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Fostering collaboration amongst business intelligence, business decision makers and statisticians for the optimal use of big data in marketing strategies.

By

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DEDICATION

I dedicate my PhD thesis to my dad, Mr Isaac Booysen, no longer with us, but a true inspiration of what can be achieved with hard work, dedication, and perseverance. You will forever live on in my heart. I love you, daddy!

I also dedicate this thesis to my loving husband, Edgar, for practical and emotional support throughout this process. I could not have done it without your love and encouragement. My children, Loren and Joshua, for their love and understanding when I had to work late hours and weekends to complete the thesis. I will always appreciate all they have done.

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LIST OF ABBREVIATIONS

AI	Artificial Intelligence
BI	Business Intelligence
BPM	Business Process Management
CAO	Chief Analytics Officer
CCC	Connected Customer Council
CDAO	Chief Data and Analytics Officer
CDC	Centers for Disease Control and Prevention
CDO	Chief Data Officer
CEO	Chief Executive Officer
CIO	Chief Information Officer
CoE	Centre of Excellence
COO	Chief Operating Officer
EXCO	Executive Committee
FMCG	Fast-Moving Consumer Goods
HR	Human Resources
JSE	Johannesburg Stock Exchange
KPI	Key Performance Indicators
UAE	United Arab Emirates
UK	United Kingdom
USA	United States of America

DECLARATION

I declare that

Fostering collaboration amongst business intelligence, business decision makers and statisticians for the optimal use of big data in marketing strategies

is my own work, that it has not been submitted before for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged as complete references.

Signed …………………………………………… (signed by student and supervisor(s))

ABSTRACT

The aim of this study was to propose a model of collaboration adaptable for the optimal use of big data in an organisational environment. There is a paucity of knowledge on such collaboration and the research addressed this gap. More specifically, the research attempted to establish whether leadership, trust and knowledge sharing influence collaboration among the stakeholders identified at large organisations.

The conceptual framework underlying this research was informed by collaboration theory and organisational theory. It was assumed that effective collaboration in the optimal use of big data possibly is associated with leadership, knowledge sharing and trust. These concepts were scientifically hypothesised to determine whether such associations exist within the context of big data.

The study used a mixed methods approach, combining a qualitative with a quantitative study. The qualitative study was in the form of in-depth interviews with senior managers from different business units at a retail organisation in Cape Town. The quantitative study was an online survey conducted with senior marketing personnel at JSE-listed companies from various industries in Cape Town. A triangulation methodology was adopted, with additional in-depth interviews of big data and analytics experts from both South Africa and abroad, to strengthen the research.

The findings of the research indicate the changing role of the statistician in the era of big data and the new discipline of data science. They also confirm the importance of leadership, trust and knowledge sharing in ensuring effective collaboration. Of the three hypotheses tested, two were confirmed. Collaboration has been applied in many areas. Unexpected findings of the research were the role the chief data officer plays in fostering collaboration among stakeholders in the optimal use of big data in marketing strategies, as well as the importance of organisational structure and culture in effective collaboration in the context of big data and data science in large organisations.

The research has contributed to knowledge by extending the theory of collaboration to the domain of big data in the organisational context, with the proposal of an integrated model of collaboration in the context of big data. This model was grounded in the data collected from various sources, establishing the crucial new role of the chief data officer as part of the executive leadership and main facilitator of collaboration in the organisation. Collaboration among the specified stakeholders, led by the chief data officer, occurs both horizontally with peers and vertically with specialists at different levels within the organisation in the proposed model. The application of such a model of collaboration should facilitate the successful outcome of the collaborative efforts in data science in the form of financial benefits to the organisation through the optimal use of big data.

Key terms: big data, data science, collaboration, leadership, knowledge sharing, trust, organisational culture, chief data officer.

CHAPTER 1: INTRODUCTION

Corporate organisations are in the business of making money for their shareholders. In the past few decades, data about their customers have become readily available through technology and the footprint they leave about their preferences and dislikes on social media and the World Wide Web (Kligienė, 2012). More and more customers are searching for desirable products and services online and it has become important for corporate organisations to distinguish themselves from their competitors. As the data that exist about the consumers of such products and services have exponentially increased, the term 'big data' was coined.
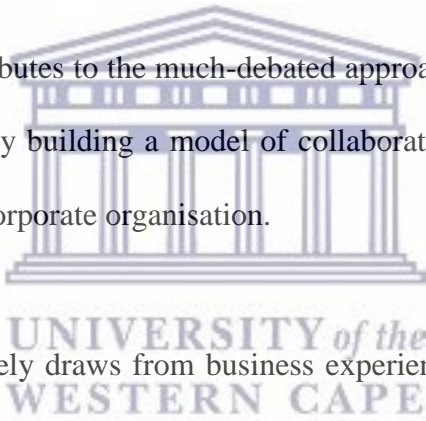
According to Marr (2018), around 2.5 quintillion bytes of data are created per day worldwide and 90 percent of the world's data was created in the past two years. One quintillion bytes equal 10^{18} bytes. This number gives the extent of big data created on the Internet and retail stores like Walmart, where 2.5 petabytes (10^{15} bytes) of data are generated every hour from customer transactions (McAfee and Brynjolfsson, 2012). Provost and Fawcett (2013) believe that industries are using this type of data to gain advantage over their competitors. Examples of big data are data generated from Google searches and social media data (Hammer, Kostroch, Quirós and STA Internal Group, 2017). According to Marr (2018), there are 3.7 billion people using the Internet and that Google searches account for 3.5 billion per day (overall searches on the Internet are 5 billion per day).

Big data requires data science to make sense of it, according to Schutt and O'Neil (2014). The skills required in data science are expertise in computer science, creativity in solving business problems, an understanding of numbers and statistical analysis, and being a subject matter expert (Provost and Fawcett, 2013). It is difficult to find one

person who possess all these skills. Schutt and O'Neil (2014) contend that data science requires a team of people with various skills to work together to achieve the optimal use of big data.

The study, thus, critically examines the extent to which collaboration takes place among business decision makers, business intelligence (BI) specialists and statisticians, who cumulatively possess all the required skills in optimising the information contained in big data through statistical analysis in marketing strategies.

1.1 The purpose of the study

- The research contributes to the much-debated approach of big data and how to make sense of it, by building a model of collaboration in the context of data science at a large corporate organisation.

- The study inductively draws from business experiences with collaboration to ground an integrated model of collaboration among the relevant stakeholders in big data and data-driven marketing strategies.

- It identifies the role to be played by the stakeholders in arriving at an integrated model for a big data-driven organisation.

1.2 The theoretical perspectives of the study

The research is informed by collaboration theory and organisational theory. Collaboration used to mean that shared creation can only occur between people within

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the same field of expertise like science or literature. However, collaboration can occur across various disciplines (Rosen, 2007). Collaboration theory has been extensively researched and for the purposes of this research, various collaboration theoretical perspectives are considered in the understanding how collaboration should occur among the various stakeholders in the optimal use of big data in marketing strategies in corporate organisations.

Since collaboration in the context of big data occurs in an organisational environment, organisational theory informs this research as it is important to understand how organisations function. Organisational theory comprises organisational processes, which consist of organisational structure and design, and organisational culture (Barzilai, 2010). Organisational culture and the structure of the organisation is important in how collaboration among stakeholders in the optimal use of big data occurs and these concepts are explored to determine their influence on effective collaboration in the organisational setting.
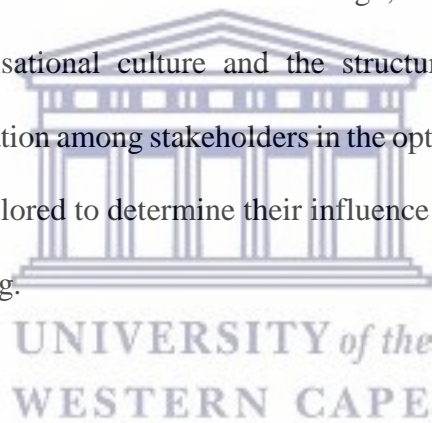
1.3 Background to the issues investigated

Traditionally, statisticians have been at the forefront of dealing with data almost exclusively when the datasets were smaller and did not require any other contribution to the analysis of this type of data. Organisations used to recruit statisticians in their marketing departments to be data analysts and to inform decisions about their customers for financial gains. In recent years, with the explosion of new data sources through all the various new technologies, the concept of big data was coined. Big data comes with many challenges, according to EE publishers (2016), which include the storage of the volumes of data, as well as the management and security of this data. This requires

businesses to invest in technology and people to deal with the complexities big data brings. There are, however, also benefits to big data. If properly analysed, it can be used to drive financial gains. The importance of big data has, thus, been acknowledged.

An argument in respect of this research is that the optimal use of big data is yet to happen in most organisations. Even though many organisations have big data and the technology to store it, it is not effectively used to exploit the many opportunities that big data provides. In the retail industry, the arrival of big data has effected the ability to understand customers' behaviour and to make data-driven decisions with financial benefits (Gutierrez, 2017). There are, however, still many challenges in optimally using big data. One of the challenges is to make sense of big data from an organisational point of view.

Hey, et al., cited by Cavanillas, Curry and Wahlster (2016), state that the eruption of the large amounts of data available has produced a discipline called data science, a scientific approach to discover insight from data. Marr (2015) postulates that this new discipline of data science originated from the need to make sense of big data. Kuonen (2015) agrees and advocates that the statistician plays a vital role in data science.

In the current debate around big data, however, the role of statisticians is challenged (Royal Statistical Society, 2014). It is questioned whether statisticians are still relevant in the new era of big data or if they have become redundant (Granville, 2015). Examples of big data are data generated from the Internet and social media. Such data make the datasets that statisticians worked with in the past tiny in comparison and large datasets can be a challenge for statisticians. (Royal Statistical Society, 2014). Some of the challenges statisticians face with big data are dealing with the complexity of the different types of data and formats that did not exist with the traditional smaller datasets.

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The Royal Statistical Society (2014) suggests that statisticians should adapt to the times if they wish to stay relevant in the era of big data.

According to Carmichael and Marron (2018), data science today is the business of learning from data, whereas traditionally statistics was the discipline to learn from data. However, a debate exists on whether the discipline of data science means the end of statisticians (Normal Deviate, 2013). There are conflicting views that the advent of data science means that, optimistically, the field of statistics is a sought-after field and that, pessimistically, statistics is being side-lined (Normal Deviate, 2013). In attempting to answer the question why statisticians are possibly left out of data science, the writer uses a comparison of how a statistician and a computer scientist will solve a complex data science problem, like machine learning, a component of data science. Puget (2016) defines machine learning as the "field of study that gives computers the ability to learn without being explicitly programmed". The skills required in machine learning are the understanding of statistical algorithms and computer programming (Forbes, 2017). There are roles for the statistician in data science where one is to perform statistical methodologies, and for the computer scientist to programme in R and Python and to understand large datasets. Data science is 80% about data management and cleansing at scale and requires computer science skills and only 20% about "applying statistical techniques" (Normal Deviate, 2013). This means that the statistician is still needed in data science. However, in the era of big data, statisticians either "need to improve the algorithms or design new ones that trade off theoretical accuracy for speed" (Royal Statistical Society, 2014, p.5). Statisticians can no longer by themselves take the responsibility for the handling and analysis of data. They need to work with others with complementary skills to optimally use big data for financial gain.

Many organisations claim to have big data initiatives, but there has not been full adoption owing to organisational misalignment (NewVantage Partners, 2017). Thus, organisations require collaboration among this team of people from various disciplines like the business decision makers, that is, the senior leadership of the organisation, and domain specialists, IT specialists and the statistician as one of the crucial elements for the optimal use of big data.

Collaboration is a concept that has been tested and in many cases it has been used effectively in many contexts and industries such as science, education, government, business, etc. In education, as an example, collaborative efforts bring sustainable solutions and better ways of working together (Slater, 2010). In large organisations across different industries, various forms of collaboration within the organisation have been developed. Collaboration helps organisations to put the right people together to make the best possible decision for their business (Ricci and Wiese, 2011). A company like Toyota, a popular global car brand, is successful because of its culture of collaboration (Rosen, 2007). Collaboration, however, is not easy to achieve, and a culture of collaboration is needed for it to be successful (Kelly, 2014).

Gajda (2004) defines collaborative effort as attaining long-term goals that cannot be achieved by groups on their own without collaboration. Gajda (2004) had success in devising a four-step evaluation process to both quantitatively and qualitatively assess collaborative effort in the study of school safety and prevention of violence in schools. This process was based on collaboration theory to describe and assess levels of collaboration. Collaboration can be an intervention and a consequence by applying principles of collaboration (Gajda, 2004).

Wood and Gray (1991) use the example of a public–private partnership as a collaborative alliance to solve complex social problems like housing and drug abuse, among others. The authors claim that such complex problems in society cannot be solved individually and require the coming together of the public and private sectors. Based on existing theories of collaboration at that time, Wood and Gray's (1991) research postulated three issues in understanding how collaborative alliances happen, that is, the preconditions set before collaboration, the process of collaboration, and the outcome of collaboration. It is thus important for the collaborators to define the outcome of collaboration, that is, what will be effective collaboration.

Even though there are many examples of collaboration in large organisations (Ricci and Wiese, 2011), there is a paucity of knowledge of how collaboration in the context of data science should take place as well as the factors that would lead to effective collaboration. To optimally use big data in marketing strategies requires investment in infrastructure, the management of the data and skilled professionals to analyse it. The stakeholders are, thus, the business decision makers, the IT specialists and the statisticians working in the marketing departments, coming from diverse areas of the organisation. Many large organisations work in silos, which makes it difficult for employees from different departments or business units to collaborate. According to Rosen (2007), organisations with a culture of collaboration do not work in silo fashion across departments.

Effective collaboration is a concept that underpins this research. This concept is key to the success of the stakeholders collaborating in optimally using big data in marketing strategies to obtain financial gain for the organisation. Effective collaboration is the successful outcome of the collaborative efforts, based on principles guiding the process of collaboration as defined. These principles refer to leadership, the culture of the

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organisation, the level of trust, and the sharing of knowledge among the stakeholders. The more the principles of collaboration are applied, the more effective the collaboration. Operationalising effective collaboration is when the outcome of the collaborative effort has been achieved. Collaboration is a process and not necessarily an activity, so the effectiveness of the collaborative effort takes time (Kelly, 2004).

Since data science is new in organisations, and in order for organisations to exploit big data through data science, there needs to be a better understanding of data science (Provost; and Fawcett, 2013). According to Schutt and O'Neil (2014), data science consists of many different skills; however no one person possesses all these skills. It requires a cross-functional team of business, technological and analytically skilled people to work together to make sense of big data.

 [Current] organisational structures are not designed to accommodate such interactions or ways of working (Morgan, 2015). Organisations require new forms of organising themselves to allow for this type of collaboration. These forms of organisation should be in the form of vertical and horizontal collaboration. Data science is a discipline that requires people from various areas in the organisation, with various skills, namely, a cross-functional team, to collaborate to achieve optimisation in the richness of big data and its use in marketing strategies to gain competitive advantage over others. Statistical skills are required in data science, which means that the statistician should, together with IT specialists and business decision makers, collaborate to ensure optimal use of big data. Most large organisations have a hierarchical organisational structure, but this structure usually hinders effective collaboration and communication (Morgan, 2015). The current organisational structure may have to be amended to encourage effective collaboration for the optimal use of big data.

In this new organisational framework, the use of data science in the optimal use of big data can be successfully implemented. This requires that, in the context of data science and to ensure the optimal use of big data in organisations, ways of effective collaboration have to be developed, built on existing collaboration theories and principles.

The aim of this research is to fill the gap in knowledge as such collaboration does not exist in the context of data science in the optimal use of big data, and to propose an appropriate model of collaboration for large organisations to benefit financially by leveraging their data to inform their decisions. The focal point of the research is to investigate how collaboration can be applicable within this context to promote the optimal use of big data.

Elements that could influence how collaboration might occur are explored and assessed, such as the role of leadership and organisational culture, as well as the concepts of trust and knowledge sharing. A successful company like Toyota has a collaborative leadership, where the leaders "explain direction and purpose and then guide team members towards the goal" (Rosen, 2007, p.201). Leadership is thus important in companies with a culture of collaboration. The culture of an organisation also has an important role to play in ensuring the success of collaboration, according to Hartlieb, Leber, Tuppinger, and Willfort (2005). Ricci and Wiese (2011) believe that trust is vital to the success of collaborative teams, while Rosen (2007, p.50) claims that "building trust is a critical success factor in effective collaboration". Rosen also contends that in companies where sharing is promoted, information or knowledge sharers exist, so such employees collaborate better than those who do not share (Rosen, 2007).

New functions that emerged from the research, like that of the chief data officer (CDO) in the context of large organisations and his or her crucial role in the model of collaboration, are also explored. The CDO is the main facilitator of collaboration in terms of data evangelisation throughout the organisation (Teerlink, Sigmon, Gow and Banerjee, 2014).

Concomitant with the central argument, developing a structure that is flatter and incorporates the right leadership within the organisation, as well as including aspects such as culture, trust and knowledge sharing, will allow for the effective collaboration of these various stakeholders. As organisations realise that they have to be more data driven and that using big data will benefit the organisation, this collaboration of the key stakeholders will help organisations to achieve the optimisation of this new concept of big data. New roles such as that of the CDO may also have to be introduced to facilitate collaboration (Teerlink, Sigmon, Gow and Banerjee, 2014).
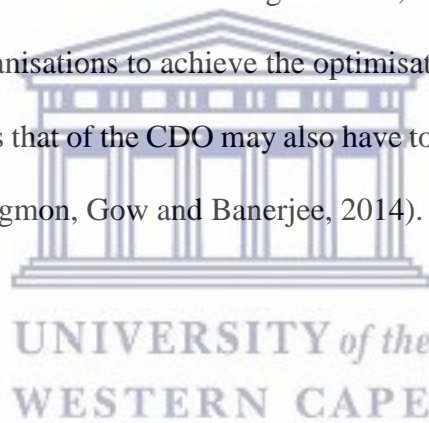
1.4 Objectives

The research objectives are to build an appropriate model of collaboration which can be used in the optimal use of big data in marketing strategies in large organisations and to ascertain how the various groups within the organisation collaborate with the key stakeholders to ensure the optimal use of big data in marketing strategies. The intention of this study is to understand aspects like leadership, trust and knowledge sharing that could influence how collaboration happens among stakeholders and to explore how these aspects will enhance or hinder collaboration. The aspects considered in the hypothesis or problem statements are trust, knowledge sharing, and leadership.

More specifically, the following objectives were pursued:

- To identify the forms of outcomes-driven collaboration operational in marketing, drawing on best practices.

- To identify the constraints hindering effective collaboration.

- To build a guiding model of collaboration for large organisations to achieve optimal use of big data in marketing strategies.

1.5 The research problem statement

The research attempted to answer the problem statements with regard to collaboration among those stakeholders identified to make sense of big data in marketing strategies at large corporate organisations. The research questions are as follows:

- Is leadership required for creating a culture of collaboration to inform data-driven decision making in large organisations?

- To what extent does trust play a role in promoting collaboration among the stakeholders in optimising the use of big data in organisations?

- Does the sharing of knowledge benefit the outcome of collaboration in the use of big data for marketing strategies in organisations?

To answer the specific research questions, the following scientific hypotheses are proposed for testing:

Hypothesis 1:

Effective collaboration is influenced by the leadership of the organisation in the optimal use of big data in marketing strategies.

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Hypothesis 2:

There is a relationship between trust among the various stakeholders and effective collaboration within the organisation in the optimal use of big data in marketing strategies.

Hypothesis 3:

There is a relationship between knowledge sharing among the various business units and effective collaboration within the organisation in the optimal use of big data in marketing strategies.

1.6 Methods and data

The study used a mixed methods approach in the following way:

- A qualitative study of how large organisations deal with collaboration around this topic. This was an in-depth personal interview with many open-ended questions to assess how collaboration occurs. The study comprised extensive interviews with the key people within the business intelligence, business, and marketing areas of the company to understand why the various stakeholders should work together, if they do. This qualitative study was conducted at Woolworths, a large South African retail organisation with its head office in Cape Town.

- A quantitative study was conducted by testing the hypothesis of whether collaboration on the use of big data differs in form among various business units. This hypothesis was tested by doing a survey of the population of

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Johannesburg Stock Exchange (JSE)-listed Cape Town companies from various industries with marketing departments.

The research commenced with the qualitative study at Woolworths, where various senior and middle managers were interviewed. The in-depth interviews were analysed and transcribed. The quantitative study was followed by online surveys sent to the JSE-listed companies in Cape Town.

A triangulation methodology was also used, by introducing additional qualitative interviews from both local and expert overseas consultants, as well as a quantitative analysis using secondary data, to strengthen the research. These additional research items were used to validate the results of the initial qualitative and quantitative studies.
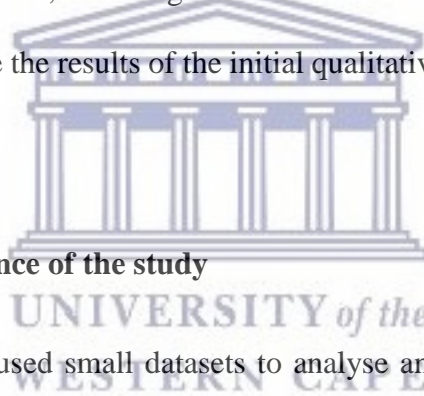
1.7 Professional significance of the study

Traditionally statisticians used small datasets to analyse and then interpret, by using scientific methodologies. Owing to the recent advent of various technologies and data collected about people through different social media platforms and online, this data cannot be processed by traditional tools, and thus, the term 'big data' was coined in 1998 (Kuonen, 2015). Big data requires technology to collect, store and clean it (Agrawal et al., 2011). The IT industry has undertaken this big task and in order to establish how this industry is dealing with big data and analytics, the Intel IT Center surveyed 200 IT professionals in the US on how organisations plan to use big data (Intel[®] IT Center, 2013). This survey found that 70% of companies had a formal strategy in place for big data. This survey also found that the most common challenges

around big data are security, data storage, and analytics (Intel® IT Center, 2013). The NewVantage Partners (2018) survey showed that 97% of large organisations in the US are investing in big data projects of which 73% claim to have already had success in such initiatives.

In order to analyse the plethora of data available to companies, business intelligence and data warehousing software technology are needed and most companies have adopted tools like the Apache Hadoop technology (an open-source solution) to store all this data at a reasonable cost. One of the concerns of the IT professionals is the shortage of skilled professionals like data scientists (or statisticians) to help to make sense of this data.

In the growing body of literature on the subject, the question of whether big data has 'killed' the statistician is being asked. Jones (2014) believes that as big data and data science are the new fads in the IT industry, it is easy for people to define themselves as data scientists without understanding statistics and, thus, diminishing the role of the statistician. Data science requires a team with interdisciplinary skills (Schutt and O'Neil, 2014) – including statistical skills – to make sense of big data, and this team needs to collaborate.

The research proposed a model of collaboration that will provide inputs to business organisations; the application of such a model should help the successful outcome of collaborative efforts in data science in the form of financial benefits to the organisation through the optimal use of big data.

1.8 Delimitation

The qualitative study, in terms of in-depth interviews at Woolworths, was conducted with interviews of eight key stakeholders, also drawing on ten years of the principal researcher's experience at Woolworths. A further 10 in-depth interviews were conducted to strengthen the research by adding 'different voices'.

The quantitative part of the study is limited to the use of big data for marketing purposes in JSE-listed companies in Cape Town and how the various stakeholders collaborate to achieve the effective use of big data for predicting future customer behaviour. JSE-listed companies in Cape Town with marketing departments were approached to participate in an online survey. Only those companies that gave permission to contact their key marketing people by supplying email addresses were sent an online survey to complete.

1.9 Definitions

For the purpose of clarifying the concepts, it is important to provide appropriate, agreed-upon definitions used in the literature.

Big data

This study borrows from the definition of big data by Gartner, Inc., an international leading information technology research and advisory company, as "high-volume, high-velocity and high-variety information assets that demand cost-effective, innovative forms of information processing for enhanced insight and decision making" (Gartner, 2013).

Business

According to the *Business Dictionary* (2015), business is "an organization or economic system where goods and services are exchanged for one another or for money. Every business requires some form of investment and enough customers to whom its output can be sold on a consistent basis in order to make a profit".

Chief Data Officer (CDO)

Teerlink, Sigmon, Gow and Banerjee (2014, p.2) define the CDO as "a business leader who creates and executes data and analytics strategies to drive business value".

Collaboration

"Collaboration is a trusting, working relationship between two or more equal participants involved in shared thinking, shared planning and shared creation of integrated instruction" (Montiel-Overall, 2005, p.4).
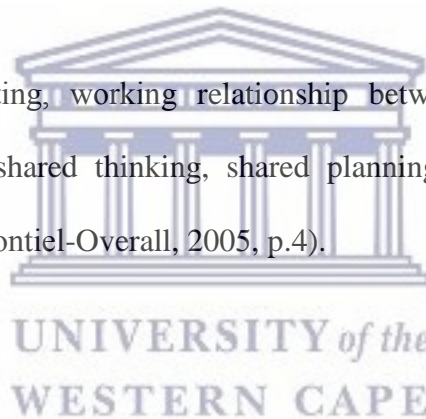
Data Scientist

A data scientist, according to Schutt and O'Neil (2014, p.338), is "a person whose aptitude is distributed within the following domains: mathematics, statistics, computer science, machine learning, visualisation, communication, and domain expertise.

Information Technology (IT)

Information Technology is usually a dedicated department in most companies and the people there deal with computer technology like networking, and the hardware and software requirements of the business (Christensson, 2006).

Knowledge Sharing

For the sake of this research, knowledge sharing is defined as the sharing of ideas and the understanding of the role of the other stakeholders. It also requires the various stakeholders to learn the 'language' spoken by the others. In business, for example, IT and business decision makers do not speak the same 'language'. IT is technical and uses different abbreviations to denote processes and activities within the IT space. Business speaks in financial terms. Trying to understand the other stakeholders is to devise a common language or to explain terms that may be technical or financial.

Leadership

For the sake of this research, leadership is defined as in terms of business hierarchy, like senior management and the executives of corporate organisations.

Statistician

The *Oxford Dictionaries* website (2015) defines a statistician as "an expert in the preparation and analysis of statistics".

Triangulation Methodology

"The use of more than one method or source of data in the study of a social phenomenon so that findings may be cross-checked" (Bryman and Bell, 2011, p.720).

Trust

For the sake of this research, trust is defined as "to have faith in the honesty, integrity, reliability, and competence of another", according to Dawes (2003, p.1).

1.10 Structure of the thesis

This study aims to outline both the theoretical and methodological perspectives of the PhD study. It is structured around seven chapters.

Following the introductory chapter, the second chapter critically reviews the empirical and theoretical literature – the stock of knowledge on the issue under investigation. The third chapter describes the design of the research, while the fourth and fifth chapters present the results of the qualitative and quantitative data analyses. In the sixth chapter, the discussion of the results is presented. The seventh chapter is the integrated model of collaboration for the optimal use of big data. This chapter is followed by the concluding chapter containing the recommendations for future research, with the references and appendices concluding the thesis.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The chapter reviews the literature on the theoretical framework of the research, based on collaboration and organisational theories. A conceptual framework is based on various factors like organisational culture, leadership, knowledge sharing and trust that can influence how collaboration in organisations can occur. The literature review aims to strengthen the argument of the research.

This chapter also reviews the literature with regard to why companies need to be data driven, what big data is, its current benefits and challenges, the concept of data science and its importance, as well as the role of the statistician and other key stakeholders in data science.
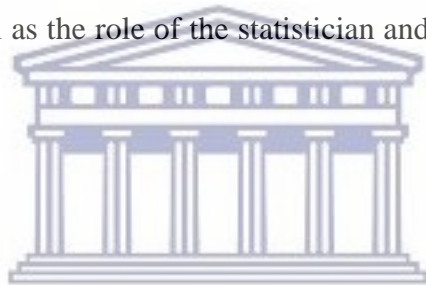
2.2 Theoretical literature review

Business decision makers, IT specialists and statisticians need to collaborate in their efforts of making sense of big data. This study explores how this collaboration can be fostered among these stakeholders.

There are two concepts that drive the theoretical construct of this study: collaboration and organisational theory. There are many factors that influence how collaboration happens in an organisational environment. It is important to understand how organisations encourge collaboration.

2.2.1 Collaboration theory

To establish a theoretical framework that drives this research, it is essential to first define the concept of collaboration. Wood and Gray (1991) note that in order to devise a general theory of collaboration, a definition is required. Gray, cited in Wood and Gray (1991, p.4) defines collaboration as "a process through which parties who see different aspects of the problem can constructively explore their differences and search for solutions that go beyond their own limited vision of what is possible".

Collaboration, according to Rosen (2007), can also be defined in many different ways. Firstly, Rosen (2007, p.8) cites the *Oxford English Dictionary* definition of collaboration as "united labour, co-operation; especially in literary, artistic, or scientific work". Rosen (2007, p.8) further cites Schrage (1995), who defines collaboration as "the process of value creation that our traditional structures of communication and teamwork can't achieve". Collaboration used to mean that shared creation can only occur between people within the same field of expertise like science or literature. However, more recently collaboration has occurred across disciplines (Rosen, 2007). Hence, Rosen (2007, p.9) finally developed a broader definition of collaboration – "working together to create value while sharing a virtual or physical place".

Thomson, Perry and Miller (2009) postulate that there is no real consensus among researchers about the meaning of collaboration. They argue that it is difficult to compare across different disciplines, as well as to measure it in practice. For the sake of this research, as part of the theoretical framework, various collaboration theoretical perspectives and how to implement them are considered to assist in the understanding of collaboration among the various stakeholders in the optimal use of big data in marketing strategies in corporate organisations, as well as to assist in devising a guiding

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model of collaboration in the marketing environment. Many of the collaboration theories are based on inter-organisational collaboration in the public sector in the USA.

The next section considers different theorical perspectives of collaboration.

2.2.1.1 Collaboration as an inter-organisational collaborative effort

The definition of collaboration can be vague and difficult to understand how to put into practice. Therefore, Gajda (2004) uses principles of collaboration theory both to put collaboration into practice and to be able to assess it. The author applied this in an inter-organisational collaborative effort to address school safety within the Federal Department of Education in the USA.

Generally accepted principles of collaboration were derived from observed evidence presented in literature and are as follows (Gajda, 2004):

Principle 1: Collaboration is an Imperative

In the world today, it is difficult for non-profit or community organisations, government agencies, businesses or individuals to solve complex problems by themselves. Working with others allows the different entities to combine resources to solve problems which otherwise would be impossible to solve by themselves. This is why collaboration is important.

Principle 2: Collaboration is Known by Many Names

There are many names that describe collaboration, where the different entities benefit from the collaborative effort. Dictionaries, like Merriam–Webster, define collaboration as "working together", "pooling resources", "joining forces" and "co-operating with

one another". Terminologies to describe collaboration are broad and include terms like consortium, alliances, task forces, groups, network partnerships, etc. It is important for the groups collaborating to jointly understand the nature and complexity of the collaboration.

Principle 3: Collaboration is a Journey, not a Destination

There are different levels in collaborative efforts that range from low to high integration, depending on the purpose and process of the type of collaboration. Peterson (1991) suggests three different points on the integration scale, namely co-operation (where the groups involved share information), co-ordination (where they align their activities for a mutually beneficial outcome) and collaboration (where there exists an interdependence to achieve their shared goal). Different partnerships move from the low to high levels of integration and are thus a journey and not a destination.

Principle 4: With Collaboration, the Personal is as Important as the Procedural

For successful collaboration, efforts require interpersonal relationships based on trust to succeed, which develop over time. There should be an expectation of conflict among individuals and an effective system of communication should exist.

Principle 5: Collaboration Develops in Stages

From literature on organisation change (Tuckman, 1965; Tuckman and Jensen, 1977, cited in Gajda, 2004), various stages of collaboration have been developed:

1. Assemble and Form

2. Storm and Order

3. Norm and Perform

4. Transform and Adjourn

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Although idealistic, this four-stage process is a logical way of implementing inter-organisational collaborative effort and is widely used. Morgan (2010) adapted these stages of collaboration into five:

1. Forming, where the team is first put together.

2. Storming, where there can be much debating and confrontation within the team.

3. Norming, when team member get to know one another and their work ethic.

4. Performing, when the team is efficient and starts making decisions.

5. Adjourning and Transforming, where the team is either adjourned or moves to another project.

2.2.1.2 Collaboration in the public sector and the output of collaboration in practice

Huxham (2003, p.402) gives an overview of the theory of collaboration with its practice in mind. The author's research is to understand how to "develop, present and disseminate the theory" into practice that is positive and real. The focus is on inter-organisational collaboration with a wide variety of disciplines in the public sector. Huxham's (2003) research is dominated by two concepts: collaborative advantage, that is, the potential interaction for collaboration as a guide of how it should happen, and collaborative inertia, the output of collaboration in practice.

To understand how collaboration happens in practical terms, Huxham (2003:404) introduces five themes to describe areas of concern when putting the theory into practice. The themes are described by listing "common wisdom" and "common practice" to distinguish between the ideal and the reality.

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Theme 1: Common Aims

Huxham (2003, p.404) states that "common wisdom" (a clear aim of the collaboration) is vital, but in "common practice", it is difficult to agree on the aims when various organisations have their own agendas. It is thus important to discuss the goals of the collaborative efforts from the outset, but not to let a lack of agreement on such goals or aims stop the collaboration from starting.

Theme 2: Power

The "common wisdom" states that power is held by those with the "purse strings", but in practice, power in situations of collaboration is negotiated and it influences how actions are carried out (Huxham, 2003, p.406). Many of the role players in collaborative efforts can exert power, like the chairperson of the team. The venue at which the meetings are held gives power to the organisation that owns that venue. In situations where an independent partner manager is appointed, that person can hold the power base in the collaboration. Power can assume many forms, but there should be an acceptance among the collaborators that there will be some manipulation of power, even though it could be against the spirit of collaboration.

Theme 3: Trust

The "common wisdom" is that many who have participated in collaboration will agree that trust should exist before collaboration starts, but this is difficult to achieve.

The "common practice" is that in the beginning of the collaboration, there is some level of mistrust among the various organisation participants. There should, however, be an effort to start to build trust among the partners. Huxham (2003, p.409) lists two important elements in establishing trust: one is a "formal contract" and the other merely

involves taking a risk in being open with the rest of the participants. If there is the willingness to do this, trust can be built among participants. Huxham (2003) advises to start the collaborative process even if there is not complete trust, and to build trust through relationships.

Theme 4: Membership Structures

Membership structures of collaborations can be ambiguous, complex and dynamic in reality. Huxham (2003) finds that there are many members of collaborative partnerships that are unclear about their roles in the collaborative effort. Not only are members unclear about their roles, they also find the collaborative arrangements complex in practice in terms of how some parts relate to other parts of the collaboration. Collaborative effort is dynamic in nature, as an individual's role can change within his or her organisation, making that individual no longer part of the collaborative effort. New members can also join the collaboration during the project, owing to a resignation or promotion, adding to the dynamic nature of collaboration.

Theme 5: Leadership

Leadership is crucial in a collaboration as it is the "mechanism that makes things happen" (Huxham, 2003, p.415). Huxham's (2003) theory of leadership has two parts: the first part concerns "leadership media", while the second "leadership activities". Leadership media includes not only the participants, but also structures and processes through which leadership is conducted. This theory argues that these structures and processes are as important as the collaborating participants. The leaders may not need to be collaborative members. Leadership activities are the tasks carried out by the leaders of collaboration. The collaboration outcomes are affected by the carrying out of these activities.

2.2.1.3 The effective implementation and measurement of collaboration

Thomson, Perry and Miller (2009) note that a valid theory of collaboration that can be practically implemented requires a systematic way of assessing what collaboration entails and how to measure it. There is considerable research on collaboration from a range of different theoretical perspectives and there are many different understandings of the meaning of collaboration. Because of this, it is difficult to compare findings in research and to measure the effectiveness of collaboration. In collaborations within private and public organisations, the expectation of the various participants is to derive shared value and benefit for such efforts. The various stakeholders, however, may understand collaboration differently, and therefore have different ways of measuring success. Because of this, Thomson, Perry and Miller (2009) found it important to stipulate how collaboration be implemented and how measured.

The research of Thomson, Perry and Miller (2009) was aimed at advising on the implementation and measurement of collaboration within the public sector in order to drive change in policy. Their conceptualisation of collaboration was established on theoretical evidence from different bodies of research, in the form of a review of literature, and on field research by interviewing 20 directors as part of their quantitative research design. From this, five dimensions of collaboration were devised as part of their conceptualisation of collaboration.

The dimensions as per Thomson, Perry and Miller (2009) are as follows:

1. Governance – the various stakeholders of the collaborative partnership need to understand how decisions will be made in this collaborative effort. There should be working rules allowing each of the partners an equal share in making decisions to reach solutions as part of the process.

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2. Administration – it is important to have an administrative structure in place to ensure clarity in respect of the different roles and responsibilities among the participants, as well as effective communication channels. This will advance the governance phase to achieve the shared goals of the collaboration.

3. Organisational autonomy – this is a defining dimension as it encapsulates both the implicit dynamism and frustration associated with the double interest that partners in collaboration have – to themselves and collectively (Thomson, Perry and Miller, 2009). This tension needs to be understood and how it plays out in the collaborative effort must be carefully handled.

4. Mutuality – there should be an interdependence between the partners of collaboration. Wood and Gray (1991) state that collaboration can occur if both parties can fulfil the other's interests without causing harm.

5. Norms – trust is one of the values required for effective collaboration Thomson, Perry and Miller (2009) do, however, recognise it takes time to develop trust among partners within collaboration and it takes repeated interactions.

The quantitative research design delivered a 32% response rate, and generalisation could not establish a validated theory of collaboration. The research did, however, have statistical significances in some of the dimensions, and future research was recommended (Thomson, Perry and Miller, 2009).

The three theories above provide different points of view on the importance of collaboration, in the context of either the public sector or collaboration between organisations. This study is concerned with collaboration within a corporate organisation, but the principles from these theories can still be applied in this context.

In the past, employees did not work as much in teams as they are currently doing, which indicates a change from a more individual way of working to a more collaborative way (Colbry, Hurwitz and Adair, 2014). The authors are of the view that collaboration in research is seen more as a leadership tool and that not much research has been done on the broader construct of collaboration. Collaboration can be investigated at three levels, interpersonal, intra-organisational and inter-organisational, but not enough research is done at the interpersonal level. Colbry, Hurwitz and Adair (2014, p.64) describe this type of collaboration as "an influence tactic for garnering cooperation". The authors use this paper to develop an interpersonal theory of collaboration which comprises how collaboration works regardless of known forms like collaboration between the manager and subordinates or among subordinates, unlike the leadership theories, but collaborations that exist between groups without the hierarchical structures.

According to Kelly (2014, p.3), collaboration within organisations is more than an activity, but is a process with shared norms. Each participant's contribution is considered and the "collective intelligence" is extracted from all the participants. Collaborations in organisations have been used to break down silos and to encourage cross-functional team undertakings to be more innovative (Kelly, 2014). The author further claims that such collaboration can lead to benefits like "high retention rates", the ability to bring products "faster to the market" and increased "top-line revenue and better profitability". Kelly (2014) believes that usually only senior leadership is trained in how to collaborate and not employees across the organisation; this can cause collaboration to fail in organisations. To create a culture of collaboration, openness to debate, without the criticism of leadership, should be encouraged, which will lead to new and creative ideas (Kelly, 2014). The author lists the "building blocks required for

effective collaboration" to be "trust, communication, and shared vision and purpose" (Kelly, 2014, p.5).

In order to develop a model of collaboration within a corporate organisation, it is important to understand how such organisations work. The next sections will explore organisational theory, organisational structure, and organisational culture.

2.2.2 Organisational theory

The qualitative part of the study investigates how collaboration is fostered among stakeholders at Woolworths, a JSE-listed retail company in Cape Town, South Africa. It is, therefore, important to consider how collaboration occurs in an organisational environment in order to understand how organisations drive collaboration. For this reason, organisational theory needs to be explored.

Barzilai (2010, p.1) describes organisational theory as "the study of organisations for the benefit of identifying common themes for the purpose of solving problems, maximising efficiency and productivity, and meeting the needs of the stakeholders". Barzilai (2010) further states that organisational theory encompasses three concepts: individual, group, and organisational processes. Motivation, personality, and role theory are explored under individual processes. Employees' behaviour is driven by what motivates them and in organisations this can be different things, for example, their salary, level or certain 'perks'. The role of an individual in an organisation 'shapes' him/her and it determines how the individual sees himself/herself within the organisation. When collaborating with others, the employee's role needs to be clearly defined to avoid unnecessary conflict in the collaboration (Barzilai, 2010). Different personality types can either encourage or hamper meeting goals. Personality types A

and B are most common and known types. Type A is more competitive and Type B more patient, thus less competitive.

There are theories that propose that individual processes form a significant part of the success of an organisation. The group processes considered by Barzilai (2010) are Leadership, Power and Influence. Parry (2011, p.55) states that leadership can greatly influence team performance and is responsible for identifying the "possible obstacles between the team and its goals". Power and influence can affect both individual and group activities in an organisation. These are mostly seen as negatives, but according to Barzilai (2010), it is a positive to generate productivity in an organisation and to achieve team goals. The author further states that it is important to work in groups, as these constitute the building blocks for achieving the goals of the organisation. Managers should choose individuals with the right traits and talents to create groups that will be successful, according to Barzilai (2010).

