?*". In order to analyse the main research problem effectively, five sub-questions (RQ_1 - RQ_6) were identified, based on the secondary research objectives, in order to suggest solutions to this main problem.

The questions that needed to be answered were:

- **RQ_1:** What is the importance of Alumni satisfaction with the Department of Computing Sciences?
- **RQ_2:** Which factors should be included in a proposed model for the perception of Alumni in the Department of Computing Sciences?

- **RQ_3:** How can a detailed description of the research methodology be provided in order to understand and reproduce this research study in future?
- **RQ_4:** What are the relationships between the independent and dependent variables of Alumni satisfaction in the Department of Computing Sciences?
- **RQ_5:** Which factors in the proposed model for the Department of Computing Sciences have a higher correlation to Alumni satisfaction than other identified factors?
- **RQ_6:** What is the significance of the difference between Alumni satisfaction in the Department of Computing Sciences as perceived by graduate and postgraduate Alumni?

5.2.1 Research Question RQ_1

Research Question 1 (RQ_1) stated; "*What is the importance of Alumni satisfaction with the Department of Computing Sciences?*". The literature study in Chapter 2 answered this question by identifying the various factors. The concepts of Alumni and student evaluations were introduced. The unique features of Alumni surveys compared with student surveys were highlighted and the useful results that can be obtained from an Alumni survey were highlighted. The uniqueness of Alumni surveys, which feature above student surveys in assessing the quality of the education received after graduating was shown.

The value of Alumni was highlighted by showing the importance of and understanding the value of Alumni. Alumni also provide valuable insight and valuable feedback to improve university offerings.

5.2.2 Research Question RQ_2

Research question two (RQ_2) stated; "*Which factors should be included in a proposed model for the perception of Alumni in the Department of Computing Sciences?*". The literature study in Chapter 2 continued to answer this question by identifying various factors. Concepts of service guarantees, consumer satisfaction and how customers perceive these guarantees were introduced. Guarantees were further broken down into conditional and unconditional guarantees and service guarantees in education. The market signalling theory, investment theory and being focused on the customer were discussed. The benefits of including service guarantees in education and treating

students as customers were identified. The importance of understanding the needs, wants and expectations of customers were then highlighted. How to establish a service guarantee with customer focus in mind was explained as well as how a well-designed guarantee can positively influence business profitability.

The investment theory, that views a guarantee as a risk management instrument was discussed. In a university where a service is provided, the student might perceive risk in enrolling for a class and offering a guarantee might be an effective tool in reducing the risk.

The concepts of shareholder and stakeholder theory were discussed. The importance of understanding the benefits of a stakeholder approach over a more traditional shareholder approach were mooted. The benefits of treating students as stakeholders and using feedback from Alumni were identified from the literature. Then teaching models in a stakeholder university were identified. The factors that might influence the perceptions of Alumni of an educational institution were listed as course contents, modern technologies, academic and administrative staff roles, the university atmosphere and supporting departments.

The concepts of customer value and perceived value were then introduced. The section continued by identifying perceived value as well as how Alumni create value for the university. The benefits of delivering value to the customer and of increasing the perceived value of the service through the Alumni were highlighted. The perceived value that the customer gains when purchasing a product or receiving a service was emphasised. The importance to a firm, to the extent to which it delivers value to the customers and how the achievements of Alumni directly reflect on the university were shown.

The last section of Chapter 2 answered RQ$_2$ by identifying, from literature, characteristics affecting Alumni satisfaction as: *Service Guarantees, Customer Satisfaction, Course Contents, Modern Technologies, Academic Staff, Admin. Staff, Departments, University Atmosphere* and *Perceived Value.*

5.2.3 Research Question RQ$_3$

Research question three (RQ$_3$) stated; "*How can a detailed description of the research methodology be provided in order to understand and reproduce this research study in*

future?". Chapter 3 answered the research question by proving that the research methodology used for this research study had sufficient detail to allow it to be reproduced in future.

The research and the various paradigms namely positivistic and quantitative paradigms were defined. The process followed for this study and the purpose of the literature review was explained. The various hypotheses from the proposed model for this research were formulated. The survey design, pilot study and sampling methods were discussed and data collection and data analysis were explained. The concepts of validity, reliability and generalisability were discussed as well as the topic of ethics, the relevance thereof and how it applied to this study.

5.2.4 Research Question RQ₄

Research Question 4 (RQ$_4$) stated; *"What are the relationships between the independent and dependent variables of Alumni satisfaction in the Department of Computing Sciences?"*. Chapter 4 answered the research question by first explaining various univariate and multivariate data analyses and interpretation methods applied in this study.

Throughout Section 4.3 the data captured by the empirical study covering the biographical data, Alumni perception of the Department of Computing Sciences, communication methods used by Alumni and the Graduate Degree course experience were illustrated and discussed. The various factors, Independent variables, and the Dependent variable were illustrated and discussed by using descriptive statistics that consisted mainly of frequency distributions. In Section 4.2.2, research Question 4 (RQ$_4$) was answered by accepting or rejecting the hypothesised relationships by using inferential statistics in the form of Pearson Coefficients. The importance of each factor was identified to understand how to improve the Alumni perception.

5.2.5 Research Question RQ₅

Research Question 5 (RQ$_5$) stated; *"Which factors in the proposed model for the Department of Computing Sciences have a higher correlation to Alumni satisfaction than other identified factors?"*. Section 4.4.4 answered the research question by the use of inferential Ranking of Alumni Satisfaction and Pearson Product Moment

Correlations. From the inferential ranking of Alumni Satisfaction that ranks the factors based on the average mean values, the factor that should be improved upon is the Alumni Network. Recommended improvements were suggested for the Department of Computing Sciences based on the statistical analysis of the survey results.

5.2.6 Research Question RQ_6

Research Question 6 (RQ_6) stated; *"What is the significance of the difference between Alumni satisfaction in the Department of Computing Sciences as perceived by graduate and postgraduate Alumni?".* Section 4.4.5 of Chapter 4 answered this research question. This section established that the two sub-groups which are defined by different levels of education have different perceptions of the factors that were measured and thereby achieved the sixth research objective of this study. It was shown that there is a small and medium significant difference in only two of the factors of the proposed Alumni satisfaction model indicated by different levels of education. Recommended improvements were suggested for the Department of Computing Sciences based on the statistical analysis of the survey results.

5.2.7 Main Research Question RQ_m

The main research question (RQ_m) states; *"What are the perceptions of graduate and postgraduate Alumni of the Department of Computing Sciences?".* In order to suggest solutions to the main research problem, five sub-questions (RQ_1 to RQ_5) were identified and investigated.

The main research question (RQ_m) was answered by developing and testing the hypothesised Alumni Satisfaction model as shown in Figure 5.2. This model identified the following factors as having an influence on Alumni Satisfaction with the NMMU Department of Computing Sciences: C*ustomer Satisfaction, Course Contents, Modern Technologies, Academic Staff, Admin. Staff, Departments, University Atmosphere* and *Perceived Value.*

5.3 Summary of Contributions

The research conducted in this study contributed to the existing body of knowledge on the subject of Alumni Perception of the NMMU Department of Computing Sciences by making the following contributions:

- A proposed new Alumni Satisfaction Model of the NMMU Department of Computing Sciences. The basis of this model is from literature reviewed on Service Guarantees and Marketing, Stakeholder Theory, Customer Perceived Value and Alumni Perceptions;
- A method to measure the Alumni Satisfaction of the Department of Computing Sciences was developed;
- Marketing at the Department of Computing Sciences can make use of the Alumni Satisfaction model in order to recognize factors that are important for Alumni and students and factors that are not important or need to be adapted. This model is shown in Figure 5.2;
- Factors of the Alumni Satisfaction model which have to be improved in order to gain a competitive advantage over other universities; and
- How to improve communication with Alumni and focus on channels and social media that the majority of Alumni use.
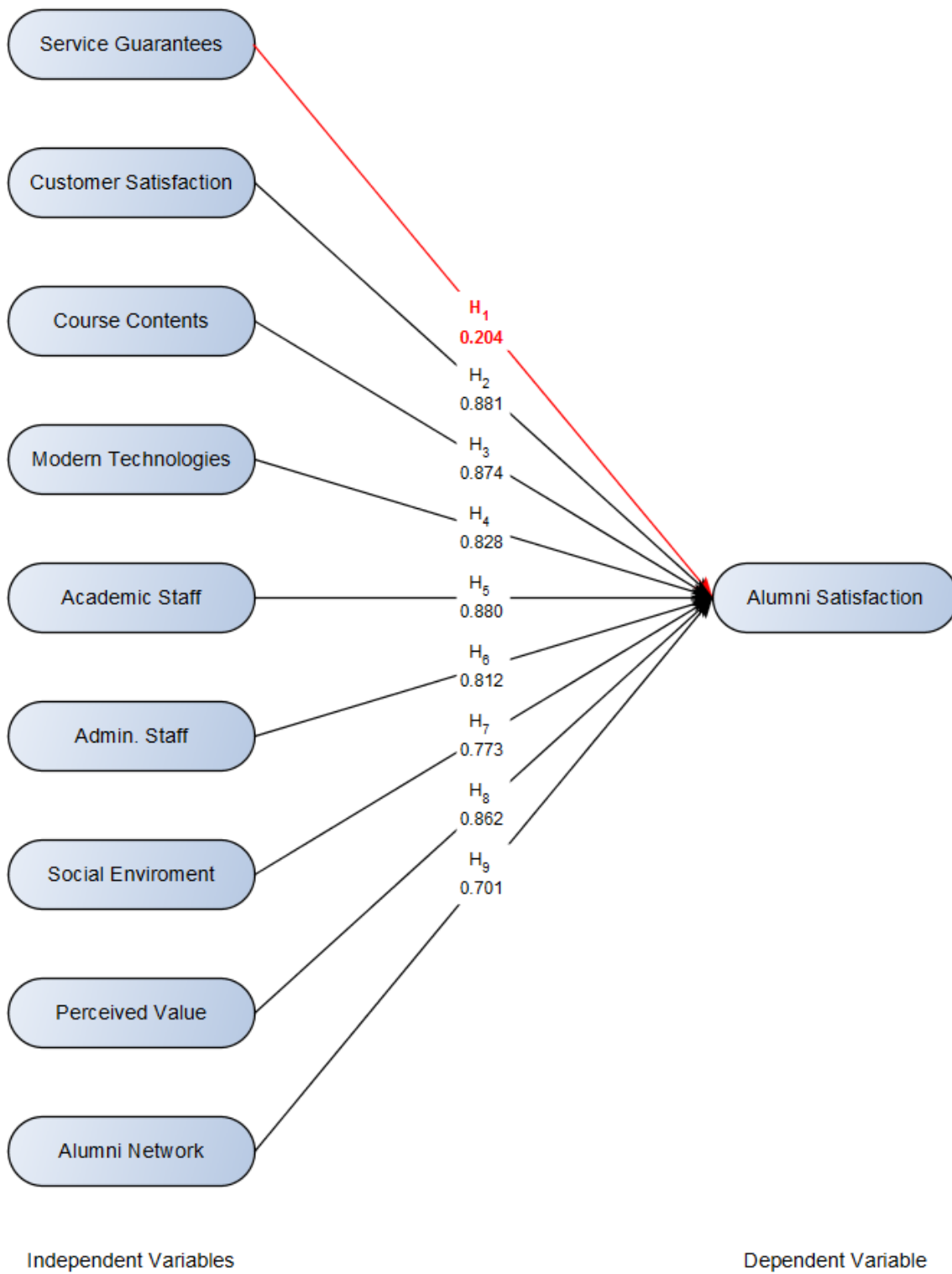
Figure 5.2 - Alumni Satisfaction Model of the NMMU Department of Computing Sciences