The third process in organisational theory comprises organisational processes, which consist of organisational structure and design, and organisational culture (Barzilai, 2010). Edwards (2003) differentiates between the concepts of management and leadership, noting that it is not mutually exclusive. Management refers to a social construct of individuals overseeing others and implementing processes, whereas leadership is being responsible for the strategic direction of the company. In terms of the hierarchy of the organisation, the higher up the manager, the more leadership is required.

2.2.3 Organisational structure

Laegaard and Bindslev (2006) discuss five models of organisational structures:

1. Simple Structure

2. Hierarchical System

3. Functional Organisation

4. Product Organisation

5. Matrix Organisation

For the purposes of the literature review, the simple structure will be excluded from the discussion as it pertains to small companies where the owner works in the business.

A hierarchical organisational structure develops as an organisation grows; it is derived from military systems with a 'chain of command' indicating the different levels of line managers in organisations (Laegaard and Bindslev, 2006, p.20). Many big organisations have this type of structure. In Figure 2-1, a hierarchical structure is shown.
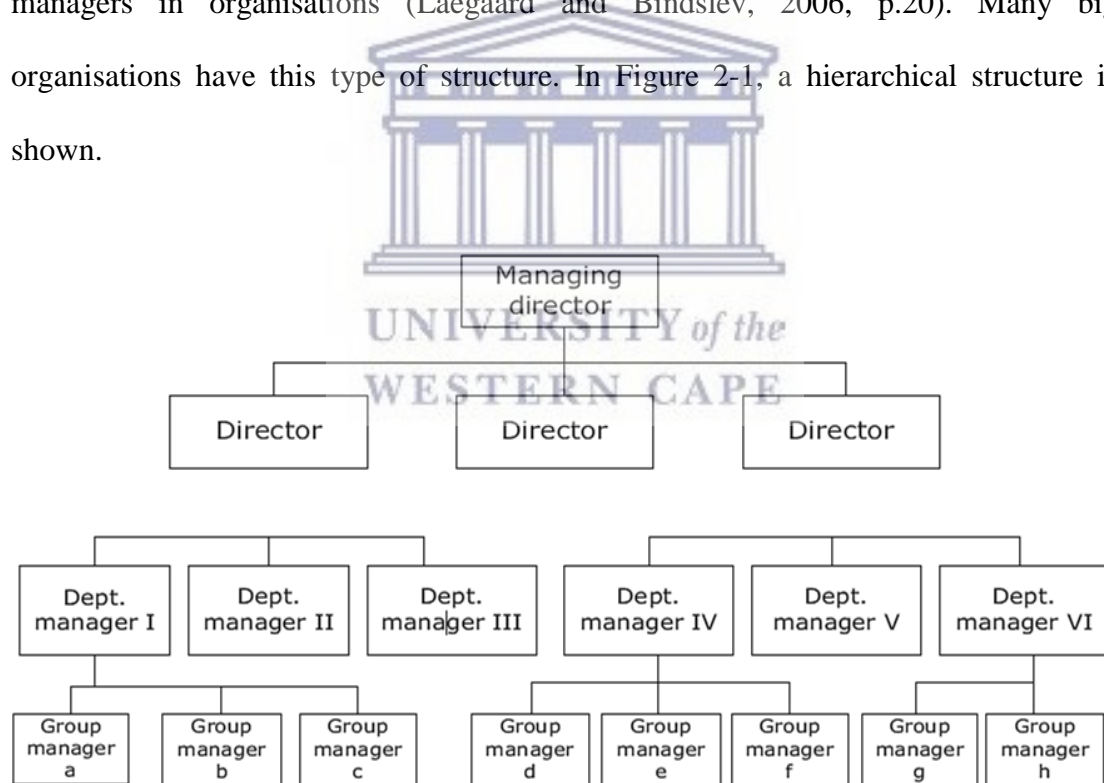
Figure 2-1. Hierarchical organisation (Laegaard and Bindslev, 2006, p.20)

The functional organisational structure is based on having expertise in the same areas within the business, grouping people with the same qualifications and backgrounds

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together. An advantage of such a structure is that within each of the functions, deep expertise develops. However, a disadvantage of this type of structure is that it can lead to the various groups distancing themselves from the other areas and can lead to conflict and misunderstandings.

This structure is shown in Figure 2-2 below.
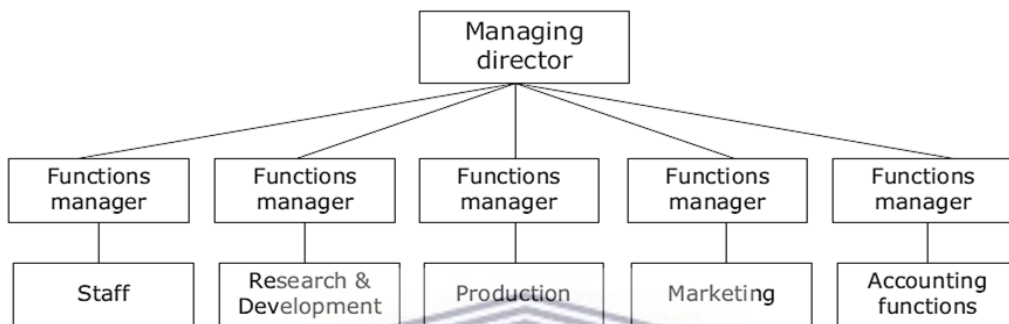
Figure 2-2. Functional organisation (Laegaard and Bindslev, 2006:21)

The product organisational structure is "a significant form of organization today" and is useful in organisations with "separate products or services" (Laegaard and Bindslev, 2006, p.21). One of the advantages of this organisational structure is it is focused, with dedicated staff working on a specific product, and decisions can easily be made. It does, however, become difficult when the different functions have to work together to solve complex problems that can affect the entire organisation. This organisational structure is not appropriate to collaboration for a new and complex concept like big data. The product organisational structure is shown in Figure 2-3 overleaf.
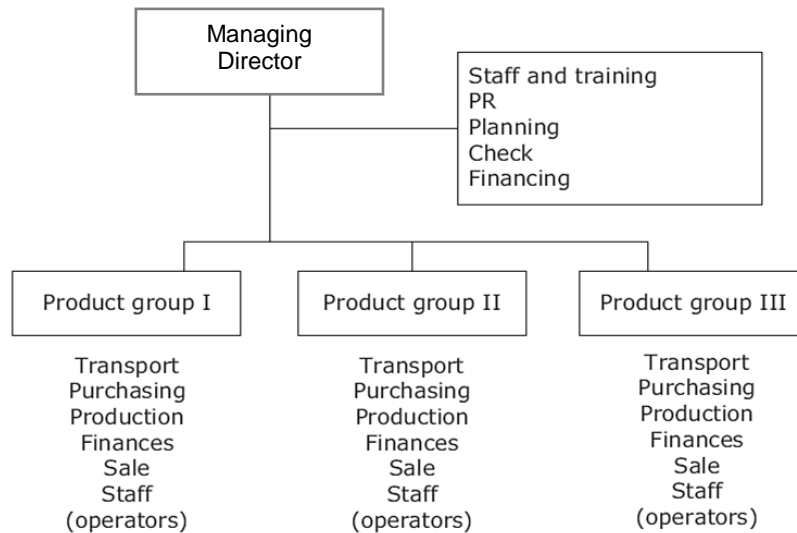
Figure 2-3. Product organisation (adapted from Laegaard and Bindslev, 2006, p.22)

The matrix organisational structure is seen as a theoretical model and many industrial organisations, wanting to be more competitive, assume this type of structure. There is a focus on process logistics, quality and cost. This type of organisational structure lends itself to conflict between top management and the rest of the organisation. The middle management of the organisation are required to have competencies across logistics, quality and cost, which is difficult, so they do not have a clear expertise. Because of the many operational tasks, it is difficult for middle management to bring teams together to brainstorm and collaborate (Laegaard and Bindslev, 2006). The main disadvantage of this type of structure is that it makes collaboration between middle and top management difficult, owing to the reliance on middle management to make decisions in this type of structure. This structure is shown in Figure 2-4 overleaf.

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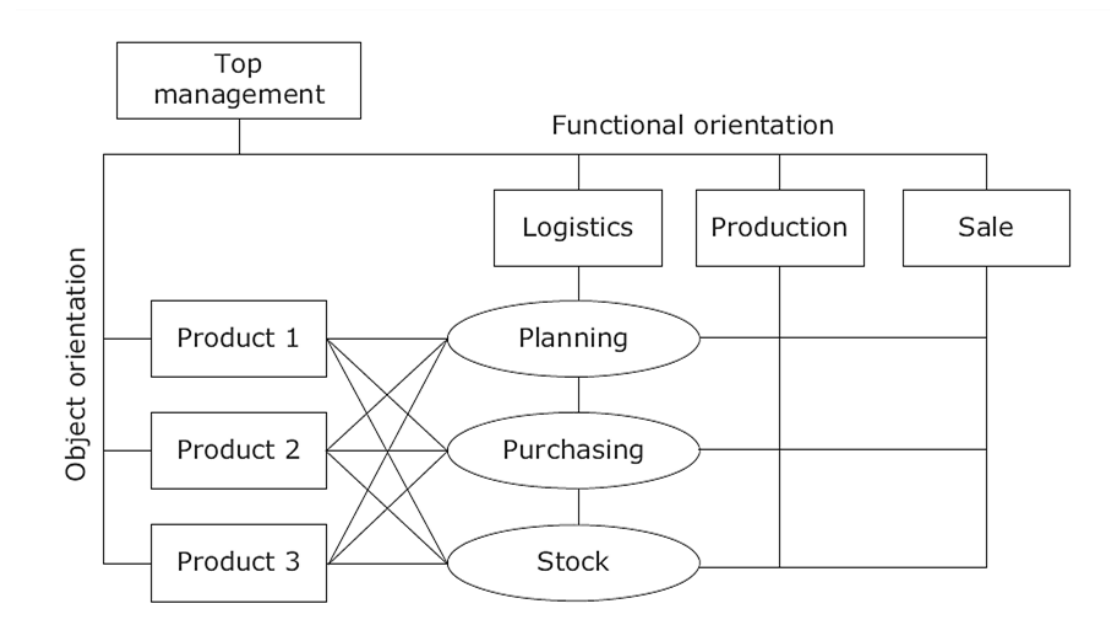
Figure 2-4. Matrix organisation (adapted from Laegaard and Bindslev, 2006, p.23)

According to Laegaard and Bindslev (2006, p.25), there is no perfect structure for an organisation.

Almost all companies in the world, irrespective of their size or industry, have a hierarchical organisational structure (Morgan, 2015). This organisational structure used to be a good structure; however recently organisations have been looking at alternative structures, since this structure has not allowed for effective communication and it makes collaboration difficult. The hierarchical structure makes it tough to retain talented employees, but even though organisations want a flatter structure, many organisations around the world are struggling to move away from it (Morgan, 2015).

It seems that most companies will retain the hierarchical structure for a while still as organisations are "having a tedious time getting rid of it" (Morgan, 2015) and the challenge will be to encourage collaboration in terms of big data within this type of structure. In order to use big data optimally, organisations will require a culture of

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collaboration and the next section explores organisational culture and how it impacts collaboration.

2.2.4 Organisational culture

Big data and data science are new and unexplored concepts for many organisations. They also are difficult to understand and require various stakeholders from across the organisation to collaborate. Big data thus requires a change in culture to achieve effective collaboration among the various stakeholders. "Effective collaboration requires breaking down the barriers and bridging the cultures" (Rosen, 2007, p.112).

Culture differs from organisation to organisation, and is established over time and adopted by the leadership to be enforced by its employees. The culture of an organisation can be described in written mission and vision statements as well as by the "unspoken set of values that guide employees' actions" (Al-Alawi, Al-Marzooqi and Mohammed, 2007, p.25). Barzilai (2010) defines organisational culture, according to a framework of values, behaviours and expectations shared among the employees of an organisation that provides a unique identity for those in the organisation.

Organisational culture is also defined by categories that include "information systems, people, process, leadership, reward system and organisational structure" (Al-Alawi, Al-Marzooqi and Mohammed, 2007, p.37). Schein (2004) explains culture in an organisation is difficult to define, and that over the past three decades many academics have debated this. That so many are addressing it, underscores its importance.

Culture somehow implies that rituals, climate, values, and behaviours combine into a coherent whole; this patterning or integration is the essence of what we mean by culture, and such patterning or integration ultimately derives from the human need to make our

environment as sensible and orderly as we can (Weick, 1995). Disorder or senselessness makes us anxious, so we will work hard to reduce that anxiety by developing a more consistent and predictable view of how things are and how they should be. Thus "organizational cultures, like other cultures, develop as groups of people struggle to make sense of and cope with their worlds" (Trice and Beyer, 1993, p.4). Schein (2004, p.17) formally defines culture as

> ... a pattern of shared basic assumptions that was learned by a group as it solved its
> problems of external adaptation and internal integration, that has worked well enough
> to be considered valid and, therefore, to be taught to new members as the correct way
> to perceive, think, and feel in relation to those problems.

This definition of culture is the ideal situation but in practice complete integration and patterning is not always achieved (Schein, 2004). Clawson (2008) believes employees at all levels in an organisation can influence the culture that exists in that organisation, but those with the most power or status (like the top leadership) are in the best position to change the culture.
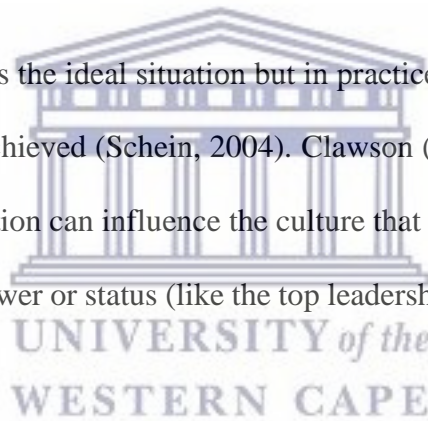
In most large organisations a corporate culture and multiple subcultures can exist. The core values are shared by all employees within the corporate culture. Subcultures develop in large corporates owing to the varied problems and experiences of the subgroup or department, as well as the frequency of their interaction (Khatib, 1996). Khatib (1996) contends that subcultures are formed in specific geographical locations or departments, management or staff groupings. If they move from the core values of the corporate culture, they could create tensions and cause the failure of the organisation (Schein, 2004). In this study, how different groups from various departments or management have to work in a cross-functional team to make sense of big data can be

difficult should subcultures exist within these groups. A culture of collaboration should be a core value within the organisation to bind different departments even if subcultures exist. In the age of technology, the organisation's leaders may blame technology for the lack of collaboration, but it could be because of a lack of a culture of collaboration in that organisation (Rosen, 2007).

The next section considers the culture of collaboration and its importance in modern organisations.

2.2.5 The culture of collaboration

According to Rosen (2007, p.114), "Companies with collaborative cultures have less defined barriers among departments and functions, and therefore it's easier to avoid silo syndrome and enable collaboration." To make sense of big data requires the skills of a cross-functional group of people from different departments within the organisation, so in order to effectively collaborate, a culture of collaboration is crucial.

Rosen (2007) suggests that many organisations in the USA have a star culture, much like the predominant culture of the country itself with its obsession with celebrity. Organisations with such a culture encourage employees to compete with their colleagues. Rosen (2007) contends this leads to employees holding on to information to get ahead. Such a culture does not lend itself to collaboration. Understanding the organisation's culture can determine how well its employees collaborate. "Without a culture of collaboration, the best processes, tools and leadership strategies fall flat" (Rosen, 2007, p.xii). The culture of an organisation speaks to how the employees are treated and how they cooperate with one another and their employers. In the same way in a culture of collaboration, they must trust one another and share information (Ricci and Wiese, 2011).

The DNA of the culture in USA corporate organisations in terms of reward systems is individual rather than team based; this will have to change if organisations want to be more team based – hence teams working together and collaborating (Rosen, 2007).

The workplace is changing and the style of work has been impacted (Rosen, 2007). Employees used to receive work in an in-basket and later in an email inbox. Tasks are received this way and then passed on the next person, like a relay race (Rosen, 2007). The author notes that "the inbox culture is dead" and that the era of value creation, this "pass-along approach" can no longer work. In order to solve problems and make better decisions efficiently, we must come together often in real time rather than wait for emails, the file, or for someone else's input" (Rosen, 2007, p.1).

With the advancements in technology, information is easily accessible at our finger tips and people do not have to wait. People can work together from across the world in real time. Collaboration is no longer restricted by location, and the changes in the corporate landscape over the past decades, according to Rosen (2007), can be considered in four key trends: technological, economic, cultural, and regulatory. These trends all create better opportunities to collaborate. The author suggests that to effectively collaborate, organisations need to break free from their comfort zones and to shift culturally and adopt collaboration in work styles.

Companies have evolved over the years in terms of how they collaborate or function, mainly because of communication (or possibly collaboration) tools. Before the telephone became a tool used in companies in the 1940s, it was difficult to collaborate in business. Thus, the telephone made a big difference to how people worked together (Rosen, 2007). Over the next decades, with the creation of the fax machine and the personal computer, and eventually the Internet and email, it became even easier to

collaborate in organisations. With almost every person in an organisation having an email account, this communication tool, however, has caused a setback in collaboration. If an email is sent, the recipient may not respond immediately, and as a consequence, decisions cannot be made until a response is received. Other tools, for example video conferencing, are widely used, and allow people to meet from across the city or even across the world, making collaboration and value creation more effective. Even though such tools make it easy to collaborate, companies are still resisting the new tools, and this requires a culture change (Rosen, 2007).

Rosen (2007, p.9) advocates that there are ten elements that usually exist when collaboration occurs. These are listed as "trust, sharing, goals, innovation, environment, collaborative chaos, constructive confrontation, communication, community, and value" in organisations. Black et al. (2003) claim that there is a relationship in the dynamics of trust, knowledge sharing and collaboration in the context of designing and implementing information systems in multi-governmental and inter-organisational projects. It is the intention of this study to interrogate the factors that influence how collaboration occurs among stakeholders and to explore the factors that will enhance or hinder collaboration. The factors considered in the hypothesis or problem statements are trust, knowledge sharing, and leadership.

2.3 Empirical Literature Review

Organisations use data in their marketing strategies to create value for their business, such as their customers' demographic and transactional data. Organisations also use sales and customer services data to understand their customers better (Hill, Towers and Borne, 2013).

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In recent years, with the advancement of technology, customers leave a footprint when they interact on organisations' websites and this type of data tells them more about their customers' preferences. Big data has created a significant opportunity in retail organisations to use customer data through their interaction online on the retailers' websites, as well as their transactional data to better market their products to their customers through more personalised content and offers (Cavanillas, Curry and Wahlster, 2016).

Big data have also provided opportunities in other sectors, like media and entertainment sectors, to deliver personalised content to their customers dynamically, as well as opportunities in the finance and insurance sectors through the "proactive management of a wide range of issues from credit to operational risk (Cavanillas, Curry and Wahlster, 2016, p.6). The authors also state that big data offers innovative ways of extracting value to gain advantage over competitors.

In order for businesses to extract financial value from data, they need to become data-driven businesses. This concept is explored in the next section.

2.3.1 Being a data-driven business

In a world where technology constantly changes, data is being generated at an exponential rate, doubles every two years and will have increased 50 times from 2010 to 2020 (insideBIGDATA, 2017). Data is generated in all spheres of life and businesses are starting to realise that it is important to leverage this data and the insights gained from it to make more informed and strategically beneficial decisions faster (Provost and Fawcett, 2013). Businesses now have to rely on data, not only to gain competitive advantage over others, but also as a necessity to survive in business (Harvard Business

Review, 2012). Provost and Fawcett (2013) define data-driven decision making as decisions based on data analysis and not only on intuition. Brynjolfson and McElheran (2016) proved statistically that organisations that use data to drive decision making, are more productive than those organisations that do not.

In an organisation that wants to be data driven, a relationship of trust between the decision makers and the analysts is required (Davenport and Harris, 2007). The authors also propose that there are three types of groups in an organisation with regard to analytical skills: senior management members who determine the tone of the analytic culture at the organisation, professional analysts, and those staff members who are considered amateur analysts.

Another important role in the organisation regarding analytics is that it should be performed by middle managers. Middle managers are considered those in the organisation who need to oversee the implementation of analytic projects that are based on the strategies set by senior management (Davenport and Harris, 2007). Important to analytics are the IT employees who are responsible for the software and hardware to perform analytics (Davenport and Harris, 2007). Business intelligence (BI) exists within the IT department, defined by Zeng et al. (2007) as "sets of tools, technologies and solutions designed for end users to efficiently extract useful business information from oceans of data". BI also houses the company's data warehouse where data is stored and managed (Ranjan, 2009) and is thus an important part of the analytics process. Success in analytics, therefore, does not depend on a single individual, but on many stakeholders or departments across the business. It requires good data management competencies, and quality and accurate data, thereby delivering value to the business and creating trust (Stubbs, 2013).

The type of analytics in a corporate business is termed business analytics, which is defined as all types of analytics – reporting, predictive, etc. – to acquire good business outcomes and thus create value for the business, and that can be operationalised in the sustainably of the business (Stubbs, 2013). The value created by business analytics comes from leveraging people, processes, data and technology within the business. Business analytics gives the organisation the competitive advantage over others because it enhances the decision-making process (Stubbs, 2013).

Figure 2-5 below illustrates how data is turned into intelligence; this increases the competitive advantage over others as the value of the data is extracted.
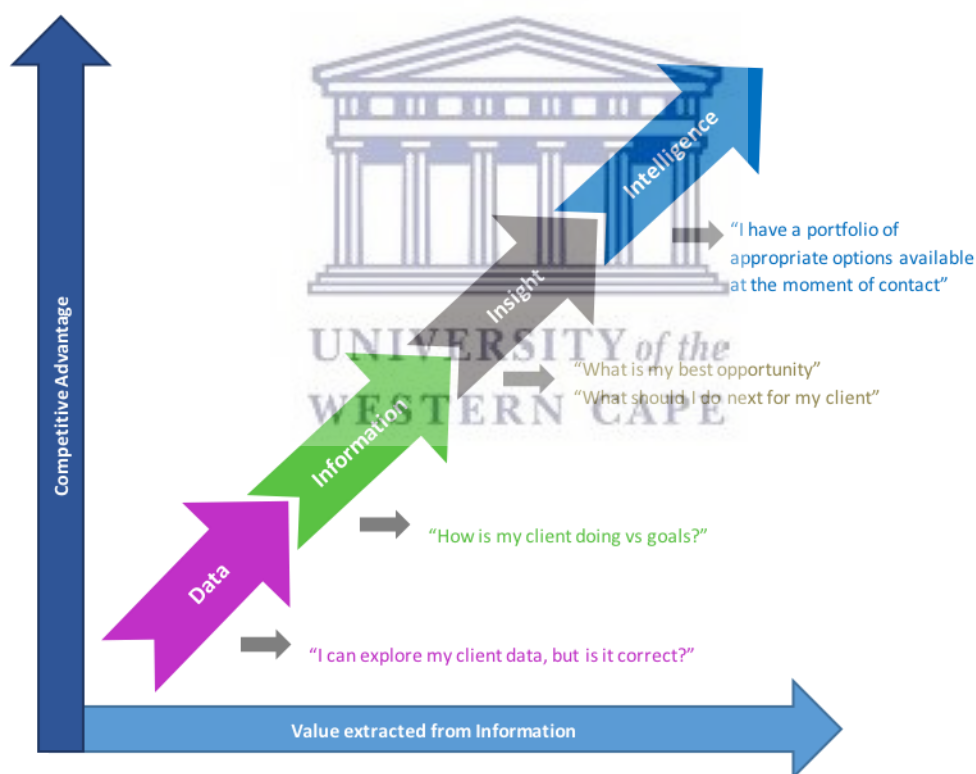
Figure 2-5. What does the data-driven enterprise look like? (Adapted from KPMG, 2015, p.5)

A data-driven organisation requires a change in organisational culture. It requires not only great analytics professionals, but also having discussions about data for all to understand it across the organisation and giving access to the data to everyone in the organisation (Patil and Mason, 2015). The role players that ensure organisations are data driven, therefore, are the management of the organisation, who set and implement strategy – the decision makers, IT or business intelligence specialists, who store and managing the data, as well as the analytics professionals, who analyse the data and interpret it.

With the advancement of technology and the amount of data available, the concept of big data has emerged. It has become important to understand and make sense of big data within corporate organisations. The next section explores this concept.

2.3.2 Big data

Big data, a term coined in 1998 (Kuonen, 2015), has taken the world by storm in the recent past. According to Davenport and Kim (2013), big data offers opportunities to many organisations across the world to gain insights from the data derived from their customers and obtain greater competitive advantage over others. This type of data about people or customers is collected online through social media and other online activities and is seen as a person's footprint, which is big data (Kligienė, 2012). Big data, in the form of complete customer data, has the potential to increase the operating margins of a retail business by 60% by gaining market share over the competition (Ram, Zhang and Koronios, 2016).

 In a survey done by Intel® IT Center (2013) of 200 IT professionals in the USA on big data analytics, 70% indicated that the organisations they worked for had a formal strategy in place for big data analytics (Intel® IT Center, 2013). However, according to

Davenport (2014), of 339 organisations responding to a survey conducted by the SAS Institute Inc., 71% indicated that they had not started planning for the strategy they had in place, owing to factors like data quality, etc. A survey published in January 2018 by NewVantage Partners (2018), indicated that 97% of the respondents were investing in big data projects, of which 73% claimed to have had success already in such initiatives. This increase in the number of organisations embarking on big data projects since 2013 shows its importance.

Big data was defined in 2001 by Doug Laney by the three V's: Volume, Velocity, and Variety. Volume speaks of the amount of different types of data, that is, from transactional data and more recently unstructured social media data (SAS Institute Inc., 2015). According to the SAS Institute, although data storage costs have decreased in recent years, issues like how to use such big volumes of mostly unstructured data are still problematic. The second V – Velocity – addresses the speed at which this data is generated in almost real time and organisations are struggling to manage this. Variety indicates the different types of data, from unstructured social media data and structured numeric data from traditional databases, to text data. Having so many varieties of data is challenging for organisations to merge and govern it all (SAS Institute Inc., 2015).

SAS added two extra dimensions to their observations on the definition of big data – Variability and Complexity. Variability in big data means that the volume and variety of data flow inconsistently. This phenomenon makes it difficult to manage the data, especially when it is unstructured. Complexity speaks of the different sources of data; its linking and merging can become problematic as data needs to be transformed and matched across different data systems (SAS Institute Inc., 2015).

Davenport (2014) explains that some have defined big data according to the 3 V's, while others have added more V's to the definition, but that the term 'big data' is relative, because when the definition was first devised, the size of the data was big at that time; however since then the size of data has exponentially increased. The author also notes that not all datasets classified as big data have all the V's. Davenport (2014, p.8) explains that to some, big data is now also synonymous with data-driven analytics and that the term 'big data' has a "relatively short life span". However, this phenomenon will not go away and there are many opportunities for using big data in industries to drive business decision making.

Big data is defined visually to describe the different V's in Figure 2-6 below:
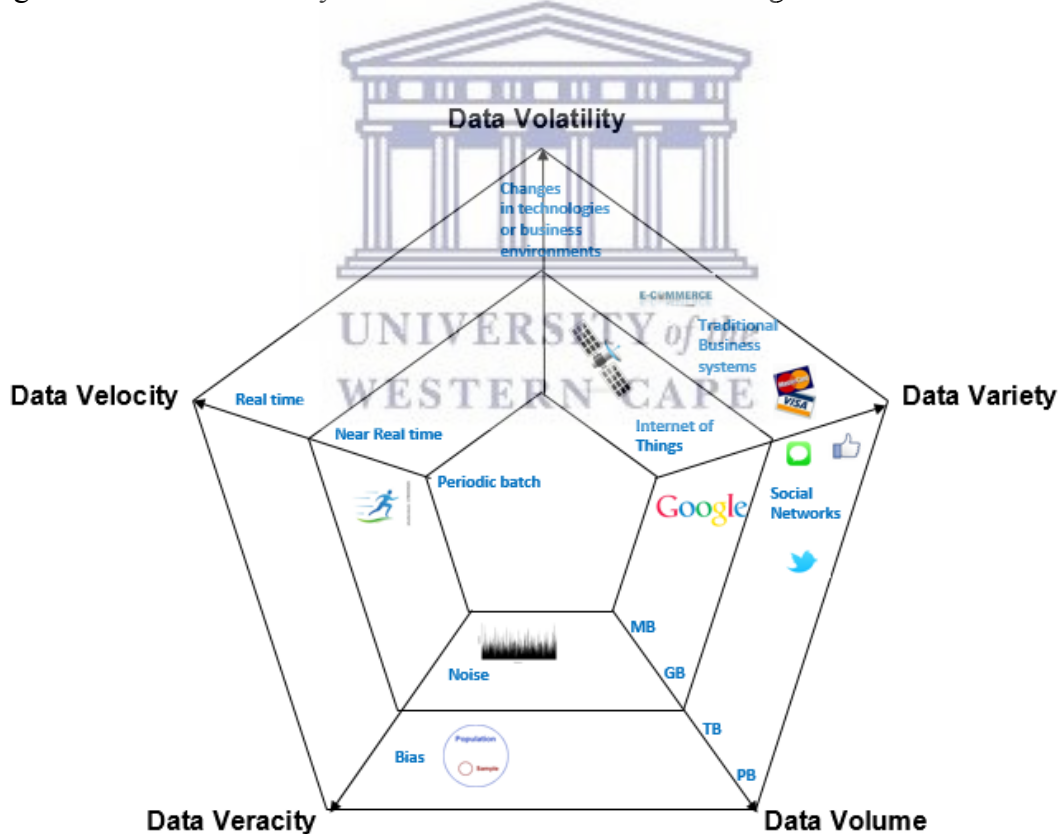
Figure 2-6. The 5 V's of big data (based on Laney, 2001, cited in Hammer, Kostroch, Quirós and STA Internal Group, 2017, p.9)

Analysis of data to help businesses to make sense of their data has been around for many years, according to Davenport (2014). The various terms used throughout the years and the timeframes are listed in Table 2-1 below:

Table 2-1. Timeline of data analysis (adapted from Davenport, 2014, p.10)

Term	Time frame	Specific meaning
Decision support	1970–1985	Use of data analysis to support decision making
Executive support	1980–1990	Focus on data analysis for decisions by senior executives
Online analytical processing (OLAP)	1990–2000	Software for analysing multidimensional data tables
Business intelligence	1989–2005	Tools to support data-driven decisions, with emphasis on reporting
Analytics	2005–2010	Focus on statistical and mathematical analysis for decisions
Big data	2010–present	Focus on very large, unstructured, fast-moving data

The timeframe of big data is from 2010 to the present and Davenport (2014, p.10) explains that it followed on from the Analytics phase around the mid-2000s, where the

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focus for analysing data was on "statistical and mathematic analysis for decisions". The next section focuses on the opportunities that big data brings.

2.3.3 Opportunities of big data

Today big data is being used to solve problems in many different industries in the world. An example is in the primary healthcare sector in the USA to predict new flu cases (Mayer-Schönberger and Cukier, 2013). The Centers for Disease Control and Prevention (CDC) in the USA records new flu cases from information provided by medical practitioners. The data is then collated in a table for analysis. However, there is always a lag of two weeks, which is not adequate to help prevent a possible flu pandemic. In order to also predict flu cases, Google used 50 million frequently searched terms (big data) for flu symptoms or remedies. They compared the results with those of the CDC over a period of five years and produced similar results in almost real time. This is a display of the power of big data. Google could do this prediction because of the company's knowledge of how to process huge quantities of data combined with their statistical expertise (Mayer-Schönberger and Cukier, 2013).

In a research community technical report (Agrawal et al., 2011), the writers discuss the opportunities that big data has brought to companies in various disciplines like education, urban planning, astronomy, and biological sciences that can benefit from all the data available; this data is increasing exponentially. They did, however, also list all the challenges that have troubled the research community and the world in past decades. It is believed that "big data analysis drives nearly every aspect of modern society" (Agrawal et al., 2011, p.1).

There are three different opportunities to create value from the use of big data: cost reductions, decision improvements, and improvement in products and services

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(Davenport, 2014, p.22). In healthcare, for example, big data can reduce costs in the sector and improve quality by using more of patients' data (Agrawal et al., 2011). Manyika et al. (2011), suggest that the application of big data in healthcare can potentially result in 90 billion euros in the European Union's healthcare budget.

Regarding the opportunities for improving business decisions in organisations, Davenport (2014) believes that big data brings additional sources of data to enrich predictive models for decision-making purposes; companies in the USA like Netflix and Google have had success in using big data in making data-driven decisions. Another benefit of big data is to improve products and services, and in EE Publishers (2016), one of the interviewees mentions that in South Africa the banks are examples of companies using big data to improve the service and products for their customers.

Even though the benefits of big data are clear, it is noted that there are many technical challenges that need to be overcome for it to reach its full potential. One of the initial challenges of big data was the sheer volume it generated, but in more recent times the cost of storing and managing the data has been solved by new technologies like open source Hadoop cluster (Davenport and Dyché, 2013).

2.3.4 Challenges in big data

 Agrawal et al. (2011) note the challenges in the analysis of big data by showing the different phases of data analysis flow as well as factors that underpin these stages. This process can be very challenging in resolving the analysis of big data.

Phase 1. The acquisition of data could be challenging, for example, the filtering of the data owing to its magnitude. The second challenge is the recording of the metadata for

all this data. Correct recording of the metadata is crucial in understanding the data and in using it the further processes of analysing big data.

Phase 2. The extraction of data is challenging because when the data is collected, it may not be in the proper format for analysis. Not all data within big data is 'telling us the truth', so it is important that the data is cleaned before use in analysis.

Phase 3. The aggregation of the data is more challenging as the data may be heterogeneous with different data structures. Big-scale analyses to identify and understand data in an automated way if the data structures are different, is difficult for a machine to understand. Furthermore, database design is challenging and requires the skills of a highly paid professional.

Phase 4. Analysis, modelling and mining of big data are very different from traditional statistical analysis using small samples, because of the often heterogeneous nature of big data.

Phase 5. Interpretation of data is challenging as the person interpreting the data needs to be able to explain this to the users in a way that is understandable.

Agrawal et al. (2011, p.8) explain that these different stages are underpinned by the following issues that make big data even more challenging:

1. Heterogeneity – Because the data are not all homogeneous and current, analytical tools can only deal with homogeneous data.
2. Scale – The sheer volume of data can be challenging and requires technology, for example, cloud computing, to handle the processing of such volumes.
3. Timelines – The bigger the dataset that needs to be analysed, the longer it takes.

4. Privacy – The use or sharing of personal data is regulated in many countries and it may thus not be able to be used in data analysis.

5. Human collaboration – Many different experts are required to deal with the various stages of the data analysis systems and these experts are usually not together in a team (Agrawal et al., 2011).

Hammer, Kostroch, Quirós and STA Internal Group (2017) list the challenges that come with big data:

A. Data quality – some of the big data types are not random samples of the data population. Also, big data can be unstructured and requires transformation and cleaning of variables, like dealing with outliers.

B. Access to big data – Since big data is generated mostly by the private sector and the data are of private people, privacy and confidentiality need to be addressed.

C. New skills and technologies – Making sense of big data requires the skills of data scientists and IT specialists to work with the domain experts (Hammer, Kostroch, Quirós and STA Internal Group, 2017:23).

In South Africa, the challenges that big data brings, according to EE Publishers (2016), are storage of the volumes of data, and its management and security.

The UN World Data Forum held a conference in Cape Town in January 2017 with the topic of big data innovation for sustainable development. At this conference, the opportunities and challenges of big data were discussed in the context of developing countries, including South African and other African countries, in achieving sustainable development goals (Kirkpatrick, 2017). One of the opportunities of big data is that digital data sources, like online and social media, can help to show changes in

behaviour. A challenge, however, is the use of such data, owing to privacy legislation in various countries (Kirkpatrick, 2017).

Big data is currently more of a buzzword, and organisations mostly look to IT departments to solve issues of big data. The best way to be effective in using big data is for these stakeholders to get together as a new group under the auspices of data science or customer intelligence (Bowers, 2013). This thinking is confirmed by Kuonen (2015), who states that solving business problems with data requires a cross-functional team effort.

Provost and Fawcett (2013) contend that most companies first adopt the necessary technologies like Hadoop for processing big data for use in their operations before considering using big data for data-driven decision making and data science. Companies like Amazon were one of the first to use big data to make recommendations to their customers (Provost and Fawcett, 2013).

In a *Harvard Business Review* article, McAfee and Brynjolfsson (2012) refer to a large retailer in the US that realised that to use the large amount of data collected from its customers effectively, it needed to apply big data technologies. The retailer acquired the Hadoop platform to cluster and store all its customer data. An IT company was contracted to implement this technology, since the retailer did not have this skill within its own IT department, but eventually it was able to do this work independently. By using the Hadoop technology, the retailer was able to increase monetary value from its customers through more precise predictions. The authors confirm that there are many examples of the value of using big data in retail and that it is "fundamental[ly] transform[ing] … the economy" (McAfee andBrynjolfsson, 2012, p.7).

Not only is big data used to drive decision making; companies where big data is used successfully are where business decision makers have a good understanding of big data and data science, and how to use the output these skilled data scientists provide. Companies where the decision makers do not understand data science, often make incorrect decisions owing to this lack of understanding. It is important for organisations to invest in data analytics, but unless the managers know how to incorporate the data analytics into their decision making, it can be useless (Provost and Fawcett, 2013). According to Ram, Zhang and Koronios (2016, p.223), "collaboration among decision makers and data analysts can enhance the effective utilization of big data in decision making", but it should be managed cautiously.

Data science is the discipline that can make sense of big data (Kuonen, 2015). It requires many different skilled people to work together to optimise its use in organisations. In the next section, literature on data science is reviewed.

2.3.5 Data science and its limits

As companies become more data driven and all this data is available for analysis, the right people are required to conduct the analysis. According to Provost and Fawcett (2013), there is a relationship between data science, big data and companies being data driven; therefore companies need to hire more data scientists to make sense of big data. The position of data scientist has become a sought-after career and academic institutions are urgently implementing programmes to supply this demand. The term 'data scientist', however, has different connotations. Marr (2015) notes that many people call themselves data scientists, while they probably do not have the right qualifications for this designation. Marr (2015) claims that business analysts, without the knowledge of big data technology, think of themselves as data scientists.

Programmers in IT departments understand programming but do not have the required business or analytics skills; however they also consider themselves data scientists (Marr, 2015). Marr (2015) further contends that this is due to the lack of true data scientists, although there is great demand for them in the new world of big data. The author claims that a range of professional people, from data engineers to statisticians, call themselves data scientists.

In attempting to explain the requirements for a data scientist and for academia to know how to train students in this field, Provost and Fawcett (2013, p.52) compiled the skills a data scientist needs to possess to be successful. They believe that a successful data scientist needs "to view business problems from a data perspective". In addition to statistics, which they think is crucial in data science, other softer skills like "intuition, creativity, common sense" and specific knowledge of the field of application are required. Provost and Fawcett (2013) agree with Marr (2015), who suggests in his blog that data scientists should have business acumen, be analytical, possess good communication skills, be creative, be well versed in computer science, be able to solve business problems creatively, understand numbers and statistical analysis, have the ability to make sense of the data, and be able to explain it to business decision makers. Schutt and O'Neil (2014) agree. The above-mentioned authors all concur that all the above skills are required of a data scientist. It is, however, difficult for one person to possess all these skills, and therefore Schutt and O'Neil (2014) recommend using the term 'data science', encompassing a team of interdisciplinary skilled people, rather than one person, the data scientist (unlikely to possess all the required skills). Combining the skills of different people with varied levels of the required skills will enhance the performance of the data science functions. Kuonen (2015) agrees that data science constitutes an interdisciplinary and cross-functional team of subject matter experts,

rather than an individual. Business decision making should be driven by data, and in particular big data, to solve business problems and it is a process that requires a team effort from different disciplines (Kuonen, 2015).

In an organisation, these skills exist in various departments. The business intelligence skills exist in the IT department, the domain expertise and communication skills reside in the various business units where the data decisions will be made, while statisticians have the advanced knowledge of statistics and data analytics.

The Data Science Code of Professional Conduct (Kuonen, 2015, p.15) defines data science as the "the scientific study of the creation, validation and transformation of data to create meaning". According to Weihs and Ickstadt (2018), data science is a discipline of science that is influenced by other disciplines like computer science, mathematics and statistics, as well as by other applied sciences. Kuonen (2015) contends that even though the concept of data science is relatively 'new', this profession has existed for a long time, and he believes that it is just a hyped-up name for a statistician. In his presentation, the author notes that statistics is the study of making decisions when faced with uncertainty. The authors continues that data science is not a "rebranding of statistics" but that it is actually data mining to uncover patterns or trends in data to make data-driven decisions (Kuonen, 2015, p.24).   Since statistics comprises a considerable part of the data science function, it is important to discuss the role of statisticians in data science.

2.3.6 The role of the statistician in data science

One of the key stakeholders in data science is the statistician, and as stated above, an understanding of statistics is important in profiling the data scientist or science team (Schutt and O'Neil, 2014). However, the role of the statistician in big data has been

questioned and challenged, and according to Normal Deviate (2013), it is debated whether the discipline of data science could mean the end of statisticians. In the Report of the London Workshop on the Future of the Statistical Sciences, the authors discuss big data and how various statisticians view this phenomenon. Some see it as an opportunity for statisticians, while others believe that big data will change the role of statisticians (Royal Statistical Society, 2014). Big data should not be seen as a challenge but as an opportunity for statisticians to review their assumptions and to develop new ideas (Royal Statistical Society, 2014). Trikha (2015) questions if the new term 'data scientist' exists, if the statistician has in the past been the 'leader' of data.

Carmichael and Marron (2018) claim that data science solves twenty-first century data problems by visualising the huge amounts of data and using computer coding methods to manipulate data. The authors also note that statisticians mostly choose not to be part of solving twenty-first century data problems (Carmichael and Marron, 2018). Also, Randall (2016) believes that there is little difference between a statistician and a data scientist, and that a statistician (or a data scientist) needs to help make sense of the huge amounts of data that big data brings.

Scale is a problem with regard to big data in web companies and with so much data and decisions that need to be made while a customer is on the website, statisticians have to come up with models that will guide the customers and adapt to the next customers' choices. It is suggested by the Royal Statistical Society (2014), that statisticians need to deal with the issue of time by adopting ideas from computer scientists. Speed is an issue for these professionals. The report indicates that statisticians should not forget to think like statisticians. They bring a skill to companies that IT specialists do not possess (Royal Statistical Society, 2014).

The challenge for statisticians is to work with the computer scientists to make statistical methods work better and faster on the latest computer technologies, especially with the volume of data required to be processed (Royal Statistical Society, 2014). Granville (2014) states that data scientists scarcely use the old statistical methods and that data science has created a new statistical science. This challenges the view that statisticians are actually needed in making sense of big data. This contradicts Kuonen (2015), who believes that there is a link between data science and the statistician.

Even though Talend Tech Team (2016) agree that there is a link between data science and the statistician, how statistics in business is applied has fundamentally changed. In the era of big data and its use in business today, the role of the data scientist has developed. A discipline based on statistical analysis and probability, data science has become an important skill to have in business today (Talend Tech Team, 2016). Data science uses statistical methods and computational algorithms to find patterns and gain deep insights in the data to drive business value.

Talend Tech Team (2016), however, state that there is a difference between the data scientist and the statistician. Statisticians work on their own, whereas data scientists work in a team and are more consultative in their approach compared with statisticians who react to the situation (Talend Tech Team, 2016). Statisticians prefer pre-prepared and clean data only kilobytes in size, whereas data scientists work with messy and unstructured data, as well as with gigabytes of data.

Table 2-2 oveleaf shows the differences between the statistician and the data scientist:

Table 2-2. Comparison of a statistician and data scientist (adapted from Smith, 2013)

	Statistician	Data scientist
Image	Baseball (cricket)	HBR sexiest job of 21st century
Mode	Reactive	Consultative
Works	Solo	In a team
Inputs	Data file, hypothesis	A business problem
Data	Pre-prepared, clean	Distributed, messy, unstructured
Data size	Kilobytes	Gigabytes
Tools	SAS, Mainframe	R, Python, Hadoop, Linux…
Nouns	Tables	Data visualisations
Focus	Inference (why)	Prediction (what)
Output	Report	Data app / data product
Latency	Weeks	Seconds
Stars	George E.P. Box, Trevor Hastie	Hilary Mason, Nate Silver

While some analysts have argued that a data scientist is the best person to make sense of big data, others have challenged this view in claiming that data science comprises a group of people in the organisation with expertise and experience, rather than an individual (Schutt and O'Neil, 2014).

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Hammer, Kostroch, Quirós and STA Internal Group (2017, p.23) also believe a team coming from different disciplines is required to "make big data speak" and that statisticians should understand the importance of collaboration with "abundant human and technical resources to proficiently exploit big data". They contend that to make sense of big data requires data scientists, IT specialists, and subject matter experts.

The interrelated domains of skills, suggested by Dew Conway, cited in Kuonen (2015), is visually shown in Figure 2-7.
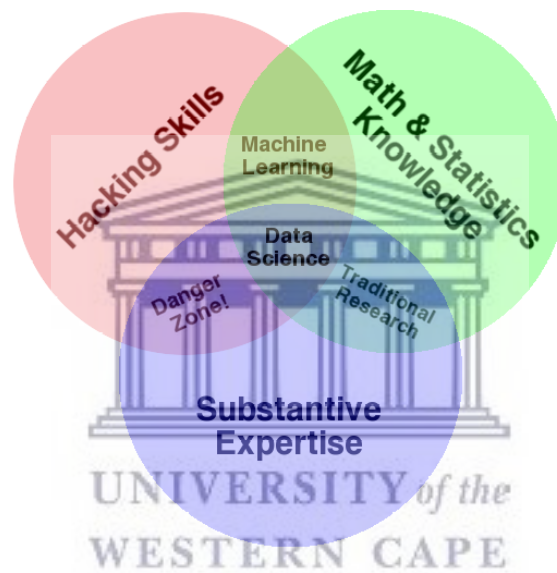
Figure 2-7. The data science Venn diagram (Dew Conway, cited in Kuonen, 2015, p.25)

The Venn diagram above illustrates the term 'data science' in a simple and visual way. Data science is the discipline that can make sense of big data (Kuonen, 2015). This view is shared by Carmichael and Marron (2018), who define data science at the intersection of statistics, computation and the domain expert. It requires different expertise as shown in the diagram. Statistical and mathematical skills are required; computer software and hardware skills are also required, as well as people with considerable experience in the area in which the data will be used. There are such people with the necessary skills in organisations; and an effective way of working together (or

collaborating) is required to make use of big data successfully and turn organisations into data-driven decision-making organisations.

2.3.7 The data scientist

Carmichael and Marron (2018) define a data scientist as a person who solves problems through the use of data. Kuonen (2015) states that there is a demand for skilled data science professionals to make sense of big data and that this new concept of data science has crept into various sectors, from business to government institutions. Kuonen (2015) notes terms like big data and data science have become buzzwords and are mostly misunderstood. Jones (2014) cannot understand why people refer to themselves as data scientists when this new concept merely describes a modern statistician. Kuonen (2015) aims to show the link between data science and statistics, and focuses on the challenges and opportunities for statisticians in this new environment. However, in a blog posted by Granville (2015), the writer claimed that statisticians believe that data scientists do not know anything about statistics and that "they know everything". He contends that data scientists contribute to statistical analysis while statisticians do not. One of the readers (followers) has commented on this statement and disagreed with his point of view.

Hammer, Kostroch, Quirós and STA Internal Group (2017) describe the data scientist in **Table** *2-3* overleaf.

Table 2-3. Description of a data scientist (adapted from Hammer, Kostroch, Quirós and STA Internal Group, 2017, p.24)

Roles	Expertise	Skills	Mindset
Identifies analytical opportunities	Programming (Python, R. Spark)	Databases (Cloud, SQL, NOSQL)	Thinks outside the box
Gathers and cleans data	Applied mathematics and statistics	Data Modelling	Develops agile prototypes rapidly
		Algorithms	
Applies statistical methods and models	Domain knowledge (economics, finance)	Data visualisation	Stays in touch with new technologies
		Story-telling	
Communicates data insights to stakeholders	Project management		Communicates proactively

It was established in the literature above that data science comprises a cross-functional team working together to make sense of big data. The key stakeholders are the statistician, to analyse and interpret the data, the business intelligence or IT specialists, and the business decision makers. The business decision makers are the chief executive officer (CEO), and executive and senior management of the organisation. In a Harvard Business Review (2012) report, the results of in-depth interviews with 646 key people in corporate business in the USA that have adopted a culture of being data and analytics driven are discussed and some of the key findings are:

1. There needs to be an integration of analytic tools and thinking as part of a new way of working within the organisation and both the executives and staff need to learn to use analytics tools.

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2. Management need to learn to not only depend on their instincts, but to also rely on data for decision making.

3. Since data analytics have become crucial, management has to establish deep and trusting relationships with the analytics professionals.

4. Analytics need to be entrenched throughout the organisation.

An analytics culture, much like a culture of collaboration, is determined by the leadership in an organisation, according to Davenport and Harris (2007). The authors believe that even though the CEO of a company has many other responsibilities, it is also his/her responsibility to build an analytics culture, if the organisation aspires to be data driven. McKinsey & Company (2016), in a survey of executives in large companies in the USA, reported that the involvement of executives is crucial in the success of an organisation's analytics efforts. The other factors that can hinder a successful analytics programme are an incorrect organisational structure and finding and retaining the right analytics professionals. The McKinsey report notes that only 25% indicated that the CEO leads the analytics, but among these, many do not communicate their vision for analytics to the organisation. McKinsey & Company (2016) further report that even though 38% of CEOs say they lead analytics programmes in their organisations, only 9% of the other C-level executives agree. They claim that the analytics programmes are rather led by the chief information officer (CIO) or specific business unit heads. The role of the CEO is to set an analytics culture within the organisation (Davenport and Harris, 2007), but with all the other responsibilities of the CEO, and in this growing need to drive competitive advantage through analytics (Mckinsey & Company, 2016), the analytical responsibility must reside in someone else. The CDO is the executive who holds the keys to help an organisation both protect and unlock the full value of its data assets (Deloitte, 2016).
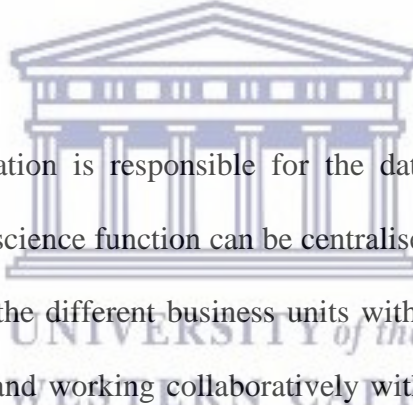
2.3.8 The chief data officer

The role of the CDO is a recent development within large organisations. In the past, many organisations only had the CIO responsible for data in the organisation, but with the advent of big data and the management required for organisations to use it successfully, the role of the CDO has become a necessity.

Deloitte (2016) advocates the creation of the CDO, with the primary role of overseeing the data strategy of the organisation. According to Steele (2017, p.22), the CDO "functions best when it reports directly to the CEO", working closely with the CIO, and assisting the board in understanding the importance of data and being a data-driven organisation. Cohen and Gopal (2011) also believe that the CDO should be part of the executive team of the organisation and some of the CDO responsibilities include to "provide executive stewardship, champion and implement data management strategies and standards, institutionalize data quality management", to "develop capabilities to measure and predict risk, influence enterprise risk appetite at the executive table", to "enable better analytics for decision making, help refine corporate strategy using insight gained from effective analysis of data", and to "increase revenue, customer approval ratings, customer retention, and market goodwill through the effective governance and use of data" by improving productivity and lowering the cost through the use of the correct use of data. In addition, Steele (2017, p.5) believes that one of the responsibilities of the CDO is to "expose the data insights to the rest of the organization and to encourage the decision makers to execute" these insights. A successful CDO position should "exist to drive business value" and to work with the various business units in the organisation to ensure that the entire organisation is moving in the same direction in terms of data and being data driven (Steele, 2017, p.4). The CDO should

champion the data for the entire organisation at board level and take the ultimate responsibility and leadership for managing the enterprise data (Cohen and Gopal, 2011).

According to a PricewaterhouseCoopers report in the USA, only 6% of the companies surveyed have a CDO, 13% in Europe and only 2% of Middle Eastern and North African countries (JLL™, 2016). A Gartner report is cited, stating that by 2019, 90% of large organisations will have CDOs to gain competitive advantage and to make use of their data assets (JLL™, 2016). In a Big Data executive survey, conducted by NewVantage Partners LLC, indicated that 55.9% of those large companies in the USA surveyed had a CDO in an executive role within their organisations (NewVantage Partners, 2017).

The CDO of the organisation is responsible for the data science function in the organisation, and the data science function can be centralised, reporting directly to the CDO, or decentralised in the different business units within the organisation, where they are domain experts, and working collaboratively with the CDO (Steele, 2017). Unlike the CIO of the company, who is technical, the skills a successful CDO should possess are not only technical skills, but also business and people skills. Such a person should be able to effectively collaborate with different groups across the organisation and lead the organisation from the top in becoming data and analytics driven (Cohen and Gopal, 2011). Steele (2017, p.10) concurs and believes that the CDO should "speak both languages" of the IT teams as well as the business decision makers.

In the quest to make sense of big data through data science, the CDO is a key stakeholder, leading from the CEO's table in collaboration with the IT specialists and

with the data scientists or statisticians, either reporting to this role or the role actively collaborating with them.

2.3.9 The CDO – in the South African context

In two separate interviews by Corinium, two of the very few CDOs in South Africa addressed this new role, its function and the challenges experienced in this recently introduced role within the South African corporate environment. One of the CDOs explained that this new role had become more of a requirement within the financial services sector than in the other corporates owing to compliance and regulatory requirements (Corinium, 2017a).

The Chief Data and Analytics officer (CDAO) of Hollard, an insurance company in South Africa, believes that the role of the CDAO within the group was created to "drive better decisions and bottom-line value by leveraging data and advanced analytics" (Corinium, 2017b). This position is one of few C-level executive ones with this type of role in South Africa. The interviewee explained that the reason for the introduction of this role at Hollard was to fulfil a strategic objective to "help unlock further business value through understanding customer behaviour and leveraging advanced analytics" (Corinium, 2017b). Another reason for the role of the CDAO is to ensure "efficient regulatory and compliance reporting".

2.4 Conceptual framework

2.4.1 A brief guidance on the conceptual framework

Rather than testing a specific theory, the study has given preference to a conceptual framework built around two interrelated theories, namely collaboration theory and organisational culture theory. This preference is guided by the recognition of the

complexity and technically demanding work challenges associated with a data-driven organisational environment. Such a complexity is reflected in the choice of a mixed methods design of collecting evidence from the field, as described in chapter three. The concepts of data-driven organisation, culture of the organisation, leadership, trust and knowledge sharing are very central to the conceptual framework.

The chapter on the research design to come provides a methodological discussion and further description of the conceptual framework by eliciting the testable hypotheses. Borrowing from Wood and Gray (1991), and particularly referring to the analytical complexity embedded in big data that collaboration has increasingly gained in importance because it is regarded as an intra-organisational (as well as inter-organisational) phenomenon in order to achieve the desired results that no individual or departmental unit within the organisation. Within the context of big data, it is assumed that organisational culture will have an influence on how effective collaborative efforts are.
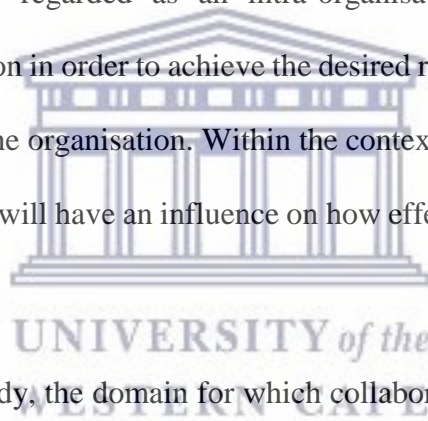
For the purpose of this study, the domain for which collaboration is required is that of the optimal use of big data in marketing strategies. In order to optimally use big data in a large organisation, the organisation needs to be data driven, and for the organisation to be successful in being data driven, it requires an analytics culture. A culture of collaboration should also exist among the employees, both of which form part of the organisational culture, which is set by the leadership of the organisation. Leadership that is more inclusive, both vertically and horizontally, is more conducive to effective collaboration. It is expected, where such leadership exists in an organisation, that collaborative efforts toward desired results from big data use are greater effectiveness. Collaboration goes hand by hand with collective decision making and learning. It is

therefore also assumed that knowledge sharing and trust are important in successful collaborative efforts. In organisations where the different business units work in silos and do not share knowledge, the collaboration process is hindered. Finally it is assumed that collaboration is associated with trust among the stakeholders involved in the process.

2.4.2 The importance of being data driven

Big data has changed the world of business and it is now of utmost importance that organisations transform their businesses through robust analytics to become data driven and to drive decision making (KPMG, 2015). Even though big data is much spoken about in business, "true data-driven enterprise is still in its early stages" (KPMG, 2015, p.3).

Gleeson (2017) believes that in business today, there is an opportunity to leverage big data to extract intelligence from it to change decision making in the business environment. For this to happen, the organisation needs to be come data driven and this requires a "shift in mindset and culture". Gleeson (2017) thinks that there are still hurdles to overcome before organisations can "reach their full business intelligence potential". The author lists three areas that require improvement for business to be more data driven:

1. The management and organisation of the various sources of data, both internal and external.
2. People with the necessary skills to create analytical models to make sense of big data.
3. The senior management within organisations need to change the culture in their organisation to be more data driven.

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In the South African context, Corinium (2017c) claims that the number of qualified data scientists to help "drive value through insights and advanced analytics" is limited. Another challenge recognised in the South African landscape is ensuring senior management support such initiatives (Corinium, 2017c).

Data is often located in various areas in the organisation and can be siloed as well as conflicting in its use; because there are no analytical processes or the necessary infrastructure, data and analytics are neglected and do not drive value in the business (KPMG, 2015). In order for businesses to see the benefits of their data, there needs to be a better understanding of the data and it is important to develop a data strategy (KPMG, 2015). Developing and executing the enterprise data strategy is one of the roles of the CDO (Teerlink, Sigmon, Gow and Banerjee, 2014). According to Hill, Towers and Borne (2013, p.4), the CDO needs to be at the "top of the organization hierarchy", so that this important data leader in the organisation is at most senior management tier to be able to influence and drive data decision making.

Since big data brings organisations the opportunities to drive financial benefit from it through data science, there is an opportunity to explore the way collaboration occurs among the various key stakeholders of data science: business decision makers, business intelligence or IT specialists and statisticians. While some analysts have argued that a data scientist is the best person to make sense of big data, others have challenged this view by saying that data science constitutes a group of people in the organisation with diverse expertise and experience, rather than an individual (Schutt and O'Neil, 2014). Thus, for this group of people to make sense of big data, they need to not only work together, but collaborate as per the broader definition of collaboration – "Working together to create value while sharing a virtual or physical place" (Rosen, 2007, p.9).

Rosen (2007, p.8) cites Schrage (1995), that collaboration is "the process of value creation that our traditional structures of communication and teamwork can't achieve". Such collaboration among the various stakeholders is required to use big data optimally in marketing strategies in organisations.

It is assumed that effective collaboration, with optimal use of big data, is dependent on the following variables.

2.4.3 Organisational culture

In a rapidly changing technological environment, the culture of an organisation has an important role to play in ensuring the success of such efforts (Hartlieb, Leber, Tuppinger, and Willfort, 2005). Gleeson (2017) believes that the opportunity to leverage insights from big data for decision making in an organisation needs first to overcome the challenge of a change in mind set and culture in that organisation.
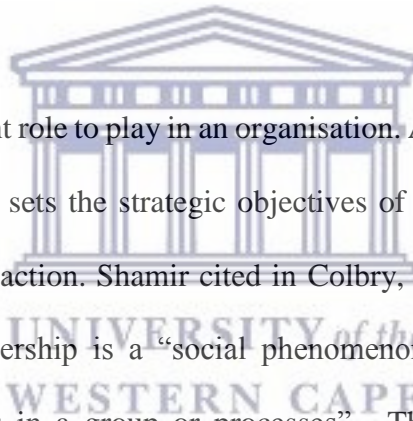
Rosen (2007, p.8) agrees that in order to collaborate effectively, there needs to be a cultural shift in the organisation and the organisation needs to break out of its "individual comfort zones". Ricci and Wiese (2011) believe that if collaborative leaders display the behaviour they want, then their staff will follow.

Kotter and Heskitt (1992), define corporate (or organisational) culture as "values that are shared by the people in a group and that tend to persist over time even when group membership changes". Culture differs from organisation to organisation; it is established over time and adopted by the leadership to be enforced by its employees (Al-Alawi, Al-Marzooqi and Mohammed, 2007). Rosen (2007) lists various cultural elements that influence collaboration, like trust and sharing of information. Schein (2004) believes that leaders in an organisation influence culture and that culture

happens through a shared experience based on values and beliefs set by leadership. In organisations, there is a difference between management and leadership in terms of culture. Leadership creates and is able to change culture, whereas management has to work within that culture (Schein, 2004).

2.4.4 The leadership of the organisation

Defining a leader is not simple, as a leader can have different meanings. A person can be a leader because of his or her role in an organisation or by having followers and not because of position (Hermanlin, 2013). A leader, however, without an "office or title", has limited ability to influence followers compared with one with an "office or title" (Hermanlin, 2013, p.433).

Leadership has an important role to play in an organisation. According to Sadhu (2013), leadership gives guidance, sets the strategic objectives of the organisation and spurs those following them into action. Shamir cited in Colbry, Hurwitz and Adair, (2014, p.65), proclaims that leadership is a "social phenomenon", where one person has influence over "the others in a group or processes". The authors note that in an organisation, senior and middle managers are considered leaders of the organisation, but can both lead and follow, so they thus exert influence over others and are influenced by others. This interaction and the way these groups of people work together are collaborative in nature (Colbry, Hurwitz and Adair, 2014).

Management is a tool of leadership and leadership can be expressed as the sum of capability and effectiveness (Sadhu, 2013). Peter Drucker and Warren Dennis, cited in Sadhu (2013), state that management is about "doing the right things", but leadership is about "doing things right". In organisations there are managers – executive, senior and middle – and they are called to do the thing right, as well as doing things right. The

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CEO of the organisation is considered the ultimate leader of the organisation. The role of the CEO is to lead the day-to-day operations of the organisation and the execution of the organisation's strategy, and show value to the shareholders. The senior (or C-level) leadership, report to the CEO and together are responsible for running the organisation. Appelbaum and Paese (2003) list nine roles of strategic leaders in organisations, which include developing the long-term goals of the organisation based on their vision, leveraging opportunities and solving problems. In a changing world of technology and competition, the senior leaders have to drive change and still answer to the shareholders to deliver profits. Since the CEO heading the organisation sets the culture of the organisation, as well as the analytics culture (Davenport and Harris, 2007), the CEO is important in ensuring collaboration occurs within the organisation. In the context of this research, another leader important in ensuring effective collaboration, is the CDO. One of the roles of the CDO is to serve and lead "as a bridge between business and IT" and to work across different functions and stakeholders to drive the value data in business decision making (Hill, Towers and Borne, 2013, p.5).

According to Horney and O'Shea (2009), the new role of a manager is to be a collaborative leader, as opposed to taking a directive approach to leadership. As a leader, it is necessary to instil collaboration into the culture of the organisation (Rosen, 2007). In Ricci and Wiese's (2011) interviews, four leadership skills were proposed for leaders to develop a culture of collaboration.

1. To be able to redefine what success is. It is the success of the organisation as a whole, not only for one department, when a culture of collaboration exists in an organisation.

2. To engage people in the organisation and make them part of the decision-making process.

3. To demand accountability for collaboration from the team.

4. To connect with people from various industries to apply the ideas from these networking opportunities within their organisations (Ricci and Wiese, 2011, p.55). Building consensus among managers shows that the leader is collaborative (Ricci and Wiese, 2011).

In a survey by McKinsey & Company (2016), the executives surveyed from high-performing companies ranked the factor that most influences the success of an organisation's analytics efforts to be top leadership involvement, more so than technology and analysts. Low-performing companies' executives ranked the correct organisational structure as the biggest challenge for successful analytics programmes in their organisations.
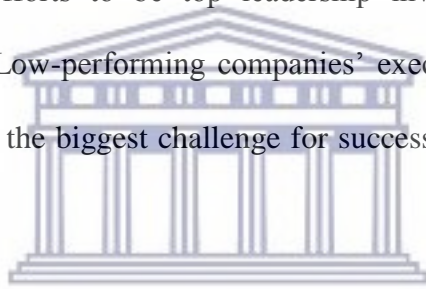
2.4.5 Trust and knowledge sharing among the stakeholders

Trust among people and various organisations is important in coordinated efforts or teamwork in various situations. Ricci and Wiese (2011) believe that trust is vital in the success of collaborative teams. Dawes (2003) states that trust (and even mistrust) grows from people sharing experiences of working together over time. The author contends that when trust is low, people tend to have more protective walls built around their relationship, but when trust is high, the working relationship is less formal and better understood. The concept of professional trust is when groups, possibly from different work environments, have to work together on projects effectively with the aim of achieving set goals. Trust then becomes an important component of such relationships

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(Dawes, 2003). However, according to The Economist Intelligence Unit (2008), it is difficult in a business context for organisations to measure trust.

In a paper by Black et al. (2003), the role of trust in an inter-organisational collaboration situation is considered. They believe that the concept of trust is important in collaboration, but that there are many forms of trust, like "the trustor's capacity to assess trustworthiness", the "trustee's propensity to trust", "identity-based trust (based on an emotional or personal attachment formed by long-term reciprocal interaction" and "institutional-based trust based on institutional factors such as organisational culture" (Black et al., 2003, p.3).

Rosen (2007) places trust at the top of ten cultural elements of collaboration, as it is important to develop trust when ideas are exchanged in situations where colleagues work together. A fear exists that others will take your ideas as their own, especially in a competitive work environment, but to collaborate effectively, trust needs to be developed. To establish trust, cultural differences in a diverse group need to be addressed so that a working team can be created (Rosen, 2007).

In organisations where teams need to work together closely in a collaborative way, it is important to build trust among the team members. The building of trust takes time, and it is essential to invest early in the process to ensure the building of trust among the team members. In clarifying the purpose of the team and the role that each team member plays can also foster trust among the team members (Ricci and Wiese, 2011).

Hosmer (1995) believes that trust is crucial in interpersonal exchanges and that nothing influences interpersonal or group behaviour as much as trust. Davenport and Harris (2007) note that to build analytics capability in an organisation, if the decision makers do not trust the analytics professionals to implement what the statistical analysis

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suggests, it might as well not have been done. In fostering collaboration among stakeholders for the use of big data, trust is crucial and will be a factor hypothesised in this study.

Knowledge is defined as "a combination of experience, values, contextual information and expert insight" (Al-Alawi, Al-Marzooqi and Mohammed, 2007, p.22). It should not be mistaken for data, which is factual in nature. Knowledge comprises the original thoughts of individuals or groups, which once formed cannot be replaced, and it becomes an asset of the organisation (Al-Alawi, Al-Marzooqi and Mohammed, 2007).

Features like trust, communication, reward systems, and organisational culture are significant in effective knowledge sharing within an organisation (Al-Alawi, Al-Marzooqi and Mohammed, 2007). In surveying staff at various organisations in Bahrain from both corporate and public sectors, it was found that these factors positively influence effective knowledge sharing (Al-Alawi, Al-Marzooqi and Mohammed, 2007). Some organisations have a culture of sharing, while other organisations promote hoarding information (Rosen, 2007). In companies where sharing is promoted, information or knowledge sharers exist, so such employees collaborate better than those who do not share (Rosen, 2007).

Al-Alawi, Al-Marzooqi and Mohammed (2007) state that the concept of knowledge management was previously based on how technology leveraged knowledge, and not on people, but that the transfer of knowledge sharing requires working with others. The result of this sharing will benefit all involved (Al-Alawi, Al-Marzooqi and Mohammed, 2007).

Gleeson (2017) does not doubt that organisations want to be more aligned and collaborative, to communicate better and to improve trust, but it is difficult to change legacy systems and structures. According to Gleeson (2017), some organisations are not able to move towards being more data driven, because of a fear of the unknown and the loss of control. It may also be difficult for organisations to invest in the appropriate technology and people that will allow them to be more data driven.

These variables – culture, leadership, trust and knowledge sharing – can derail efforts of collaboration. When working as a team, it is likely that the collaborative effort can help ensure profits for the business. A shared vision for success is able to drive this collaborative process, rather than individual recognition. Effective collaboration can be effected when all of the team members have the same key performance indicators (KPIs) to evaluate their performance. Rosen (2007, p.111) postulates that there are no organisations that are immune to the 'silo syndrome', a concept that describes how organisations continue to work in a silo and struggle to change this way of working. The author further states that there is a "cultural divide" that adds to the silo ways of working across business units and that only "effective collaboration can break down these barriers" (Rosen, 2007, p.111).

2.5 Concluding remarks

This chapter gave a review of the literature with regard to the theoretical and conceptual framework of the research as well as an empirical review of the main areas of the topics researched. The next chapter describes the methodology of this research.

CHAPTER 3: RESEARCH DESIGN

3.1 Introduction

The focal point (aim) of the research is to investigate how collaboration can be applicable within the context of optimal use of big data in marketing strategies. The purpose of this chapter is to present the methodological and epistemological approaches underpinning this research and to describe the research and techniques applied.

In the development of this knowledge, the research was done from an interpretivist perspective, since most of the research was based on multiple qualitative studies. "Interpretivism is an epistemology that advocates that it is necessary for the researcher to understand differences between humans in their role as social actors" (Saunders, Lewis and Thornhill, 2009, p.8). The interpretivist perspective is the most prevalent in business and management research (Saunders, Lewis and Thornhill, 2009).

From the onset of the research, hypotheses were set to be tested and the research intended to assume a deductive approach. A deductive approach is when the researcher develops hypotheses based on an existing theory and designs the research in such a way to test the theory (Dudovskiy, 2018). However, in the progression of the research, unforeseen findings during the research led to the formulation of a model of collaboration, a grounded theory from the data. The research design then transitioned to an inductive approach. An inductive approach is where theories are proposed at the end of the research process based on the findings of the research (Dudovskiy, 2018).

This chapter is divided into four sections. In the first section, the research design is described. The research is a mixed methods approach with multiple qualitative and quantitative studies as part of the research. The second and third sections deal with the

data collection and analysis of the data. The fourth section outlines ethical considerations and the limitations of the research.

3.2 Perspective of the study

The study used a mixed methods approach. This methodology was chosen as it combines qualitative and quantitative research to provide research that is "more rounded and complete" (Bryman and Bell, 2011, p.28).

There are different types of mixed methods: the sequential explanatory strategy, where a quantitative study is done prior to the qualitative study, and a sequential exploratory strategy, where qualitative research is conducted first. The type of mixed methods approach for this study was triangulation, where different methods, qualitative and/or quantitative are "used to assess the same phenomenon toward convergence and increased validity" (Cameron, 2009, p.144).

Bryman and Bell (2011, p.630) explain that there are two versions of qualitative and quantitative research, their implications, and whether they can be combined. The first version is an epistemological version, as "the embedded methods argument and the paradigm argument, sees quantitative and qualitative research as grounded in incompatible epistemological principles". This version makes mixed methods impossible. In the second version, the technical version, adopted by many mixed methods researchers, importance is given to the strengths of the data collection and the techniques of analysing the data, as "quantitative and qualitative research are each associated and ... these [are] capable of being fused".

Triangulation combines different qualitative or quantitative studies to validate the findings and to strengthen the research (Cooper and Schindler, 2014, p.166-167). According to Cooper and Schindler, the use of different types of research methods can compensate for weaknesses in the other method, but others believe that the different (or mixed) methods rather complement one another.

The mixed methods approach is as follows:

A qualitative study (interpretative perspective) was done on how Woolworths deals with collaboration. In-depth interviews with open-ended questions were conducted to gain a deep understanding of the experience at Woolworths. Oliver-Hoyo and Allen (2006) believe that qualitative research is useful as such research examines the subject in depth by establishing meanings that lead to results. Although their views support the use of qualitative research, the qualitative research method is sometimes criticised by quantitative researchers as subjective (Bryman and Bell, 2011, p.408).
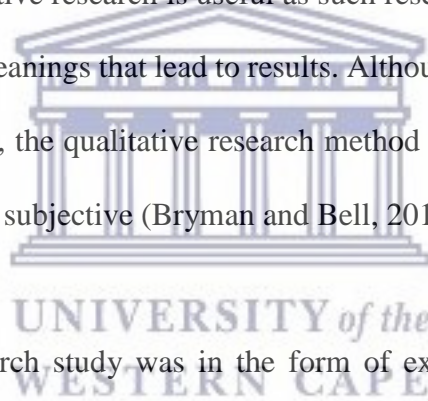
The first qualitative research study was in the form of extensive personal in-depth interviews with members of the Customer Connected Council at Woolworths, an initiative conceived by the CEO appointed in September 2015. This council consists of key people within the business intelligence and marketing areas of the company, and was established to align the key stakeholders across the business in achieving the best experience for customers. This council was selected for the research to understand why the various stakeholders should work together, if they do. Their understanding of the concepts of big data and data science was also determined though specific questions, led by concepts from the literature review. The strength of a qualitative study is that it provides a comprehensive description of the experiences of the respondents and it allows the researcher deep insight in the psyche of the interviewees that cannot be

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achieved in quantitative research (Castro, Kellison, Boyd and Kopak, 2010). The interviews revealed considerable insight into how the various stakeholders collaborate, what they think of such collaboration, and how they see collaboration working. The interview questions were open-ended, with opportunities for the respondents to give their opinions freely. The questions to all the stakeholders were specifically devised to compare their responses and to ascertain individual viewpoints in respect of collaboration. Copies of the interview questions are provided in the Appendix A, B and C.

A quantitative study was conducted after the qualitative research to test different hypotheses of how collaboration on the use of big data differs among business decision makers, business intelligence specialists, and the statistician or statistical analysts within the marketing departments of various JSE-listed companies in Cape Town. A key senior person within the marketing departments of these companies from various industries was identified and once the email address and permission to contact the key person had been obtained, an online survey was emailed to them. According to Castro, Kellison, Boyd and Kopak (2010), the strength of quantitative research is that comparisons between various groups can be made and different variables can be measured.

The responses from the survey were very slow and after a couple of weeks only a few had been returned. In order to expedite the responses, email reminders were sent, as well as telephonic communication with some of the companies to encourage further responses. More responses were received, but insufficient. Convenience sampling was deployed by contacting various people (already sent the survey as part of the population selected) from the retail industry through the initiative of the researcher, and the rest of the responses were secured in this way. Convenience sampling, a nonprobability

sampling method, can still be useful, even though there are "no controls to ensure precision" (Cooper and Schindler, 2014, p.359). This type of sampling is done when there is no other way of obtaining responses from the survey. The use of convenience sampling limited the research, since it is not representative, and bias may exist in the results (Farrokhi and Mahmoudi-Hamidabad, 2012).

Triangulation methodology was considered as the first qualitative study was based on one organisation, while the quantitative study had a low response rate and the results could not be generalised. These factors made the quantitative research weak. Additional qualitative studies were done with in-depth interviews at Woolworths with middle managers as well as the analytics manager and business intelligence manager. To further strengthen the research, personal and email interviews were conducted with big data and analytics experts from South Africa and abroad. These additional interviews gave 'more voices' to the research and the insight gained served to strengthen the research.   The quantitative study, although biased, can corroborate the various pieces of qualitative research as part of this research. In business and management research, the triangulation approach is often considered to "cancel out the limitation of the one method", but using evidence from other methods to corroborate the findings of the research (Bryman and Bell, 2011, p.57).

The mixed methods approach, with both the qualitative and quantitative sections, was the intention from the outset of the research, but the triangulation approach was considered to solve some of the problems of the initial qualitative and quantitative studies.

The hypotheses set out in the introductory chapter were tested by the analysis of the responses to specific questions asked in the online survey.

3.2.1 Testing the hypotheses

As stated in the introduction, the study tested the following hypotheses.

Hypothesis 1:

The null hypothesis – H0: Effective collaboration is not influenced by the leadership of the organisation in the optimal use of big data in marketing strategies.

The alternative hypothesis – H1: Effective collaboration is influenced by the leadership of the organisation in the optimal use of big data in marketing strategies.

The independent variable is leadership and the dependent variable is effective collaboration. The concept of leadership in the research refers to the executive management of the organisation.

The online survey questionnaire considered the following questions with regard to leadership to assess the relationship between leadership and effective collaboration.

Q: How frequently does such collaboration happen?

Q: Rate how collaboration with peers across business units is encouraged by top management in the organisation?

To determine if there was an association between the two variables – the frequency of collaboration and top management's influence on collaboration, the statistical test was the chi-square test. Owing to the counts in the cells of the contingency table, the chi-square test was not valid and the Fisher Exact test was used to assess the association.

Hypothesis 2:

H0: There is no relationship between trust among the various stakeholders and effective collaboration within the organisation in the optimal use of big data in marketing strategies.

H1: There is a relationship between trust among the various stakeholders and effective collaboration within the organisation in the optimal use of big data in marketing strategies.

The independent variable is trust, and the dependent variable is effective collaboration. Trust is a concept that has been operationalised and is defined for the purposes of this research as "to have faith in the honesty, integrity, reliability, and competence of another", according to Dawes (2003, p.1).
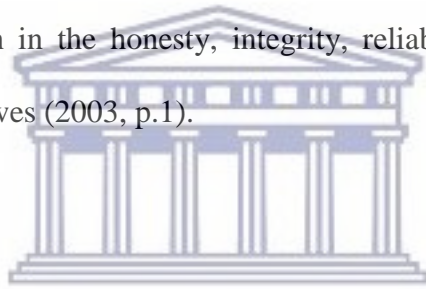
Questions:

How frequently does such collaboration happen?

Are there trust issues among the various business units with regard to data use?

To assess whether there is an association in the way participants responded in terms of the trust question and how often collaboration occurs. The chi-square test was used to assess the relationship between trust and the frequency of collaboration, and because of the small numbers within each cell, the Fischer Exact test was used.

Hypothesis 3:

H0: There is no relationship between knowledge sharing among the various business units and effective collaboration within the organisation in the optimal use of big data in marketing strategies.

H1: There is a relationship between knowledge sharing among the various business units and effective collaboration within the organisation in the optimal use of big data in marketing strategies.

In order to assess the relationship between knowledge sharing and effective collaboration, the Spearman's rank correlation was calculated. The Spearman's correlation coefficient measures the strength and direction of association between two ranked ordinal variables.

3.2.2 Type of research

The biggest qualitative piece of the research was the study of Woolworths Ltd, which occurred from September to December 2016. In the progression of the research, additional qualitative studies, in the form of in-depth interviews with big data and analytics experts, were conducted.

The quantitative part of the research consisted of:

1. A cross-sectional design based on the practices and past behaviours in marketing in the companies selected. According to Bryman and Bell (2011, p.53):

   > A cross-sectional research design entails the collection of data on more than one case (usually quite a lot more than one) and at a single point in time in order to collect a body of quantitative or quantifiable data in connection with two or more variables (usually many more than two), which are then examined to detect patterns of association.

2. This quantitative study was in the form of an online survey, sent to senior people in the marketing departments of all the JSE-listed companies within the Cape

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Town area. This online survey was sent via email where email addresses were provided.

3. A secondary data analysis was performed using data from annual big data surveys from NewVantage Partners to about 50 to 60 Fortune 1000 companies in the USA, which spanned the period 2012 to 2018.

3.2.3 Context

The participants in all the qualitative studies, who were interviewed in person, were contacted via email and 30-minute meetings were convened. An information sheet on the intended study, as well as consent forms, was sent to the participants before the interviews. Once the consent was given, in a signed form, the interview was recorded and open-ended questions were asked. The interview questions can be found in the Appendices section.

Two of the interviewees, experts from abroad, were contacted via email requesting an email interview. Both responses were in the affirmative, which acted as consent. Questions were then sent via email and the responses to the emails included the answers to the questions. The South African analytics experts were contacted to request personal interviews, to which they agreed. The in-depth interviews lasted approximately 30 minutes. A copy of one of the transcripts of the in-depth interviews are available in Appendix G.

The quantitative study was conducted by surveying key people online via email within the marketing departments of all JSE-listed companies in Cape Town. The principal researcher telephonically contacted each of these companies to request participation in the intended research. Since the quantitative study was in the form of an online survey, an email address was required to mail the survey. The intention of the research was

declared and an email address was requested where there was interest in participating in the research. Some of the marketing personnel stated no interest in the research and that organisation was also removed from the potential list of participants.

Figure 3-1 illustrates how the sample used in the quanitative study was derived.
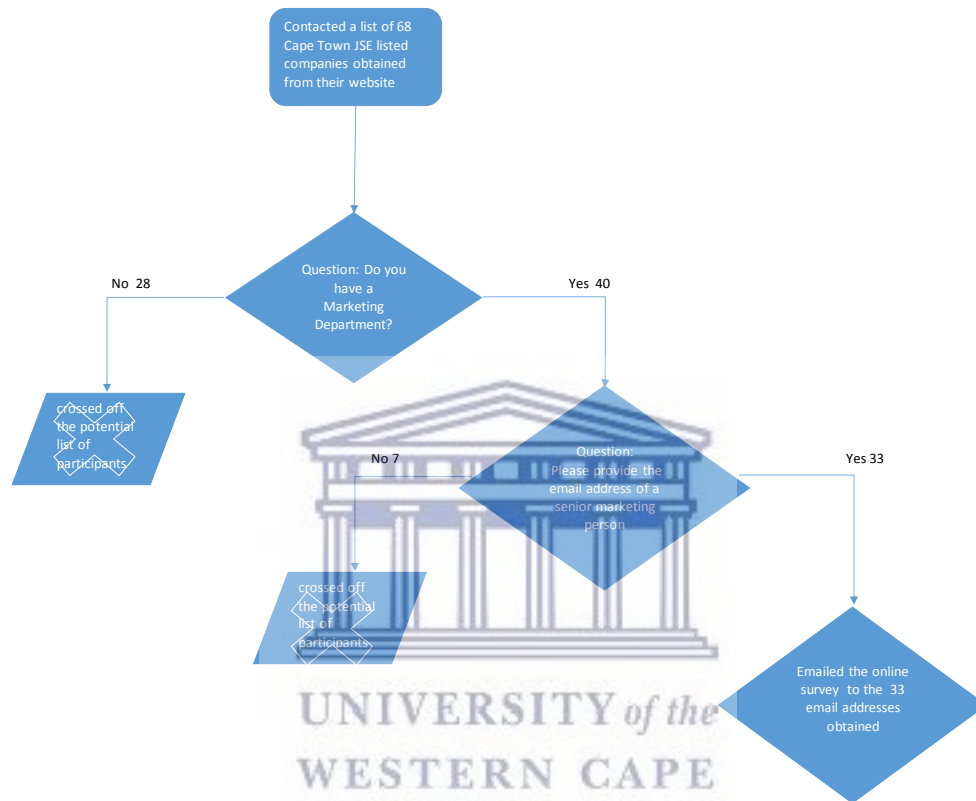
Figure 3-1. The method in which the sample used in the quantitative study was derived

This process of collecting emails reduced to a sample of 33. The online survey was created using Google forms, a free resource to create customised surveys with the ability to analyse the data derived from them. The survey was then sent to one person within this sample of organisations to complete. This group of 33 organisations was a non-random sample. There may be bias in this sample, as those companies that were not interested could have had a particular distribution due to their lack of interest. The final list of organisations to be contacted was a convenience sample.