5.4 Future Research Possibilities

Throughout this study, there are numerous possibilities that have been identified for future research. A list of some of the opportunities are shown below:

- Develop the Alumni Satisfaction model, so that it can be applied to other departments or business units at the NMMU or other universities in South Africa. A larger sample size will provide advanced statistical analysis where the model can be evaluated further;
- Further in-depth research can be conducted to understand why there are differences between the perception of graduate degree and postgraduate Alumni and how to address their various needs;
- In order to better market the Department of Computing Sciences at the NMMU to new students, further in-depth research can be conducted to identify strategies to improve alignment with industry and market requirements;
- Further in-depth research into the alignment of current subjects and programming languages to real world requirements could be conducted to improve the quality of the subjects on offer for future students and Alumni; and
- Communication methods to Alumni can be researched further to improve the current Alumni network and improve involvement from all stakeholders in the Department of Computing Sciences.

5.5 Possible Limitations of the Study

Certain possible limitations of this research study identified are listed below:

- Computing Science evolves quickly with new programming languages, hardware and methods being introduced frequently. This study had respondents that had studied at the NMMU over 30 years ago. As they are a crucial part of the Alumni and courses were very different 30 years ago this study could be adapted to more accurately capture their perception;
- Due to the limited number of respondents, limited statistical information was available. More detailed statistical information could have been extracted if the study was accessible for a longer period; and

- Reponses from Alumni that graduated more recently would be more accurate than those from decades ago with a better representation of the current product and service offering from NMMU.

5.6 Recommendations for the Department of Computing Sciences

In the research study, various real-world recommendations were made for the Department of Computing Sciences. These recommendations are based on the literature reviewed and the statistical analysis performed.

5.6.1 Importance of identified factors in the Alumni Satisfaction Model

In Section 4.4.2 it was shown that there exists a relationship between the Dependent variable *Alumni Satisfaction*, and the independent variables, *Customer Satisfaction, Course Contents, Modern Technologies, Academic Staff, Admin. Staff, Social Environment, Perceived Value* and *Alumni Network* by using Pearson's product-moment correlation coefficient to measure the linear association between the variables. It was shown that there is no relationship between the Dependent variable *Alumni Satisfaction*, and the independent variable *Service Guarantees.*

5.6.1.1 Findings of Factor Correlations to Alumni Satisfaction

An important finding was the strong positive relationship between *Customer Satisfaction* and *Alumni Satisfaction.* A student, as a satisfied customer, becomes a satisfied alumnus. The Department of Computing Sciences should assign sufficient resources and prioritise this factor, as any perceived change would have a significant effect on the Alumni Satisfaction.

The *Academic Staff* on offer at the Department of Computing Sciences had a strong positive relationship with *Alumni Satisfaction.* This was supported by the reviewed literature where a strong positive correlation between the student perceptions of learning and the ranking of the instructor was identified by Stapleton and Murkison (2001). This finding suggested that Alumni place high value on the quality and professional competence of the academic staff at the Department of Computing Sciences. It is recommended that the same high quality standard be applied with future academic staff appointments at the Department of Computing Sciences.

The *Course Contents* on offer at the Department of Computing Sciences were strongly positive to *Alumni Satisfaction.* This finding was supported by the reviewed literature where students are influenced by various factors when selecting a course. Factors that were identified as influential were dealings with staff, university location, clarity and quality of printed materials and the course content (Brown, Varley & Pal, 2009). The course content was considered to be of principal importance as the starting point for new students. As the *Course Contents* had a strong relationship with *Alumni Satisfaction* the Department of Computing Sciences should maintain up to date and high quality courses to positively influence and satisfy Alumni.

The *Perceived Value* on offer at the Department of Computing Sciences had a strong positive relationship to *Alumni Satisfaction.* This finding supported the reviewed literature where the achievements of Alumni directly reflected on the university and any improvements to the quality of the education at the university automatically improves the perceived value of the graduate's degree (Egizii, 2015). The recommendation was that the Department of Computing Sciences should maintain this perceived value which is a high quality offering at a reasonable price.

The *Modern Technologies* on offer at the Department of Computing Sciences had a strong positive relationship to *Alumni Satisfaction.* This finding supported the reviewed literature where universities strategically used technology to support learning in ICT. The respondents placed a high value on the technology in use at the Department of Computing Sciences and found it to be adequate during their studies. The recommendation was that as *Modern Technologies* have a strong relationship with *Alumni Satisfaction* the Department of Computing Sciences must frequently update the technology, because ICT is a continuously, fast -developing sector.

The *Admin. Staff* at the Department of Computing Sciences had a strong positive relationship with *Alumni Satisfaction.* This finding supported the reviewed literature where administrative staff is key in the interface to students and contributed to a positive or negative experience at the university (Caballero et al., 2015). Due to the strong relationship between *Admin. Staff* and *Alumni Satisfaction,* the Department of Computing Sciences should teach new staff the same values of existing staff to uphold the high quality of service.

The *Social Environment* at the Department of Computing Sciences had a medium positive relationship with *Alumni Satisfaction.* This positive correlation supported a well-designed social environment not only at the university, but also at the surrounding facilities. The university experience is often remembered for its social events and interactions and therefore the Department of Computing Sciences should organise and support these events to build on the social experience.

The *Alumni Network* at the Department of Computing Sciences had a medium positive relationship with *Alumni Satisfaction.* This positive correlation was supported by the literature where Alumni are seen as the most important assets of a university. They are important assets as the university is represented in the real world by the Alumni (Chi et al., 2012; Rattanamethawong et al., 2015; Watt et al., 2013). It was found that Alumni networks are vital for universities to enhance their growth and development (Chi et al., 2012). Due to the medium positive relationship between *Alumni Network* and *Alumni Satisfaction* the Department of Computing Sciences should develop the network further by frequent communication and involvement with the Alumni.

Service Guarantees only had a low positive correlation and any change in this factor was unlikely to influence *Alumni Satisfaction.* The low positive correlation was in contrast with the knowledge gained from literature study as discussed in Section 2.2.3. As this concept in education is not well known to the Alumni, many questions were asked during the survey about this concept. The respondents felt that there was no real value added to *Alumni Satisfaction.* From the literature, *Service Guarantees* offered by a university could still generate feedback in cases of dissatisfaction and failure (McCollough & Gremler, 1999; Song et al., 2015). The Department of Computing Sciences could still learn from students who invoke guarantees and adapt the programme to service future students better.

5.6.1.2 *Factors that had a greater effect on Alumni satisfaction in the Department of Computing Sciences*

Section 4.4.4 established which factors had a greater effect on Alumni satisfaction in the Department of Computing Sciences. From the inferential ranking of Alumni Satisfaction, the factor that should be improved upon was the *Alumni Network*. Recommended improvements were suggested for the Department of Computing Sciences based on the statistical analysis of the survey results.

A mismatch in the communication methods for the Department of Computing Sciences was also identified were the methods of communication. Those most frequently used by the respondents were email, social media, SMS and telephone as illustrated in Figure 4.26. A recommendation to involve the Alumni and improve the *Alumni Network* was that these channels should be used more frequently to contact Alumni. The Alumni portal was not used often and currently was not an effective way to communicate with the Alumni. The Department of Computing Sciences needs to create greater awareness of this communication method or use it as a secondary communication channel.

5.6.1.3 Difference between Alumni satisfaction in the Department of Computing Sciences by graduate and postgraduate Alumni.

Section 4.4.5 established that the two sub-groups that are defined by different levels of education had different perceptions of the factors that were measured. It was shown that there is a small and medium significant difference in only two of the factors of the proposed Alumni satisfaction model defined by different levels of education. A recommendation was made to the Department of Computing Sciences to develop and implement a regular survey on undergraduate students after completing each subject to measure their perception of the lecturer.

5.7 Summary

The main research objective of this study was to measure the perception and satisfaction of Alumni of the Department of Computing Sciences and identify areas for improvement. In order to achieve this objective, the following was performed:

- Established the importance of customer satisfaction in the Department of Computing Sciences by performing a literature review on Service Guarantees and Marketing, Stakeholder Theory, Customer Perceived value and Alumni Perceptions;
- Factors were identified that influence the perception of Alumni in the Department of Computing Sciences and a proposed model was developed;
- Described the research methodology used for this research study in sufficient detail to allow it to be reproduced in future;

- Evaluated the proposed model of Alumni satisfaction in the Department of Computing Sciences;
- Established which factors had a greater effect on Alumni satisfaction in the Department of Computing Sciences; and
- Established the significance of the differences between Alumni satisfaction in the Department of Computing Sciences of graduate degree and postgraduate Alumni.

The Alumni Satisfaction model development in this study specified the factors that influence the Alumni Satisfaction of the Department of Computing Sciences and the effect that each of these factors has on satisfaction.

The main problem that was addressed by this study, namely, what are the perceptions of graduate and postgraduate degree Alumni on the Department of Computing Sciences, was effectively addressed.

Improvements to the model were recommended in the study, future research possibilities were identified, possible limitations were highlighted and recommendations for the Department of Computing Sciences based on the analysis were made.

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7   APPENDICES

Appendix A: Questionnaire

Dear NMMU Department of Computing Sciences Alumni,

My name is Arthur Glaum; I am studying towards a Masters in Business Administration (MBA) degree at the Nelson Mandela Metropolitan University (NMMU) Business School. I am conducting research on the perceptions of NMMU Alumni regarding the NMMU Department of Computing Sciences. I believe this research will make an important contribution towards the enhancement and marketing of the programme, provide strategic insight, enhance the student experience and build a stronger Alumni association. As a key stakeholder of the institution, you are one of the selected sample of respondents whose views are highly respected. We would therefore appreciate if you could answer all the questions of this survey. It should not take more than fifteen minutes of your time and we thank you kindly in advance for your co-operation.

There are no right or wrong answers. Please follow the instructions for each question and answer as accurately as possible. The survey is strictly confidential and respondents will remain anonymous. Please further note that your participation in this study is entirely voluntary and you have the right to withdraw at any stage.

The results of this research will be submitted to the NMMU in partial fulfilment of an MBA and the outcome of this study will be made available to the public by the university. It will be greatly appreciated if you could complete this by Monday, 10th October 2016. Should you require any further information, please contact me at arthur.glaum@gmail.com or on 083 417 2103.

The survey can be completed online at
http://forms.nmmu.ac.za/websurvey/q.asp?sid=1710&k=zzmfosxyrn

By following the link, you consent that you are willing to answer the questions in this survey.

Thank you for your participation.

Kind Regards,

Arthur Glaum

To verify the authenticity of the study, please contact Prof. André Calitz at +27 (0)41 504 2639 / Andre.Calitz@nmmu.ac.za or Prof. Jean Greyling at +27 (0)41 504 2081 / Jean.Greyling@nmmu.ac.za

Please place a tick next / select from drop down box / enter in field for each selection. One tick per question. Complete all questions unless states otherwise.

1 of 14. Demographic Data

1.1	Gender	**Male**	**Female**

1.2	What is your undergrad qualification?	**BSc CS**	**BSc IS**	**BCom CS & IS**	**BCom IS**	**BCom Rat**	**Other**

1.3	Year of Completion (value between 1970 and 2015):	

1.4	If you completed a postgraduate Degree in the Depertment of Computing Sciences, what is your highest qualification?	**Honours**	**Masters**	**Doctorate**

1.5	Year of Completion (value between 1970 and 2015):	

1.6	Any Other Degrees (if applicable; ex. MBA)	

1.7	Age	**20 - 24**	**25 - 34**	**35 - 44**	**45 - 54**	**55 +**

1.8	Where do you reside?	Eastern Cape	Free State	Gauteng	KwaZulu-Natal	Limpopo
		Mpumalanga	Northern Cape	North West	Western Cape	Country Outside SA

1.9	Which city do you live in?	

1.10	Years in ICT Industry	< 5 years	5 – 9 years	10 – 19 years	20+ years

1.12	Company where you are employed *(Optional)	

1.13	Current Job Title	

1.14	Your Job Title when you started?	

1.15	In what industry sector are you currently employed / self-employed in? (If unemployed, the industry sector prior to unemployment) Please tick the most appropriate box.	
Government		
Manufacturing		
Financial Services		

Pharmaceutical	
Agriculture	
Mining	
Education	
Management Consulting	
Health Services	
Retail	
Services	
Information Technology/Telecommunications	
Electricity/Water Services	
Other	

1.16	Company size in number of employees	1 – 9 employees	10 – 99 employees	100 – 999 employees	1000 – 4999 employees	5000 + employees

1.17	Are you self-employed?	Yes	No

Please indicate how strongly you agree or disagree with each statement by selecting the appropriate number from 1 - 5. Complete all questions.

2 of 14. Academic Staff in Department of Computing Sciences					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

2.1	The academic staff were adequately qualified.	1	2	3	4	5
2.2	Academic staff had a good command of the subject content.	1	2	3	4	5
2.3	Academic staff gave clear explanations of subject content.	1	2	3	4	5
2.4	Academic staff used appropriate resources to explain the subject contents.	1	2	3	4	5
2.5	Academic staff made it easy to understand the CS subjects.	1	2	3	4	5
2.6	Academic staff made the CS subjects interesting for me.	1	2	3	4	5
2.7	During the course, students knew the assessment criteria for the CS subjects.	1	2	3	4	5
2.8	Overall I was satisfied with the academic staff.	1	2	3	4	5

3 of 14. Admin. & Technical Staff in Department of Computing Sciences

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.1	Department of Computing Sciences admin. staff are very knowledgeable.	1	2	3	4	5
3.2	I received prompt answers to my enquiries from Department of Computing Sciences admin. staff.	1	2	3	4	5
3.3	My problems were always quickly resolved by Department of Computing Sciences admin. staff.	1	2	3	4	5
3.4	The student assistants (Demi's) in the Department of Computing Sciences was of great assistance.	1	2	3	4	5

3.5	I was satisfied with the service I received from the Administrative & Technical staff.	1	2	3	4	5

4 of 14. Technology used in the Department of Computing Sciences.

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
4.1	Technology utilised at the Department of Computing Sciences was kept up to date.	1	2	3	4	5
4.2	The technology at Department of Computing Sciences was relevant to the subject content.	1	2	3	4	5
4.3	The technology at Department of Computing Sciences was easily accessible.	1	2	3	4	5
4.4	The Internet and communication technology was suitable at Department of Computing Sciences.	1	2	3	4	5
4.5	The technology (hardware and software) available at the Department of Computing Sciences prepared me for a job in Industry.	1	2	3	4	5
4.6	I was satisfied with the technology available at the Department of Computing Sciences.	1	2	3	4	5

5 of 14. CS & IS Course Content

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.1	The course content taught me how a concept could be applied to an actual problem or situation.	1	2	3	4	5

5.2	Department of Computing Sciences creates a learning climate.	1	2	3	4	5
5.3	Department of Computing Sciences encourages students to extend their analytical and critical thinking.	1	2	3	4	5
5.4	The course content is aligned to industry requirements.	1	2	3	4	5
5.5	I was satisfied with the course content provided during my studies at the Department of Computing Sciences.	1	2	3	4	5

6 of 14. Teaching Guarantee

In education, universities with intangible products can use a guarantee to improve the teaching quality on offer. Some universities have now included a guarantee in the service offered. With this in mind, please answer the following questions.

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6.1	The concept of a teaching guarantee is a good idea.	1	2	3	4	5
6.2	A teaching guarantee would be important for me.	1	2	3	4	5
6.3	A teaching guarantee can add value to the Department of Computing Sciences in providing service excellence.	1	2	3	4	5
6.4	A teaching guarantee will only offer what is expected.	1	2	3	4	5
6.5	A teaching guarantee will compensate students for their complaints.	1	2	3	4	5

6.6	Invoking the teaching guarantee would affect the student negatively in class.	1	2	3	4	5
6.7	I feel a teaching guarantee would be difficult to enforce as the performance of the tutor is open for interpretation.	1	2	3	4	5

7 of 14. Service Perception

Viewing yourself as a customer of the Department of Computing Sciences and reflecting on the service received, please respond to the following statements.