The organisations were then contacted in writing (via email) with the online survey to be completed attached. Informed consent, in writing, was required from each of the respondents before the study could take place. Once the necessary permission had been granted for a survey to be conducted, the person participated in the study by answering the survey questionnaire. The full survey questionnaire can be found in Appendix D.

The responses from the survey were assessed a week after deployment of the survey. After only two responses had been received, a follow-up reminder to complete the survey was sent via email. This reminder delivered a few more responses, but the response rate was very low at this stage. In order to boost the response rate, the principal researcher considered contacts mainly within the retail industry and contacted the participants directly to urge them to complete the survey. This effort boosted the response rate, and after a month 15 responses had been received. Since a convenience sample was used, and as the efforts to boost the response rate were non-random, generalisations from the results of the online survey could not be made.

In recognising the need to strengthen the quantitative and qualitative studies, triangulation methodology was considered by including additional qualitative analyses in the form of in-depth expert interviews. Another quantitative analyisis was added in the form of a secondary data analysis from the findings of annual big data surveys conducted by NewVantage Partners. These reports are provided in the References.

3.2.4 Participants of the study

For the quantitative part of the study, all the JSE-listed companies with head offices in Cape Town and with marketing departments were considered for the survey, but only those organisations where an email address was secure were sent the online survey to complete. The companies were contacted to acquire the email addresses of senior marketing personnel. Most of the companies supplied email addresses, but some companies, at this point, did not want to participate in the survey. Those people whose email addresses were secured, were contacted and asked to complete the survey. Fifteen responses were returned.

For the qualitative study, various senior managers on the Customer Connected Council of Woolworths were approached to be interviewed in person, of whom eight from the various areas in business, BI and marketing accepted and were interviewed. They were interviewed extensively about big data and the collaboration of key stakeholders on how big data was used to secure profits for the business by making sense of the data through predictive analysis on customer data. In addition to the senior managers, middle managers from marketing, the business units and IT were also interviewed to gain their perspective.

Since triangulation methodology was used in this research, additional evidence through further interviews and analyses, to corroborate the initial qualitative and quantitative studies, was sought. Thus, as a way of applying triangulation, international experts in the field were also interviewed via email to collect their points of view on the research study on the collaboration of key stakeholders in organisations in terms of big data issues, as well as questions on the newly formed executive, the CDO. Additional people were also subsequently interviewed on the role of the CDO and how such an executive might impact collaboration among the various stakeholders in the use of big data for the benefit of the organisation.

3.3 Triangulation methodology

The term 'triangulation' has been borrowed from surveying (to determine an object in space with reliance on two points to triangulate on an unknown point) for application to social science research as part of the process of validation and assessing the veracity of the research results (Mertens and Hesse-Biber, 2012). Triangulation is used by many researchers in the social sciences to justify the use of the mixed methods research design (Mertens and Hesse-Biber, 2012).

At the start of the research study, to establish how to foster collaboration among key stakeholders, a qualitative study of Woolworths was considered, as well as a quantitative study surveying one key person in the marketing department of all the JSE-listed companies in Cape Town. The study went well but access to the email addresses in the various Cape Town companies became a problem. The telephone numbers of these companies were easily accessible from the company's website, but acquiring the name and email address of the key person when the companies were contacted, was difficult. After a while, 33 email addresses were obtained and the survey was sent to them. The response rate in the first two weeks was poor − only 2 out of 33 possible responses. The number of responses was increased to the final 15 of respondents by convenience sampling through contacts and influences within the retail sector. The study is open to bias owing to the limited number of responses, and generalisations could not be made as the intended quantitative study was limiting.

This problem was solved by considering triangulation methodology to validate the research already done, by adding addition evidence through further interviews. In reviewing the literature on the need for data science, the role of the CDO was

foregrounded; this was also underscored in references to this potential stakeholder in interviews conducted in the original qualitative study. This discovery led to further interviews with experts in business analytics and big data from the USA and India, with interview questions focusing on the advent of big data and the role of the CDO in organisations. Interviews with the CIO of Woolworths, and the newly appointed marketing executive, whose previous function at a telecommunications company was the responsibility for big data initiatives, were conducted to further interrogate this conception of the CDO. To strengthen the research, data analytics experts and consultants from South African and African contexts were also interviewed to gain insight into how big data has been adopted in various industries within South Africa and in other African countries.

The following interviews, surveys and analyses were considered in the research:

1. A qualitative study of key stakeholders at Woolworths.

2. An online survey to key people in the marketing departments of all the JSE-listed companies in Cape Town.

3. Interviews with the CIO of Woolworths and the marketing executive in the Woolworths marketing department with regard to a concept pertinent to the research – the CDO.

4. Interviews with international consultants working in business analytics across the world in India, the Middle East, the UK and USA, to understand how companies have adopted big data and the new concept of the CDO.

5. An email interview with a big data expert from a business consultancy in the USA regarding big data and the role of the CDO.

6. A secondary quantitative analysis of the Newvantage Partners 2012–2018 surveys.

7. Interviews with two business analytics consultants across various industries in corporate South Africa and Africa, to gain a perspective of big data and data-driven organisations in the South African and African contexts.

3.4 Fieldwork to collect data on the ground

A mixed methods approach was selected to gain a deep understanding of the experience at Woolworths of the research concepts through a qualitative research design and a quantitative study to various Cape Town organisations. In business and management research, according to Bryman and Bell (2011), increasingly more research articles are utilising the mixed methods approach.

Gaining access to organisations for research can be problematic, according to Shenton and Hayter (2004). They claim helpful tactics in gaining access are to express gratitude for the informants' time and their contribution to the research, and providing an explanation of the importance of the research. Using contacts within the organisation is also helpful in gaining access to organisations (Shenton and Hayter, 2004).

The research occurred in three stages, and therefore the instruments of data collection are distinguished accordingly.

3.4.1 Qualitative study procedures

3.4.1.1 The Original Qualitative study (collected by the investigator)

One unit of observation, namely Woolworths, was used to gain an interpretive perspective of the participants' experience with the research concepts. Woolworths is a large retail chain with its headquarters in Cape Town and its first store was opened in 1931. Another organisation was approached for participation in the qualitative study to

extend the number of units of observations, but the prinicipal investigator could not gain access as permission was not granted.

One unit of observation, as such, is not a threat to the qualitative study as it has been argued that a qualitative approach may rely on one unit of observation (Boddy, 2016). According to Boddy (2016, p.428), "despite the apparent limitations of samples which involve a single case or single research participant" a single unit of observation in qualitative research can offer a trustworthy direction for future research and that "individual cases can also provide a new, deep and nuanced understanding of previously unexplored phenomena". Since the research is dealing with a relatively new concept which has not been sufficiently investigated, using a single case by conducting in-depth interviews with an expert group of senior managers in their field, does not require a large sample and it is thus justified.

The in-depth study from the qualitative fieldwork was also intended to provide the basis for designing the quantitative study questionnaire. A strength of a qualitative approach is it "provides flexibility to the investigator to explore new ideas and issues" with in-depth interviews (Carvalho and White, 1997, p.16). The qualitative approach has been associated with some weaknesses, hence the need to combine this with a quantatitive approach to form a mixed method approach. A weakness of the qualitative approach is its inability to generalise as the small sample is not random (Carvalho and White, 1997).

The participants selected were all key senior managers and executives, experts in their business unit at the organisation. This diverse group represented unique points of view on the research subject, which helped in establishing a model of collaboration, leveraging their expertise as stakeholders in the optimal use of big data in marketing strategies.

The categories of data collection were prioritised and a series of questions was considered for the in-depth interviews, guided by the literature reviewed. There was a focus on concepts of the research, like big data, the statistician, and collaboration, to determine the set of questions for the interview.

Informed consent was received from the respondents of this study through a signature on a consent form. As most of the interviews were recorded, prior permission to record was received, and thus all the rules were followed in this study in terms of anonymity, confidentiality, privacy, and the protection of data. Ethical considerations were taken into account before the collection of data from the selected companies.

The participants were encouraged to 'bring out their own voice' in the interviews, to answer questions freely and to comment on additional points of view. This allowed the participants to contribute fully to the interview process. Where deemed necessary, the investigator probed to gain even deeper insight that would benefit the research. Special care was taken not to lead the interviewees by 'putting words into their mouths'.

In the transcripts of interviews in the results chapter, the interviewees' names were changed to protect their anonymity.

3.4.1.2 Additional qualitative studies

In order to corroborate the insights through triangulation and to strengthen the research, additional qualitative studies were conducted to fill the gaps or deficits in the original qualitative and quantitative studies considered at the start of the research study. The triangulation methodology used in the research is a form of face validity, which allows for the veracity of all the different sources of data collected.

The data collected from the various qualitative studies were in the form of open-ended answers in terms of the respondents' understanding of the questions asked. Various experts in big data and analytics were interviewed to gain insight into the impact of these areas in fostering collaboration among the stakeholders. The interviews were transcribed and the answers analysed, using summative content analysis.

In addition to the qualitative studies, to further strengthen the research, a secondary data analysis was conducted using survey results from a study by NewVantage Partners in the USA from the period 2012 to 2018.

3.4.1.3 Quantitative study procedures

Data was collected from an online survey conducted in the marketing departments of JSE-listed companies in Cape Town through online interviews. Only one senior person was surveyed to answer questions on behalf of his/her organisation. According to Bryman and Bell (2011), in business and management research, when only one person (especially a senior manager) is requested to complete a survey, it may be difficult to respond because of his/her workload. Also, by approaching only one person from the company, the views that person expresses in answering the survey are solely from a single point of view. A disadvantage of using a single respondent per organisation is that he or she may represent his/her role in a favourable way and it could be considered a limitation of the study (Bryman and Bell, 2011, p.190).

The data was collected from May 2017 to July 2017.

Firstly, the process started with securing email addresses of all the JSE-listed companies in Cape Town. The list of companies considered for the research was obtained from the JSE website. The telephone numbers of these companies were then checked on the

organisations' individual websites. The principal researcher contacted each of the companies on the list to secure an email address for the key person within the marketing departments. This process was slow, because key persons were not always available and email addresses could not be provided without their permission. After a couple of weeks, and by applying a convenience sampling method (personal and colleague connections within certain organisations), the rest of the email addresses were secured. Bryman and Bell (2011) suggest that in business research, gaining access to organisations sometimes requires the researcher to use friends or contacts for this purpose. There were also some organisations that did not want to be part of the research and indicated this in the initial contact via telephone. At the end of the process of obtaining email addresses, 33 email addresses were secured.

The data was collected via an online survey, create in Google forms, a survey tool. The questions were based on the insights from the qualitative enquiry. The survey was sent to the potential participants by email. The email outlined the reason for the research and university information, the intention of the study in the form of an information sheet, and the relevant consent form.

In the online survey, informed consent was received from the participants of this study through their response to the first statement on the survey. Only once consent had been given, did the other questions on the survey become accessible to the participants.

The instrument (or questions) was tested with the help of colleagues to determine whether the questions made sense and whether the possible responses would be able to be properly analysed, that is, whether the questions were clearly understood by the participants. This was done by a test survey to various people; the survey was then refined from the feedback.

The questionnaire was designed with structured, close-ended questions. Questions were asked on big data and collaborations based on the normative, as well as questions on the possible factors that might influence collaboration, like leadership, trust and knowledge sharing. The measurement scales used for the questions were mostly nominal and ordinal scales, which are common in business research (Cooper and Schindler, 2014). The data collected from the survey were in different formats like ordinal, interval and nominal data variables. These variables were captured in the data-analysis tool, SAS® Enterprise Guide, for analysis.

Some of the questions in the survey used the Likert scale, which is ordinal, to give the respondents the opportunity to give the extent of agreement or disagreement to the question asked. Likert scales are popular as they are reliable and "provide a greater volume of data than many other scales" (Cooper and Schindler, 2014, p.278). They note that researchers should be careful when using Likert scales that they effectively test the distinction between "favorable and attitudes". Internal content validity was achieved since the questions asked in the survey generated the intended results. External validity was not established as the results of the online survey were not able to be generalised owing to the non-response rate and small sample.

3.5 Data analysis

3.5.1 Analyses to guide the qualitative study

The first qualitative study was in the form of in-depth interviews with key people from Woolworths and those selected from the Connected Customer Council (CCC), a cross-functional collaborative group of senior managers, led by the CEOs of the

organisations. The additional qualitative studies were in the form of personal in-depth and email interviews with experts from South Africa and abroad.

After permission had been requested from the interviewees, audio recordings of the interview sessions were made, by using the researcher's cell phone. In the case of the email interviews, permission was first requested and then a list of questions was sent via email; the interviewees then responded with answers to the questions via email. All those interviewed personally agreed to having their interviews recorded. The audio recordings were downloaded in an MP4 format from the cell phone and sent to a professional transcriber for transcription. This ensured that the details of all the answers and discussions during the interviews were accurately captured. This also allowed the researcher to listen to the participants without having to take notes of the conversations.

Content analysis was the technique used to analyse the transcribed interviews. The specific type used was a summative content analysis, which involves the counting and comparing of keywords or the content and then interpreting the underlying context (Hsieh and Shannon, 2005). Once the transcriptions had been received in MS Word format, the researcher read the transcribed interviews and organised them by highlighting the themes emerging from the different interviews. Similarities and contrasts in the views of the various people interviewed were combined to analyse the results. These views and sentiments based on the themes were organised in MS Excel for ease of comparison.

The analysis of this research helped to create narratives around topics or opinions expressed in the interviews and the key points were reported accordingly. This analysis was used to build the arguments of the research.

3.5.2 Analyses to guide the quantitative study

The themes and concepts from the first qualitative study of the key stakeholders at Woolworths helped to inform the questions of the quantitative study in the form of an online survey to senior marketing staff at JSE-listed companies in Cape Town, where an email address was secured.

The completed surveys were collated in MS Excel. The MS Excel table was then imported into SAS® Enterprise Guide, a statistical analytics tool for the analysis of the survey data. The variables were mostly nominal and ordinal. The variables were organised using univariate and bivariate analyses. For the univariate analysis, a frequency distribution was used to display the responses. Since the responses were low, based on only 33 surveys distributed, the absolute numbers were displayed in the frequency distribution instead of percentages. The frequency distribution gives a count of each of the different variables and it restricts the measure of central tendency to the mode, "the most frequently occurring value" (Cooper and Schindler, 2014, p.252).

The designated group for the online survey was senior marketing managers from various industries like retail, banking, insurance, etc. This allowed for respondents from similar areas in the organisation and from diverse points of view, as the research focused on collaboration for the use of big data in marketing strategies. Examples of the questions asked, the variables, and the measures, are shown in the Table 3-1:

Table 3-1. Survey questions

Question	Variables	Measure
On a scale of 1 to 10, in your opinion, how important is using data in decision making?	1 – 10	Ordinal
Does your organisation use data to make business decisions?	YES NO	Nominal
What type of data is used in making business decisions? (Select all that apply)	Customer Data Economic Data Environmental Data Regulatory Sales Data	Nominal
Who performs the data analysis for the organisation?	Both in-house analysts and consultants In-house analyst	Nominal
List the people in the organisation who analyse and interpret the data for decision-making purposes? (Select all that apply)	Business Analysts Business Intelligence (IT) Executives Managers Marketing Marketing Analysts, Statistical Analysts	Nominal

For the bivariate analysis, statistical analysis was used to explain the relationship between two variables. Cross-tabulation was used to examine the patterns between the variables.

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The survey was based on a set of various questions to assess collaboration between business, BI, and statisticians, as well as factors like leadership, trust, and knowledge sharing that could possibly impact collaboration among the stakeholders.

Many of the questions in the survey had nominal variables, and the way the variables were analysed was through cross-tabulation to distinguish patterns in the data. Even though nominal data are considered to be statistically weak, they can still be useful (Cooper and Schindler, 2014). According to these authors, nominal data are valuable in exploratory studies where the "objective is to uncover relationships rather than secure precise measurements" (Cooper and Schindler, 2014, p.252). The survey questions also had ordinal variables. The statistical tests used on this type of variables were descriptive statistics, as well as chi-square and Fischer Exact tests.

Statistical analysis requires significance testing. The significance level, α, the probability of making a Type I error to be small – 0.01, 0.05, or 0.10. The p-value was determined when the Spearman test was performed, and this was compared to α (the default in SAS is 0.05). If the p-value is less than (or equal to) α, the null hypothesis should be rejected in favour of the alternative hypothesis, which lends support to generalisation.

The secondary data analysis was re-organised in tables, showing pertinent data variables over the period 2012 to 2018 to indicate trends and changes in those variables over time.

3.6 Validity and reliability

According to Yeasmin and Rahman (2012, p.156), triangulation is the "process of verification that increases validity by incorporating several viewpoints and methods".

The additional in-depth interviews were used to validate and corroborate the findings from the initial qualitative and quantitative studies.

For the quantitative study, internal validity was achieved, since the questions in the survey were consistent where some of the questions used the Likert scale with at least five possible ratings. Reliability was established from the survey questionnaires by asking a contradictory question at the end to assess the reliability of one of the key questions in the survey.

The study used the normative method of research by citing the experience of how collaboration in big data is approached in the USA, in Europe and in other economically advanced countries like the UAE. The experiences of these countries were compared with the experiences in South Africa. Content validity was determined by researching collaboration in the USA and in Europe, and by treating the practices in these countries as the acceptable way of working when it comes to big data and the collaboration of stakeholders in the marketing departments of companies of various industries. Reliability was checked by examining collaboration and concepts like big data and the CDO in different contexts, based on advice from experts in the USA, and in Europe, the Middle East and South Africa.

3.7 Ethical considerations

Ethics approval was solicited from the ethics committee of the University of the Western Cape before data collection commenced. Diener and Crandall, cited in Bryman and Bell (2011, p.128), list the following ethical considerations for business research:

– Harm to the participant in the study

– Lack of informed consent

- Invasion of privacy

- Deception

In the research conducted, informed consent was received from the respondents of this study. Most of the interviews were recorded, and permission to record was received. Thus, all the rules were followed in this study in terms of anonymity, confidentiality, privacy, and the protection of data. No identities of participants were revealed in the research.

3.8 Concluding remarks

The research design considered a mixed methods approach with a qualitative study in the form of in-depth interviews, as well as a quantitative study in the form of an online survey. To strengthen the research, additional in-depth interviews were conducted to corroborate the findings from the qualitative and quantitative studies through the use of triangulation methodology.

CHAPTER 4: RESULTS OF THE QUALITATIVE COMPONENT

4.1 Introduction

The first qualitative study was carried out in the form of in-depth personal interviews with the leadership of the Connected Customer Council (CCC) at Woolworths. The CCC is a collaborative leadership forum comprising members from the leadership teams of various business units at Woolworths such as marketing, the product groups (fashion, food, and financial services), stores, the human resources department (HR), the online division, as well as finance. The forum is led by the chief executive officer (CEO).

Eight relevant senior managers who are active in the CCC, as well as middle managers from the various business units, were interviewed for this study. The results of this qualitative research are explored in this chapter.

The questionnaire solicited information on the role of the forum, and of various stakeholders and statisticians regarding their understanding of big data and how they collaborate to use big data optimally for marketing strategies, as well as whether there is a need for analytics in the organisation. The leading questions revolved around leadership, trust and knowledge sharing, and these concepts were explored in the interviews. Interviews were also held with three subject matter experts on projects and pertinent strategy documents with regard to customer focus, analytics, and big data. The questionnaire can be found in the Appendices section. A further three interviews were held to discuss the conception of a CDO and to probe whether such a role was necessary to take the primary responsibility for the data strategy of the organisation. The first interview was held with the CIO of Woolworths, and the second was with the marketing executive within the marketing department. The third interview was with an

analytics consultant with experience in many parts of the world to gain insight into other organisations' perceptions of the role of the CDO.

To add different voices and to strengthen the research, additional interviews with five different experts were conducted. The experts consisted of a business analytics consultant, consulting in India, the Middle East and the UK; a big data expert with a background in business consulting from the USA; two business analytics consultants, consulting across various industries within South Africa; and a management consultant, working in South Africa, the Congo and Ghana. The presentation of the results from the qualitative studies is organised along the themes discussed in the chapter on research design.

4.2 Collaboration

In the literature review, the theme or concept of collaboration was defined as "the process of value creation that our traditional structures of communication and teamwork can't achieve" (Rosen, 2007, p.8). This value creation happens among different people and this concept guides the study. Also, according to Ricci and Wiese (2011, p.25), "better collaboration means better business operations and, ultimately, better results – faster". It is thus important for people in organisations to work together for the good of the organisation.

In response to the first question in the interview, the CEO recognised a need for and an opportunity to bring together the different 'touch points' (where the customer interact with the organisation) of the customer to ensure a better experience. This was after she had been presented with different customer-related presentations at the first EXCO

strategy meeting after being appointed CEO. The CEO then established the CCC and felt it was necessary for her to chair this council personally, which revealed her leadership style. The intention of this forum is to promote customer initiatives. In the words of the CEO, the CCC was established for the purpose of, "making sure that all the key stakeholders across the business are aligned about what we are trying to achieve in the customer experience space". This sentiment speaks of the CEO's desire for a shared vision among the members of the CCC and across the different business units of the organisation. To effectively implement the outputs of this council, a framework was developed by the strategy department together with the CEO.

The interviewees' names were changed to protect their anonymity. Eunice, one of the members, said the following regarding the role of the CCC (this view was also shared by other members):

> The Council is also there to promote a collaborative leadership approach so it is the only forum that really covers every single aspect of the business with the Customer at the centre.
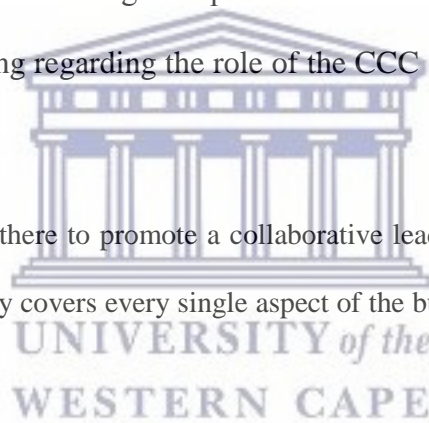
This sentiment from Eunice demonstrates that there exists a desire from the top management to make the organisation more customer focused through collaboration.

It was observed from the interviews that many of the respondents concurred that the role of the CCC is to promote collaboration among the various stakeholders by taking customer-related initiatives, for example, digital initiatives, into the future. The stakeholders, under the direction of the CEO, understand that placing the customer at the centre of their decision making is important in order to be "future fit" (from one of the respondents), meaning prepared for the future. This forum provides an opportunity

for debate and discussion to arrive at a common understanding across the organisation, through collaboration and regular interaction.

The CCC advocates interaction among the stakeholders with each of the members fulfilling a different role. Understanding the roles of these stakeholders is important and crucial to the effectiveness of collaboration within the organisation as well as being more customer focused. The next section of the survey was concerned with exploring the role that the various stakeholders play, generally, and in terms of big data.

4.3 The role of the business unit stakeholders

In organisations, each of the business units has a specific role to play to ensure the success of the organisation. For effective collaboration, these roles need to be clearly understood by all the stakeholders (Ricci and Wiese, 2011) and this section explores the respondents' understanding of the different roles. All the questions were aimed at anticipating those roles in line with fostering collaboration within the optimal use of big data.

For the purpose of this research, the stakeholders are the marketing department, the IT department and the product business units. Moorman and Rust (1999, p.180) cite Day (1994), who stated that "the marketing function facilitates the link between the customer and various key processes within the firm". Also generally in organisations, the marketing department has a significant role to play in bringing the customers and organisation together in terms of the products offered (Wirtz, Tuzovic and Kuppelwieser, 2014). The product business units in an organisation need to sell their product to the consumer (with the help of marketing and IT).

In response to the questions regarding the roles of the stakeholders (in general, being customer focused in the era of big data) in assessing whether there were differences in their perceptions and understanding, there was consensus that understanding the roles of the stakeholders should make it easier to collaborate effectively.

4.4 Marketing

According to McGee (2018), the role of marketing is not only to guide the organisation in terms of its brand strategy, but also to grow the business through great customer experience by utilising customer data. Marketing is also responsible for impacting the organisation's profit margins by understanding the company's customers. In the era of big data, the marketing departments in organisations should use big data to better understand their customers' needs by analysing their preferences from their web-browsing data to formulate marketing plans that are personalised to make data-driven business decisions (Hu, 2018). The author further states that there is still a lack of understating of big data and that marketers "blindly deny the importance of large data" and continue to use traditional ways of marketing to their customers (Hu, 2018, p.1751).

When asked about the role of marketing, the general understanding in the organisation under consideration was similar across the various respondents. Some respondents referred to this department as being the "custodian of the brand", with many also referring to its function regarding understanding its customer. The importance of this department's function to support the organisation to "drive the product strategy to customers" was also emphasised.

http://etd.uwc.ac.za/

When probed how this role could be improved to make the organisation more customer focused, many of the respondents thought that understanding the customer better by leveraging customer information or data, as well as by "listening" to the customers, would improve the role. One interviewee alluded to the fact that silos existed and suggested that to improve this, customer information should be shared with the entire business. Another commented that a way to improve the role would be for marketing to help make the organisation more customer led by having "actionable and clear messages".

The role of marketing in terms of big data was articulated by some of the respondents as "to provoke the business into action in a way that we engage our customers" and to "deliver those answers to business". It was also suggested that Marketing should take "a leading role as they have the understanding of the change in customer environment and the change in world environment".

Even though the respondents generally believed that marketing could benefit from big data, there was no clear understanding of how big data could be accessed and used in marketing strategies.

4.5 Information Technology (IT)

One of the functions of IT is to "collect, store, manage, secure and distribute data to employees who need access to the latest information to make decisions about strategic, financial and operational issues" (Linton, 2018). In the era of big data, the onus is on the IT department to take special care owing to the volume and complexity of the data in terms of storage, using Cloud storage solutions (McAfee and Brynjolfsson, 2012).

The majority of the respondents agreed that the role of IT was to provide the business with necessary platforms and technology. Sentiments among the respondents and the business consultant interviewed were that IT was still quite traditional, but was slowly changing to align with world trends. In terms of improving IT, there was a sense that this area was not changing fast enough and that they had to collaborate more with the other divisions in terms of implementing new technologies. One felt that IT was "too much involved in the decision processes". Another expressed a challenging view that a cultural change was required from leadership to move IT into the future.

IT needs to collaborate more with marketing to understand the business problems they are trying to solve, and partner more with marketing, rather than taking the lead. One individual stated that the role of IT was "understanding big data use cases to facilitate the process from technology to governance". Another summarised the role of the IT department as "to streamline and to make it simple", referring to the management and implementation of big data in the organisation.

Many of the respondents felt that IT was too traditional. In order to use big data optimally for financial gain for the organisation, the IT department will have to find more contemporary methods to deal with big data.

4.6 Business decision makers

 All the respondents agreed that the role of the business decision makers or senior management was to set or drive the strategy of the business. One of the respondents stated that another role was to "maximise the value for the business".

In terms of making the business more customer focused, some respondents were critical. One view was that the senior managers and executives were slow to change and needed to listen to the customers more. Another view was that more "collaboration with people who understand the customer" was required. The introduction of big data in large organisations gives the decision makers the opportunity through collaborating with domain experts within the organisation to drive value through the use of data.

Optimising the use of big data in marketing strategies requires people to make sense of the data. This study explores the involvement of a statistician in making sense of big data through the analysis and interpretation of such data. The next section deals with the role of the statistician and how the interviewees viewed this function.
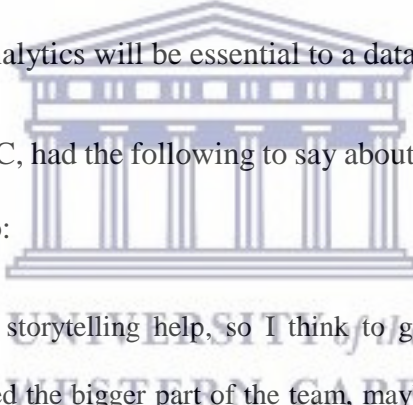
4.7 The role of a statistician in the organisation

There is a misconception that statisticians are not concerned with big data (Carmichael and Marron, 2018). The function of the traditional statistician in the era of big data is argued to be at the crossroads, as other skills like business and information technology are required. The role of a data scientist has become more prominent in relation to the phenomenon of big data and the need for a statistician is questioned. The Report of the London Workshop on the Future of the Statistical Sciences (Royal Statistical Society, 2014) indicates that statisticians should not forget to think like statisticians. They bring a skill to companies that IT specialists do not possess, but that is required**.** The report further contends that the challenge of big data is an opportunity for statisticians to revisit their assumptions and to develop new ideas (Royal Statistical Society, 2014).

The question of whether there was a role in the organisation for statisticians within the context of big data and analytics was posed to the respondents of this study and there were varied responses. Some saw the statistician as any person who analyses data and reports the statistics to the business. Some respondents thought that people who qualified as statisticians should have postgraduate degrees in statistics and mathematics, whereas others felt that having the experience of doing the job of reporting and analysing data qualified them as performing the duties of a statistician in an organisation.

There were two specific views among those interviewed regarding what exactly was required from the person doing statistical analysis at a retail organisation, especially in the future when big data analytics will be essential to a data-driven organisation.

Delia, a member of the CCC, had the following to say about what the business required a team of statisticians to do:

> It might need some storytelling help, so I think to get the business to buy in, a statistician might need the bigger part of the team, maybe you need research, maybe you need what I call storytellers – the kind of people that can go and take what is coming out of the data and position it to the business in a compelling way, not just lots of charts.

This assessment by Delia addresses the role of a data science team rather than traditional statisticians.

David, a middle manager, also felt that the business needed more than a statistician by stating:

> … depending on your needs from a business, you can have an actuary-levelled individual doing very high-level strategic business decisions about, for instance,

acquiring a new business or what is the value of a database, whereas a statistician could probably be just a level below that and has the ability to mine those statistics ...

The comments of these two respondents concur with the literature in the global community that states that more data science is required in the future and that having statistical abilities is not enough (Kuonen, 2015). Having business and communication skills are crucial in the world of making sense of big data.

As it appears, there is a consensus or understanding of the various roles the stakeholders could play in fostering collaboration in the optimal use of big data in marketing strategies. It is important to examine these stakeholders, so we now turn to how these stakeholders operate together.
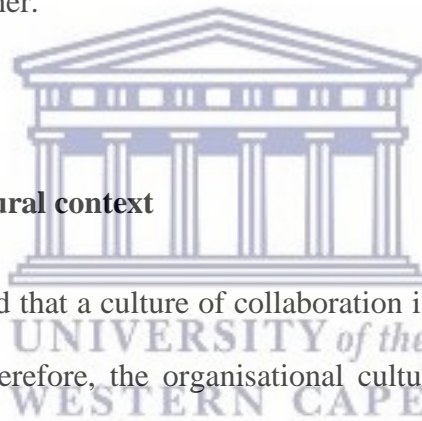
4.8 Collaboration in cultural context

The literature review found that a culture of collaboration is driven by the company's organisational culture. Therefore, the organisational culture needs to be taken into consideration. In the literature, it was stated that culture varies from organisation to organisation and that it develops over time. It is adopted by the leadership and is then observed by employees. According to Ricci and Wiese (2011), it is the responsibility of senior management to encourage, among the employees or teams in the organisation, a culture of collaboration.

In response to the question "To what extent are the various key stakeholders working together in the organisation?" the majority commented that they could be collaborating better and more frequently. Some participants expressed the belief that the stakeholders were currently working well together, an example being the marketing and IT

departments, according to one participant. Another believed that the product groups viewed marketing and IT as only service areas and not as partners. Several of the middle managers felt that Woolworths was still too hierarchical and that the business units worked in silos. This suggests a patriarchal organisational culture.

The view of the CEO on whether collaboration occured at the organisation was that even though the intention to collaborate existed, the organisation was not yet good at it.

In order to foster collaboration among the various stakeholders in the optimal use of big data for marketing strategies, it is important to understand how big data is being used around the globe. The next section shows the results of the consultants interviewed, particularly on this topic, from both a South African and a global perspective.

4.9 Big Data

As shown in the review of the literature, there are many opportunities to use big data to financially gain a competitive advantage across different industries. For the purpose of distinguishing between the two consultants, the first consultant interviewed is referred to as Vindaloo and the second consultant as Ronaldo. Please note that these names are fictitious and are only used for the purpose of reporting the results of these interviews.

When asked about how the big data phenomenon has been adopted in South Africa, the first of the two consultants, Vindaloo, responded that there were many industries using data in predictive analysis to make better business decisions in South Africa. The consultant provided an example of a retail company where data, including unstructured

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data (i.e. big data), was used to solve a business problem successfully. The use of data in this manner occurs at many of the organisations where the interviewee consults. Ronaldo, the second consultant, disagreed that the big data phenomenon had been fully adopted. His words:

> I don't think anything that has been discussed before now is really big data … that's a big thing. I don't think it is big data; that's the whole point.

Ronaldo further contended that "a lot of people talk about big data; there is zero relation between the big data discussion having a tech provider and their business, because they just ask, "What is it and how do I use it?" "So for me that is a fundamental flaw and I don't think that it is really big data." This speaks to Ronaldo's fervent disbelief that big data has been adopted in South Africa. He believes that he has only "come across three businesses that are big data contenders, only about 2% in South Africa".

Vindaloo further noted the different ways big data is used in various organisations. The interviewee referred to the use of visualisation tools to help make sense of big data. In the words of Vindaloo:

> In terms of visualising the data – if we consider that your big data source (which is called the data lake nowadays) is not only unstructured, it's uncategorised (if that is the right word), so you've got structured data in there and you've got unstructured data in there – it is not categorised whatsoever, so we dumped a whole lot of stuff there, so the process of gaining insight from that is often very time consuming…

This gives an indication of the extent of the use of big data. These comments were unsolicited regarding the different types of uses of big data by the interviewee.

Vindaloo also referred to the use of big data in the insurance industries and the considerable investment in using big data to build predictive models. Furthermore, it

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was mentioned that it was imperative for the insurance industry to use their data, "because if they price their product incorrectly they lose money".

4.9.1 Big data infrastructure

Vindaloo mentioned that certain retail organisations have been storing volumes of data (more than half a petabyte of data) in the cloud, a big data platform, successfully. There has been a trend that organisations are "definitely moving away from building it yourself to using a cloud-based service of some type or another that already has this capability". Ronaldo believed that the problem was not related to big data technology. This has been implemented successfully for years and many organisations store their data on big data platforms.

According to EE Publishers (2016), big data has huge potential in business, but also comes with many challenges.

4.9.2 Challenges of big data

In response to the question regarding the challenges of big data in the South African context, Vindaloo stated that big data technology was not the problem, since it has been available and successfully used. The challenges are not about acquiring big data technology, but setting up the organisation's data and building frameworks to consume big data. Vindaloo further noted that this could be "very time consuming, and the resources are scarce to find". Vindaloo believes that the challenge of big data centres on the business's capability to understand the value of (big) data.

Vindaloo's words:

> The challenge is how to create a data-driven culture; how do we create that data-driven culture inside the organisation; how do we become more data literate so that we can understand the value of these things and what they can bring to the organisations.

According to EE Publishers (2016), speaking from a South African context, the volumes of data (big data) need secure and proper data management, and business applications.

Ronaldo, like Vindaloo, believes that the challenge of big data is not the technology. Ronaldo was resolute that the challenge of big data is that the technological side and the business side of large organisations are not aligned; they are not speaking the same language. Ronaldo's own words:

> The business people don't know what the tech is doing and the tech team does not know what the business is trying to do.

A business management consultant also interviewed, working in countries like the Congo, noted that "the USA and European countries have many venture capitalists, as well as large corporate organisations that invest in big data technology and use the insights from it to make data-driven decisions", compared with their African counterparts. According to this consultant, "South Africa seems to sit in the middle, where some investments are made into big data platforms and cloud technologies". In the African context, however, there is a big lag between First-World countries and continents, like the USA and Europe, and Africa in terms of big data technology, owing to the ability of businesses to invest in such technologies. A contributor to the article by EE Publishers (2016), however, believes that "as a gross generalisation, South African businesses are not ready yet to work with big data" and that "data first needs to become central to the organisation".

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To assess how well they will need work together to optimise big data in marketing strategies, the findings on how the respondents viewed analytics at their organisations are explored in the next section.

4.10 The need for analytics at an organisation

An analytics culture, much like a culture of collaboration, is estblished by the leadership in an organisation. In the literature review, it was stated that among the many responsibilities, the CEO of the company also has the responsibility of building an analytics culture among the staff members of the organisation.

It was found during the interviews that all of the respondents considered statistical analytics to be important to the business. However, there were varying views about what they considered statistical analytics. These ranged from financial and business intelligence reporting to predictive analytics. The difference between reporting and predictive analysis, according to Stubbs (2013), is that more advanced statistical techniques are applied in predictive analytics.

Exclusively using one's 'gut feel' and intuition is the enemy of data-driven decision making in an organisation, according to Davenport and Harris (2007). One of the respondents referred to merchants in the organisation as "intuitive retailers", having to sell their merchandise and to apply their intuition. The respondent, however, contended that if they had data insights and analysis at their disposal, the combination would help them to sell more products. The respondent did not feel that data analytics was filtered to all the different areas of the business. This was not because leadership was not distributing the data, but that there was a lack of education in understanding the

analytics. Talking about this issue, an interviewee said: " … and again you have true traders that use information very effectively, too often leapfrog the competition and work quicker with the decision, whereas not true traders without information will grow but [with] very small incremental steps".

Diverse views were expressed in the understanding of big data among the interviewees. Some referred to it as volumes of data, while others had a more comprehensive view of the term. The deeper understanding was more prevalent among middle managers and those working in IT. The understanding of big data among the product groups was more generic. The phenomenon of big data has been a buzzword for the last couple of years and corporates understand the need to leverage such data to better understand their customers and thus to gain competitive advantage over other companies.

One of the projects of the CCC is to derive a single view of a customer, where the use of big data will be explored. The interviewees generally had a good understanding of the concept of big data. The middle managers, though, had a better understanding of big data than the senior managers.

In the interview with the CEO, she referred to a conversation with executives at a retail conference, where big data was referred to as 'smart data' by a delegate. It was insinuated that this was how big data needed to be implemented for the benefit of the organisation.

When asked whether analytics should be a core function or not, most of the respondents thought that it was important that this function be core to the business. In the age of technology and big data, being data driven is vital to have a competitive edge.

Davenport and Harris (2007, p.143) argue that many organisations in the USA have the analytics function centralised "to some degree". They state that in some companies the analysts are housed in the organisation where the most of the analysis is done. At Woolworths, the customer team within the marketing department has the highest concentration of analysts. When questioned about whether this function should be centralised within the organisation, the respondents had varied opinions. An example of the distributed view is given below:

> I think [it should] not [be] centralised, because you would lose the expert knowledge
> of the data of that business unit which I think is critical to being a statistician.

The centralised view:

> [It should] be centralised ideally, have a point person, work across [business units] so
> they need to kind of bring together parts of the business.

Business analytics is important for an organisation and helps in their making better business decisions to gain an advantage over competitors (Stubbs, 2013). Even though the respondents had differing views of what was considered analytics and how it was applied in the organisation, all realised its importance and that it would benefit the organisation.

The sections above addressed the importance of the role of statisticians, analytics, and the various stakeholders that need to collaborate for optimal use of big data. The next section analyses the role of the CDO, which according to literature could be a key stakeholder in fostering collaboration in the use of big data.

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4.11 The chief data officer

Not everyone understands big data and how to make sense of it. Teerlink, Sigmon, Gow and Banerjee (2014, p.1) believe that there is a "growing need for a leader whose primary role is to understand and advocate on behalf of data" in modern organisations in the twenty-first century. Leading organisations in various industries around the world are introducing positions like the CDO to fulfil this role.

Additional interviews with the CIO and a marketing executive were conducted to scrutinise the concept of the CDO. An email interview with a business analytics consultant, consulting in the USA, the UK, the Middle East and India, was also conducted around the concept of the CDO and the role it plays in organisations. The results from these interviews are reviewed in the paragraphs below.