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.1	I see the Department of Computing Sciences as one of the best in South Africa.	1	2	3	4	5
7.2	The service quality at Department of Computing Sciences met my expectations.	1	2	3	4	5
7.3	I feel satisfied with this Department of Computing Sciences overall performance in delivering its services.	1	2	3	4	5
7.4	I believe that Department of Computing Sciences has established procedures address student needs.	1	2	3	4	5
7.5	Overall I was satisfied with the service received from the Department of Computing Sciences.	1	2	3	4	5

8 of 14. University Culture & Atmosphere

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
8.1	Learning about different cultures or perspectives was an important part of university education.	1	2	3	4	5
8.2	I enjoyed the culture and atmosphere at Department of Computing Sciences.	1	2	3	4	5
8.3	Contact with other individuals different from me is an essential part of my university education.	1	2	3	4	5
8.4	Friendships were made among students in my classes.	1	2	3	4	5
8.5	Students assisted each other during their studies at the Department of Computing Sciences.	1	2	3	4	5
8.6	I'm overall satisfied with the culture and atmosphere in the Department of Computing Sciences.	1	2	3	4	5

9 of 14. Perceived Value

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
9.1	Based on the value received I would recommend Department of Computing Sciences to colleagues / friends / family.	1	2	3	4	5
9.2	Compared to alternative educational institutions, Department of Computing Sciences charges me fairly for similar products/services.	1	2	3	4	5
9.3	The reason I chose to study at the Department of Computing Sciences was due to the higher perceived value.	1	2	3	4	5

9.4	Overall I'm satisfied with the value received from the Department of Computing Sciences.	1	2	3	4	5

10 of 14. Department of Computing Sciences Alumni Network						
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
10.1	The Alumni network is important to me.	1	2	3	4	5
10.2	The Alumni network provides adequate opportunity to meet new people on a professional level.	1	2	3	4	5
10.3	The Alumni network provides adequate opportunity to meet new people on a social level.	1	2	3	4	5
10.4	Alumni help fellow Alumni on a professional level.	1	2	3	4	5
10.5	In our company we hire Alumni from the Department of Computing Sciences.	1	2	3	4	5
10.6	Overall I was satisfied with the Department of Computing Sciences Alumni network.	1	2	3	4	5

Please indicate how often you use the following communication methods:

11 of 14. Communication						
		Never	Daily	Weekly	Monthly	Once a year
11.1	Email					

11.2	Social Media					
11.3	Department of Computing Sciences Website					
11.4	Alumni Portal					
11.5	Telephone					
11.6	SMS/Text/Instant Messaging					
11.7	Video Conferencing					
11.8	Traditional Mail					
11.9	E-Newsletters					
11.10	Paper based newsletters/magazines					

Please indicate how often you use the following social media platforms:

12 of 14. Social Media Platforms		Never	Daily	Weekly	Monthly	Once a year
12.1	Facebook					
12.2	Twitter					
12.3	LinkedIn					
12.4	YouTube					
12.5	Pinterest					
12.6	Instagram					
12.7	Snapchat					
12.8	Periscope					

12.9	Tumblr					
12.10	Other					

Please provide feedback on your Under Graduate degree course experience:

13 of 14. Under Graduate degree course experience		
13.1	Which under-graduate Computing Sciences course(s) did you find relevant?	
13.2	Which undergraduate Computing Sciences course(s) did you find less relevant?	
13.3	Which undergraduate Computing Sciences course(s) should the Department of Computing Sciences include in the future?	
13.4	Pick 3 words that you associate with the Department of Computing Sciences (please do not include a department name).	

If you completed a Post Graduate degree, please provide course experience:

14 of 14. Post Graduate degree course experience		
14.1	Which postgraduate course(s) did you find relevant?	
14.2	Which postgraduate course(s) did you find less relevant?	
14.3	Which postgraduate course(s) should the Department of Computing Sciences include in the future?	

Thank you for taking the time to complete the questionnaire. Your input is appreciated.

Feedback will be provided in the Department of Computing Sciences Facebook page.

Appendix B: Research Ethics: Form E

Nelson Mandela Metropolitan University

for tomorrow

FORM

ETHICS CLEARANCE FOR TREATISES/DISSERTATIONS/THESES

Please type or complete in black ink

FACULTY: BUSINESS AND ECONOMIC SCIENCES

SCHOOL/DEPARTMENT: BUSINESS SCHOOL

I, PROF ANDRE CALITZ the supervisor for ARTHUR GLAUM (9738189) a candidate for the degree of MAGISTER IN BUSINESS ADMINISTRATION with a treatise/~~dissertation/thesis~~ entitled:

ALUMNI PERCEPTION OF THE NMMU COMPUTING SCIENCES DEPARTMENT

considered the following ethics criteria *(please tick the appropriate block)*:

	YES	NO
1. Is there any risk of harm, embarrassment of offence, however slight or temporary, to the participant, third parties or to the communities at large?		X
2. Is the study based on a research population defined as 'vulnerable' in terms of age, physical characteristics and/or disease status?		X
2.1 Are subjects/participants/respondents of your study:		
(a) Children under the age of 18?		X
(b) NMMU staff?		X
(c) NMMU students?		X
(d) The elderly/persons over the age of 60?		X
(e) A sample from an institution (e.g. hospital/school)?		X
(f) Handicapped (e.g. mentally or physically)?		X
3. Does the data that will be collected require consent of an institutional authority for this study? (An institutional authority refers to an organisation that is established by government to protect vulnerable people)		X
3.1 Are you intending to access participant data from an existing, stored repository (e.g. school, institutional or university records)?		X
4. Will the participant's privacy, anonymity or confidentiality be compromised?		X
4.1 Are you administering a questionnaire/survey that:		
(a) Collects sensitive/identifiable data from participants?		X
(b) Does not guarantee the anonymity of the participant?		X
(c) Does not guarantee the confidentiality of the participant and the data?		X

(d) Will offer an incentive to respondents to participate, i.e. a lucky draw or any other prize?

(e) Will create doubt whether sample control measures are in place?

(f) Will be distributed electronically via email (and requesting an email response)?

	X
	X
	X

Note:
- If your questionnaire **DOES NOT** request respondents' identification, is distributed electronically and you request respondents to return it *manually* (print out and deliver/mail); **AND** respondent anonymity can be guaranteed, your answer will be NO.
- If your questionnaire **DOES NOT** request respondents' identification, is *distributed via an email link and works through a web response system (e.g. the university survey system); AND* respondent anonymity can be guaranteed, your answer will be NO.

Please note that if ANY of the questions above have been answered in the affirmative (YES) the student will need to complete the full ethics clearance form (REC-H application) and submit it with the relevant documentation to the Faculty REC-H (Ethics) representative.

and hereby certify that the student has given his/her research ethical consideration and full ethics approval is not required.

A. Calitz
SUPERVISOR(S)

1 Oct 2016
DATE

HEAD OF DEPARTMENT

3 Oct. 2016
DATE

STUDENT(S)

2016-10-01
DATE

Please ensure that the research methodology section from the proposal is attached to this form.

Please note that by following this Proforma ethics route, the study will NOT be allocated an ethics clearance number.

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Appendix C: Statistics for Alumni Sample

Demographics

Female	18	18%
Male	82	82%
Total	100	100%

Table 7.1 - Frequency Distribution: Gender

BSc CS	34	34%
BSc IS	14	14%
BCom CS & IS	30	30%
BCom IS	9	9%
BCom Rat	6	6%
Other	7	7%
Total	100	100%

Table 7.2 - Frequency Distribution: Undergrad qualification

None	36	36%
Honours	44	44%
Masters	14	14%
Doctorate	6	6%
Total	100	100%

Table 7.3 - Frequency Distribution: Postgraduate qualification

None	91	91%
Degree	2	2%
MBA	1	1%
MBL	5	5%
DBA	1	1%
Total	100	100%

Table 7.4 - Frequency Distribution: Other degrees

20 – 24	19	19%
25 – 34	43	43%
35 – 44	28	28%
45 – 54	7	7%
55+	3	3%
Total	100	100%

Table 7.5 - Frequency Distribution: Age

1974	1	1%
1975	0	0%
1976	0	0%
1977	0	0%
1978	1	1%
1979	0	0%
1980	1	1%
1981	0	0%
1982	0	0%
1983	0	0%
1984	1	1%
1985	0	0%
1986	0	0%
1987	0	0%
1988	1	1%
1989	2	2%
1990	0	0%
1991	1	1%
1992	1	1%
1993	2	2%
1994	0	0%
1995	0	0%
1996	2	2%
1997	1	1%
1998	4	4%
1999	2	2%
2000	5	5%
2001	4	4%
2002	4	4%
2003	2	2%
2004	2	2%
2005	4	4%
2006	2	2%
2007	2	2%
2008	8	8%
2009	4	4%
2010	7	7%
2011	3	3%
2012	5	5%
2013	10	10%
2014	9	9%
2015	9	9%
Total	100	100%

Table 7.6 - Frequency Distribution: Graduate Year of Completion

1979	1	2%
1980	0	0%
1981	0	0%
1982	0	0%
1983	0	0%
1984	0	0%
1985	0	0%
1986	0	0%
1987	0	0%
1988	0	0%
1989	1	2%
1990	0	0%
1991	1	2%
1992	0	0%
1993	1	2%
1994	1	2%
1995	0	0%
1996	0	0%
1997	2	3%
1998	0	0%
1999	1	2%
2000	0	0%
2001	6	10%
2002	3	5%
2003	1	2%
2004	0	0%
2005	1	2%
2006	1	2%
2007	3	5%
2008	2	3%
2009	4	7%
2010	2	3%
2011	3	5%
2012	1	2%
2013	4	7%
2014	9	15%
2015	11	19%
Total	59	100%

Table 7.7 - Frequency Distribution: Postgraduate Year of Completion

Eastern Cape	47	47%
Free State	0	0%
Gauteng	12	12%
KwaZulu-Natal	0	0%
Limpopo	0	0%
Mpumalanga	0	0%
Northern Cape	0	0%
North West	0	0%
Western Cape	21	21%
Country Outside SA	20	20%
Total	100	100%

Table 7.8 - Frequency Distribution: Reside

<5 years	41	41%
5 - 9 years	20	20%
10 - 19 years	28	28%
20+ years	11	11%
Total	100	100%

Table 7.9 - Frequency Distribution: Years in ICT Industry

Government	2	2%
Manufacturing	9	9%
Financial Services	9	9%
Pharmaceutical	2	2%
Agriculture	1	1%
Mining	1	1%
Education	4	4%
Management Consulting	0	0%
Health Services	1	1%
Retail	2	2%
Services	7	7%
IT / Telecommunications	45	45%
Electricity/Water Services	1	1%
Other	16	16%
Total	100	100%

Table 7.10 - Frequency Distribution: Industry Sector

1 - 9 employees	9	9%
10 - 99 employees	23	23%
100 - 999 employees	30	30%
1000 - 4999 employees	16	16%
5000 + employees	22	22%
Total	100	100%

Table 7.11 - Frequency Distribution: Company size in number of employees

No	92	92%
Yes	8	8%
Total	100	100%

Table 7.12 - Frequency Distribution: Self-employed

Factor and Item Descriptions

Key to Questions	Item Description
Q2-1	The academic staff were adequately qualified
Q2-2	Academic staff had a good command of the subject content.
Q2-3	Academic staff gave clear explanations of subject content.
Q2-4	Academic staff used appropriate resources to explain the subject contents.
Q2-5	Academic staff made it easy to understand the CS subjects.
Q2-6	Academic staff made the CS subjects interesting for me.
Q2-7	During the course, students knew the assessment criteria for the CS subjects.
Q2-8	Overall I was satisfied with the academic staff.
Q3-1	Department of Computing Sciences admin. staff were very knowledgeable.
Q3-2	I received prompt answers to my enquiries from Department of Computing Sciences admin. staff.
Q3-3	My problems were always quickly resolved by Department of Computing Sciences admin. staff.
Q3-4	The student assistants (Demi's) in the Department of Computing Sciences were of great assistance.
Q3-5	I was satisfied with the service I received from the Administrative & Technical staff.
Q4-1	Technology utilised at Department of Computing Sciences was kept up to date.
Q4-2	The technology at Department of Computing Sciences was relevant to the subject content.
Q4-3	The technology at Department of Computing Sciences was easily accessible.
Q4-4	The Internet and communication technology was suitable at Department of Computing Sciences.
Q4-5	The technology (hardware and software) available at the Department of Computing Sciences prepared me for a job in Industry.
Q4-6	I was satisfied with the technology available at the Department of Computing Sciences.
Q5-1	The course content taught me how a concept could be applied to an actual problem or situation.
Q5-2	Department of Computing Sciences creates a learning climate.
Q5-3	Department of Computing Sciences encourages students to extend their analytical and critical thinking.
Q5-4	The course content is aligned with industry requirements.
Q5-5	I was satisfied with the course content provided during my studies at the Department of Computing Sciences.

Q6-1	The concept of a teaching guarantee is a good idea.
Q6-2	A teaching guarantee would be important for me.
Q6-3	A teaching guarantee can add value to the Department of Computing Sciences in providing service excellence.
Q6-4	A teaching guarantee will only offer what is expected.
Q6-5	A teaching guarantee will compensate students for their complaints.
Q6-6	Invoking the teaching guarantee would affect the student negatively in class.
Q6-7	I feel a teaching guarantee would be difficult to enforce as the performance of the tutor is open for interpretation.
Q7-1	I see the Department of Computing Sciences as one of the best in South Africa.
Q7-2	The service quality at Department of Computing Sciences met my expectations.
Q7-3	I feel satisfied with this Department of Computing Sciences overall performance in delivering its services.
Q7-4	I believe that Department of Computing Sciences has established procedures which address student needs.
Q7-5	Overall I was satisfied with the service received from the Department of Computing Sciences.
Q8-1	Learning about different cultures or perspectives was an important part of university education.
Q8-2	I enjoyed the culture and atmosphere at Department of Computing Sciences.
Q8-3	Contact with other individuals different from me was an essential part of my university education.
Q8-4	Friendships were made among students in my classes.
Q8-5	Students assisted each other during their studies at the Department of Computing Sciences.
Q8-6	Overall I was satisfied with the culture and atmosphere in the Department of Computing Sciences.
Q9-1	Based on the value received I would recommend Department of Computing Sciences to colleagues / friends / family.
Q9-2	Compared to alternative educational institutions, Department of Computing Sciences charges me fairly for similar products/services.
Q9-3	The reason I chose to study at the Department of Computing Sciences was due to the higher perceived value.
Q9-4	Overall I was satisfied with the value received from the Department of Computing Sciences.
Q10-1	The Alumni network is important to me.
Q10-2	The Alumni network provides adequate opportunity to meet new people on a professional level.

Q10-3	The Alumni network provides adequate opportunity to meet new people on a social level.
Q10-4	Alumni help fellow Alumni on a professional level.
Q10-5	In our company we hire Alumni from the Department of Computing Sciences.
Q10-6	Overall I was satisfied with the Department of Computing Sciences Alumni network
Q11-1	Email
Q11-2	Social Media
Q11-3	Department of Computing Sciences Website
Q11-4	Alumni Portal
Q11-5	Telephone
Q11-6	SMS/Text/Instant Messaging
Q11-7	Video Conferencing
Q11-8	Traditional Mail
Q11-9	E-Newsletters
Q11-10	Paper based newsletters/magazines
Q12-1	Facebook
Q12-2	Twitter
Q12-3	LinkedIn
Q12-4	YouTube
Q12-5	Pinterest
Q12-6	Instagram
Q12-7	Snapchat
Q12-8	Periscope
Q12-9	Tumblr
Q12-10	Other

Table 7.13 - Factor and Item Descriptions

Factor Items

	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
Q2-1	2	2%	0	0%	1	1%	34	34%	63	63%
Q2-2	2	2%	1	1%	3	3%	37	37%	57	57%
Q2-3	2	2%	3	3%	13	13%	48	48%	34	34%
Q2-4	2	2%	4	4%	9	9%	52	52%	33	33%
Q2-5	3	3%	4	4%	15	15%	46	46%	32	32%
Q2-6	3	3%	2	2%	9	9%	37	37%	49	49%
Q2-7	2	2%	1	1%	15	15%	39	39%	43	43%
Q2-8	4	4%	2	2%	2	2%	34	34%	58	58%

Table 7.14 - Frequency Distributions: Academic Staff Items (n = 100)

	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
Q3-1	2	2%	0	0%	8	8%	34	34%	56	56%
Q3-2	1	1%	2	2%	6	6%	48	48%	43	43%
Q3-3	2	2%	1	1%	6	6%	46	46%	45	45%
Q3-4	4	4%	5	5%	19	19%	41	41%	31	31%
Q3-5	2	2%	1	1%	8	8%	40	40%	49	49%

Table 7.15 - Frequency Distributions: Admin. Staff Items (n = 100)

	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
Q4-1	3	3%	2	2%	16	16%	39	39%	40	40%
Q4-2	1	1%	2	2%	12	12%	38	38%	47	47%
Q4-3	2	2%	2	2%	10	10%	40	40%	46	46%
Q4-4	2	2%	3	3%	17	17%	42	42%	36	36%
Q4-5	7	7%	5	5%	17	17%	39	39%	32	32%
Q4-6	4	4%	3	3%	9	9%	44	44%	40	40%

Table 7.16 - Frequency Distributions: Technology Items (n = 100)

	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
Q5-1	3	3%	6	6%	10	10%	43	43%	38	38%
Q5-2	2	2%	3	3%	10	10%	41	41%	44	44%
Q5-3	2	2%	3	3%	12	12%	30	30%	53	53%
Q5-4	6	6%	10	10%	23	23%	35	35%	26	26%
Q5-5	3	3%	5	5%	17	17%	39	39%	36	36%

Table 7.17 - Frequency Distributions: Course Content Items (n = 100)

	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
Q6-1	4	4%	2	2%	51	51%	28	28%	15	15%
Q6-2	6	6%	8	8%	55	55%	20	20%	11	11%
Q6-3	3	3%	3	3%	49	49%	33	33%	12	12%
Q6-4	4	4%	4	4%	59	59%	24	24%	9	9%
Q6-5	4	4%	9	9%	61	61%	20	20%	6	6%
Q6-6*	8	8%	18	18%	58	58%	10	10%	6	6%
Q6-7*	23	23%	31	31%	39	39%	4	4%	3	3%
* Item Reversed										

Table 7.18 - Frequency Distributions: Teaching Guarantee Items (n = 100)

	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
Q7-1	4	4%	4	4%	4	4%	37	37%	51	51%
Q7-2	3	3%	4	4%	5	5%	36	36%	52	52%
Q7-3	3	3%	3	3%	2	2%	40	40%	52	52%
Q7-4	2	2%	4	4%	8	8%	47	47%	39	39%
Q7-5	3	3%	3	3%	4	4%	36	36%	54	54%

Table 7.19 - Frequency Distributions: Customer Satisfaction Items (n = 100)

	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
Q8-1	8	8%	13	13%	27	27%	26	26%	26	26%
Q8-2	2	2%	2	2%	13	13%	43	43%	40	40%
Q8-3	8	8%	10	10%	25	25%	32	32%	25	25%
Q8-4	2	2%	0	0%	9	9%	40	40%	49	49%
Q8-5	1	1%	2	2%	7	7%	41	41%	49	49%
Q8-6	2	2%	2	2%	7	7%	38	38%	51	51%

Table 7.20 - Frequency Distributions: Social Environment Items (n = 100)