The CIO at Woolworths, when asked about the role of a CDO at Woolworths, indicated, "I don't have a view for or against it, actually." He believes that much of the data strategy resides with either the CEO or COO in a traditional retail organisation.

Words from the CIO – "I feel hard pressed to see how a chief data officer role would work in a traditional sort of corporate value chain enterprise type environment like retail." The CIO believes that a case for a CDO is more applicable to a digital business, rather than to a complex business, like Woolworths, where there is a foods business, a fashion business, and a financial services business.

The marketing executive at Woolworths supposed that the role of the CDO was to communicate to the CEO and other executives of the organisation the importance of data as an asset going forward into the future, as well as communicate the benefits of data in the era of big data. When asked whom the CDO should report to, the marketing

executive responded that it depended on the structure of the organisation, but believed that the role of CDO should at the EXCO level, reporting to the CEO of the organisation.

Regarding the role of the CDO, the business analytics consultant interviewed considered the role of the CDO as an emerging role. According to the interviewee, many organisations are still not sure at what level of the hierarchy of the organisation this role should reside. In the opinion of the interviewee, the role should be:

> Ideally reporting into the COO or CEO, depending on the size of the organisation. He could be a part of the Board in the future. Reporting to the CFO (like CIOs do in a large number of companies) is a bad idea as CFOs are typically not agents of innovation, creativity, out-of-box thinking and risk taking.

The function of the CDO should "ideally focus on delivering major business value across the organisation". The interviewee further stated that, "to deliver business value, they need to be in constant touch with the business leadership, understand strategy, vision, challenges and know all initiatives".

The concept of the chief data officer was brought up spontaneously in the interviews with the two data analytics consultants, consulting to organisations in South Africa, while discussing the challenges of big data and the lack of understanding of big data in organisations. One of the consultants mentioned that for one of the retailers in Cape Town, "there is an intent to appoint a chief data officer reporting directly to the CEO". The consultant suggested that the reason for this intended appointment was due to a lack of understanding of the value of data and that the appointment recognised this. Once the appointment was made, the CDO would then drive the data strategy of the organisation.

The second consultant defined the role of the CDO as follows:

> I think it is imperative, because you've always got this technology in this business, but everybody is trying to get the business to talk to technology, so what do they do … because the goal of it is not about technology or business, his [the CDO] goal is to uncover value to use data in every aspect wherever it is in the business and to turn it into something.

This response indicates the consultants' sentiments about how crucial the role of the CDO currently is, as well as the skills a CDO should possess, which accords with the literature. Since both these consultants work with South African organisations, and they noted the importance of the CDO in an organisation, it illustrates the need for CDOs in the South African context.

Another question was posed to the interviewees regarding the relationship between the CIO and the CDO at an organisation. In response to this, the CIO of Woolworths stated that the CDO should work closely with the CIO and that their roles were complementary, with no overlap in duties. The marketing executive responded that the CDO and CIO should sit at the same level and that they should work closely together. Regarding the role of IT and the CIO in data and analytics at Woolworths, the marketing executive believed that without "proper direction" in the organisation in terms of data strategy and analytics, the IT department merely do their jobs and are "just trying to service all the different business units and their requirements". She stated that if the organisational data strategy sat in the correct place with a role like a CDO, "that centralisation of the data requirement … will only help IT and the CIO and make their lives a heck of a lot easier because they now have proper direction". The difference between the CIO and the CDO, according to the marketing executive is that

> ... a CIO should be someone with more understanding of the organisation's systems, architecture and technologies, etc., whereas the CDO actually needs to be an evolution of a data scientist, someone who understands how to connect different pieces of data and what kind of models are required, as well as the type of measurement required.

The CDO knows how to use data to drive decisions at a strategic level.

In probing the difference in the roles of the CIO and CDO at an organisation, the business analytics consultant from India commented:

> CIO's are certainly not CDO material as data is a weak aspect of most of their repertoire. Also, most CIO's are not quite deeply aware of business dynamics to deliver business value directly. They simply deliver a platform full of data and expect business to figure out what to do with it! So, while CIO will be responsible for all IT infrastructure, CDO will own the data Infrastructure part.

These comments indicate that the CIO and CDO have clear and distinct roles, with the role of the CDO being to deliver business value to the organisation through the use of data, whilst the CIO is to ensure the infrastructure exist to hold all the data. According to Steele (2017, p.6), the responsibilities of many CDOs are "centralization, prioritization, evangelization, and facilitation" of data as an asset.

The next question asked of the interviewees was whether analytics in the organisation should be centralised in the organisation, or distributed across the organisation in the form of a federated model. The core team of data scientists and the statistical analysts should sit within the hierarchical line of the CDO, according to the marketing executive, with the decentralised teams sitting within the business units, collaborating regularly with the core team. The marketing executive does not believe that many organisations

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have this model right yet. The CIO's response to the question of a centralised versus a federated analytics model was that he favoured a federated analytics model, thus decentralised within the business units, with the advanced analytics being done in the centralised team. He believed that both the centralised and decentralised (or federated) models had pros and cons, but in a retail organisation like Woolworths, the federated model would probably work best.

In an interview with the Customer Strategy Manager, the necessity of an analytics Centre of Excellence (CoE) within an organisation like Woolworths was mentioned and that it "might be a way for innovation and processes and policies perhaps to be aligned across an organisation by a group of people who are more than interested parties, experts in doing that…". She further contended that the CoE should have a permanent leader with a small highly skilled analytics team. The subject matter experts from across the organisation would work with this specialist team, headed by either a chief analytics officer or a CDO, driving the data and analytics strategy of the organisation. The idea of a CoE is similar to the suggestion made by the CIO and the marketing executive in terms of a core team and decentralised specialists sitting in the various business units.

4.12 Internal vs external analytics

A question about the need for external analytics partners was posed, and there was agreement that there would always be a need for such a partner in modern organisations. The marketing executive stated that even though organisations would always have external analytics partners, organisations needed to be careful of service level agreements with them in respect of retaining intellectual property. The external partners should be vetted by the CDO and such partners fed into the business units through the

core team residing in the CDO line. According to the CIO, the relationship with the external analytics partners is held by the core team.

4.13 Collaboration with the CDO and their different levels

According to the marketing executive, collaboration at the executive committee and senior management level is important as the rest of the organisation will take direction from them. Middle management needs to be aligned with senior management as they have to execute the strategies set by senior management. It is her opinion that collaboration should happen at all levels of the organisation in line with the direction set by senior management, based on their KPIs or corporate scorecards.

The CDO is considered a business leader and should play a collaborative role from the top, working closely with the CIO (Teerlink, Sigmon, Gow and Banerjee, 2014). Since the research aims to show that successful big data initiatives require collaboration and leadership, a question posed to the big data expert from the US regarding the role of the CDO in implementing big data initiatives. The expert agrees that the CDO is instrumental in the success of big data initiatives, but that "there is wide disparity in the implementation and effectiveness" of the role of the CDO. The expert also believes that the CDO and CIO should work closely in order to have successful big data initiatives. However, after further contemplation, added that from experience working with many of the Fortune 1000 companies within the USA, it may be "too early to tell" whether the CDO will be instrumental in big data initiatives.

The business analytics consultant, when asked about the skills that a CDO should possess responded by listing the skills as:

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- Key skill of a CDO is to understand business thoroughly and then understand how analytics can impact it positively, whether transformational or incremental.

- Second important skill is the consensus building skill to socialize the value and drive adoption within the organisation.

- Third important skill is to put in place data engineering and data science organisation that delivers effectively.

- Finally, lookout for opportunities to innovate and disrupt the marketplace using data and create quantum competitive advantage for the organization.

These skills indicate that the chief data officer (CDO) should be a transformational leader in the era of big data and a key collaborator in large organisations, driving value for the business through data analytics and thus gaining competitive advantage for the organisation. Teerlink, Sigmon, Gow and Banerjee (2014, p.7) state that the CDO needs "sharp skills in negotiation and leadership to maintain a healthy collaboration" with the rest of the organisation regarding the data function.

Concepts like leadership, trust and knowledge sharing can impeach on collaboration within the organisation in the attempt to foster better collaborative efforts among the stakeholders. Collaboration in practice involves people with feelings, and factors such as leadership, trust and knowledge sharing can be subjective; thus to assess the effectiveness of such factors can be difficult. In the following section, these factors are explored in respect of how they influence effective collaboration.

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4.14 Leadership

The literature indicated that in organisations, the dynamic trait of leadership is to take ownership of collaborative efforts (Ricci and Wiese, 2011). When the participants were asked about the role of leadership in ensuring effective collaboration, they all shared similar views. Their views were that the leadership needed to create the right culture and implement it across the organisation. Some thought that the culture of the organisation needed to change for the leadership to effectively collaborate. It was said that it takes a combination of the A and B leadership styles to achieve effective collaboration. These statements resonate with what the literature review reflected.

Below are some of the views from the respondents about the responsibility of leadership on effective collaboration within the organisation:

> …creating the right cultural way of working in the team.

> …if they collaborate among themselves as a behaviour they should model the behaviours they wish to see in the teams.

> It is leadership's role to create the right structure and the right environment that facilitates and enables collaboration.

According to Rosen (2007, p.51), to develop a culture of collaboration, attributes such as "frequent, cross-functional interaction" and effective leadership need to exist within the organisation. This is one of the reasons why the council was established based on these attributes and is being led by the CEO, which shows leadership commitment.

4.15 Trust

In order to effectively collaborate, trust needs to be developed (Rosen, 2007). When asked about whether there were trust issues among these stakeholders, the respondents mostly concurred that trust could cause people not to work well together. One of the respondents felt that in the case of the CCC, which had only recently been established, relationships among its members first needed to be built, before trust could exist. Another similar view from David, a middle manager, was: "Yes. I think it takes time; it takes leadership. It takes more engagement. It takes first and foremost to recognise that that is the case …."

A contrasting view is that what seem to be trust issues, might be cultural issues. It is suggested that what can seem to be lack of trust is actually fear. This individual believed that fear of failing was "deeply ingrained in the organisation".

Another respondent thought that the trust issues that existed were because of the culture of the organisation. The respondent felt that the organisation was very traditional in its thinking, hierarchical, and not collaborative enough. She further noted that collaboration existed among peers at a particular level and not across the levels. Rosen (2007, p.51) lists "frequent, cross-functional interaction" as a key attribute of collaborative culture.

Hosmer (1995) believes that trust is crucial in interpersonal exchanges and that nothing influences interpersonal or group behaviour as much as trust.

Further views from the respondents on trust issues at Woolworths were:

I don't know but I do think that when you put a team of people together, they first have to get to know each other a bit more and build a relationship before you actually start trusting each other in the real sense of the word.

… the leadership sets the tone for trust.

From the respondents' comments above, there is a sense that trust issues exist for different reasons. Leadership and culture seem to be some of the aspects that define the extent of trust issues at Woolworths. To succeed in effective collaboration, especially in the complexities of a new phenomenon such as big data, developing trust among the stakeholders will be of paramount importance.

4.16 Knowledge sharing

In companies where sharing is promoted, information or knowledge sharers exist. Such employees collaborate better than those who do not share (Rosen, 2007).

Edgar, one of the product group heads, had this to say about how the stakeholders currently work together at Woolworths:

I think in isolation they work well; I think there is a general lack of subject matter expertise in a lot of areas and therefore some voices are too loud in areas that they don't understand, so you get massive imbalances – so that could be improved. I think there should be a much bigger appreciation for subject matter expertise (interviewed on 18/10/2016).

Three of the eight participants noted that the organisation had a silo approach to work and that this style did not promote good knowledge sharing. Others thought knowledge

sharing did occur, but that it could be improved. One person thought that people did not have enough time to share or transfer their knowledge.

Some of the views expressed when the participants were asked whether knowledge sharing existed among those who should effectively implement the decisions of this council are given below:

> One of the impacts of our traditional way of doing things is that we still very much work in silos and that we haven't really crossed that barrier or those boundaries. So everyone tries to deliver to organisation strategies but on their own.

> I think it can be more effective; I think it has improved significantly; I think this whole piece of work we are busy with on nodal analysis is really addressing business challenges, and trade issues are forcing people to share information in a collaborative way and looking for solutions that are cross-business, which is the only way we can resolve some of these big challenges.

> I think if you approach people they will give you the time to understand or to explain. It is whether we all have time. I definitely think we have a business that shares knowledge; I don't think we keep things to ourselves. Everybody knows there is transparency of information. We all know the sales. We all know who our customers are; you can go on … The business does share information, the right information.

> In spite of some of the behaviours that go on at all the levels of both parties, I do think that there is a general willingness amongst some parties to share knowledge. I think IT, BI have come in leaps and bounds in being viewed as trusted partners to marketing and to others, so I think that's improved. I think there is still a deep suspicion between, for instance, marketing and clothing, and marketing and foods.

From the literature, it is argued that if sharing is promoted within an organisation, there will be knowledge sharers, and such employees collaborate better than those who do

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not share (Rosen, 2007). Is a cultural change required for knowledge sharing to expand? The answer will be discussed in the next chapter.

4.17 Some preliminary concluding remarks

In summary, the results in this chapter indicate that the people interviewed had strong views on how collaboration should exist in the organisation and within the context of big data in particular. All the respondents agreed that the CCC, led by the CEO, showed commitment from leadership to promote collaboration to make the business more customer focused. Because of the centrality of data to the context, the narrative foregrounded what the position of the statistician should be. The views on the role of the statistician were varied, and the experience of statistical analysis in the company was very diverse among those interviewed. Data is no longer the traditional, privileged domain of the statistician. Silo working and the organisational culture of the company could be contributing reasons why collaboration is not as effective as it should be, as expressed by the respondents. Nevertheless, the results indicate that the promises of effective collaboration are in place in order to foster the use of big data in an organisation of this type. The findings from the additional interviews strengthen the research with input from analytics and big data experts regarding the use of big data and the role of the CDO.

The next chapter presents the findings from the quantitative component of the research.

CHAPTER 5: RESULTS OF THE QUANTITATIVE COMPONENT

The results of the two quantitative studies conducted are presented in this chapter. The two studies are:

1. Online surveys sent to key people in the marketing departments of JSE-listed companies in Cape Town, as well as six retail organisations abroad.

2. A secondary data analysis of a big data executive survey, conducted between 50 and 60 Fortune 1000 companies in the USA (NewVantage Partners, 2018).

5.1 The online survey

5.1.1 Background

Data were collected by obtaining feedback from online surveys sent to 33 people via email with questions in response to the research problems posed in Chapter 1 of this thesis. The results were then analysed in SAS.

The survey was created in Google forms, a free online survey platform. It allowed some customisation in terms of adding the UWC logo. An information sheet with all the relevant details of the researcher and the research, as well as a consent form, was added to the email. The first question requested the consent of the participant.

A test survey was sent to five individuals to assess various aspects of the survey, for example, length, ease of answering the questions, understanding of the questions, and choices. Some suggested changes to the questions be made and some of the terminologies, which were too specific to the retail industry, were made more generic. The changes were incorporated into a final survey.

5.1.2 Survey response

Thirty-three surveys were initially sent to senior marketing personnel at all the JSE-listed companies with marketing departments in the Cape Town area. In order to gain email addresses, telephone calls were made to the companies from the telephone numbers listed on the companies' websites. Of the 40 companies with marketing departments, 33 email addresses were secured; two companies did not want to participate in this study; while there were five companies where direct email addresses of key marketing personnel could not be secured after several attempts to contact the organisations.

The responses were initially very slow and convenience sampling was employed through contacts within the retail industries. Fifteen responses were received in total, of which 12 were retail companies, two financial services companies, and one a fast-moving consumer goods (FMCG) company. The overall response rate was thus 15 returns out of 33 emails sent; this corresponds to a 45% response rate.

The survey was also sent to six retail companies outside South Africa, of which five were returned. The retail organisations were identified through personal contacts and not randomly selected. A convenience sampling method was employed to secure the six email addresses. The reason for sending the online survey to these organisations was to get an indication of retail organisations in India, the Middle East and the UK and their collaboration with key stakeholders in using big data in marketing strategies.

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5.1.3 Results from Cape Town companies

5.1.3.1 Data in decision making for business

Businesses realise that it is important to leverage data, especially in marketing, to gain insights from it to make more informed and strategically beneficial decisions (Provost and Fawcett, 2013). The use of data in business decision making allows organisations to have competitive advantage over others, but it has also become a necessity to survive in business (Harvard Business Review, 2012).

The first question asked of the participants was to rate the importance of data in decision making in business. Seven of the respondents rated this at 10, the top end of the scale. This indicates that in the industries surveyed, data in decision making is of utmost importance. All the respondents indicated that their organisations used data to make business decisions. According to McAfee and Brynjolfsson (2012), an effective organisation needs to make decisions based on data driven evidence. The authors note that even though there are companies that do not embrace data-driven decision making, successful companies in the world are those where data-driven decision making occurs.

5.1.3.2 Big Data and the Statistician

As stated in the literature review, even though big data started out as a buzzword, it has become a critical part of large organisations in recent years to drive business value. Currently, 97% of large organisations in the USA are investing in big data projects of which 73% claim to have already had success in such initiatives, according to NewVantage Partners (2018).

When asked whether their organisation had a big data strategy or vision, 12 of the 15 respondents indicated that they did have a strategy. This is in line with organisations

around the world, as many organisations are starting to invest in big data initiatives (Pearson and Wegener, 2013). Organisations are thus incorporating big data in their day-to-day operations. To further assess the respondents' understanding of big data, they were asked to list what type of data they considered to be big data. All the respondents considered transactional retail data as big data, followed by economic data, where 11 of the 15 indicated this, with 9 respondents indicating that social media could be considered big data. There seems to be a good understanding of big data among the participants of the survey.

Data science is the discipline that requires a multidisciplinary team to make sense of big data (Kuonen, 2015). Statistical analysis is an important component in data science and is performed by the statistician (Schutt and O'Neil, 2014). When the participants of the online survey were probed in terms of their understanding of the people responsible for the analysis and interpretation of data, less than half (7) indicated that statistical analysts were required in the analysis and interpretation of data in their organisations. Most (12) indicated that data analysis was mostly done by business intelligence (BI) and a business analyst (both situated in the IT department of the organisation) and management (14). This could indicate that the statistical analyst's role is not properly understood as the function that scientifically analyses and interprets data, which is in fact the function of a statistician.

5.1.3.3 Collaboration in the organisational context

It was established in the literature review chapter that making sense of big data requires a data science team to work together to optimally use big data in an organisation; this requires these stakeholders to collaborate.

Based on this, a series of questions was posed to the participants of the online survey to establish their understanding of the concept of collaboration, the role of leadership in ensuring collaboration, as well as how effective they thought collaboration was in their organisation.

The frequency distribution of some of the questions asked is shown in Table 5-1 below:

Table 5-1. Questions on collaboration

	Question	Variables	Frequency Count	Frequency (%)
Q11	How frequently does such collaboration happen?	Infrequently	1	7
		Often	12	80
		Sometimes	2	13
Q13	Rate how collaboration with peers across business units is encouraged by top management in the organisation.	Always	7	47
		Often	4	27
		Sometimes	4	27
Q14	In your opinion, does a culture of collaboration exist at your organisation?	No	4	27
		Yes	11	73
Q15	If collaboration exists at your organisation, how effective do you think it is on a scale of 1 to 10?	5	3	20
		6	2	13
		7	3	20
		8	6	40
		10	1	7

The frequency distribution above gives an indication of the different responses from the 15 participants. Most (12) of the responders indicated that collaboration occurred "often" at their organisation, with only 1 indicating that it happened infrequently. This implies that collaboration in organisations occurs often and is part of how organisations operate.

The responses to the question, rating the collaboration encouraged by top management, revealed that 7 respondents believed that collaboration with peers was 'always' encouraged, whereas the other responders indicated either 'often' or 'sometimes'. Among the respondents, almost 50% agreed that collaboration required encouragement,

implying the propensity to collaborate and that the collaborative efforts are more than just casual.

The extent of encouragement from top management to collaborate could imply that a culture of collaboration exists at that organisation, since top management is responsible for determining the culture of the organisation (Davenport and Harris, 2007). The next question was posed to the respondents to ascertain whether they were aware of this link.

Figure 5-1 below is a visual representation of the question whether a culture of collaboration exists.

Figure 5-1. Results of question posed on existence of a collaborative culture in the respective organisations

Based on the question posed to the respondents, 11 of the 15 believed that a culture of collaboration existed. To further explore the extent of collaboration, a question on the effectiveness of collaboration was posed, requesting respondents to rate how effective collaboration was in their organisations on a scale of 1 to 10. Most of the respondents rated the effectiveness of collaboration as an 8, which is quite high, based on a scale of

1 to 10. This implies that respondents considered their organisation generally to collaborate effectively.

5.1.3.4 Organisational dimensions of effective collaboration

There are many aspects that can influence collaboration and these aspects were explored in the questions posed to the respondents of the online survey. It was found that organisational culture (13), communication (12) and leadership (11) were the top dimensions that could impact effective collaboration, according to the 15 respondents of the online survey. Nine of the 15 indicated that knowledge sharing and trust were dimensions that could impact collaboration.

This research considered leadership, knowledge sharing and trust as embedded in the hypotheses to be tested. All the respondents stated that the leadership teams in their organisations influenced how the various business units collaborated. This statement accords with Rosen's view. According to Rosen (2007), it is necessary for leaders to instil collaboration into the culture of the organisation.

Nine of the 15 respondents indicated that leadership was an aspect that could impact effective collaboration. Organisational culture was the aspect indicated by 13 of the respondents that impacted effective collaboration. According to Davenport and Harris (2007), the culture of an organisation is driven by its leadership. Many (11) of the respondents thought a culture of collaboration existed in their organisations, while only four respondents felt that there was no such culture in their organisations.

5.1.3.5 Leadership and Collaboration

According to Rosen (2007), it is necessary for a leader to instil collaboration into the culture of the organisation. This sentiment is echoed in the qualitative study, that the

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role of the leadership is imperative in ensuring effective collaboration in organisations. In the online survey, participants were asked whether the frequency of collaboration was influenced by top management. To determine if there was an association between the two variables – the frequency of collaboration (how often it occurs) and top management's influence on collaboration, the statistical test used was the chi-square test. Since 89% of the cells had expected counts less than 5, the chi-square test was not valid and Fisher's Exact test was considered instead. Fisher's exact test was considered, as this test is more accurate when the expected numbers of two nominal variables are small (McDonald, 2014).

The results are shown in Table 5-2 below.

Table 5-2. Cross tabulation of Q11 (How frequently does such collaboration happen?) and Q13 (Rate how collaboration with peers across business units is encouraged by top management in the organisation)

Statistics for Table			
Frequency of collaboration	**Collaboration Encouragement by top management**		
Frequency	**Always**	**Often**	**Sometimes**	**Total**
Infrequently	0	0	1	1
Often	7	4	1	12
Sometimes	0	0	2	2
Total	7	4	4	15

Statistic	DF	Value	Prob
Chi-square	4	10.3125	0.0355
Likelihood ratio Chi-square	4	10.5134	0.0326
Mantel–Haenszel Chi-square	1	0.6608	0.4163
Phi Coefficient		0.8292	
Contingency Coefficient		0.6383	
Cramér's V		0.5863	
WARNING: 89% of the cells have expected counts less than 5. Chi-square may not be a valid test.			

Fisher's Exact Test - Sample Size = 15

Table Probability (P)	0.0088
Monte Carlo Estimate for the Exact Test	
Pr <= P	0.0187

Number of Samples	10000
Initial Seed	384028122

A p − value of 0.0187 was reported (at a significance level α of 0.05), indicating that there is a relationship between the frequency of collaboration and top management's influence on collaboration**.**

5.1.3.6 Trust and Collaboration

From the literature and the qualitative part of this research, the concept of trust was identified as a critical component of collaboration and crucial for effective collaboration. In this quantitative study, in the form of an online survey, respondents were probed on how they perceived trust issues among the various business units in their organisations.

One of the questions asked in the survey was whether trust issues existed among the various business units with regard to data use. Figure 5-2 overleaf is a bar chart representation of the responses to the question on trust among business units.

Q19: Are there trust issues among the various business units with regard to data use?
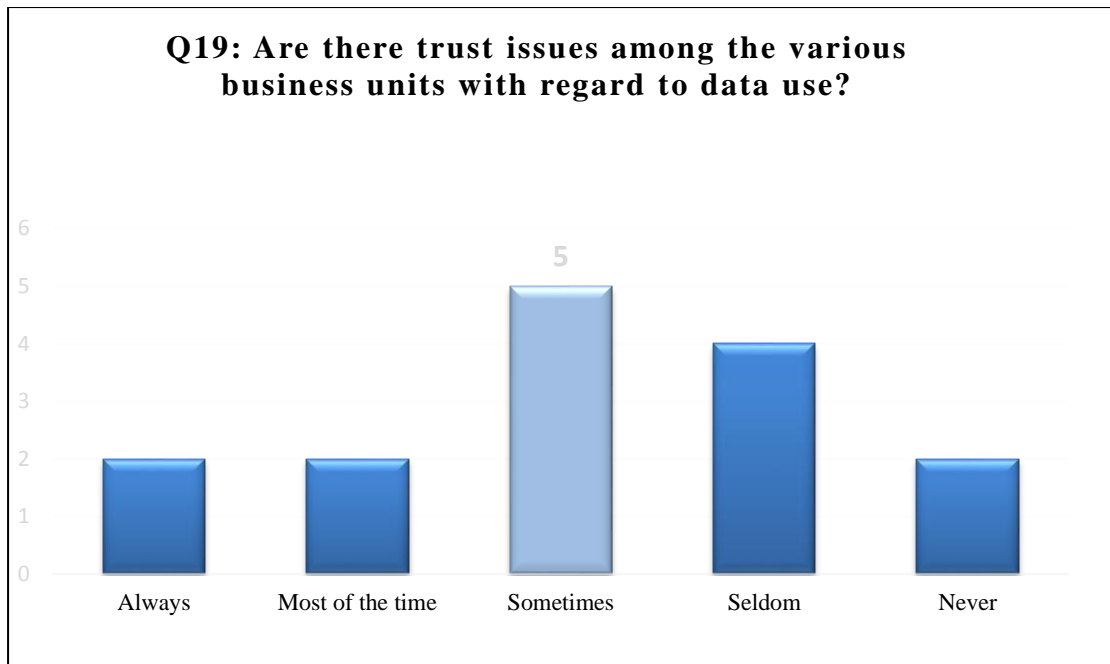
Figure 5-2. Trust issues among the various business units

The figure above displays the frequency distribution for each of the categories. Since this variable is nominal, the statistic used to measure the central tendency, which conventionally summarises the distribution, is the mode. The mode is thus the response that was mostly answered, that is, 'sometimes'; therefore 5 out of 15 respondents stated that there were sometimes trust issues among the various business units. Two respondents indicated that there were always trust issues, and two other respondents indicated that there were never trust issues among the various business units in their organisations.

The null hypothesis states that there is no relationship between whether trust issues exist among business units and how often collaboration happens. In order to assess this hypothesis, whether there is an association in the way participants responded in terms of the trust question and how often collaboration happens, was tested. These variables are nominal, and the chi-square test would be the most appropriate statistical test; of

the number of cells with fewer than 5 expected counts, the Fischer exact test for contingency tables of more than 2x2 table is used with a certain degree of caution.

The results are shown in Table 5-3.

Table 5-3. Cross-tabulation of Q11 (How frequently does such collaboration happen?) and Q19 (Are there trust issues among the various business units with regard to data use?)

A Cross-Tabulation of Frequency of Collaboration and Trust Issues among Business Units					
Frequency of Collaboration	**Q19**				
Frequency	**Always**	**Most of the time**	**Never**	**Seldom**	**Someti mes**	**Total**
Infrequently	0	0	0	0	1	1
Often	2	2	2	4	2	12
Sometimes	0	0	0	0	2	2
Total	2	2	2	4	5	15

Statistic	DF	Value	Prob
Chi-square	8	7.5000	0.4838
Likelihood ratio chi-square	8	8.2820	0.4064
Mantel–Haenszel chi-square	1	0.3453	0.5568
Phi coefficient		0.7071	
Contingency coefficient		0.5774	
Cramér's V		0.5000	
WARNING: 100% of the cells have expected counts fewer than 5. Chi-square may not be a valid test.			

Fisher's Exact Test	
Table Probability (P)	0.022
Pr <= P	0.5165

Sample Size = 15

A *p*-value of 0.5165 was reported (at a significance level, α of 0.05), indicating there is no relationship between trust issues and how collaboration happetns. It is generally acknowledged that collaboration cannot happen if there is no trust. The result is an

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apparent contradiction, which could be due to the measuring of this concept quantitatively. Trust is subjective and difficult to measure. The concept of trust may have to be explored qualitatively in the form of in-depth interviews to see how people perceive trust issues among peers and management in organisations.

5.1.3.7 Knowledge Sharing and Collaboration

In companies where sharing is promoted and/or information or knowledge sharers exist, such employees collaborate better than those who do not share, according to Rosen (2007). In the online survey, a question was posed regarding the extent that knowledge sharing influences collaboration.

When asked to rate how effective collaboration was in their organisations on a scale from 1–10, most of the respondents (6) gave an 8-rating, whereas 3 respondents gave a 5-rating, 2 respondents gave a 6-rating, and 3 gave a 7 rating. Only 1 respondent gave a 10 rating on a scale of 1–10, the best rating possible.

A similar rating on a scale of 1–10 was requested from the participants on how well they felt knowledge sharing occurred among the various business units in their organisations. The mode rating was a 7-rating, with ratings from 4 to 10 across the respondents.

The null hypothesis that needed to be tested was that there is no relationship between knowledge sharing and effective collaboration. In order to assess this, the Spearman rank correlation was calculated to determine if there was a relationship between these variables. The Spearman correlation coefficient measures the strength and direction of association between two ranked ordinal variables. The Kendall's tau b test was also calculated to measure the strength of the relationship between these two variables.

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The results are as follows in Figure 5-3:

```
                    The CORR Procedure

            2   Variables:    Q15      Q21


                    Simple Statistics

   Variable     N       Mean      Std Dev      Median      Minimum      Maximum

   Q15         15     7.06667     1.43759      7.00000     5.00000      10.00000
   Q21         15     6.73333     1.66762      7.00000     4.00000      10.00000


            Spearman Correlation Coefficients, N = 15
                  Prob > |r| under H0: Rho=0

                            Q15              Q21

           Q15         1.00000          0.74392
                                        0.0015

           Q21         0.74392          1.00000
                       0.0015


          Kendall Tau b Correlation Coefficients, N = 15
                 Prob > |tau| under H0: Tau=0

                            Q15              Q21

           Q15         1.00000          0.65950
                                        0.0024

           Q21         0.65950          1.00000
                       0.0024
```

Figure 5-3. Results of the Spearman rank correlation and Kendall's tau b test

The statistical test used was Spearman's rank correlation coefficient to determine the strength and direction (negative or positive) of a relationship between two variables. This coefficient ranges between -1 and 1. The Spearman rank correlation coefficient was determined to be 0.74392, which indicates that there is a fairly strong positive linear relationship between respondents' rating of effective collaboration and knowledge sharing at their organisations.

The *p*-value calculated is 0.0015, which is less than α (0.05), therefore the null hypothesis can be rejected and, based on the hypothesis, and this suggests that there is a relationship between effective collaboration and knowledge sharing. The participants of the online survey was based on a convenience sample. Therefore, owing to these

constraints and the character of the sample analysed, generalisation to the population cannot be supported without a certain degree of caution. In the next section the response from a group of international retailers is compared with that of the local retailers to determine whether they have a similar experience in terms of collaboration in their organisations.

5.1.4 Results of comparison of Cape Town vs international retailers

To corroborate the findings of the online survey conducted in Cape Town companies, and to add an international point of view, retail organisations in Cape Town were compared with international retailers, based on the principal researcher's contacts with consultants working with international retailers.

In order to assess the differences between the retailers in Cape Town and retailers based outside of South Africa that were surveyed, a comparison was done using a cross-tabulation of their results. Because the sample of the international retailers was fewer than 10 (only 5 units of observations), frequency responses are the recommended way of assessing the data, since statistical tests cannot be performed under such conditions (University of Wisconsin-Stout, 2015).

Additionally, the retailers selected were based on a convenience sample, so no generalisations can be made. The cross-tabulation only gives an indication of the differences or similarities between the responses of the two groups.

Seven questions were posed to those surveyed on the way collaboration occurs in their organisations. Comparisons of some of the key questions were done to assess differences within the two groups. The list of the questions is shown in the following Table 5-4:

Table 5-4. The frequency counts of comparison questions

Question	Variables	Frequency count – Local Retailers	Frequency count – International Retailers
1. How frequently does such collaboration happen?	Often	10	1
	Sometimes	1	4
	Infrequently	1	0
2. Rate how collaboration with peers across business units is encouraged by top management in the organisation?	Always	5	0
	Often	4	3
	Sometimes	3	1
	Rarely	0	1
3. In your opinion, does a culture of collaboration exist in your organisation?	No	3	2
	Yes	9	3
	Total	12	5
4. If collaboration exists in your organisation, how effective do you think it is on a scale of 1 to 10?	3	0	2
	4	0	1
	5	3	1
	6	1	0
	7	2	0
	8	6	1
5. Are there trust issues among the various business units with regard to data use?	Always	1	0
	Most of the time	2	1
	Sometimes	4	3
	Seldom	3	1
	Never	2	0
6. On a scale of 1 to 10, how would you rate knowledge sharing among the various business units in terms of data use in your organisation?	4	1	1
	5	2	1
	6	0	3
	7	1	4
	8	1	2
	9	0	t

The individual frequency distributions of the comparison of the local vs international retailers of the above questions can be found in Appendix E. The analysis of this comparison is discussed in the following section.

5.1.4.1 Analysis of results of the comparison of Cape Town versus international retailers

Question 1: How frequently does such collaboration happen?

Most (4) of the sample of 5 international retailers indicated that collaboration in their organisations 'sometimes' occurred, whereas the biggest proportion of the respondents, (5) of the 12 local retailers, indicated that collaboration among the business units 'often' occurred.

Question 2: Rate how collaboration with peers across business units is encouraged by top management in the organisation?

Nine of the 12 Cape Town-based retail companies indicated that collaboration with peers from other business units was 'always' or 'often' encouraged by top management, whereas 3 out of 5 of the international retailers indicated that they were 'often' encouraged by top management to collaborate. This implies that the two groups are in agreement that collaboration is encouraged by top management.

Question 3: In your opinion, does a culture of collaboration exist in your organisation?

Most of the respondents in both groups thought that a culture of collaboration did exist within their organisations. We observe that a culture of collaboration among the local retailers and the same pattern exist among the international retailers. This corroborates with literature and qualitative study that irrespective from where the retail organisation is, abroad or in Cape Town that the culture of collaboration does not commonly exist.

Question 4: If collaboration exists in your organisation, how effective do you think it is on a scale of 1 to 10?

The effectiveness of collaboration in terms of the mode was rated lower in the international group compared with the Cape Town group. This could mean that there is a difference in how the international retailers perceive effective collaboration compared with the local retailers.

Question 5: Are there trust issues among the various business units with regard to data use?

The spread of the ratings of trust issues among both the local and international retailers suggests that trust is perceived very differently by individuals, probably dependent on their relationship with their collaborators. This response could imply that organisations, whether local or abroad, view trust issues similarly (i.e. individually, not corporately) and that it is difficult to achieve a good level of trust in collaborative efforts.

Question 6: On a scale of 1 to 10, how would you rate knowledge sharing among the various business units in terms of data use in your organisation?

When asked to rate knowledge sharing among the various business units in their organisationa, among the international and local retailers there was a diverse rating in response to this question. Knowledge sharing happens differently at the various retailers, irrespective of where the retailer is, in South Africa or abroad.
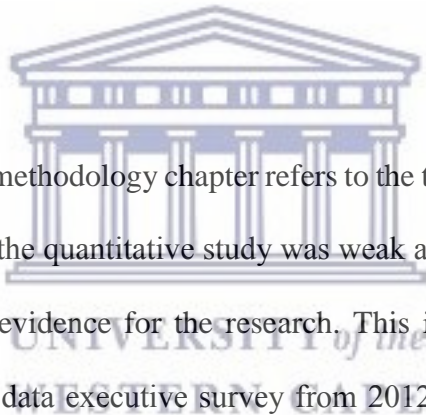
5.1.4.2 The interpretation of the results

There are many similarities between local and international retailers regarding the way they collaborate and the aspects that influence collaboration. The reason for comparing local retailers with some international retailers was to strengthen the research by adding a different voice and perspective, and thus to assess similarities and contrasts between

retailers, both locally and abroad. The group of international retailers was selected based on a non-random sample, that is, a convenience sample, and thus no generalisation could be made. Overall, although a convenience sample, this comparison elicited insight into the issue of collaboration within organisations by showing a different perspective. From the analysis done, it appears that the international retailers mostly have a similar view to local retailers of how collaboration within retail organisations should occur.

5.2 A secondary data analysis of the Newvantage Partners Big Data Executive Survey 2012–2018

5.2.1 Background

The research design in the methodology chapter refers to the triangulation methodology that was considered, since the quantitative study was weak and different 'voices' were required to provide more evidence for the research. This is why an analysis of the Newvantage Partners' big data executive survey from 2012 to 2018 was considered. This secondary data analysis added a different 'voice', as well as support to the argument previously developed regarding a data-driven culture in organisations and the role of the CDO in the era of big data, which emerged from the literature review.

NewVantage Partners LLC is a business strategic consulting company consisting of executives from business and technology, and subject experts in various industries. The founder and CEO, Randy Bean, is a regular contributor on the topic of big data to the *Harvard Business Review*, *MIT Sloan Management Review* and *The Wall Street Journal*. Newvantage Partners has conducted annual big data surveys since 2012 to Fortune 1000 companies after being encouraged by a group of executives from both

business and technology to assess where their peer Fortune 1000 companies were in terms of data-driven decision making and big data activities (Newvantage Partners, 2018).

5.2.2 Some of the results of the data analysis

Executives and senior staff of Fortune 1000 companies were surveyed annually from 2012 to 2018. Details of the design of the first survey can be found in the methodology chapter. The questions posed aimed to obtain insight and to benchmark big data initiatives at Fortune 1000 companies in the USA. The results over the period 2012 to 2018 have been consolidated for the purposes of this secondary data analysis.

Table 5-5 indicates the number of respondents from each of the annual surveys:

Table 5-5. Number of respondents

	2012	**2013**	**2014**	**2015/6**	**2017**	**2018**
Number of respondents to the survey	Over 50	Over 50	59	44	50	Nearly 60

Since 2012, the respondents have grown from around 50 to nearly 60. The author, Thomas Davenport, in the foreword of the Newvantage Big Data Executive Survey (2012), suggested that this survey was "one of the few I have seen that focuses on large organizations and offers responses from C-level executives" (Newvantage Partners, 2012, p.2). The respondents surveyed are, thus, senior leaders in their organisations, which makes the survey extremely valuable, since big data initiatives are decided by and investments are made by the executives of large organisations. The growth in the executives participating over the period shows the importance of big data and being data driven in Fortune 1000 companies in the USA.

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Table 5-6 gives the responses for the various surveys regarding the big data initiatives introduced in the respondents' organisations.

Table 5-6. Big data initiatives

	2012	**2013**	**2014**	**2015/6**	**2017**	**2018**
Big data initiatives	Not indicated. 85% had plans	31.4%	48.2%	62.5%	87.1%	97.2%

Currently, in 2018, 97.2% of companies surveyed have big data initiatives, such as using big data in business decision making, etc, underway in their organisations, whereas in the 2013 survey only 31.4% of the organisations that responded had big data initiatives implemented in their organisations. In 2012, when these surveys were conducted for the first time, none of the companies indicated that they had big data initiatives in their organisations; however, 85% had plans to introduce such initiatives.

One of the reasons for having big data initiatives implemented in the organisations surveyed, is to create a data-driven culture within the company. The 2015/6 survey shows that only 9.3% of the respondents indicated that a business driver of big data is to create a data-driven culture. Results from the 2017 and 2018 surveys show that 85.5% and 98.6%, respectively, indicated that their companies aspired to be more data driven.

The results, with reference to the question on whether organisations are moving towards a data-driven culture, are shown in Table 5-7:

Table 5-7. Data-driven culture

	% Companies in the process of creating a data-driven culture	% Companies successful in creating a data-driven culture
2017	85.50%	37.10%
2018	98.60%	32.40%

In 2018, only 1.4% of the organisations surveyed did not have the creation of a date-driven culture as a priority, whereas in 2017, 14.5% did not have it as a priority. This is a big change in over just one year. In 2017, even though 85.5% aspired to have a data-driven culture, only 37.1% felt that they had been successful in this. For 2018, the success rate among those surveyed reduced to 32.4% with 98.6% of the respondents aspiring to have a data-driven culture. Some of the challenges for the poor success rates cited are people (48.5%), process (32.4%), and technology (19.1%), according to the 2018 Newvantage Big Data Executive Survey (Newvantage Partners, 2018). Having a data-driven culture at a large organisation means that big data initiatives will be implemented and taken seriously and will ultimately generate financial benefits for the organisation.

It is the responsibility of the CDO to create a data-driven culture in an organisation (Patil and Mason, 2015). Newvantage Partners (2018) agrees with this and suggests that the CDO has emerged as a key role player in changing the culture of the organisation to that of a data-driven culture over the years. Because of this, many organisations have introduced the role of CDO in their organisations (Newvantage Partners, 2018).