	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
Q9-1	4	4%	3	3%	1	1%	22	22%	70	70%
Q9-2	2	2%	3	3%	12	12%	34	34%	49	49%
Q9-3	7	7%	9	9%	34	34%	25	25%	25	25%
Q9-4	2	2%	5	5%	0	0%	33	33%	60	60%

Table 7.21 - Frequency Distributions: Perceived Value Items (n = 100)

	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
Q10-1	9	9%	23	23%	32	32%	25	25%	11	11%
Q10-2	10	10%	15	15%	45	45%	22	22%	8	8%
Q10-3	12	12%	13	13%	48	48%	19	19%	8	8%
Q10-4	10	10%	18	18%	41	41%	24	24%	7	7%
Q10-5	18	18%	8	8%	37	37%	25	25%	12	12%
Q10-6	8	8%	6	6%	52	52%	24	24%	10	10%

Table 7.22 - Frequency Distributions: Alumni Network Items (n = 100)

	Never		Once a Year		Monthly		Weekly		Daily	
Q11-1	1	1%	0	0%	2	2%	3	3%	94	94%
Q11-2	4	4%	1	1%	4	4%	20	20%	71	71%
Q11-3	65	65%	25	25%	7	7%	3	3%	0	0%
Q11-4	83	83%	10	10%	5	5%	1	1%	1	1%
Q11-5	4	4%	1	1%	4	4%	22	22%	69	69%
Q11-6	1	1%	0	0%	2	2%	7	7%	90	90%
Q11-7	11	11%	8	8%	40	40%	22	22%	19	19%
Q11-8	49	49%	27	27%	18	18%	3	3%	3	3%
Q11-9	16	16%	7	7%	36	36%	23	23%	18	18%
Q11-10	35	35%	14	14%	34	34%	13	13%	4	4%

Table 7.23 - Frequency Distributions: Communication Items (n = 100)

	Never		Once a Year		Monthly		Weekly		Daily	
Q12-1	12	12%	2	2%	3	3%	17	17%	66	66%
Q12-2	47	47%	2	2%	17	17%	18	18%	16	16%
Q12-3	9	9%	5	5%	36	36%	36	36%	14	14%
Q12-4	1	1%	0	0%	10	10%	47	47%	42	42%
Q12-5	63	63%	6	6%	15	15%	12	12%	4	4%
Q12-6	56	56%	5	5%	5	5%	9	9%	25	25%
Q12-7	89	89%	5	5%	2	2%	1	1%	3	3%
Q12-8	98	98%	2	2%	0	0%	0	0%	0	0%
Q12-9	94	94%	3	3%	3	3%	0	0%	0	0%
Q12-10	70	70%	2	2%	4	4%	9	9%	15	15%

Table 7.24 - Frequency Distributions: Social Media Items (n = 100)

	Negative [1.00 to 2.60)		Neutral [2.60 to 3.40]		Positive (3.40 to 5.00]	
Academic Staff	4	4%	6	6%	90	90%
Admin. Staff	3	3%	7	7%	90	90%
Alumni Network	24	24%	44	44%	32	32%
Course Content	6	6%	12	12%	82	82%
Perceived Value	6	6%	4	4%	90	90%
Social Environment	4	4%	14	14%	82	82%
Technology	5	5%	6	6%	89	89%
ALUMNI SATISFACTION	5	5%	6	6%	89	89%
Customer Satisfaction	6	6%	4	4%	90	90%
Teaching Guarantee	8	8%	66	66%	26	26%
Communication	6	6%	65	65%	29	29%
Social Media	62	62%	37	37%	1	1%

Table 7.25 - Frequency Distributions: Factors (n = 100)

Appendix D: Sample Study

CS and IS Alumni Post-Graduate Course and Supervision Perceptions

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ABSTRACT

Stakeholders in academic departments include Faculty, Alumni, Advisory Board members, current students and employers. Stakeholder analysis provides information that academic departments can utilise to evaluate their program offerings, post-graduate supervision quality and program relevance. Alumni can provide valuable feedback to Computer Science (CS) and Information Systems (IS) departments sharing relevant information of their experiences during their studies at an academic institution. CS&IS Departments can assess how effective an institution's academic programs are in preparing their graduates for a successful career in the ICT industry and how the Alumni experienced their studies in a specific academic department. This study focuses on CS&IS post-graduates' (Alumni) perceptions of their education experience at an academic institution and in a CS&IS department. The study further focuses on post-graduate courses they studied, their relevance and if the academic program adequately prepared them for a career in the ICT industry. The supervision of their post-graduate research was further investigated as well as their overall university experience. The results of the study indicate that the Department of CS&IS provided the required courses for employment in the ICT industry at the specific time they completed their studies. This research could assist academic departments in acquiring Alumni feedback on their academic experience at the institution and improve post-graduate supervision practices.

Categories and Subject Descriptors

K.3.2 [**Computers and Education**]: Computer and Information Science Education – *Computer Science Education, Curriculum.*

K 6.1 Project and People Management – *Staffing.*

General Terms

Management, Human Factors.

Keywords

Post-graduate supervision, Alumni study experience.

1. INTRODUCTION

Academic departments at Higher Education Institutions (HEIs) are increasingly engaging with various stakeholders. The external stakeholders include Alumni, employers, Advisory Board members and professional accreditation bodies. Stakeholder engagement ensures closer university and Alumni/industry collaboration and liaison, and is required for academic program quality assurance. Stakeholder analysis refers to feedback obtained in various forms from stakeholders, specifically for program quality evaluation and improvement.

A number of ICT related departments, such as Computer Science, Informatics, Information Systems, etc. at academic institutions have established closer collaboration with industry. Industry Advisory Boards have been established at the academic institutions in order to address the industry ICT graduate skills requirements and establish closer collaboration [5]. The stakeholder engagement has further influenced computing curricula and the introduction of specific new courses, specifically at the post-graduate level.

Academic departments have used surveys, mailing lists, web-sites and social media, such as Facebook and LinkedIn, to maintain contact and acquire information specifically from graduates (Alumni) working in industry [6, 7, 15]. Alumni tracking for program quality assurance using web-based systems have become an important activity at HEIs [11]. Studies have also utilised Alumni to meaningfully connect Alumni to currently registered students [17]. Alumni further provide an important perspective and valuable contribution for the assessment of a department's academic programs. Academic programs have been restructured in response to international curricula [1, 2] as well as recommendations by Professional Advisory Boards and Alumni [11, 14].

Academic departments perform research, specifically at the post-graduate level and research supervision is an important academic process and practice. Successful and quality post-graduate research supervision is linked to study completion times and rates [9]. Post-graduate Alumni feedback on their research supervision experiences are further important for academic departments and supervisors. Studies investigating the satisfaction ratings by Alumni of research supervision emphasise the importance of continuous training and education of supervisors [9].

This paper provides additional supporting evidence regarding post-graduate perceptions and experiences. The results highlight the importance of relevant post-graduate courses and quality supervision. The research problem and research question are discussed in Section 2. Literature on stakeholder analysis and specifically Alumni surveys are discussed in Section 3. The Post-graduate survey is presented in Section 4 and the Post-graduate survey results are presented in Section 5. The paper is concluded and proposals and future work are discussed in Section 6.

2. THE RESEARCH PROBLEM AND RESEARCH DESIGN

South Africa presently has 26 universities which have a combination of departments offering Information Technology (IT) related study programs. The department names include Computing Sciences, Computer Science (CS), Information Systems (IS), Informatics and Information Science. Generally the Computer Science related departments are located in the Science Faculty and the Information Systems related departments in the Economic Sciences Faculty. In this study, the authors grouped the Computer Science related departments and the Information Systems related departments together.

Departments of Computer Science (CS) and Information Systems (IS) should utilise the information provided by stakeholders, such as Advisory Boards, employers and Alumni, to evaluate their program offerings. The research problem investigated in this study is based on the realisation that CS&IS departments in South Africa generally do not regularly survey post-graduate Alumni to determine their post-graduate experience during their studies at the academic institution. Additionally the content of the CS&IS program may not satisfy the requirements of industry and post-graduates (Alumni) could identify additional courses and knowledge required by industry [6, 12]. Further, CS&IS departments do not regularly ascertain the effectiveness of their post-graduate supervision by faculty.

The Nelson Mandela Metropolitan University, Department of Computing Sciences offer CS and IS programs. In the department undergraduate students can complete an undergraduate program, such as a BSc in Computer Science or a BCom in Information Systems. Post-graduate Alumni are graduates who have completed either a BCom Honours, BSc Honours, MCom, MSc or PhD in Computer Science and Information Systems at NMMU. Post-graduate Alumni would have had a supervisor(s) for their Honours Treatise, Master's Dissertation or PhD Thesis. This study focused only on post-graduate Alumni in the Department of Computing Sciences at NMMU.

The research question addressed in this study is: *What are the CS/IS Alumni perceptions of their post-graduate studies?*

The Alumni post-graduate questionnaire was compiled using a number of existing Alumni questionnaires utilised in similar studies [4, 12, 16]. In order to acquire personal perceptions and honest information, it was decided to keep the survey anonymous. The NMMU Post-graduate questionnaire consists of the following sections:

1. Degree details – highest CS or IS degree, starting position, current position, years in industry;
2. Departmental post-graduate courses – relevance of courses, suggested new courses;
3. Post-graduate experience – positive and negative experiences, preparation for a career in ICT, supervision experience, suggestions for improvement; and
4. University experience – positive and negative experiences, suggestions for improvement.

Sections 1 to 4 were all open-ended questions and qualitative in nature (Appendix A). A number of faculty in the Department of Computing Sciences and NMMU Business School evaluated the questionnaire and suggested changes and improvements. A pilot study was conducted among three Alumni working at NMMU to validate the questionnaire initially.

The questionnaire was captured using the NMMU on-line survey tool. The next step in the research process was contacting post-graduate Alumni who graduated and worked in industry. Social networks are increasingly being used and a large number of graduates are on social networks such as Facebook and LinkedIn. The Department of Computing Sciences created a profile on Facebook. The first call for participation was distributed via Facebook, LinkedIn and an Alumni e-mail address list, known to the author and academic members of the department. The *snowball sampling technique* was utilised, requesting participants, through a referral network, to forward the survey request to other possible respondents. A total of 39 Alumni completed the survey over a three week period and two requests for participation. The qualitative results were thematically analysed.

3. ALUMNI SURVEYS

Accreditation of academic programs requires departments to assess if the graduates obtained the required skills and educational objectives. Alumni surveys assess whether graduates feel that the academic program adequately prepared them for their IT careers. McGourty et al. [12] conducted two surveys to establish Alumni perceptions on the quality of their education. The surveys focused on undergraduate experience and employment. The results indicated surveying Alumni is an effective method for gathering information regarding their perceptions of job preparation, employment, skills development and program effectiveness.

Academic departments must continuously monitor the employability of their graduates in order to evaluate the effectiveness of their academic program offerings. Lending and Mathieu [11] conducted a web survey amongst IS graduates (n=173) and found that the program prepared them well for software implementation, Business Process Modelling and database solutions. The gaps identified in the program were IT Project Management, analysis of technical solutions and non-technical writing skills. The value of the academic programs to graduates, career placement (employability) and continued educational needs are areas departments must continuously investigate [19]. Research has further indicated that graduates require competitive knowledge and skills that lead to gaining full-time employment with high levels of career satisfaction [19].

It is important that departments manage the information of their Alumni, gathering information on Alumni perceptions of program offerings and employability of the graduates. Responses to Alumni surveys have varied and researchers are increasingly investigating additional methods of acquiring the relevant information, utilising social media platforms such as Facebook and LinkedIn. Researchers have further implemented web-crawling algorithms, specifically focused crawlers to search for Alumni information on the web [7].

Alumni employment rates and job position listings are useful indicators of the quality of a department's program offerings. The information could be used for attracting prospective students and business partners. Mijic [13] implemented a web-based system that was used as an efficient tool for communication between a higher education institution and its Alumni. The system collected and analysed Alumni related data that were used for different purposes, including improvement of academic programmes.

On-line surveys however still remain the most popular method of obtaining relevant information from Alumni [4]. The surveys focus on obtaining information regarding program quality and relevance, employability of the graduates and Alumni departmental and university experiences. Generally Alumni addresses are obtained from the university's Alumni Office, Departmental Facebook pages and LinkedIn. Bulk e-mails are sent to the Alumni requesting them to complete the surveys [4, 12]. Requests have also been posted on social media sites such as Facebook and LinkedIn. Various departments have established Alumni groups on Facebook and LinkedIn to maintain contact with ICT graduates, track graduate destinations and engage with graduates in industry [18].

Limited studies focused on post-graduate surveys specifically. The majority focused on general Alumni surveys [4, 7, 12, 14]. Post-graduate course offerings and research topics are important factors influencing the employability of the post-graduates (Section 4.2). Research supervision is specific to research projects conducted in post-graduate studies. Supervision research is an extensive specialised research area and will be discussed in more detail in Section 4.3.

4. CS&IS POST-GRADUATE COURSES AND SUPERVISION

Universities nationally and internationally generally follow the ACM and IEEE international CS&IS curricula - Computer Science departments the ACM CS2013 [2] and Information Systems departments the ACM IS2010 [1]. The curriculum guidelines suggest core and elective courses, credit values and possible career opportunities linked with specific subject combinations [1]. This sub-section will present the ACM/IEEE CS&IS curriculum guidelines and courses (Section 4.1). The Post-graduate course offerings by selected universities in South Africa will be presented with the course post-graduate course offerings of the NMMU Department of Computing Sciences (Section 4.2). Finally the importance of quality research supervision will be discussed in Section 4.3.

4.1 CS 2013 and IS2010 Curricula

The international educational authorities (ACM, IEEE, AIS) have been involved with research studies examining ICT graduate skills requirements and have updated curricula frequently [1, 2]. Educators need to adapt CS programs so the prospective students find the CS programs appealing, interesting, motivating and challenging [3].

The ACM (the Association for Computing Machinery; http://www.acm.org/) and the IEEE Computer Society (http://www.computer.org/) have released jointly developed new curriculum guidelines for undergraduate degree programs that take a "Big Tent" view of computing, fostering the integration of computing with other disciplines. The report, Computer Science 2013 (CS2013) [2], organises computer science around 18 Knowledge Areas (KAs) that reflect the application of computing tools in a wide array of disciplines.

CS2013 incorporates new KAs for computing skills that include information assurance and security, parallel and distributed computing and platform-based applications. A new KA in Software Fundamentals reorganizes topics commonly covered in introductory programming courses, and a new Systems Fundamentals KA helps highlight more broadly applicable systems-level concepts.

There are more than 80 course exemplars and 5 curricular exemplars for a broad range of higher education institutions worldwide. The report also includes examples of ways in which an undergraduate Computer Science program encourages the development of soft skills and personal attributes that play a critical role in the workplace and in promoting successful professional practice in a variety of career paths. It takes a balanced view of theory and practice encouraging use of abstraction and good engineering design.

CS2013 was put together by the ACM-IEEE CS2013 Joint Task Force co-chaired by Mehran Sahami (Stanford University) and Steve Roach (Exelis, Inc.). The final report reflects the input of more than 100 contributors at global institutions of higher learning (both public and private), as well as consultation with industry. It is available for your computing program(s) from ACM at http://www.acm.org/education/CS2013-final-report.pdf and IEEE-CS at http://www.computer.org/portal/web/education/home. More information on the project is available http://cs2013.org.

The CS2013 report includes "Characteristics of Graduates" and amongst others indicates the technical competencies, problem solving skills, project experience, life-long learning and communication and organisational skills graduates should possess. It further includes examples of ways in which an undergraduate Computer Science program encourages the development of soft skills and personal attributes that play a critical role in the workplace and in promoting successful professional practice in different ICT careers. The courses suggested in CS2013 are:

- AL-Algorithms and Complexity
- AR-Architecture and Organization
- CN-Computational Science
- DS-Discrete Structures
- GV-Graphics and Visualization
- HCI-Human-Computer Interaction
- IAS-Information Assurance and Security
- IM-Information Management
- IS-Intelligent Systems
- NC-Networking and Communication
- OS-Operating Systems
- PBD-Platform-based Development
- PD-Parallel and Distributed Computing
- PL-Programming Languages
- SDF-Software Development Fundamentals
- SE-Software Engineering

- SF-Systems Fundamentals
- SP-Social Issues and Professional Practice

The ACM IS2010 curriculum (Figure 1) was released in 2010 and impacted on university curricula and IS related qualifications [1]. The curricula included core and elective courses and for the first time, included IS programs for specific career tracks and industry related career opportunities linked to specific courses and degree programs. The core courses include Enterprise Architecture, SAD and Project Management. Electives include BPM, Data Mining/Business Intelligence, Enterprise Systems and Social Informatics. The courses are further linked to specific careers, such as Business Analyst, ERP Specialist and Project Manager.

Structure of the IS Model Curriculum:Information Systems specific courses

Career Track:	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Core IS Courses:																	
Foundations of IS	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Enterprise Architecture	○	●	○	○	○	●	○	○	○	○	●	○	○	○	●	○	○
IS Strategy, Management and Acquisition	○	●	○	○	○	●	○	○	●	○	●	○	○	○	●	○	○
Data and Information Management	●	○	○	●	●	○	○	●	●	○	●	○	●	○	○	○	○
Systems Analysis & Design	●	●	●	○	○	○	●	○	○	○	○	○	○	○	●	●	●
IT Infrastructure	○	○	○	●	○	○	○	●	●	●	○	○	●	●	○	○	○
IT Project Management	●	○	○	○	○	●	○	○	○	○	●	○	○	○	●	●	●
Elective IS Courses:																	
Application Development	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	●
Business Process Management		●	●			○	○	○		○	●			○			
Collaborative Computing						○								○			○
Data Mining / Business Intelligence		●		●	●	○	○	○	●		○	○	○	○	○		○
Enterprise Systems		●	●	○	○	○	●	●	○		●	●	○	○			
Human-Computer Interaction	●				○	○					○					●	
Information Search and Retrieval		○		○	●								○				●
IT Audit and Controls	○		●	○	○	○	○	●		●	○		○	○	○		○
IT Security and Risk Management	○			○	○	○	○	●	●	○	○		●	●	○		○
Knowledge Management		●		○		○	○			○							
Social Informatics													○		○		

Career track legend:
- A = Application Developer
- B = Business Analyst
- C = Business Process Analyst
- D = Database Administrator
- E = Database Analyst
- F = e-Business Manager
- G = ERP Specialist
- H = Information Auditing and Compliance Specialist
- I = IT Architect
- J = IT Asset Manager
- K = IT Consultant
- L = IT Operations Manager
- M = IT Security and Risk Manager
- N = Network Administrator
- O = Project Manager
- P = User Interface Designer
- Q = Web Content Manager

Key:

● = Significant Coverage

○ = Some Coverage

Blank Cell = Not Required

Figure 1: IS2010 curriculum.