Table 5-8 shows the various organisational roles that participated in the survey, which over time included more from the C-level of the organisation, thus showing interest in the importance of big data from these executives. The proportion of C-executive respondents dramatically increased from only 30% in 2012 to 93.1% in 2018.

Table 5-8. Organisational roles of the survey respondents

	2012	2013	2014	2015/6	2017	2018
Chief Data Officer (CDO)			31%	50%	32.3%	55.6%
Chief Analytics Officer/Chief Data Scientist/Chief Technology Officer	30%	44%	15%		22.6%	15.3%
Chief Information Officer (CIO)			31%	15%	12.9%	13.9%
CEO/President				20%	8%	5.6%
Chief Marketing Officer (CMO)			10%		4.8%	2.8%
Other *	70%	56%	7%	15%	8%	6.9%

*Senior Information Technology and Data Experts within the company

The number of CDOs who responded to the survey increased from 30% in 2012 to 55.6% in 2018. This shows the increasing role of the CDO, which is part of the argument of the research. This stakeholder is critical in the data-driven environment in the era of big data. Over time, the presence of the CDO as a respondent to these surveys implies the importance of this role and is shown in this growth in the number of CDOs in the USA.

The companies surveyed by NewVantage Partners have shown a steady increase in the percentage of companies with a CDO. It increased from 12% in 2012 to 63.4% in 2018.

The results are shown in Table 5-9 overleaf.

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Table 5-9. Companies with a chief data officer

	2012	2013	2014	2015/6	2017	2018
Companies with a chief data officer	12%	26%	43%	54%	55.9%	63.4%

The growth in the rise of the number of CDOs over the past years is in agreement with the qualitative research and is also supported by the literature. In the USA only 6% of the companies surveyed have a CDO (JLL™, 2016). In Europe, 13% of companies have CDOs, whereas a CDO exists in only 2% of companies in Middle Eastern and North African countries and by 2019, 90% of large organisations would have CDOs to gain competitive advantage and to make use of their data assets (JLL™, 2016).

Even though many companies in the USA and across the globe are increasingly appointing CDOs in their organisations, it appears that even though there is evidence that the role of the CDO is recognised (Newvantage Partners, 2018), there is no consensus of what the mandate of the CDO should be, according to Bean (2018).

To understand whether there is a link between the growth in the number of companies with CDOs and companies with big data initiatives, a correlation analysis was performed to establish whether there is such a link. The correlation analysis, based on data from 2013 to 2018, showed a result of 0.938, which indicates a strong positive correlation (a linear relationship) between the number of CDOs and the number of big data initiatives. This suggests the increasingly important role of the CDO, but a deeper exploration is needed to establish whether there is a causal relationship between the presence of a CDO and big data initiatives at that company.

The secondary data analysis is complementary to the online survey conducted with companies in Cape Town, as well as with some retailers from outside South Africa,

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where collaboration and the aspects influencing collaboration were explored. This data analysis corroborates the findings from the additional qualitative studies, where concepts like the role of the CDO, as well as big data in a data-driven organisation, was explored.

CHAPTER 6: DISCUSSION

6.1 Introduction

In the current debate, there are some conflicting views on the future role of the statistician in making sense of big data. Traditionally statistics was the discipline of learning from data, whereas today data science is the new discipline of learning from data (Carmichael and Marron, 2018). Kuonen (2015) agrees, adding that data science can make sense of or learn from big data.

Schutt and O'Neil (2014) indicate that the biggest skill required within in data science is statistical skills. The statistician has these skills. Yet both the role of statisticians and the part they play in data science have in recent years been challenged. From the literature reviewed in Chapter 2, many believe that a role does exist for the statistician in the use of big data; however statisticians need to move with the times by developing new statistical methodologies and working with computer scientists to process and analyse big data. The reliance on the sole statistician to produce data that informs decision making is relatively limited when it comes to big data. The statistician solely is not able to make sense of big data and needs to work with others who possess the skills required in data science, like computer skills, communication, and specific industry expertise. Statisticians need to operate in a collaborative environment to remain relevant in the era of big data. This environment includes business decision makers, business intelligence or IT practitioners, and statisticians.

In examining the feasibility of this prospect, the study also explored the factors that influence effective collaboration in organisations, such as leadership, trust and knowledge sharing. In concrete terms, the study has explored how collaboration operates within large organisations. In this era of exponential advancement in

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technology and big data, it is important for organisations to understand how to use big data to gain competitive advantage (Powell, 2018). This is, however, not easy to achieve. To make sense of big data and to make it actionable is complex, and many organisations are grappling with it. It will take many different people in an organisation working together to accomplish this. It requires the various stakeholders to collaborate effectively to gain such an advantage over their competitors. Teerlink, Sigmon, Gow and Banerjee (2014, p.13) contend that collaborations that are successful include a "diverse array of stakeholders but also involve complex human and organizational issues".

The assumptions regarding the factors or variables such as leadership, trust and knowledge sharing were stated. The study took a mixed methods form of research design, with a triangulation methodology. The triangulation methodology combined qualitative with quantitative studies to cross-validate one another and to strengthen the research (Cooper and Schindler, 2014). The importance of the CDO as a key stakeholder in the optimal use of big data and data science emerged from the initial fieldwork. This chapter interrogates and critically assesses the findings from the various in-depth interviews that were conducted, as well as from the quantitative methods performed.

The qualitative studies were in the form of interviews which included:

1. In-depth interviews with various key stakeholders at Woolworths, both from senior and middle management, who are required to collaborate for the optimal use of big data in marketing strategies.

2. Further interviews with the analytics manager in marketing about the organisation's advanced analytics strategy, and with the BI manager regarding the organisation's Business Intelligence roadmap and big data strategy.

3. An interview with the programme manager of the transformational programme, Customer2020, at Woolworths.

4. Interviews with the CIO and newly appointed marketing executive at Woolworths regarding the role of the CDO.

5. Interviews with five experts: a business analytics consultant, consulting in India, the Middle East and the UK; a big data expert with a background in business consulting from the USA; two business analytics consultants, consulting across various industries within South Africa; and a management consultant, working in South Africa, the Congo, and Ghana.

These interviews were conducted to discuss experts' views and experiences with big data in their respective roles, their organisations being data driven in their decision making, as well as to clarify the role of the CDO. These interviews and qualitative studies gave necessary insights into the study from both global and South African contexts.

The quantitative study was in the form of a structured survey distributed via email to 19 retailers and other industries in Cape Town, as well as to six retailers abroad, from India, the UAE, UK, and USA. The online survey was conducted to provide data to test the hypotheses of the influence of leadership, knowledge sharing and trust in effective collaboration among business units in their respective organisations.

Another quantitative study was data analysis using secondary data from annual big data surveys from NewVantage Partners to about 50 to 60 Fortune 1000 companies in the USA, which spanned the period 2012 to 2018.

All these various sources enriched the research with insights into and understanding of the pertinent concepts of the research, and together validated the findings and strengthened the research. According to Cooper and Schindler (2014), the use of different types of research methods can compensate for weakness in the other methods.

6.2 Discussion overview

There are many obstacles in optimally using big data in marketing strategies. Understanding of the roles of the various stakeholders in the collaborative exercise is important. From the qualitative study's findings, most respondents understood the roles of the stakeholders and agreed that it was vital for these stakeholders to collaborate effectively to gain a better understanding of how each of the stakeholders contributed to the optimal use of big data. Effective collaboration between these stakeholders requires buy-in from the leadership of the organisation. Complex issues like trust among the stakeholders and their willingness to share individual knowledge were some of the aspects probed during the interviews. The respondents agreed that for effective collaboration, the leadership of the organisation needed to drive it. There were also different views from middle management compared with those held by senior management.

Although many organisations claim to be data driven in their decision-making processes, the data is mostly used to report on the historical performance of the

organisation, rather than for predicting the future and understanding how data, and especially big data, could be used to drive profits for the organisation. Making sense of big data requires data science, which according to the literature and the findings from the qualitative and quantitative studies, is not easy to achieve and requires many and various stakeholders to collaborate. Thus, the concept of data science (or the science of data) and data as an input into business strategies are poorly comprehended at the organisational level.

It is crucial to have data-driven strategies in place to enhance the decision-making process in organisations with a market-oriented vision. Examples of such strategies are a big data strategy, as well as an enterprise data strategy and an advanced analytics strategy. Having such strategies within the organisation indicates a desire to become more data driven in decision making within the organisation. It is not enough to have such strategies or the desire to be data driven. The key stakeholders – business decision makers, IT specialists and statisticians (or data scientists) – should collaborate effectively to achieve the optimal use of big data in profitable marketing strategies. The research aimed to build a model to show how collaboration could exist, as well as the participants in the collaborative efforts in the organisation, as there is little knowledge of the use of data science and the collaboration of key stakeholders in large organisation in the optimal use of big data.

The next section discusses findings from the research questions outlined at the start of the research. Other findings regarding key concepts that emerged from the qualitative and quantitative research are discussed, followed by the key findings regarding the realisation of the CDO as the key stakeholder in fostering collaboration in the optimal use of big data and data science, and in contributing to the improvement of knowledge.

6.3 The key findings linked to the research questions

6.3.1 Research Question 1

Research Question: Is leadership required for creating a culture of collaboration to inform data-driven decision making in large organisations?

Hypothesis: Effective collaboration is not influenced by the leadership of the organisation in the optimal use of big data in marketing strategies.

In the interview, the CEO of the organisation expressed the following sentiment:

> In the business we don't spend enough time on understanding the strengths of the individual in the business and how more could be achieved through collaboration, as the collective intelligence is the single biggest and magical thing that can be shared.

This statement indicates the desire for collaboration at different levels and the capabilities of various individuals to be taken into account to grow the enterprise knowledge. This happens through listening to the people in the organisation. In establishing and leading collaborative initiatives in the organisation, the B-style leadership of the CEO is revealed. The leadership of top management will possibly cascade to the executives, to middle management, and to staff, and effect collaboration as part of the organisation's culture. Rosen (2007, p.200) states that understanding the roles of different functions across the hierarchy of the organisation will break down barriers that may exist within organisations, and that this fosters a collaborative culture, where "everybody's input not only is welcome, but also is expected". The quantitative study revealed a relationship between leadership and the frequency of collaboration. This result substantiates the qualitative research, where all the interviewees indicated

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that leadership influenced effective collaboration, even though this quantitative result cannot be generalised because of the nature of the response group.

In addition to being responsible for establishing a culture of collaboration, the CEO and senior executives have to drive a culture of analytics (Davenport and Harris, 2007). According to Davenport and Harris (2007, p.137), there are characteristics that executives in an analytics or data-driven organisation should possess, like believing in analytics and data-driven decision making, and they should be willing to implement the results of the analytics. Many of the analytics strategies are driven by middle managers, such as the advanced analytics and big data strategies, but are yet to be adopted by the executive leadership of the organisation.

Leaders drive not only the culture of the organisation and analytics, but should also drive the culture of collaboration. This indicates that the CEO, the ultimate leader of any large organisation, should drive collaboration and set the tone for the rest of the organisation to follow, as well as work with employees at different levels to utilise their collective intelligence. Together with the rest of the executive leadership, like the COO, CIO, and others, these leaders can be seen as influencers of collaboration in making data-driven decisions.

6.3.2 Research Question 2

Research Question: To what extent does trust play a role in promoting collaboration among the stakeholders in optimising the use of big data in organisations?

Hypothesis: There is no relationship between trust among the various stakeholders and effective collaboration within the organisation in the optimal use of big data in marketing strategies.

From the experience derived from previous works, trust can be subjective and difficult to achieve. Many of those interviewed acknowledged that trust was established by building relationships and time spent working together. As employees work collaboratively, more trust will develop. Ricci and Wiese (2011) emphasise that for trust to exist in a collaborative team takes time and requires the building of relationships. Trust is built and established where the role of each member is clearly defined before the first meeting of the collaborative effort. Rosen (2007) refers to an organisation with a collaborative culture where a senior manager mentored others to become collaborative leaders, and that this played an important part in building trust, even in an informal way.

This could be a method that organisations may wish to employ to develop trust among management and staff. This way of working should start with the CEO, leading by example and insisting on trust being a key value and part of the culture of the organisation. In the proposed model of collaboration, a theory grounded in the data from this research, the concept of trust becomes an important principle of collaboration. This principle, among others, will govern how collaboration will occur and underpins the collaborative efforts to ensure successful collaboration, thus generating profits for the organisation through the analysis of big data by data science to gain a competitive advantage.

Trust is not easy to achieve and requires a cultural mindset change led from the top management of the organisation and a commitment from the collaborators through a shared vision for success. The next section discusses knowledge sharing, another research question of this study.

6.3.3 Research Question 3

Research Question: Does the sharing of knowledge benefit the outcome of collaboration in the use of big data for marketing strategies in organisations?

Hypothesis: There is a relationship between knowledge sharing among the various business units and effective collaboration within the organisation in the optimal use of big data in marketing strategies.

Many respondents, especially those at the middle management level, stated that in the organisation, many of the business units worked in silos and that this style did not promote knowledge sharing. Hoarding is a "barrier that leaders face if they would like to pursue a collaborative approach". It also encourages silos, and business units usually think that "knowledge is power", and this further encourages hoarding (Ricci and Wiese, 2011, p.54). Even though many did not think that knowledge sharing freely occurred, there was consensus that it was important to have transparency in the organisation and that knowledge sharing would promote effective collaboration. The quantitative research underscores the findings from the qualitative research in terms of the importance of knowledge sharing in collaboration in large organisations. A respondent indicated that the various stakeholders did not fully understand the technical terminology used by the IT department and there seemed to be a communication gap. The opinion of one of the respondents was that a cultural change was required from leadership to move IT into the future.

For effective collaboration, there should be no barriers between business units, and knowledge sharing should be encouraged through collaboration. Another area in large organisations, the IT department, has a considerable role to play in sharing knowledge throughout the organisation, especially in the era of big data. Not only is IT responsible

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for data management, but also for the sourcing of the best technology to manage big data generated as an asset of the organisation. It is, therefore, also IT's responsibility that the organisation understands the new technology and how it will benefit the organisation, and this should be achieved by clear communication. IT should no longer be seen as part of the day-to-day operations, but as a key collaborator with the business to move the organisation into the twenty-first century. In many organisations, the CIO reports to the COO as part of the operational role IT plays. In the era of big data, there is the added responsibility of IT to manage the organisation's data, since data drives business value and is an important asset. This may mean that the CIO should be at the executive level of the organisation, therefore, report directly to the CEO. Since technology is constantly changing, and the requirements for and investment in technology are crucial in order to be competitive, the CIO needs to have access to and being able to influence the CEO.

From the fieldwork it emerged that organisations had the appetite for being data driven, from the aspects of competition and profit. There are many obstacles in their realising this desire, like boosting internal analytical capability, adopting and investing in big data technology, and being customer led. The key stakeholders at different levels of the organisation have to collaborate effectively, and build trust through a shift in the culture through leadership. Since data science makes sense of big data, an interdisciplinary team of experts with computer skills, statistical skills and domain expertise is required to make use of big data in marketing strategies.

6.4 Key findings from the concepts of the research investigated

The various qualitative and quantitative pieces of research produced many interesting findings and the key findings are represented in sections according to the pertinent concepts investigated.

6.4.1 Big data

The research centres on fostering collaboration in the use of big data. Big data has become a buzzword in recent times, and the original qualitative study revealed that there is an understanding of big data; however, the understanding of how it can be used to provide competitive advantage varies, especially among senior management. In the online survey conducted in Cape Town, most of the respondents claimed that their organisations had a big data strategy or vision, which conforms with many organisations around the world, as many organisations are preparing, storing and managing data generated (Pearson and Wegener, 2013). However, in the survey of Fortune 1000 companies in the USA, conducted by NewVantage Partners in 2017, more than 80% of the respondents reported that their big data strategies implemented had been successful (NewVantage Partners, 2017). This statistic indicates that big data strategies of the organisations surveyed in this research are likely to be successful. This underscores the importance of big data strategies in organisations, specifically in the USA. To ensure that such a strategy is successfully implemented and that effective collaboration exists among the identified stakeholders, an integrated model of collaboration is proposed in the next chapter as part of this research.

The interviews with analytics and data consultants revealed conflicting views of their experiences in South African organisations. One of the consultants stated that big data had been adopted, but another consultant disagreed and noted that, even though big data

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was a topic discussed within many organisations in South Africa, there were not many organisations using big data effectively. This indicates that big data is not consistently being utilised to solve business problems in South African companies. The consultants did agree on the benefits of gaining competitive advantage in the use of big data.

The NewVantage annual report (NewVantage Partners, 2017) gives an in-depth view of the success of big data over time in the large Fortune 1000 companies in the USA and require resource, expense and influence to establish the impact of big data in different organisations to increase revenue. Such effort is required in the South African context to gain greater insight into how big data is used. Since South Africa is such a small market compared with the developed world and difficult to penetrate, a large and reputable research organisation will have to perform such research over time to gain insight into the use of big data in South Africa. According to Tsele (2016), South Africa lags behind compared with the rest of the world in terms of big data usage in different industries. The management consultant interviewed, working with financial services organisations in the Congo and Ghana, believes that African countries are lagging behind First World countries in terms of becoming data driven, owing to their inability to invest in technology, usually readily available in countries like the USA and UK, and in Europe. A country like South Africa is able to invest in big data technology, compared with other African countries.

Big data is still conceptual in many organisations, both in South Africa and abroad, but there is definitely an appetite for the use of big data from the leadership in organisations. The domain experts are ready to implement big data strategies, but there is still a lack of buy-in from leadership, especially executive leadership. Big data needs to move from being just another a buzzword, to a greater understanding of its benefits and how to implement it to drive business value. A cultural shift is needed in organisations for such

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integration and eventual implementation. This is an important step in the process of driving value through analytics. The effective use of big data will transform organisations into being data driven and driving decision making, and this phenomenon is discussed in the section below.

6.4.2 Data-driven organisations

For organisations to be data driven, they need to succeed with data, but in order to do this, it requires a cultural change to a data culture (Patil and Mason, 2015). To create a data culture in an organisation requires data science (Provost and Fawcett, 2013). These concepts are discussed in this section.

From the fieldwork there was a perception among some that simple customer reporting qualified an organisation as being data driven. Business analytics, however, is more than just reporting, and in fact, it is driving value through "data-driven insights" that are "actionable" and business relevant, whereas analytics is the simple process of insights from data (Stubbs, 2013, p.5). Examples of this type of analytics are reporting, which is a summary of historical data, trending and segmentation, as well as predictive modelling, that is, making predictions of what could happen in the future by using historical data. Deriving insight from big data requires the use of advanced analytical techniques like predictive analysis. There are different types of analytics within business analytics, such as reporting and summarising data that explain what has happened, and predictive analysis that explains what will happen (Stubbs, 2013, p.8). Large organisations should, thus, have different types of analytics, descriptive and predictive, to make full use of their data to drive value for the business.

Many businesses have established IT strategies, and in recent years have been acquiring platforms like Hadoop to manage this type of data. By acquiring the Hadoop or Cloud

technologies to store their big data and performing predictive analysis on this data, businesses will be able to increase value from their customers (McAfee and Brynjolfsson, 2012). This requires investment in IT and data infrastructure, which is important to implement successful big data initiatives. Investing in what can be costly requires the collaboration of the top leadership of the organisation to understand the uses of big data and how it will benefit the organisation.

In addition to the necessary big data technology, skilled people are needed to analyse and interpret the data. Less than half the respondents in the online survey indicated that statistical analysts were responsible for the analysis and interpretation of data; this gives the impression that many of the organisations surveyed do not fully understand the importance of statistical analytic requirements of data science or that many are not doing predictive or advanced analytics. Even though Davenport and Harris (2007, p.133) recognise the need for amateur analysts like middle managers to make data-driven decisions, a distinction is made between such amateur analysts and professional analysts, skilled in advanced statistical methodologies to analyse and interpret data. In the era of big data and competitive advantage from it, advanced analytics through a data science team is important, and the results of the survey showed that many had not considered how big data could be analysed in their organisations.

The majority of the respondents surveyed indicated that the responsibility of data analysis and interpretation resided within the business intelligence or BI specialists, and IT business analysts. This could indicate a reliance on IT, rather than the statistician, for data analysis in organisations today. There is a difference between business intelligence (BI), which resides in IT, and data science, a discipline based on statistical methodologies. BI is backward looking in terms of what the organisation's data is showing, whereas data science is forward looking, applying advanced statistical

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methods to predict what will happen in future (Talend Tech Team, 2016). Organisations are still utilising traditional data warehouses, but in this era of big data and data science, organisations are implementing Cloud solutions and technology like Hadoop to store and manage the volumes and complexities of data.

Although 40.2% of the executives from the Fortune 1000 companies in the USA claim that they have a data-driven culture in their organisations (Bean, 2017), this seems not to be the case among the organisations surveyed in this study. Although most of those surveyed indicated that their organisation was data driven through the use of data in their organisations, how they use their data is questionable, when one refers to their lack of understanding and to the need for statistical abilities in data analysis.

From the findings of the qualitative study, the analytics performed by the respondents constituted predominantly business intelligence reporting. Statistical analysis like cluster analysis is also mature and drives much of the insight within the organisation, based on business strategy as well as tactical implementation. The quantitative study revealed that data analysis was mostly performed by the business intelligence team or business analyst, rather than by a statistician. This indicates that the statistical analyst's role is not understood as a function of a statistician. From the findings of the qualitative study, it emerged that management has difficulty in understanding what statistical and advanced analytics skills are required. The complexity of big data requires specific skills sets for data science. The achievements in data science are not because of a "superstar unicorn" data scientist, but rather a data science team with interdisciplinary skills, including not only statisticians but people with a variety of skills (Trikha, 2015). This means that if statisticians are ignored in the big data debate, how well will the fundamentals of statistics form part of data science?

In the interviews, one of the informants indicated that through having an advanced analytics strategy, big data could be used to drive competitive advantage through the use of predictive analysis and other advanced statistical techniques like machine learning. From the findings of the various studies and expert interviews, there seems not always be a clear understanding within business about how advanced analytics within the organisation can be established and how it will benefit the organisation. This requires the business decision makers to trust the professional analysts (or data scientists) within the organisation.

The data scientist has become a preferred term for the person performing the analytics in the era of big data. Kuonen (2015) believes that the data scientist is just another name for a statistician. Schutt and O'Neil (2014, p.53) believe a data scientist needs "to find a balance between the statistical and computer science approaches" and that the data scientist is basically a hybrid of a statistician and a computer scientist. In the era of big data, the statistician needs to add computer science skills to deal with the large data sets and big data technology like Hadoop and other Cloud solutions. In large organisations, traditionally the statistician was employed in marketing departments to analyse customer data; in the era of big data, such organisations employ data scientists, statisticians with competence in computer science skills. In the model of collaboration, the statistician will be referred to as a data scientist.

To have a fully functioning internal analytics or data science team, however, requires an investment in people, processes and tools. The secondary data analysis of the NewVantage survey revealed that even though most companies surveyed were creating a data-driven culture in their organisations, the lack of success in this area was due to the lack of skilled employees, processes, and, in some instances, technology. This could be due to a lack of understanding of how technology and analytical investment could

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improve the results. It is shown in the literature that making sense of big data requires a cross-functional data science team with different skills. For a data science team to exist requires the organisation to hire data scientists, statisticians, computer scientists, people proficient in machine learning, etc. Provost and Fawcett (2013, p.52) postulate that, in order for organisations to become data driven, they need to hire data scientists, as data science is "intricately intertwined" with being data driven. Another requirement is the technology and software to do predictive analysis using big data for competitive advantage.

An internal data science team is not systematically present in many organisations today, and the leadership of the organisation often prefers to outsource the analytics function, providing the organisation's data to an outside company and relying on its advice on advanced analytics or predictive analysis to solve the organisation's business problems. However, by boosting internal analytical capability within the organisation, more of the advanced analytic functions can be performed internally, thereby maintaining intellectual property and gaining advantage over competitors. From the fieldwork, many of the respondents indicated an opportunity to develop capacity within the business to produce such analyses and to keep the intellectual property within the organisation to maintain competitive advantage through the optimal use of big data in data science. This will require collaboration among business decision makers, business intelligence specialists and statisticians to solve business problems through advanced analytics techniques internally. It does not mean that external consultants should not exist in large organisations.

There are advantages, however, in utilising the services of external consultants in certain instances, as external consultants come with substantial experience. Their expertise has been developed by working with a variety of clients, possibly from

different industries. A good balance between what is done internally and what is outsourced is important because of the knowledge that external consultants bring. A disadvantage, however, is that the consultants hold the intellectual property of the analytics they perform. As Harper (2017) notes, all intellectual property should be owned by the organisation and not by the contracted consultants. From the interviews in the results chapter, it was established that there would always be a need for external analytics consultants in large organisations. External consultants enrich the existing analytics expertise of the organisation. If infrastructure does not exist in the organisation, external partners with such infrastructures or tools are complementary and should collaborate with the analytics core team reporting to the CDO. The relationship with the external consultants should be with this central analytics team and they should collaborate to achieve the statistical models best suited to the business problem to be solved. The intellectual property will remain within the organisation.

There were some unforeseen findings from the research, which constitute an important part of the model of collaboration recommended later in the chapter; these findings are discussed in the sections below.

6.4.3 The chief data officer

At the start of the research, the stakeholders identified were the business decision makers, the business intelligence specialists and the statistician in the optimal use of big data in marketing strategies. In the progression of the research from the fieldwork and the literature, an unpredicted role player emerged. There is a need for large organisations to have "a leader whose primary role is to understand and advocate on behalf of data", a key business leader and driver of data in the organisation – the CDO (Teerlink, Sigmon, Gow and Banerjee, 2014, p.1). According to the literature, this

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leader did not exist in many organisations until recently, and emerged because of advances in technology and big data, and the need for organisations to organise their data as assets in gaining competitive advantage. In recent years, many financial services companies started to employ CDOs, executives responsible for the enterprise data strategy of the organisation (Teerlink, Sigmon, Gow and Banerjee, 2014). In optimally using big data through data science, there is a missing link to ensure the execution of data science and advanced analytical activity in organisations. This new and important leader in the era of big data is responsible for leading the data science team in the organisation in making sense of big data, replacing the statistician as the sole person responsible for data analysis.

In promoting big data and data science, the CDO has not been sufficiently emphasised in research. This research foregrounds the role of the CDO in establishing the importance of collaboration in the use big data and data science. The realisation of the need for the CDO in big data and data science has great significance in terms of building a sustainable data-driven strategy in organisations to drive value from the huge volumes of data (generated from the products, services and customers) for financial gain and competitive advantage. In most of the literature, the role of the CDO as a key collaborator in data science has not been adequately emphasised. According to NewVantage Partners (2018), traditional organisations need to develop specific plans to achieve a data culture, needed to use data in decision making. Today, startup companies are disrupting these traditional organisations as these startups inherently have data-driven cultures. NewVantage Partners (2018) maintains that to counteract and to compete with these types of new companies, an executive role of CDO should be introduced. Even though some of the organisations have employed CDOs, they still do not have clarity on their role and many still do not have an enterprise data strategy.

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Since the culture of analytics is driven from the top, and traditionally the CEO is not equipped to handle this task, this could mean that there is an executive role missing that should be driving the value of data throughout the organisation. Such a leader should be driving analytics and big data strategies within the business and the role should reside at the executive committee level, reporting to the CEO, to influence him/her and other executive teams. This research has recognised the CDO as this executive and leader of the organisation in creating a data-driven culture and driving data as an asset in the organisation.

There was also a clear indication from the interviews with big data analytics consultant experts that the role of the CDO should reside at an executive level, reporting to the CEO. The key stakeholder in collaboration with the business decision makers in the optimal use of big data, thus, is the CEO of the organisation, responsible for creating a culture of collaboration, as well as the CDO, who together with the CEO will drive a culture of analytics and value from big data. The CDO should be responsible for facilitating a change in the culture of the organisation to become a data-driven culture. People are generally resistant to change and the CDO needs to spearhead the building of relationships. According to Steele (2017, p.31), "once you have that trust factor and respect, you can move the agenda".

In one of the interviews regarding the position of a CDO in organisations today, the respondent indicated that the data strategy of a company should be one of the roles of the CDO. According to Steele (2017, p.35), data strategy is defined as "the way data is used to generate new value" and it "is important to any business's ability to remain competitive in its marketplace". One of the vital roles of the CDO is to develop and execute the enterprise data strategy (Teerlink, Sigmon, Gow and Banerjee, 2014). Davenport and Bean (2018) indicate that, even though all the organisations they

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surveyed considered it important for their organisations to have an enterprise data strategy, many still did not have a data strategy in their organisations. According to Steele (2017, p.16), the data strategy of an organisation should be "written in collaboration with both the business stakeholders and the technological stakeholders, so it is well understood and agreed upon by everyone involved". Since the data strategy direction is set at an executive level and it is the role of a CDO, the CDO needs to collaborate with the CEO, who sets business strategy direction on behalf of the shareholders of the organisation, as well as the CIO, the technical stakeholder at the executive level.

The research's premise is to foster collaboration among key stakeholders in the optimal use of big data in marketing strategies, and one of the other key stakeholders is business intelligence within the IT department. From the findings, it was revealed that IT is slow and traditional, and this could be the reason for the lack of adequate big data technology. It was also thought that this inadequacy is due to lack of leadership buy-in and investment in technology. In order for the organisation to advance in the use of big data, the IT leadership and the business decision makers at the executive level have to work together to achieve this. The IT department is headed by the CIO. The literature and fieldwork indicated the necessity for the CDO and CIO to closely work together. Steele (2017, p.22) claims that "the CDO needs to be a peer and close collaborator with the CIO". Another role of the CDO is to deliver business value through data and be responsible for the data strategy of the organisation. Together with the CEO, the CIO and CDO should develop the data strategy for the business. Collaboration, thus, between the CEO, CIO and CDO, is crucial for organisations to become data driven and generate financial benefits from the use of big data. Therefore, to establish a data-driven organisation, the CDO is of utmost importance to the collaborative efforts at an

executive level. These executives form part of a collaborative group in the integrated model of collaboration, discussed in the next chapter. The realisation of the CDO as a key stakeholder in collaboration in the use of big data through data science is part of a new theory grounded from the data of this research.

From the literature reviewed and the fieldwork, there is consensus that the CDO and CIO should work closely together and use their combined skillsets to turn data strategies into operational success, thus creating financial benefits for the organisation. If there is not a good working relationship between the CDO and CIO, it could be to the detriment of the organisation. Collaboration between the CDO and CIO is thus of utmost importance, especially in the optimal use of big data in marketing strategies, as the CDO looks after the data strategy, which includes big data, while the CIO, in leading the IT department, is responsible for the infrastructure and technology needed to supply the correct platforms for the management of big data. According to Bean (2018), only 39.4% of those who responded to the executive survey of Fortune 1000 companies in the USA, recognised the CDO as the executive responsible for setting the data strategy of the organisation. This percentage is still low in the USA, which has a long way to go in establishing such a role to drive collaboration in big data and becoming more data driven. Many still see the CIO as the executive in the role of setting the data strategy. The interview with the big data expert from the USA revealed that personally, the interviewee felt that the CDO should be instrumental in ensuring successful big data initiatives at large organisations in the USA, but indicated that in working with these organisations, the decision makers were unclear on the role of the CDO.

Steele (2017, p.4) describes that one of the CDO's primary roles is to "focus on a wide variety of tasks, and be able to consider everyday tactical details as well as the bigger strategic picture". In order to both "create and drive value" from data, the CDO needs

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to work successfully with all the business units within the organisation to ensure success in using the data. This, therefore, means that the CDO, in addition to collaborating with the other executives, also collaborates across the business.

Teerlink, Sigmon, Gow and Banerjee (2014, p.13) believe that "successful collaborations include a diverse array of stakeholders but also involve complex human and organizational issues" and that it is up to the CDO to create a "culture of trust" among the stakeholders of data science in organisations. Davenport and Harris (2007, p.144) concur that there should be a very "close and trusting relationship" between the analytics team and the decision makers, in this case, the CDO. The CDO is "a business executive", not a data scientist, but leads a team that includes data scientists (Teerlink, Sigmon, Gow and Banerjee, 2014, p.6). This sentiment is echoed by the fieldwork. In order to drive business value through data, especially big data, it is important for organisations to invest in recruiting for analytic skills as part of a data science team reporting to the CDO. With the analytics or data science team in the same hierarchical line of the CDO, this can be more easily achieved. The research proposes that the statistician is another key stakeholder in the optimal use of big data in marketing strategies, and since the CDO is a business decision maker at the executive level, and the analytics professionals or data science team reports into the CDO's hierarchical line on the organisation, collaboration needs to exist between the CDO and the data science team, which includes the statistician.

This research has established the importance of the CDO as the key stakeholder at executive leadership level, reporting to the CEO of the organisation to foster and collaborate in the optimal use of big data. The addition of the CDO to organisations with a strong desire to be data driven and to use big data optimally, is thus of paramount importance in implementing an analytical culture, together with the CEO, from the

executive level. Another important function of the CDO is, together with the CEO, to drive collaboration at the executive level as well as across the different business units within the organisation. The CDO thus becomes a key stakeholder and leader in collaboration in the use of big data through data science in organisations. In the era of big data, organisations have become increasingly dependent on data to gain advantage over their competitors. The CDO's role is responsibility for defining, developing and implementing the strategy and methods by which the organisation acquires, manages, analyses and governs data to drive business value and profits for the organisation, through the use of data.

From the South African perspective, the CDO is relatively new, but according to Corinium (2017a), the CDO, especially in the financial services sector in South Africa, has become increasingly necessary as part of the executive team of the organisation to drive stronger data management and compliance because of regulatory requirements. This role is important, as the CDO has an executive role (and therefore a leadership role in the organisation), and since leadership is crucial to effective collaboration, this role should be introduced in corporations in South Africa, as in developed countries like the USA. In the interviews with one of the data analytics specialists consulting in South Africa, the respondent mentioned that one of the retail organisations in South Africa had a clear intention to appoint a CDO. This is a trend in the USA and in Europe, and it is necessary that such a role be considered in South African organisations also.

Since such collaboration in terms of a data science context to use big data optimally does not exist in organisations at present, a model of collaboration is recommended to describe how the various stakeholders in the organisation work together to be successful in the use of data science, and thus the in optimal use of big data in marketing strategies

to gain competitive advantage over others. The development of a model of collaboration and its practical implementation is discussed in the chapters that follow.

At the start of the research, three main stakeholders were identified in fostering collaboration in the optimal use of big data in marketing strategies. The progression of the research has clearly established that the CDO is the missing link that will tie the different and diverse stakeholders together. The link to the first stakeholder, the business decision maker, is that the CDO is an executive and important decision maker in terms of the data strategy and driving business value through the use of data. The CDO is also linked to the second stakeholder, the IT department. The research has shown that the CDO and CIO should be close collaborators in managing the organisation's data assets. The CDO is also linked to the third stakeholder, the statistician, as part of the data science team, with reporting lines in the hierarchical line of the CDO.

Figure 6-1 describes how the CDO is perfectly linked to the different stakeholders and is key to fostering collaboration among the business decision makers, the business intelligence or IT specialists, and the statistician in the use of big data in marketing strategies.

Figure 6-1. The CDO as the link to the key stakeholders of collaboration, source – author (2018) derived from the literature reviewed

6.4.4 Organisational culture

Organisational culture was an unexpected finding from the fieldwork. Several of the middle managers felt that their organisation was still too hierarchical, that the business units worked in silos, and that a cultural change was required.

The CEO sets the culture of the organisation and by understanding the importance of being data driven and the use of big data, can lead the organisation to have a data-driven culture. It is important for leaders to lead by example and to demonstrate the "power of collaboration" (Ricci and Wiese, 2011, p.46). The CEO interviewed indicated that the collaborative group to enhance their customers' experience of their organisation was not based on the hierarchical structure. It was created on a networked structure in order

to bring the key stakeholders together and to foster integration. This indicated a commitment from the CEO to develop a culture of collaboration.

According to Rosen (2007), when a culture of collaboration has not been established in organisations, collaboration happens in a traditional way, since a change in culture is necessary, but that such change requires considerable time. In the interview, a middle manager in the first qualitative study stated that a cultural shift was needed in how the organisation viewed the evolution of customer data in the face of constantly changing technology. The interviewee believed that the CEO showed the need for collaboration within the organisation and being strategically aligned with the executive team. However, although the CEO was eager to see collaboration happen, it needed to be embraced by the senior management as a team first and then the middle management and eventually the rest of staff will embrace colloaboration as part of the culture of the organisation. It seems that this flow stops at senior management level, and does not flow down to middle management.

Where a culture of collaboration exists in an organisation, the leaders need to explain direction and purpose to all the staff across the hierarchical levels (Rosen, 2007). This will help in ensuring that middle managers and the rest of the staff embrace this culture of collaboration. In an organisation with a culture of collaboration, the leaders need to explain direction and purpose, and then guide team members towards the goal (Rosen, 2007). The CEO, together with the executive team, needs to strengthen this effort of leading by example for the rest of the organisation to follow, and for a culture of collaboration to be instilled in the organisation. The quest to make sense of big data requires a cross-functional team at different hierarchical levels (Kuonen, 2015), and hence all the levels in the organisation need to adopt a culture of collaboration to ensure effective collaboration, and thus a competitive advantage over other organisations.

From the online survey findings, culture was the most important dimension listed as the aspect that impacts effective collaboration. According to Rosen (2007), a change of culture within an organisation is necessary to build a culture of collaboration in a work environment where it does not exist or is weak. Culture was an unexpected aspect of collaboration and was not considered at the onset of the research. The culture of an organisation sets the tone of how organisations operate and thus collaborate, and it is a key component of the model of collaboration, discussed in the next chapter. Collaboration among these stakeholders is critical in being data driven, especially in using big data optimally in marketing strategies. The next section discusses collaboration and the impact of fostering effective collaboration in the quest to use big data optimally in marketing strategies.

6.4.5 Effective collaboration within the context of big data

The effectiveness of collaboration varies in degree. From the interviews it emerged that there was a clear understanding that promoting collaboration in the organisation was important. However, many of the respondents cast doubt on the effectiveness of collaboration since too many business units were working in silos. This viewpoint was mainly from middle management that felt that senior management decisions were not effectively communicated for implementation at middle management level.

According to Cilliers and Greyvenstein (2012), organisations have been hierarchical since the 1950s and the start of large corporations, with those at the top being the most powerful within the organisation as opposed to those at the bottom deemed to be without power. In organisational psychology, silos can be vertical and horizontal from top management to other staff at lower levels and between different departments like marketing, human resources, finance and IT. These are referred to as physical silos and

are mostly an unconscious "state of mind" in individuals in an organisation (Cilliers and Greyvenstein, 2012, p.3). In the discussion of their findings, Cilliers and Greyvenstein (2012, p.7) noted that "the silos manifested horizontally in the aggressive split between staff and manager and vertically between the department and the internal client". From the first qualitative study and the interviews with the expert consultants, many organisations work in silos, but to be data driven and to drive value through data, requires business units to work closely together.

The results from the quantitative study point overwhelmingly to collaboration frequently occurring among the various business units in organisations, and this was endorsed by the executive teams. Thus, a culture of collaboration does exist. Future research should be on the effectiveness of collaboration in terms of big data and the success of such collaborative efforts in terms of revenue to the business, not specifically in marketing strategies.

Evidence from the qualitative studies revealed that the roles of the various stakeholders were relatively well understood. Some respondents, however, felt that although there was good interaction between business units like marketing and IT, thus fewer silos, such interaction and relationships do not exist with other business units. Many concurred that it would take time to break down silos and for different business units to work together and, depending on how good the interactions were, that collaboration could possibly be effective. The silo setting could affect the implementation of any data-driven vision within the organisation. The CEO and senior management are required to provide clear direction, including financial investment for the effective implementation of technology, processes and human resources to make big data a reality in the near future. According to Ricci and Wiese (2011, p.20), to build a

"collaborative organisation requires a transformative approach to culture, process and technology".

The results showed that many respondents thought that IT was quite traditional in its approach and slow to move in the direction that the world is going, that is, being more data driven in decision making. McAfee and Brynjolfsson (2012) list one of the challenges of organisations transitioning into the age of big data as technology. They also state that IT departments need new skill sets to accommodate different types of data and cannot be traditional, and consequently need to change accordingly. The qualitative study and some of the expert interviews indicated that a cultural change was needed for IT to transform from a traditional way of thinking to become customer focused. In order to move to a data-driven organisation in using data (and big data), IT will have to change from being traditional to be more transformative, and organise IT differently to succeed in this changing data and technological world of the twenty-first century. This sentiment was echoed by one of the management consultants interviewed, based on experience working with IT departments from different industries in South Africa. One of the respondents also suggested that a position of CAO or CDO needed to be created for this transformation to occur, to work together with the CIO, the head of the IT department.

Hill, Towers and Borne (2013), in a White Paper on big data, postulates that more organisations in the USA and UK are appointing CDOs because of the importance of managing organisations' data assets. They argue that data-driven decision making in the big data era "is too critical not to have an executive with an overall responsibility" of managing the data assets within organisations today (Hill, Towers and Borne, 2013, p.1). The CDO can play a vital role in the organisation to help it understand the value of its data through appropriate data management (McCall, 2015). Many organisations

in South Africa do not have a CDO or CAO, and often the CIO does not report directly to the CEO. Big data and advanced analytic strategies would have been fully adopted should there have existed a business leader at executive level like the CDO who understood the importance of data as an asset of the organisation and the extent to which data could drive value for the business. One of the data analytics consultants interviewed indicated that there was an intention from a retail company in Cape Town to appoint a CDO. Other retail organisations can benefit from such a role in their organisations. According to the literature, the CDO should play the role of a facilitator of collaboration in terms of driving value through data.

According to Ricci and Wiese (2011), future collaboration should be among smaller groups of specialists, cross-functional teams. Rosen (2007, p.32) suggests that as part of a culture of collaboration there needs to be a culture of sharing, and that a certain company in the USA achieved this by assigning these specialists to different functions within different areas to understand the other people with whom they were collaborating. This sentiment is shared by Ricci and Wiese (2011, p.26), stating that where effective collaboration exists, the employees will be "empowered by new organisational cultures that celebrate a diversity of talents and promote not only the sharing of knowledge and resources, but also of accountability and rewards".

As organisations learn to collaborate better and understand the roles of the team, a cross-functional team of subject experts with a common goal of making sense of big data can easily be deployed to solve specific business problems in a short space of time. They could then move on to the next business problem. Establishing a centre of excellence (CoE), with new dedicated roles for this cross-functional team – a data science team – to solve business problems can help to understand a new way of working. New ways of working are difficult to implement and require formal change

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management. Employees generally do not like change and find it difficult to adjust to new ways of work. New key performance indicators (KPIs) and HR management could help employees in not reverting to old patterns and doing what is comfortable and easy. To achieve the optimal use of big data, through data science, a culture of both collaboration and being data driven is needed, which requires a change in the culture of the organisation. The proposed model of collaboration, discussed in the next chapter, will take these important requirements and aspects into account.

6.5 Implications for practice

The research set out to answer the research questions around aspects of effective collaboration, like leadership, trust and knowledge sharing in the optimal use of big data in marketing strategies. In the progression of the research, many other concepts and aspects that could influence collaboration in this particular environment have been recognised.

A recommendation is that a model of collaboration, grounded from the theory, be devised to guide organisations in effective collaborations. This model of collaboration is deliberated in the next chapter. The model of collaboration can be used by organisations to implement various collaborative efforts, particularly in the field of big data and data science in large organisations today, to ensure the optimal use of big data in marketing strategies.

The research proposed a model of collaboration that would provide inputs to business organisations. The application of such a model should help the successful outcome of the collaborative efforts in data science in the form of financial benefits to the organisation through the optimal use of big data. It will also give an opportunity to the

statistician to take a rightful place as one of the collaborators of data science and advance this profession within the corporate environment.

6.6 A proposed framework for effective collaboration within the organisation

6.6.1 Introduction

Based on the discussion chapter, the model will be structured according to the following processes. In accordance with this, this chapter outlines a grounded theoretical framework from the fieldwork (results), from the mixed methods research for developing a model of effective collaboration in the optimal use of big data in a large organisation.

The collaboration model integrates the various components in making sense of big data through data science with the key stakeholders at different levels, which emerged from the previous chapter. No model exists to foster collaboration among stakeholders in the optimal use of big data and data science in marketing strategies. Also, currently, little has been said about building and achieving effective collaboration and little has been done in building an integrated model that links the key stakeholders in collaboration in data science. Thus, what follows is a model of collaboration involving all the stakeholders playing a role in data science, optimally using big data, specifically in marketing strategies in large organisations. The intended outcome of the model is an enterprise data strategy, the investment in and implementation of IT and data infrastructure to support big data initiatives in organisations. Other outcomes are advanced analytics models that will better inform customer needs, and thus the

implementation of more financial marketing strategies. The model is grounded in data that emerged from the fieldwork.

Martin and Turner (1986, p.141) defines grounded theory as "an inductive theory discovery methodology that allows the researcher to develop a theoretical account of the general features of a topic while simultaneously grounding the account in empirical observations or data".

The grounded theory is generally intended for researchers who need a method that "allow[s] them to move from data to theory, so that new theories could emerge" (Willig, 2013, p.212). Grounded theory is a method that provides researchers with rules on the process to identify categories and how to form relationships between these categories (Willig, 2013). The categories form the grounded theory that developed from the data and these categories have evolved during the process of the research study.

There are two schools of thought on grounded theory, the Glaserian and the Straussian. For this study and for developing a model of collaboration, the grounded theory was partly developed using both schools of thought. The study started with a general idea about collaboration and the possible stakeholders, which is from the Straussian school of thought (Jones and Alony, 2011); however from the literature and fieldwork, new concepts like the role of the CDO and data science were foregrounded and became an integral part of the model of collaboration. This development of a conceptual theory stems from the Glaserian school of thought on grounded theory. The theory developed was also mostly grounded in the data, from the Glaserian school of thought. The Glaserian school of thought states that the "credibility of the theory, or verification, is derived from its grounding in the data" (Jones and Alony, 2011, p.5). In the study, the emerging theory of collaboration came to the fore. The literature showed its

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applications in other fields, but with big data and data science it has not been well structured.

From the research, a number of important components emerged to develop a grounded theory to establish a model of collaboration in a large organisation in the optimal use of big data.

Some of the categories are:

1. The CDO, a role that emerged from the fieldwork and literature as a key stakeholder in collaboration in the optimal use of big data.

2. Data science – Initially the research considered the statistician as a key stakeholder, but from the literature the data science team, with the statistician as part of it, was recognised.

3. The data scientist – There is agreement in the literature and from the fieldwork that the traditional role of the statistician is no longer needed in the era of big data. In the fieldwork, greater prominence is given to the data scientist as the person responsible for the analysis and interpretation of data, instead of to the statistician, especially in the era of big data. In the literature, a data scientist is defined as someone who has business acumen, is analytical, possesses good communication skills, is conversant with computer science, is able to solve business problems, and understands numbers and statistical analysis (Provost and Fawcett, 2013), whereas a statistician is versed in statistical analysis only.

4. Aspects for effective collaboration – Some of the aspects of collaboration like leadership, trust and knowledge sharing were considered at the start of the research, but other aspects emerged from the theory. In the model these aspects are listed as collaboration principles.

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5. The organisational structure – This category emerged from the fieldwork and literature as collaboration in the use of big data occurs at different levels of the organisation. Collaboration should occur at various levels and be horizontal in the same level and vertical across multiple levels. Certain types of organisational structure can be constraining in collaboration (Morgan, 2015).

6. The role of the human resources department and change management in assisting in the adoption of new ways of working by using such a model. This is important in changing the existing culture of the organisation to have a culture of collaboration. This category of culture was an unforeseen driver of collaboration that emerged from the field.

The aim of this study was to demonstrate how fostering collaboration in optimising the use of big data could result in a boost in profit of the organisation. One of the specific objectives was to develop a guiding model of collaboration for the organisation to optimise the use of big data in marketing strategies.

6.6.2 The traditional organisational structure

The organisational structure of large organisations is usually hierarchical (Laegaard and Bindslev, 2006). Such an organisational structure has various hierarchical levels and for the sake of the model of collaboration, the organograms are divided into four levels. The first level comprises the executive level, showing the positions of the C-level executives in the organisation, like the chief operating officer, as well as all the business unit executives, including the marketing executive and product executives. All these executives usually report to the CEO, who also resides at this level. The second level consists of the senior management, reporting to the executives. The third level constitutes all the middle managers, reporting to senior management. The final level

comprises specialists, for the sake of the model; specialists are usually those in the organisation, together with the middle managers, who implement business strategies and are usually considered domain experts. The teams of employees below this level are not considered part of the organogram for the purpose of the model of collaboration.

Figure 6-2 overleaf illustrates an abridged version of the organogram of an organisation with a traditional hierarchical organisational structure.
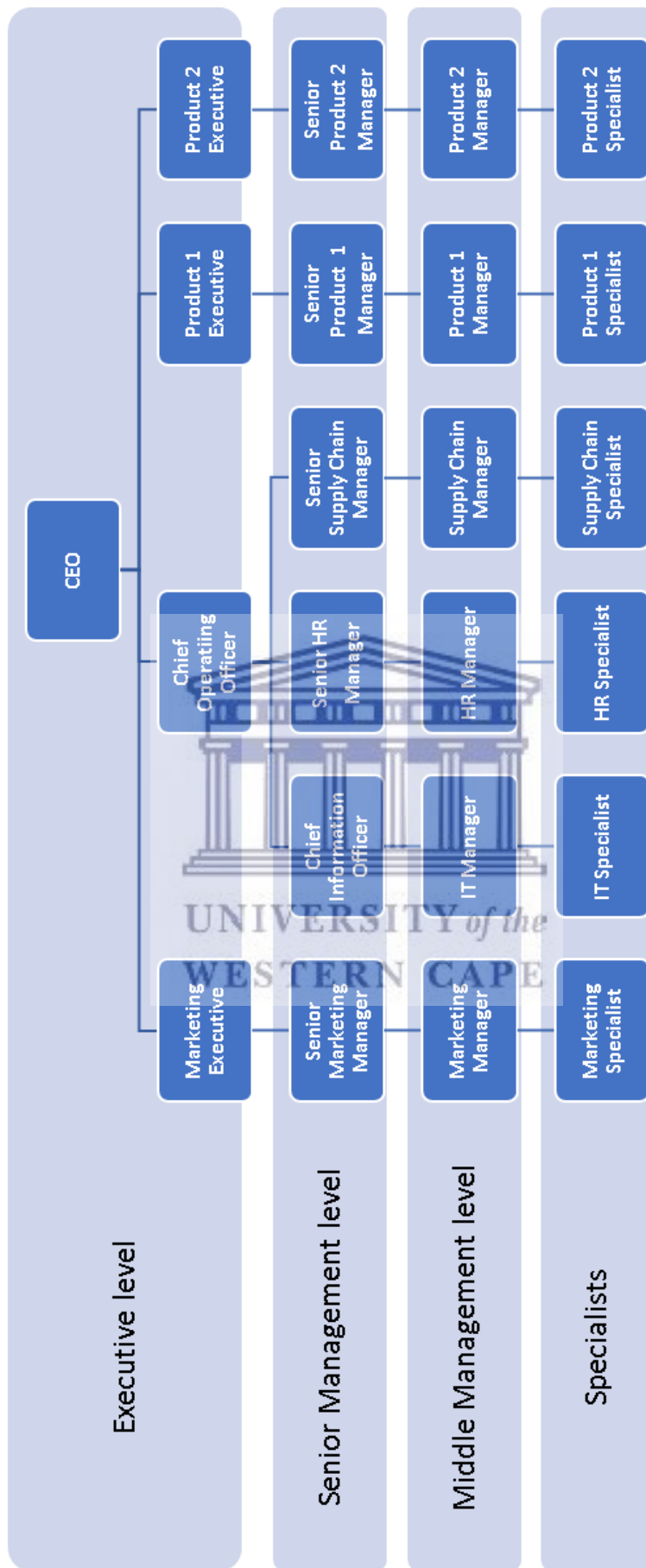
Figure 6-2. A typical hierarchical organogram

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A key executive, one of the business decision makers, is missing from the organogram of many organisations in this age of big data, namely the CDO.   The role of the CDO, as indicated in the fieldwork as well as in the literature, is to drive business value through the use of data in decision making. Other responsibilities of the CDO, according to Steele (2017, p.6), is to prioritise, evangelise and facilitate data as an asset to the business, and this requires interaction and collaboration with various people within the organisation.

The CDO is the missing link that ties the diverse stakeholders in the optimal use of big data. The CDO is both a business executive, reporting to the CEO of the organisation, and the person driving business value through the use of data (and especially big data). In addition to being a business leader, the CDO is technically astute and the CIO (the head of the second group of stakeholders) and CDO work closely together in managing the IT and data infrastructure of the organisation in order to store and use big data. The CDO is also linked to the third stakeholder, the statistician (or data scientist), as part of the data science team, with reporting lines in the hierarchical line of the CDO. Cohen and Gopal (2011) argue that the CDO plays a crucial role in influencing business strategy, through the effective use of data in decision making. Many large corporate organisations do not have such a position in their organisational structure.

6.6.3 The proposed organisational structure

The proposed organisational structure remains a hierarchical structure, since many organisations have such a structure. It is not always a good structure, because of its many levels for collaborating in such an organisational structure. Effective collaboration will require that a culture of collaboration exist in the organisation.

The position of the CDO is crucial in the optimal use of big data in marketing strategies and is therefore included in the proposed organisational structure. The proposed structure also includes the CIO reporting to the CEO, different from the organograms in many organisations, where the CIO sometimes reports to the chief operating officer (COO). This change in reporting structure will allow the CDO and CIO to both report to the CEO as colleagues, as the era of big data requires them to work together closely. This change in reporting lines stems from the interviews, the qualitative research, and the literature.

This organisational structure accommodates the CDO as an executive, reporting to the CEO, working closely with the CIO (Teerlink, Sigmon, Gow and Banerjee, 2014). This proposed view of the position of the CDO in the organisational structure is supported by Steele (2017, p.22), who believes that the CDO "functions best when it reports directly to the CEO and is allowed to be a peer at the table with other executives setting direction and strategy". Having the CDO reporting to the CEO in such an organisational structure, has pro's and con's, according to Teerlink, Sigmon, Gow and Banerjee (2014). One of the pros is that such a structure places the importance of data at the CEO's table, but the con is that there could be a power struggle between the CIO and CDO.

This proposed structure also has a centralised analytics team, together with the data scientists, reporting to the CDO (Steele, 2017). The CDO thus represents the data scientist, previously referred to as the statistician, and the specialist responsible for the analysis and interpretation of data in the organisation to make data-driven decisions. The data scientist is one of the key stakeholders, together with the other business decision makers and IT, who must collaborate effectively to use big data optimally in marketing strategies.

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Collaboration needs to happen at different levels of the organisation's hierarchy, and the next section explores how such collaboration should happen within the various collaborative groups.

Figure 6-3 presents an organogram that includes the CDO and CIO as executives, reporting to the CEO of the organisation.

Figure 6-3. Organogram proposed by the author

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6.6.4 Proposed collaboration strategy

6.6.4.1 Developing a culture of collaboration

In today's competitive environment and with the availability of big data and technology to drive value for organisations, it can mean that organisations need to have all the technology and processes in place to ensure profitability. What can sometimes be missing to guarantee such benefits from these new tools and technologies is the way in which these are used, as well as the people who use them. To ensure the optimal use of big data for profitability, collaboration among various groups of people within an organisation is important.

This research aimed to explore fostering collaboration among the key stakeholders for the optimal use of big data within marketing strategies. While the role of leadership in the assumption of the research initially, it appears from the field and the literature that it is in fact the CDO who needs to be a key leader and collaborator in the optimal use of big data. The proposed role within the organisational structure of the CDO is, thus, crucial in fostering collaboration among these stakeholders, and the CDO, according to Teerlink, Sigmon, Gow and Banerjee (2014), is a key collaborator and facilitator in the use of data. The CDO should play both a leadership and negotiator role to "maintain a healthy collaboration with other parts of the data function, including product development, corporate strategy and analysis", etc. (Teerlink, Sigmon, Gow and Banerjee, 2014, p.7). Furthermore, the CDO should also display collaborative and change management styles, which are important in helping to create a culture of collaboration within the organisation.

Rosen (2007, p.xi), suggests that without a culture of collaboration, "the best processes, systems, tools and leadership strategies fall flat". Collaboration should include both

people and technology; it should not only include technology, otherwise it will not work (Ricci and Wiese, 2011, p.45). In building a model of collaboration within an organisation, a culture of collaboration first needs to be established. From the field work, many of the respondents noted that a culture of collaboration did not exist in their organisations.

Drawing from the author's experience of working in corporate environments, new ways of working are difficult to implement and require formal change management. Employees generally do not like change and find it difficult to adjust to new ways of working. In order to drive the necessary change within the organisation, a process of change management is required.

This process, with the help of the human resources department, will facilitate a change in the culture of the organisation into an analytics culture and establish new key performance indicators or KPIs across the organisation, based on the shared goals in implementing big data strategies in the organisation.

6.6.5 Behavioural dynamics within a collaborative framework of inter-organisational collaboration

To develop a guiding model for collaborative efforts for stakeholders in the optimal use of big data in marketing strategies, it requires a set of principles of collaboration to underpin the effectiveness of such collaborative efforts. Below are some of the aspects that will lead to more effective collaboration, and some or all these aspects will underpin collaboration within the specific groups. The principles have emerged from the theory of collaboration and the empirical evidence gathered from the fieldwork.

The principles of collaborations are:

a. **Leadership** – According to Rosen (2007), it is essential for the leaders of the organisation to instil better collaboration into the culture of the organisation, which will lead to successful and effective interactions. It has emerged from the fieldwork and literature that the CDO is an important leader. From the interviews conducted, some of the informants stated the following about the role of leadership in collaboration:

    1. …if they collaborate amongst themselves as a behaviour they should model the behaviours they wish to see in the teams.

    2. It is leadership's role to create the right structure and the right environment that facilitates and enables collaboration.

b. **Trust** – The concept of trust is difficult to define and even more difficult to achieve, but it is crucial for effective collaboration. Dawes (2003, p.1) believes that "trust (or mistrust) develops out of the joint experience of working together". The author notes that when trust is high in a professional setting, there is a higher likelihood to "develop informal but well-understood ways of working together". In a professional setting, people often come from different working environments; they work on projects and need to work together effectively. This is where trust becomes an important ingredient in their working relationship (Dawes, 2003). Many of those interviewed in one of the qualitative studies acknowledged that trust was established by building relationships and by time spent working together. One of the informants noted, "As the CCC members work collaboratively, more trust will develop." Rosen (2007) refers to an organisation with a collaborative culture where a senior manager mentored others to become collaborative leaders, and that this played an important part in

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building trust, even in an informal way. This could be a method that organisations may wish to employ to develop trust among management and staff.

c. **Knowledge Sharing** – The sharing of knowledge helps others understand the importance of technological concepts. From the results of this study, many respondents, especially middle management, stated that in the organisation, many of the business units worked in silos and that this style did not promote knowledge sharing. The results of the quantitative study showed that there is a relationship between knowledge sharing and effective collaboration. According to Ricci and Wiese (2011, p.54), hoarding is a "barrier that leaders face if they would like to pursue a collaborative approach" and it encourages silos within business units. For business units to overcome this, they need to share knowledge, instead of hoarding it.

d. **Culture** – From the literature, Rosen (2007, p.32) suggests that as part of a culture of collaboration there needs to be a culture of sharing, and that a certain company in the USA achieved this by assigning staff to different functions within various areas to understand the other people with whom they were collaborating. This sentiment is shared by Ricci and Wiese (2011, p.26), that where effective collaboration exists, the employees will be "empowered by new organisational cultures that celebrate a diversity of talents and promote not only the sharing of knowledge and resources, but also of accountability and rewards". The results of this study show that most of the respondents listed organisational culture as a crucial aspect that could impact effective collaboration. Leaders can help create a culture of collaboration within an organisation through their

management style (Rosen, 2007). Organisational culture often takes years to change, but with commitment from leadership to move towards a culture of collaboration, such a shift in the culture will eventually benefit the organisation (Rosen, 2007). Kelly (2014, p.3) stresses that organisations must make collaboration "part-and-parcel" of their culture.

e. **Communication** – This principle was listed in the quantitative results of this research as a critical aspect of effective collaboration. Rosen (2007, p.14) suggests that communication occurs at the interpersonal level, where the individuals are "comfortable engaging" with one another, and at the organisational level, where "channels of communication" need to "remain open for collaboration to occur". The organisation's culture should support this. The CEO and top management in an organisation set the culture of the organisation (Manetje and Martins, 2009), and together with the HR department, should enable communication among those collaborating.

f. **Shared purpose** – The qualitative study showed that cross-functional teams of subject matter experts with common goals or KPIs can collaborate better; if they understand the roles of the team, they can easily be deployed to solve specific business problems is a short space of time. Literature shows that the silo syndrome (when business units work in silos) is infectious in an organisation (Ricci and Wiese, 2011, p.58), and to ensure effective collaboration, common key performance indicators or KPIs should exist among the business units. Organisations that are highly collaborative ensure that the metrics (or KPIs) are aligned across the business units (Kelly, 2014). Having the same KPIs among

different employees means that there is a shared purpose and thus a reason to collaborate successfully.

g. **Power** – This can be a concern when executives or senior management hold their seniority as power over others at levels below theirs. However, power struggles are also likely to exist among colleagues where the roles are not clear. From the interview held with the big data expert from the USA, the interviewee agreed that a power struggle was likely to exist between the CIO and CDO. The literature confirms that a power struggle between colleagues like the CDO and CIO could exist in the early stages of the introduction of the CDO within the organisational structure (Teerlink, Sigmon, Gow and Banerjee, 2014). Ways of working and responsibilities should be clear, and strong direction is required from the CEO to ensure a change in ways of working.

6.6.6 The collaborative process

Collaboration is more than an activity; it is a process where behaviours are developed over time (Kelly, 2014). Ricci and Wiese (2011) believe that the process of collaboration starts with a collaborative team who commit to working together, but that before the first meeting, trust needs to be encouraged and this step should not be skipped. To ensure this, the purpose and shared goals need to be clarified in the form of a team charter (Ricci and Wiese, 2011). Each team member needs to have a voice to be able to contribute and bring ideas, irrespective of his or her level within the organisation (Kelly, 2014).

Before the collaboration starts, logistical aspects like the frequency of meetings, the capture of minutes and how they are distributed to the members, and how decisions will be made, are vital to establish at the outset to ensure a successful and effective

collaboration (Ricci and Wiese, 2011). In organisations today, rewarding collaborative efforts should be part of the of the individual's remuneration package (Kelly, 2014).

6.6.7 The change management process

The HR department is important in establishing a culture of collaboration, and this can be done through a change management process. Change management is defined as "the process, tools and techniques to manage the people side of change to achieve the required business outcome" and organisational tools are used to assist employees to "make successful personal transitions resulting in the adoption and realization of change" (Prosci®, 2016). This process is important to make employees understand why change is needed and should be facilitated by not only external change management consultants, but also by the HR department.

A change management process will help employees not to revert to old patterns and doing what is comfortable and easy. Pieterse, Caniëls and Homan (2012) note that during change management processes, cooperation among the various business units is required for it to be successful. They contend that people from various professional backgrounds can interpret the same concepts differently and it is important to share knowledge and to gain mutual understanding during such interactions. If there is no cooperation, then the change management process will fail (Pieterse, Caniëls and Homan, 2012).

An important requirement to consider as part of the change management process is the legal obligation for using and storing sensitive customer data as part of the big data generated and acquired by organisations. South African companies need to comply with the Protection of Personal Information (POPI) act. The POPI act was gazetted in the Government Gazette No. 37067 of 26 November 2013 and promulgated by the

president of South Africa on 1 December 2016. Personal information include among others, their race, religious and political beliefs. Companies have to take accountability for how this data is used and stored, as well as obtaining the necessary consent from customers before their data can be used (Kandeh, Botha and Futcher, 2018). The IT departments of organisations have to ensure that the POPI act is not contravened by having sound governance and controls. The change management process will help the management of the organisation, as well as the data scientists understand the importance of treating customers' personal information with care and to ensure that the data managers, the IT specialists, have the necessary controls in place.

The model of collaboration is created for a brand new way of working together successfully. Such a model will be introduced at organisations where big data initiatives are considered. Employees identified will need to attend change management workshops to discuss the benefits for the organisational and possible cultural changes.

The collaborative groups will be identified during the change management process and they will be trained with the necessary skills. In addition to a high-level change management process prior to the collaboration, as part of the collaboration process, while meeting regularly and applying the principles of collaboration, there needs to be business process management, where the details of how the business process changes are documented and where the collaborators are trained for implementation of the new processes to optimally use big data in marketing strategies. Business process management (BPM) is defined as the use of "methods, policies, metrics, management practices, and software tools to coordinate all aspects of the specification, design, implementation, operation, measurement, analysis, and optimization of business processes" (Rahimi, Møller and Hvam, 2016). BPM will be used in the organisation as a way to both document the process and to gain consensus of the participants or

collaborators, of how the new processes will be implemented with regard to the optimal use of big data in marketing strategies.

6.6.8 Types of collaborative groups

Each of the collaboration groups considered will have a purpose and principles that will govern the collaborative group. The types of collaborative groups will be at different levels of the organisation, in the following ways:

1. Collaborations at the executive level – horizontal
2. Collaborations between levels – vertical
3. Cross-functional (and level) collaborations

Some collaborations are horizontal in their interaction, with people at the same level, whereas other collaborative groups are vertical, along the reporting lines from executive to middle management levels and cross-functional collaborative groups that can also include stakeholders at different levels. The structure of how collaboration will exist is dependent on the people and the reasons for collaboration. The hierarchical level, various stakeholders, purpose and principles that will govern their interaction will be made clear, through the change management process, in a consultative way to ensure buy-in from the employees.

6.6.8.1 Collaborations at the executive level

Group 1 – Data strategy team

The first group that needs to collaborate to use big data optimally in marketing is the executive level. According to Steele (2017, p.16), "the ideal data strategy is written in collaboration with both the business stakeholders and the technical stakeholders, so that it is well understood and agreed upon by everyone involved". These stakeholders are,

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firstly, the CEO, the person ultimately responsible for the running of the organisation, reporting to the board and therefore to the shareholders of the business; secondly, the chief operating officer (COO), overseeing the day-to-day operations of the organisation; and thirdly, the CIO, the technical stakeholder, responsible for the technological infrastructure of the organisation. Finally there is the CDO, a key business stakeholder, whose primary role is to drive value through the execution of data and analytics strategies (Teerlink, Sigmon, Gow and Banerjee, 2014). According to Teerlink, Sigmon, Gow and Banerjee (2014), the CDO has to collaborate with the leadership of the organisation to provide them with timeous and quality data to drive the goals of the organisation. Figure 6-4 highlights the collaborative group at the executive level.

The Purpose

Setting a data strategy is not a once-off activity, because a strategy is "a set of long-term goals" (Levy, 2017, p.9). Thus, the team identified above will have to collaborate over time to ensure that a data strategy is developed for the organisation.

Principles of Collaboration

1. Trust – This forms the foundation of effective collaboration, according to Kelly (2014), but requires the members to be vulnerable. Trust is developed over time through building relationships (Ricci and Wiese, 2011), and since these executives interact on a regular basis, trust should be an aspect more easily formed compared with groups that interact less frequently.

2. Power – A power struggle could exist between the CDO and CIO in the early stages of the introduction of the CDO within the organisational structure (Teerlink, Sigmon, Gow and Banerjee, 2014). Ways of working and responsibilities should be clear, and strong direction needs to come from the CEO.

3. Communication – This is crucial for effective collaboration.

4. Shared vision and purpose – These executives have a shared vision through the direction of the CEO and the purpose of setting a data strategy is to make the organisation more profitable through the use of their data for decision making (Teerlink, Sigmon, Gow and Banerjee, 2014).
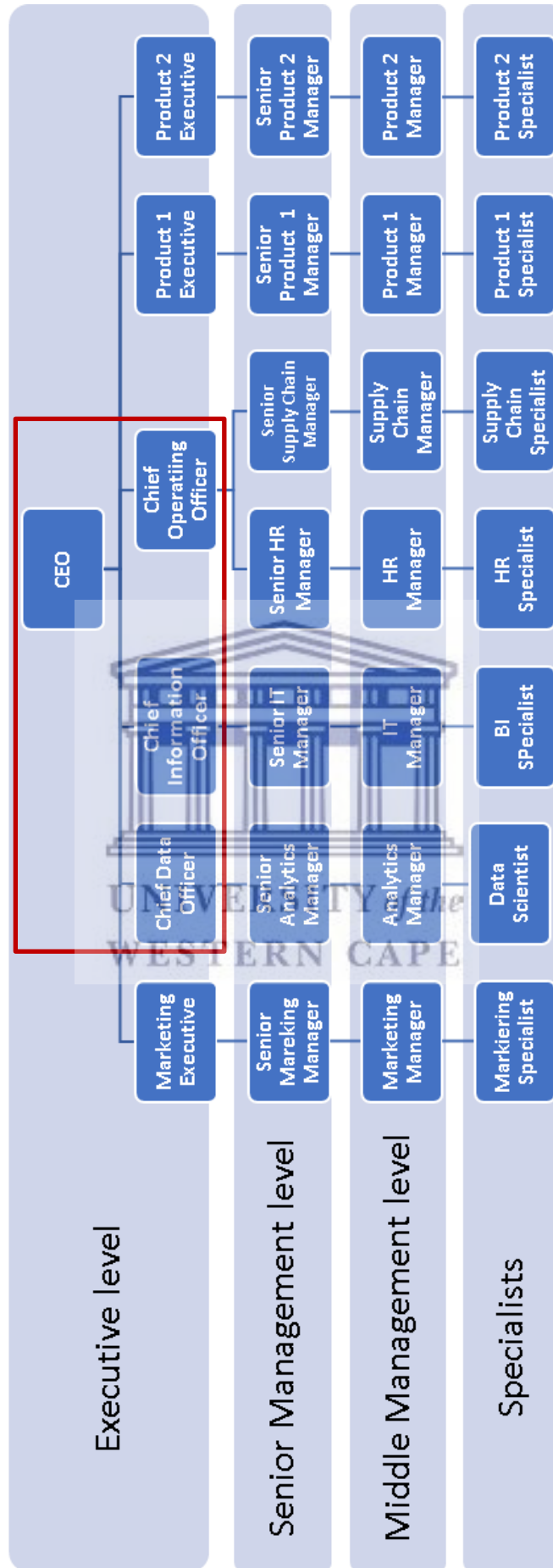
Figure 6-4. Data strategy collaboration group

Group 2 – Big data infrastructure

Some of the results from this research show the importance of leadership in effective collaboration. Since the CDO is responsible for driving the data strategy on behalf of the organisation, the CDO must lead this collaborative group to ensure the business is data driven and drives business value through data (Teerlink, Sigmon, Gow and Banerjee, 2014), which will ultimately lead to the optimal use of big data in marketing strategies. Figure 6-5 highlights this collaborative group in the proposed hierarchical structure.

Purpose

The same executive group must collaborate on the investment required for the organisation's big data infrastructure. Unlike setting the data strategy, being an ongoing effort, the big data infrastructure investment may be a once-off exercise signed off by these executives.

Principles

1. Trust – This forms the foundation of effective collaboration, according to Kelly (2014), but requires the members to be vulnerable. Trust is developed over time through building relationships (Ricci and Wiese, 2011) and since these executives interact on a regular basis, trust should be an aspect that will be more easily formed compared with groups who interact less frequently.

2. Power – A power struggle could exist between the CDO and CIO in the early stages of the introduction of the CDO within the organisational structure (Teerlink, Sigmon, Gow and Banerjee, 2014). Ways of working and

responsibilities should be clear and strong direction needs to come from the CEO.

3. Communication – This is crucial for effective collaboration.

4. Shared vision and purpose – These executives have a shared vision through the direction of the CEO and the purpose of setting a data strategy is to make the organisation more profitable through the use of their data for decision making (Teerlink, Sigmon, Gow and Banerjee, 2014).
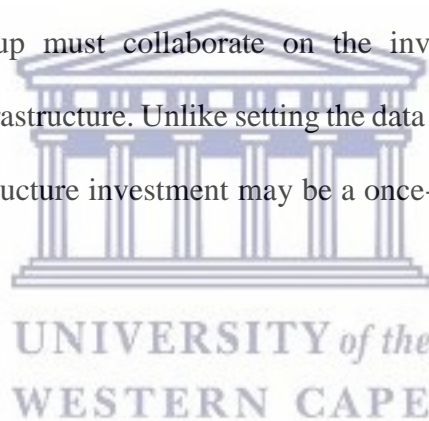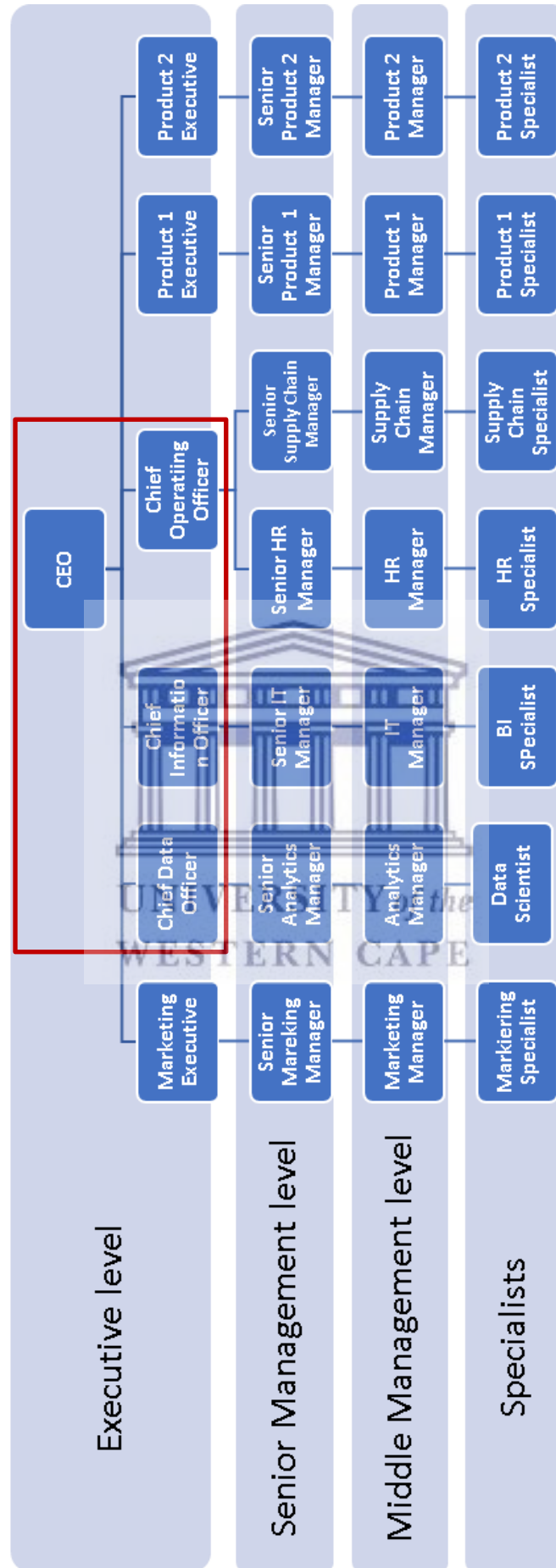
Figure 6-5. Big data infrastructure investment group

Group 3 – Implementation of big data initiatives

The next executive collaborative group comprises the marketing executive, the CDO and CIO in the use of big data in marketing strategies. Since big data is here to stay, and gaining insights from big data to gain competitive advantage is imperative (Harvard Business Review, 2012), it is important for this type of collaboration to occur effectively. Figure 6-6 highlights this collaborative group in the proposed hierarchical structure.

The Purpose

The role of the marketing executive in this collaborative effort is to brief the other executives on the marketing strategy; the CDO and CIO will give input on the data analysis and data management respectively. These three executives then collaborate to ensure that the marketing strategy is implementable.

Principles of Collaboration

1. Leadership – The CDO takes the lead to ensure the marketing executive understands how big data will improve marketing activities and that it is crucial in marketing strategies to gain advantage over competitors.

2. Knowledge sharing – This is an aspect that can influence collaboration and in this collaborative effort it is important for the stakeholders to share knowledge freely for effective collaboration. The CDO is 'able to speak' the languages, understands the 'business concepts' and is also able to speak 'intelligently' to the CIO regarding technology (Steele, 2017, p.10).

3. Trust – "Trust is the foundation of effective collaboration" within organisations (Kelly, 2014, p.5) and within this group it should develop over time, as they are

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colleagues and sit on the executive committee of the business, all reporting to the CEO.

4.   Shared purpose and vision – As executives, this group understands the vision of the organisation well. Marketing is the vehicle by which the organisation's products or services are sold to consumers (Johnson, 2015), and in respect of the importance of data in gaining profits for the business, the group has a shared purpose in ensuring the success of this collaborative effort.
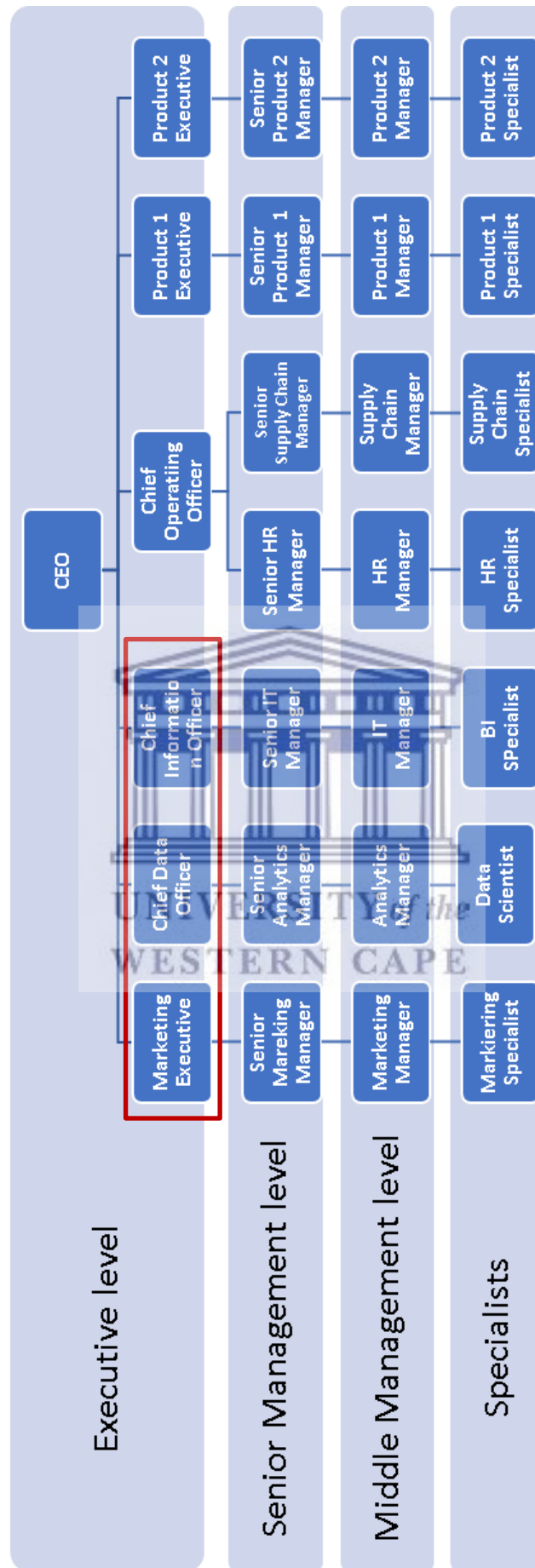
Figure 6-6. Marketing strategy group

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6.6.8.2 Collaborations at senior and middle management levels

Group 4 – The marketing strategy execution team

The next collaborative group comprises the marketing senior and middle management, led by the marketing director of the organisation. This group needs to implement the marketing strategy of the business. Big data is meant to drive this marketing strategy, while the marketing team needs to work together in executing this strategy. Figure 6-7 highlights this collaborative group in the proposed hierarchical structure.

The Purpose

The purpose of this group is to understand the importance of what the customer data is saying, and how to fit this well with the brand positioning and market to their customers. The marketing executive should help others to embrace a new way of working and give direction on how to execute the marketing strategy. A change management role in the form of HR may be required, since there now exists a reliance on big data to drive the marketing strategy into the future.

Principles of Collaboration

1. Leadership – The marketing executive must lead by example and set the direction of the marketing strategy.

2. Trust – Trust issues usually exist among the senior and middle management and it is vital that this be addressed as part of the collaborative effort.

3. Communication – Since utilising big data in marketing strategies is seen as new and may require a new way of working, change management is required and the HR team may have to facilitate some of these sessions.
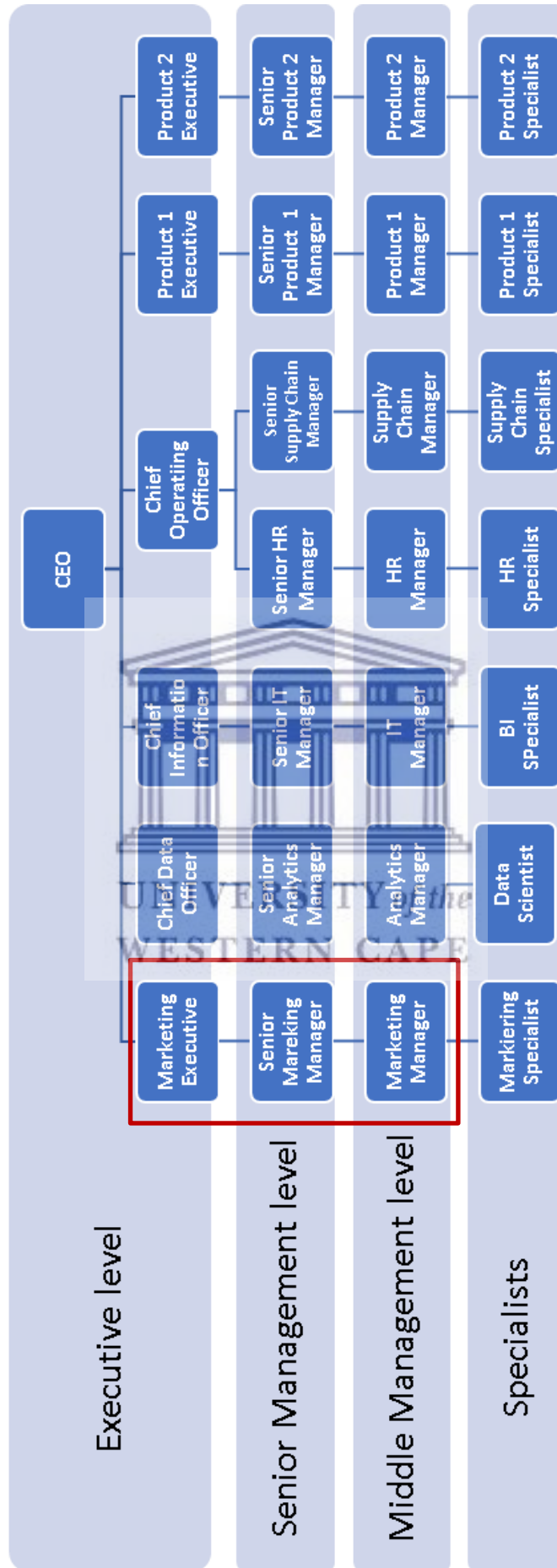
Figure 6-7. Between levels collaboration within marketing

Group 5 – The data strategy execution team

This collaborative group discusses the execution of the data strategy from an IT perspective. Figure 6-8 highlights this collaborative group in the proposed hierarchical structure.