4.2 Post-Graduate CS&IS Courses

The CS2013 and IS2010 curricula guidelines specify specific core and elective courses. Departments of CS&IS in South Africa offer a variety of post-graduate (Honours/4th year) courses depending on the institution. A detailed comparison of individual departmental course offerings in comparison to the recommended curricula guidelines of the CS2013 and IS2010 is beyond the scope of this paper. The authors however conducted an Internet investigation on the post-graduate course offerings of four prominent universities in South Africa and the main findings are discussed.

In order to determine the CS&IS post-graduate course offerings in South Africa, the authors decided to select two large universities (University of Cape Town - UCT and University of Pretoria - UP), a comprehensive university (NMMU) and a smaller university (Rhodes - RU), all departments offering CS programs in their Science Faculty and IS programs in their Commerce Faculty. A desktop study using the Internet was conducted obtaining post-graduate course offerings from the four institutions. Two universities selected have CS&IS programs that are internationally accredited. The authors found limited overlapping or similarity amongst post-graduate courses presented by the CS&IS departments in South Africa.

The CS post-graduate courses offered generally by all CS departments included: Research Methods, HCI, Evolutionary Computing, Mobile Computing, Artificial Intelligence, Computer Graphics and courses relating to different types of networks. Specific non-overlapping CS courses offered by CS departments at the four institutions included: New Venture Planning (UCT), Spatial Databases (UP), Audio Networks (RU), Digital forensics and Investigations (UCT and UP), Image processing (RU), Business Intelligence and Big Data (NMMU) and Ontology Engineering (UCT).

The IS courses offered generally by departments at the four institutions included: Research Methods, IT Project Management, IS Management and Enterprise Systems and Architecture. Specific non-overlapping IS courses offered by CS departments at the four institutions included: Computer Forensics (UCT), Mobile computing (UP and NMMU), Knowledge Acquisition and Sharing (UP), Environmental Management Information Systems (NMMU) and ICT for Development (RU).

4.3 Research supervision

Good supervisory practices assist students to complete their research successfully and obtain their qualifications timeously [3]. The quality of research supervision is linked to study completion times and rates [9]. Supervisors and students must both have a clear understanding of their roles, expectations and responsibilities. Supervision is an established practice and research area and numerous studies have identified best practices in research student supervision, describing the responsibilities of both supervisor and student [3, 9].

The responsibilities of an effective supervisor include providing advice on the research topic, the methodology, progress and timeous and constructive feedback on written work. [3]. The student/supervisor relationship is vital to the research process.

Kiley [9] reported on studies investigating the satisfaction ratings by students of research supervision and emphasized the importance of continuous training and education of supervisors. Research studies conducted on Alumni's supervision experience have further indicated that students who completed their studies timeously generally felt satisfied with their supervision and that they appreciated regular meetings [8, 12]. Keeping a *graduate student log* [3] or an e-Portfolio [10] has also been identified as a practice that contributes to successful supervision [3].

5.   ALUMNI POST-GRADUATE SURVEY RESULTS

The *Alumni Post-graduate* survey (n=39) was completed by NMMU CS and IS post-graduates working in the ICT industry. The descriptive statistics on the graduate profiles and backgrounds are provided. The questionnaire was completed on-line and the request to participate was done via e-mail and using social networks (Facebook and LinkedIn). Open-ended questions were used and thematically analysed. Standard biographical data such as gender and race were not included in the survey and the provision of names and personal information were optional in order to encourage reliable and honest feedback. The survey was completed by Honours (n=28), Masters (n=9) and Doctoral (n=2) students.

Career feedback

Table 1 shows that the graduates predominantly started working in South Africa (n = 34, 87.2%), with a few individuals starting in Germany, Zimbabwe and Rwanda. Of the 34 who started in South Africa only 4 are not presently in the country, while the one who started in Germany has returned. Although few graduates indicate foreign employment, it was noticed that some of them either work for international corporates or South African companies with international clients. This often implies short term international employment or interaction. The two who started in Rwanda and Zimbabwe are nationals of those countries.

Starting Country	Present Country	n
South Africa	South Africa	31
South Africa	UK	2
South Africa	New Zealand	1
South Africa	Hong Kong	1
Germany	South Africa	1
Zimbabwe	Zimbabwe	1
Rwanda	Rwanda	1
Unknown	Unknown	2

Table 1: Country where CS/IS PG Alumni started and are currently working.

Of the graduates participating in the survey, 23 have been in the industry prior to 2010. Only one graduate was not employed within a year of graduating. 11 of the participants were employed before completion of their studies. Of significance to NMMU, it must also be noted that 9 of the participants started their employment in Port Elizabeth. The number of software developing companies in Port Elizabeth is growing, which is making it more attractive for our students to do part time post-graduate studies.

The ICT positions that ICT graduates were initially placed in at the start of their career are indicated in Table 2. The ICT job positions were, as expected, mostly at a junior level and the graduates indicated that the skills they acquired at university were adequate to fill the positions. The ICT graduates further indicated their current job titles (Table 2) and the majority of the current positions are at a senior ICT or managerial level.

The results indicate that a large number of ICT graduates progress through an ICT career and advance into senior managerial levels and that their career path progressed in such a way that they acquired additional ICT skills to fulfil the senior ICT positions (Table 2). A number of graduates are presently Project Managers, Business Analysts and a small number of graduates were promoted to an IT manager, a Chief Technology Officer (CTO) and a Chief Executive Officer (CEO) of businesses.

your career as well as earning income, compared to staying on as a student for a further 2-5 years. The general consensus is that not much initial benefit seems to be gained in industry from having a Masters or PhD degree. On the other hand, many graduates highlighted the value of these qualifications 10-15 years into their careers. They state that Masters and PhD graduates are better positioned in companies at that stage. This trend seems to be more prevalent in foreign countries. One respondent indicated that a PhD degree has benefits when involved with negotiations with international companies.

A question was asked regarding the value of modules. Analysing this feedback is problematic for the following reasons:

- Graduates were enrolled from 1990 up to 2015 and are thus "evaluating" vast different program contents. Furthermore the ICT environment and needed skills have obviously changed considerably over this time period.
- Individual career choices and companies where graduates are employed require a very wide range of skills.
- In academia there is always a tension between "what industry needs" and basic skills which need to form part of an academic program.

Considering the above limitations and challenges, the following can be highlighted regarding individual modules. The module that clearly stand out as generally valuable is Project Management (n=15), with others including Human Computer Interaction (n = 7), Research Methodology / Project (n = 6), Data Warehousing (n = 5), Database (n = 5) and Advanced Programming modules (n = 7). Four respondents were positive about all their modules. The two modules that were highlighted by most respondents as not valuable are Computer Graphics (n = 8) and Machine Learning modules (n = 7).

Research supervision

Regarding supervision experience during their studies, the majority of respondents were very positive. Although limited, the following problems were identified by some:

- Supervisors being too busy and therefore not involved enough with the research.
- One respondent felt that the pressure from the supervisor could have been more for better preparation for industry.

An aspect of supervision that was highlighted by many respondents was the "personality match" between student and supervisor. It was stated that a healthy working relationship made a big contribution towards a successful outcome. One respondent had a very traumatic experience which nearly resulted in a "mental breakdown". Students also valued supervisors who had an understanding for their personal challenges and showed a caring attitude while maintaining a professional relationship.

Limited feedback was received from respondents regarding their general experiences at the university. A few suggestions included more access to bursaries as well as interdisciplinary interaction on a formal and social level.

6. CONCLUSIONS

Alumni are a rich source of information about program quality and industry trends [Beidler]. Obtaining input from Alumni on the quality and relevance of their education can provide a department with valuable information and assist with continuous improvement and self-evaluation. Departments should gather information from all key stakeholders regarding the effectiveness and quality of their academic program and services [5, 6]. Alumni surveys can provide information relating to academic programs' quality and relevance, experiences, participation in institutional activities and specifically employment success, i.e. finding work [12]. Alumni surveys should be an ongoing process and can increasingly lead to program improvement [12].

Maintaining contact with Alumni is essential for obtaining information on course relevance, graduate destinations and industry requirements [18]. Departments are utilising social media platforms such as Facebook and LinkedIn to establish Alumni groups, maintaining contact with graduates and providing reasonably accurate information of their current place and position of employment [18].

The post-graduate courses presented by CS&IS departments in South Africa vary from institution to institution and is mainly based on research interests and areas of academics in the department and available academic expertise. Institutions generally include limited courses suggested by the ACM/IEEE CS2013 and IS2010 curricula, such as Artificial Intelligence, HCI and Mobile Technologies.

Tertiary institutions need to take cognisance of future course requirements to ensure that the curriculum addresses the skills required in industry. The results are of specific importance to academic departments and the results could be used to address stakeholder participation and post-graduate supervision. The findings from this study are of particular importance to all universities in South Africa wanting to address stakeholder analysis and specifically Alumni post-graduate feedback

The supervision process is a complex task and requires substantial commitment from both the supervisor and student. The supervision process is open to negotiation and change depending on the supervisor and student involved, ensuring that the student makes good progress towards completion. In this study the Alumni indicated that they were generally satisfied with the supervision process and the commitment of their supervisors. An important finding was that departments accepting weak students will receive negative supervision ratings by these students.

This study has provided the foundation for continuous Alumni feedback and stakeholder engagement. Closer university and Alumni/industry collaboration and liaison are required for academic program quality assurance. A significant finding is that most Alumni participating in this survey indicated that they were satisfied with the course offerings and quality supervision. Future research will include extending this study to include more recently graduated Alumni, investigating continuous supervisor training and education and researching future ICT skills requirements.

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Appendix E: Turnitin Report

Alumni 2016_Final_Print