The Purpose

The CDO, responsible for data strategy, needs to work with the CIO and IT team to implement the data strategy to "improve all the ways you acquire, store, manage, share and use data" (Levy, 2017, p.3). The CDO and IT also need to collaborate to understand how the big data infrastructure will be implemented and how to get the data to the data analysts, scientists and various business units.

Principles of Collaboration

1. Trust – "Trust anchors every successful collaboration" (Ricci and Wiese, 2011, p.120) and this is necessary in this collaborative group, where the CIO and CDO must work together. This technical role was traditionally the responsibility of the CIO, but in the era of data driving business value, it is the CDO's role; therefore trust needs to be developed between these two executives.

2. Knowledge sharing – If no sharing exists, collaboration cannot happen (Rosen, 2007); thus it is important for the CDO to share business knowledge with the CIO, while the CIO needs to share technical knowledge.

3. Power – The power struggle could exist between the CDO and CIO (Teerlink, Sigmon, Gow and Banerjee, 2014), since the role of the CDO is new, and many of the roles of the traditional CIO in terms of data have become those of the CDO in the organisation.

Figure 6-8. CDO, CIO, IT senior and middle management - big data infrastructure, data management and storage

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Group 6 – The centralised analytics team

The next collaborative group is the hierarchical line of the CDO, which includes the centralised analytics functions in terms of its management and specialists, data scientists and analysts. Figure 6-9 highlights this collaborative group in the proposed hierarchical structure.

The Purpose

The purpose of this collaborative group is to discuss how to access data from the various sources, including big data platforms like Hadoop, and prepare the data for predictive modelling for the marketing strategies within the organisation. From the fieldwork and literature, there are those in favour of a centralised analytics team, as well as those who would like analytics teams to be decentralised. For the purpose of the model of collaboration, the data scientists and analytics team report to the CDO (Steele, 2017), and it is important for this hierarchical line to collaborate effectively to use the big data accessible via a platform set up within the IT department to use in the predictive analysis for marketing strategies. There will be amateur analytics teams across the various business units that will work directly with the centralised data science team to disseminate the relevant analytical output in the form of reports to the various business units, where appropriate.

Principles of Collaboration

1. Leadership – Direction from the CDO is important to direct the analytics team to meet the business objectives to drive sales through the use of big data. This CDO role will be new, so the CDO needs to take the lead to assure the team how such a centralised analytics team will function within the organisation.

2. Communication – Regular meetings and communication will be conducted to understand the business strategy and the analytics approach.

3. Culture – Change management is required since this is a new way of working, with the new role of the CDO.
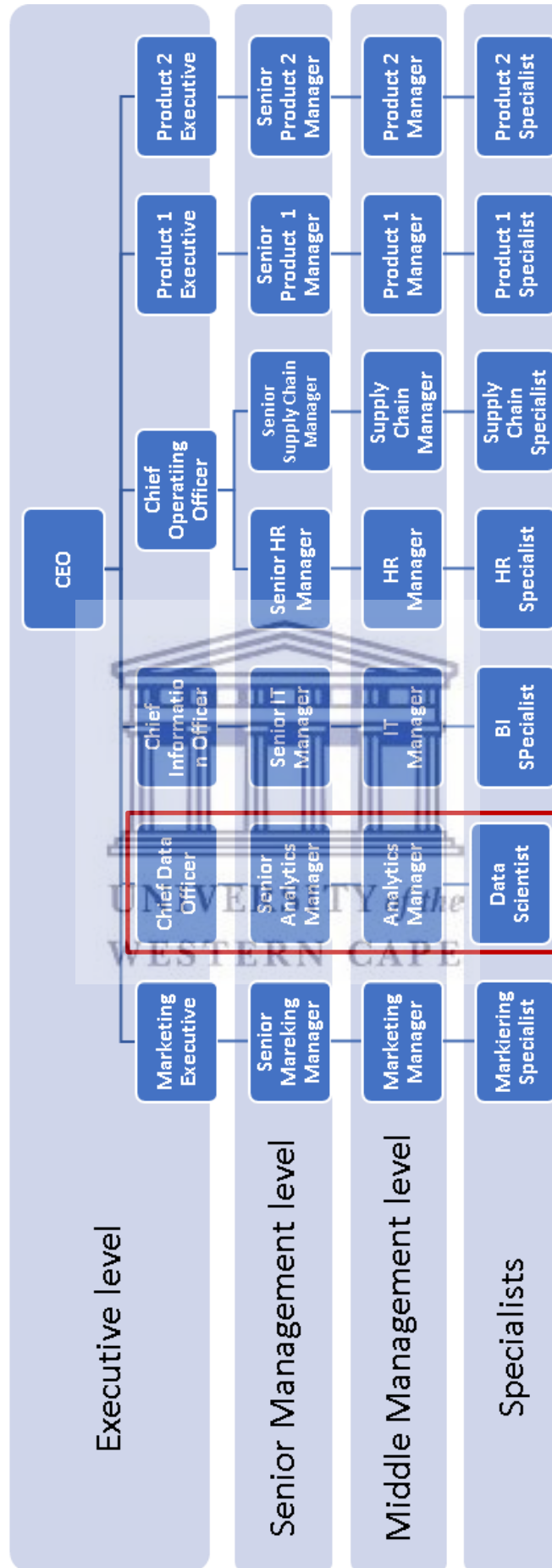
Figure 6-9. CDO, analytics manager and data scientist - big data and predictive modelling

http://etd.uwc.ac.za/

6.6.8.3 Cross-functional collaborative groups

Group 7 – The customer experience team

This group is a forum responsible for improving the customer experience at the organisation and consists of senior managers from various business units that influence the customer in some way, like marketing, IT and other business units. Concepts like big data, IT infrastructure and an advanced analytics strategy, in terms of their impact on customer experience, are discussed at this forum. Figure 6-10 highlights this collaborative group in the proposed hierarchical structure.

The Purpose

One of the mandates of this forum is to introduce various technologies to leverage data and big data in the future to improve the customer experience and to generate financial benefits from customers. This forum should be led by the CDO, as one of the business executives, to stress the importance of data and to be the ambassador of data (Steele, 2017). Another reason for the CDO to be part of this forum is that the primary role of the CDO is to "advocate on behalf of data" for the organisation (Teerlink, Sigmon, Gow and Banerjee, 2014, p.1).

Principles of Collaboration

1. Trust – From the results of the qualitative research, trust issues emerged within this group. Trust is built over time (Ricci and Wiese, 2011), and as this group collaborates over time, it will be important to build trust.

2. Knowledge Sharing – Since this group is a diverse group from various business units within the organisation, and comprises a group of senior managers with unique skills, it is important for them to share knowledge. The CDO should play

a good facilitative role, as successful evangelisation comes from "being able to speak both of those languages, to understand the business concepts that will drive the profitability of the business, and being able to talk intelligently with the technology teams" (Steele, 2017, p.10) to promote understanding among the members of this group.

3. Leadership – This forum should be led by the CDO, selected by the CEO for this task, which speaks to the commitment from the top to work at making sure this group collaborates effectively to ensure good customer experience.

4. Communication – Regular meetings or communication should be conducted to understand the business strategy and the analytics approach.

5. Culture – This collaborative group is led by the CDO, supported by the CEO, responsible for the general culture and a data or analytics culture (Davenport and Harris, 2007) in the organisation. A cultural shift is required to change the organisation to a data-driven culture, and it is thus a crucial aspect to ensure effective collaboration among the various stakeholders.
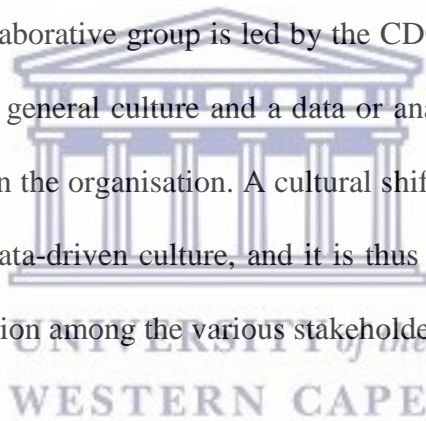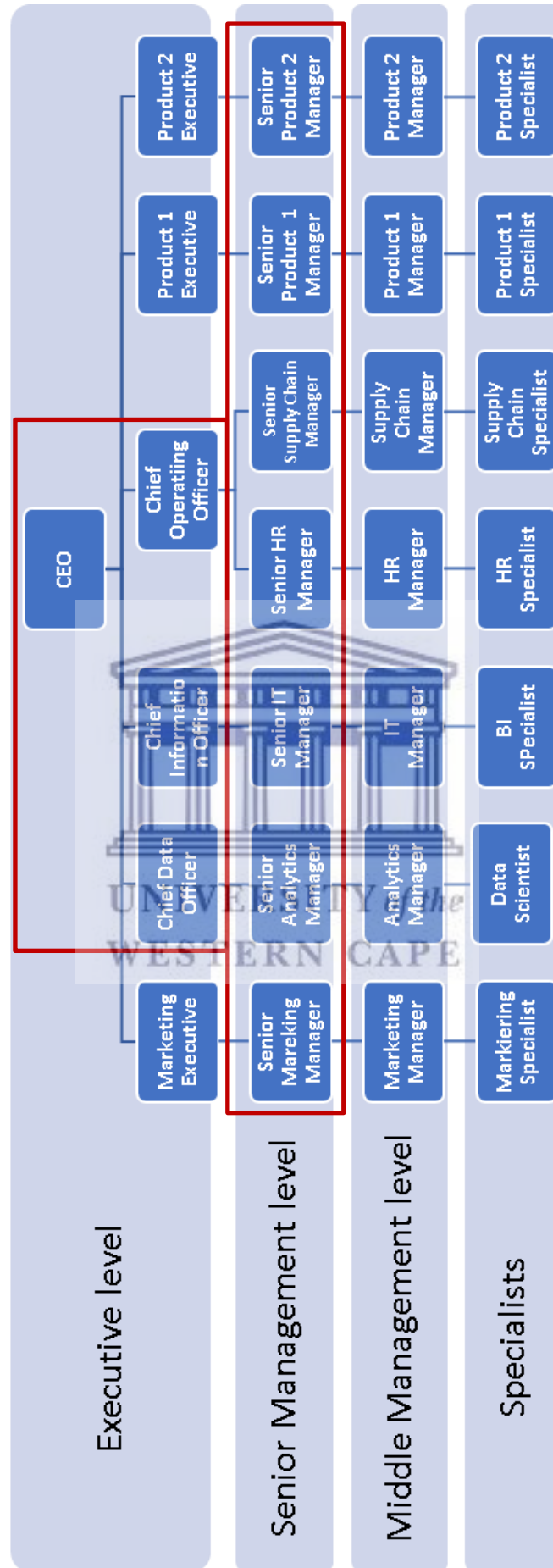
Figure 6-10. Customer experience collaboration group

Group 8 – The product and marketing teams

The next group of collaborators constitutes the product group and marketing middle managers, who collaborate on the marketing strategy and how they work together to sell the products of the organisation. Figure 6-11 presents this collaborative group in the proposed organisational structure.

The Purpose

Within the marketing business unit, the marketing executive will set the marketing strategy of the business and the middle managers will operationalise and execute the strategy. The marketing team will work together with the product groups to execute the marketing strategy.

Principles of Collaboration

1. Communication – Communication is important to execute a strategy and in order for it to happen effectively, collaborative tools need to be used to ensure an effective collaborative effort. Since implementation of big data in the marketing strategy, it may be a new way of working and may require change management and the input of the HR department to facilitate.

2. Trust – Building trust among colleagues from various business units is important in collaborative interactions, since the results of the qualitative research indicated that business units tend to work in silos.

3. Shared vision and purpose – It is necessary to include the staff in the collaboratve efforts since, according to Kelly (2014), collaboration needs to happen at all levels of the organisation. The staff need to understand the importance of the collaboration and how it will benefit the entire organisation.
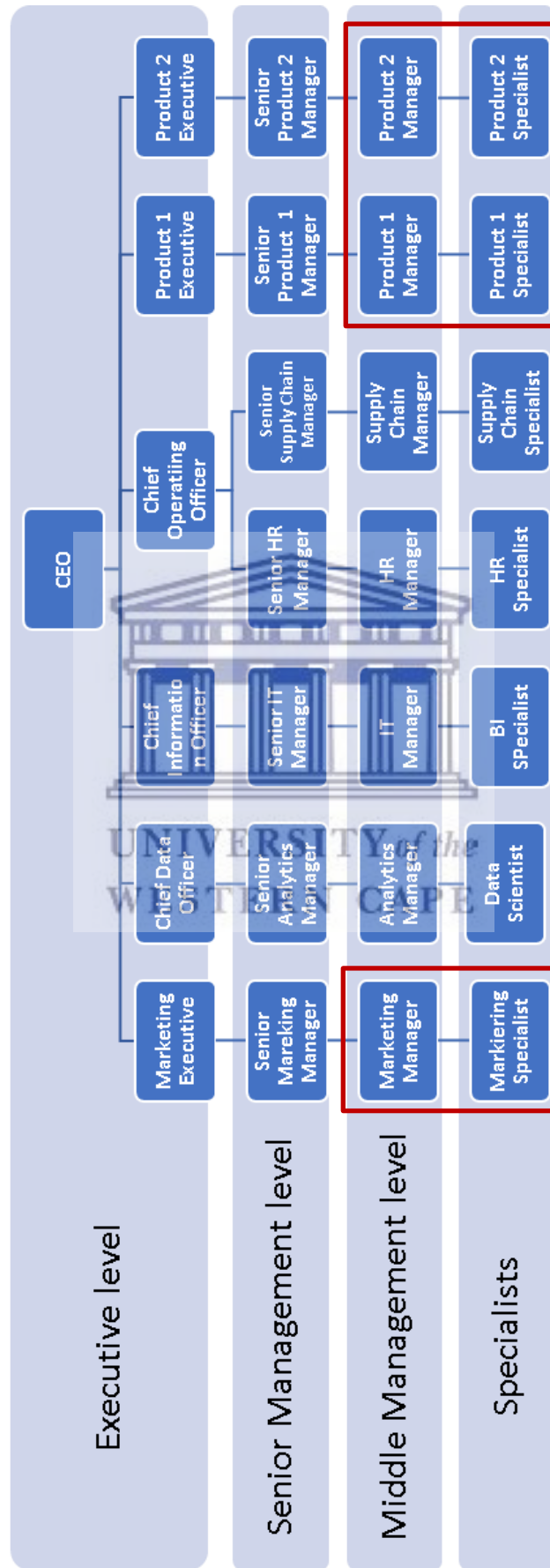
Figure 6-11. Marketing and product teams - operationalising the marketing strategy

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Group 9 – The cross-functional data science team

The final collaborative group is the cross-functional data science team, who together will work to make sense of big data for use in marketing strategies. Figure 6-12 highlights this collaborative group in the proposed hierarchical structure.

The Purpose

This is a cross-functional group of both domain experts, technological experts and those with statistical skills. This group's role is to bring together all the expertise to turn the business problem or marketing strategy into a statistical model that will use big data to predict customer behaviours to ensure profits for the organisation. The data scientists (or statistical analysts) are part of the CDO hierarchical line and part of a centralised model as specified in Steele (2017). The data scientists should collaborate with the various business units like IT, marketing, and product groups to help them to build a statistical model, using big data, to be able to execute the marketing strategy. Some of the advanced analytical work may be outsourced to external consultants, and together with the CDO, the data scientists have to collaborate with them to provide the necessary analytical requirements for the execution of marketing efforts using customer data.

Principles of Collaboration

1. Trust – Since the members of this group come from different business units, and from the qualitative results it has been established that business units tend to work in silos, trust will need to be built.

2. Leadership – The CDO should lead this group, since the CDO speaks both the language of business and technology (Teerlink, Sigmon, Gow and Banerjee, 2014).

3. Communication – It is important, especially in a cross-functional collaborative team, to have HR facilitate, as the team members speak different languages: some technical, others business. Understanding what needs to be achieved is essential to the success of such a collaborative effort.

4. Knowledge sharing – There needs to be an understanding of creative output vs statistical models, etc.

5. Shared vision and purpose – The employees or collaborators need to understand the importance of the collaboration and how it will benefit the entire organisation.
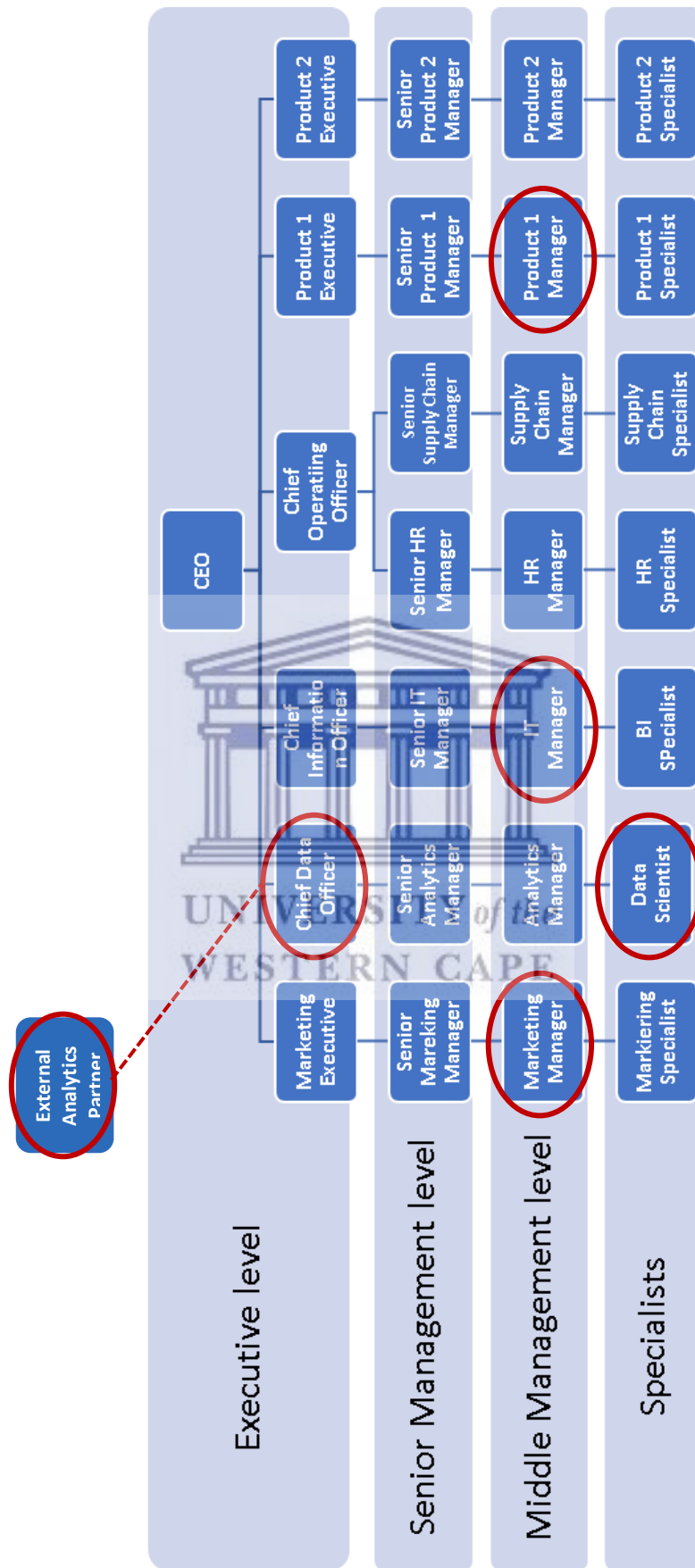
Figure 6-12. A cross functional team from marketing,

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6.6.8.4 Overview of the collaborative groups

Table 6-1. Overview of all the collaborative groups

Collaboration level	Collaborative group	Purpose	Key principles of collaboration
Executive Level	CDO, CEO, COO, CIO	Data strategy	Trust, power, communication, shared vision and purpose
	CDO, CEO, COO, CIO	Big data infrastructure investment	Leadership, trust, communication
	Marketing executive, CDO, CIO	This group needs to discuss the impact of big data on the marketing strategy	Leadership Knowledge sharing Trust Shared purpose and vision
Between Levels	CDO, senior analytics manager, analytics manager, data scientist	Discuss how to access data from various sources and prepare data for predictive modelling	Leadership, communication, culture
	CIO, senior IT managers, IT managers	Discuss the execution of the data strategy from an IT perspective.	Knowledge sharing Trust Power
	Marketing executive, marketing senior managers, marketing managers	This group needs to implement the marketing strategy of the business.	Leadership, trust and communication,
Cross-functional	CEO, CDO, CIO, COO, senior management	Improve customer experience, CDO required to evangelise importance of data and be an ambassador for data	Trust, knowledge sharing, leadership, communication, culture
	Marketing and product teams	Operationalise and execute marketing strategy	Communication, trust, shared vision and purpose
	External analytics partner, CDO, marketing manager, data scientist, IT manager, product manager	Bring together all different expertise to turn a business problem/marketing strategy into a statistical model to use big data to predict customer behaviour	Trust, leadership, communication, knowledge sharing, shared vision and purpose

The next chapter showcases the application of the model of collaboration in practice.

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CHAPTER 7: PRAXIS MODEL OF COLLABORATION IN THE USE OF BIG DATA IN MARKETING STRATEGIES

The previous chapter explained the requirements for the integrated model of collaboration in the optimal use of big data in marketing strategies. It listed the participants in the model as well as concepts like leadership, organisational culture and organisational structure, grounded from the data deemed important for effective collaboration from the fieldwork and literature. It also showed the purpose of the various collaborative groups and the principles that should govern their interactions.

This model of collaboration, grounded in the data, is thus putting into practice the theory derived from the fieldwork and literature reviewed to formulate a model that can be implemented in large organisations in using big data through data science optimally. The model follows six steps, from stating the business problem to the successful outcomes of the collaborative efforts from the combined work of the various collaborative groups.

The praxis model of collaboration in the use of big data in marketing strategies is presented in Figure 7-1 overleaf, and an explanation of how this model works follows.
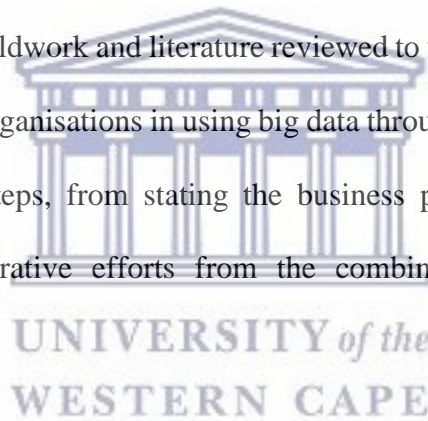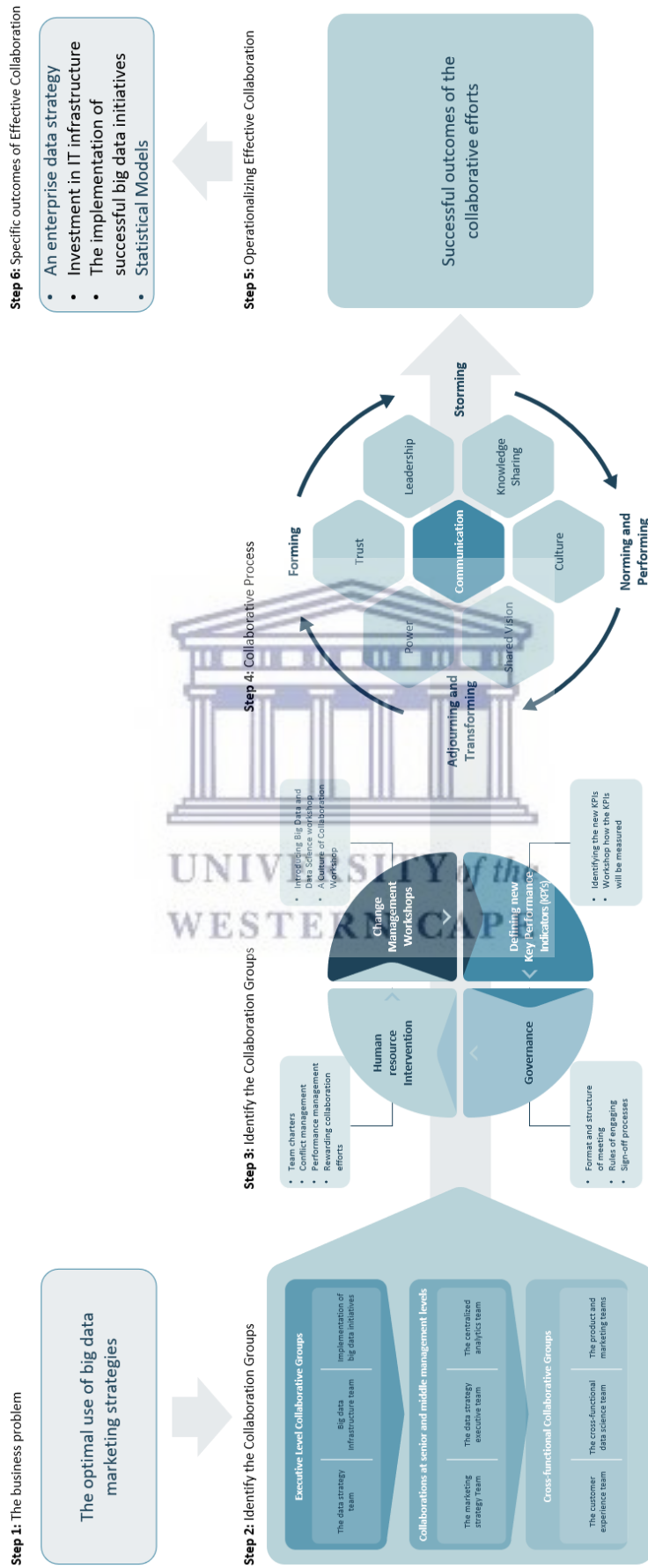
Figure 7-1. The praxis model of collaboration in the use of big data in marketing strategies

7.1 Step 1: The business problem

The business problem in the case of this research is fostering collaboration among the business decision makers, business intelligence or IT specialists, and the statistician in the optimal use of big data in marketing strategies.

From the fieldwork, a key business leader and driver of data in the organisation – the CDO, emerged. The CDO is instrumental in the model of collaboration as this role is the link to the various stakeholders in the optimal use of big data in marketing strategies as outlined at the start of the research.

It was also established from the field and the literature that the CDO is a key leader and collaborator in the optimal use of big data and is part of six of the nine collaborative groups required in this model of collaboration.

7.2 Step 2: Identify collaborative groups

This model considers nine different collaborative groups in order to have the necessary outcomes of effective collaboration. These groups play equally important roles in the optimal use of big data in marketing strategies. The collaborative groups are listed in the following Figure 7-2:

Figure 7-2. Collaborative groups

7.3 Step 3: Change management process

This process (shown in *Figure 7-3*) is extremely important in ensuring effective collaboration. Since the model of collaboration proposes a new way of working within the organisation, the HR department must assist the participants of the various collaborative groups to manage the changes in the workplace through workshops run by change managers, skilled in helping employees to successfully transition to a different way of operating.

Step 3: Identify the Collaboration Groups

- Team charters
- Conflict management
- Performance management
- Rewarding collaboration efforts

Human resource Intervention

- Introducing Big Data and Data Science workshop
- A Culture of Collaboration Workshop

Change Management Workshops

Governance

Defining new Key Performance Indicators (KPI's)

- Format and structure of meeting
- Rules of engaging
- Sign-off processes
- Legal

- Identifying the new KPIs
- Workshop how the KPIs will be measured

Figure 7-3. Change management process

7.4 Step 4: Collaboration process

Collaboration is a process and not an activity, which means that the effectiveness of the collaborative effort takes time. The following stages of collaboration form part of the collaborative process of this model of collaboration.

Forming

In this stage the collaboration groups start meeting and the expectations and challenges of the collaborative efforts are explained. At this stage, the collaborative groups will establish timelines and deadlines based on the targets set as part of their group key performance indicators (KPIs).

Storming

The collaborative process is underpinned by the principles of collaboration, which will govern the way collaboration will occur. In this stage, it is important for the groups to put the principles of collaboration, like trust, knowledge sharing, etc., into practice as it is the stage of collaboration where confrontation can occur. It also requires the group to make decisions on the best way of collaborating. It requires strong leadership to guide the group through this stage.

Norming and Performing

At this stage, the group members are more at ease with one another, the roles should now be clearly defined, and collaboration occur more naturally. The shared goals and the reasons for the collaboration should now be well understood and the collaborative group will have accepted the new ways of working. The performance of these stages is when the group has applied the principles of collaboration, like trust and sharing knowledge, and the group is able to make decisions effectively.

Adjourning and Transforming

This final stage is when either the collaborative effort has been successfully completed or another task is started. Some of the collaborative groups in the model have to continue with projects like customer experience; while data science teams must

collaborate where new statistical models need to be built. Other collaborative efforts like developing the data strategy and the investment in big data infrastructure may be suspended once they have been achieved.

Since the reason for the collaboration is to establish new ways of working and to use big data in marketing strategies, new business processes will have to be drafted and decisions on how and what will be done will have to be made. These changes will occur as part of the stages of collaboration.

The following Figure 7-4 is a representation of this process.
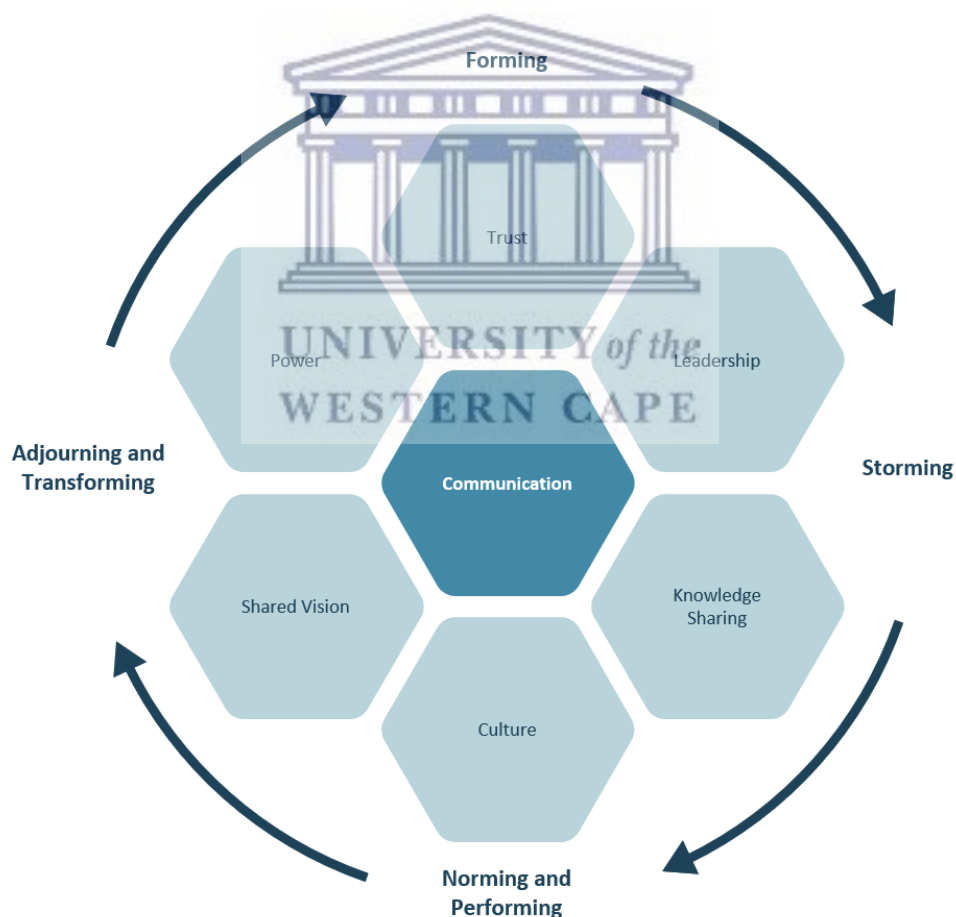
Figure 7-4. Principles of collaboration

7.5 Step 5: Operationalising effective collaboration

The step comes once effective collaboration has been achieved. This process can now be operationalised and it can be documented on how to achieve effective collaboration. Some collaborative groups may take longer to become operational than others.

7.6 Step 6: Specific outcomes of effective collaboration

The specific outcomes of effective collaboration are:

1. An enterprise data strategy

2. Investment in IT infrastructure

3. The implementation of successful big data initiatives

4. Marketing strategies based on the use of big data through data science that are profitable for the organisation

CHAPTER 8: CONCLUSION

The aim of this research was to fill the gap in knowledge with the building of an appropriate model of collaboration for large corporate organisations to benefit financially by leveraging their data to inform their decisions. Such collaboration within large corporate organisations currently does not exist in the context of data science in the optimal use of big data. The focal point of the research is to investigate how collaboration can be applicable within the context of data science to promote the optimal use of big data.

8.1 A summary of the key findings

The importance of collaboration in organisations was well understood from the fieldwork. There were differing views of what is considered analytics and how it is applied in the organisation, but its importance and financial benefits to the organisation were realised as key in the era of big data. Another finding of the research was the changing role of the statistician in the era of big data and the new discipline of data science.

The association of leadership, trust and knowledge sharing in ensuring effective collaboration was hypothesised in this research. Of the three hypotheses tested, two were confirmed. The two confirmed hypotheses were that there exists a relationship between the frequency of collaboration and the leadership of organisations, as well as that a relationship exists between knowledge sharing and collaboration. The null hypothesis tested, of whether trust issues exist among business units and how often collaboration happens, was accepted, and therefore the test determined that there is no

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relationship between trust and collaboration. It is, however, known that collaboration cannot happen without trust. Trust is subjective and not easy to measure. In future research, the issue of trust should be researched, using in-depth interviews, rather than a quantitative approach to measure trust.

A key unexpected finding of the research was the role that the CDO plays in fostering collaboration among the stakeholders in the optimal use of big data. Other unexpected findings were the importance of organisational structure and culture in effective collaboration.

The research set out to answer the research questions on aspects of effective collaboration like leadership, trust and knowledge sharing in the optimal use of big data in marketing strategies. During the research, many other concepts and aspects that could influence collaboration in this particular environment were recognised.

The model of collaboration, a practical way to effectively implement big data initiatives in marketing strategies in large organisations that was grounded in the theory, was devised to guide organisations in effective collaborative efforts. This model of collaboration could be used by organisations to initiate different collaborative efforts, particularly in the field of big data and data science in large organisations today to ensure the optimal use of big data in marketing strategies.

8.2 The contribution to knowledge

The research developed a model of collaboration that will provide inputs to business organisations to aid the successful outcome of collaborative efforts in data science and the optimal use of big data in the form of financial benefits to the organisation. It also

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provides an opportunity for the statistician to take a rightful place as one of the key collaborators of data science within the corporate environment.

The research has contributed to knowledge by extending the theory of collaboration in the domain of big data in the organisational context, by building an integrated model of collaboration, grounded in the data, in the context of optimising big data in marketing strategies in large organisations. Collaboration among the specified stakeholders can occur both horizontally with peers and vertically with specialists at different levels within the organisation. The research also specifically applied organisational theory by incorporating the structure of the organisation, as well as considering the influence of organisational culture in the model of collaboration in its application in large organisations. Such a model does not currently exist in an organisational environment.

There is limited knowledge within the South African context of how to successfully and effectively implement big data to benefit organisations financially, and an integrated model of collaboration provides a systematic way of incorporating the skills of the key stakeholders in achieving effective collaboration. The model of collaboration considered various processes and methodologies, from organisational change management to principles of collaboration in order to achieve effective collaboration. The application of this model of collaboration should help the successful outcome of collaborative efforts in data science with financial benefits for the organisation.

From the companies surveyed on collaboration in their organisations, it appeared that collaboration had not been deeply ingrained as a key principle of the organisations' culture. A culture of collaboration is imperative for effective implementation of this model of collaboration. There does not exist a systematic culture of collaboration in the organisations surveyed and part of the process in the model of collaboration is that the

leadership of large organisations should model a culture of collaboration, which will then be embraced by the employees at the lower levels of such organisations.

In the USA, large organisations like the Fortune 1000 companies are embarking on big data and artificial intelligence (AI) initiatives successfully. Although South African companies have started to embark on big data initiatives, these do not exist to the same extent as in the USA and Europe. The model of collaboration can benefit the South African context in establishing big data initiatives that can be successfully implemented for financial gain.

Another contribution to knowledge was the realisation that the CDO is the key stakeholder in fostering collaboration in the use of big data through data science. The research set out to assess whether collaboration could be fostered among the business decision makers, the business intelligence specialists, and the statistician. The CDO is the link to these stakeholders, as the CDO is the business executive and leader in the organisation responsible for the enterprise data strategy and for evangelising the use of data as an asset at the organisation. The CDO is also technologically astute, working closely with the CIO, the head of IT and business intelligence to ensure that an IT and data infrastructure exists to accommodate and facilitate the use of big data in the organisation. The CDO is also directly linked to the data scientists (previously the statisticians) and analytics teams as these roles are in the CDO's reporting line.

The key to the successful implementation of the model of collaboration and the development of a culture of collaboration in the organisation rests in the hands of the CDO. The introduction of the CDO in large organisations has been acknowledged and many of the Fortune 1000 organisations in the USA have employed CDOs. Even though

companies have employed CDOs, there is still uncertainty of what exactly the functions of a CDO are.

In the context of South Africa, there are not many organisations with a CDO. Such a function is becoming more and more a requirement in the financial services and banking sectors, owing to the importance of good data governance in these highly regulatory environments. However, there are many other responsibilities that the CDO hold. The importance of the CDO in managing data as an asset has become critical to gain financial advantage over competitors, and other sectors like retail and telecommunications organisations should consider introducing this role in their organisations. There is also a realisation that data is an asset and that it has become crucial to use data in driving sound business decisions. Developing a data-driven culture in order to gain an advantage over the competition is the order of the day in staying relevant in a highly competitive corporate environment.

Companies in South Africa are slowly embarking on big data initiatives and artificial intelligence (AI) has become the latest buzzword, as in many of the First World countries in the world. Many are calling this era of advanced technology the fourth industrial revolution, and as with all the previous industrial revolutions, it will eventually become the norm. Organisations need to be prepared for implementing these technological advancements. Those companies first to be successful in implementing these new technologies will be pioneers in their field and will show significant financial benefits. In order for this to happen, organisations need to equip themselves with the right tools, processes and people. There is a potential for a data-driven model of collaboration in South Africa and the seeds exist that such a model is implementable. The research has recognised this trend and the model of collaboration with the CDO as

the key stakeholder in collaborating for the optimal use of big data through data science will definitely benefit organisations in South Africa.

Organisations in South Africa are, however, slow to employ a CDO, but some have recognised the need and are recruiting for such a role. Organisations are also recruiting for professionals like data scientists, required to analyse and make sense of big data. Many tertiary institutions in South Africa have recognised the need for such skills and are offering courses to supply this impending demand. The building blocks are being put in place in South Africa for organisations to implement such a data-driven model of collaboration.

8.3 Areas of methodology improvement

There were areas not sufficiently investigated that require future research.

One was that the original qualitative study was limited to only one unit of observation. In future the methodology can be improved by increasing the number of units of observations. The findings of the quantitative study were also only limited to organisations with marketing departments in Cape Town. The quantitative study's number of respondents was small and non-random, and generalisations could not be made. However, during the research, there was the realisation that the quantitative study had some shortcomings, and to strengthen the research, triangulation methodology was considered through seven additional in-depth interviews of big data and analytics experts from South Africa and abroad to further explore the use of big data in large organisations today. The findings from these qualitative studies corroborated the

findings of the qualitative and quantitative instruments of the research design and strengthened the research.

One of the other limitations of the quantitative study in the form of online surveys was that a single respondent represented the organisation in the response to the survey. Even though it can be an advantage, it can be a limitation in that the person representing the organisation will respond from his/her own role and will not always be objective (Bryman and Bell, 2011).

In order to address the limitations of this study, further studies should extend the research to more than one unit of observation for the qualitative study, and for a quantitative study include organisations from the entire country of South Africa, rather than one city.

8.4 Recommendations for further research

The model of collaboration is for the use of big data initiatives in marketing strategies, but this model could be adapted for use in many different organisational collaborative efforts. Future research could be on the effectiveness of collaboration in terms of big data and the success of such collaborative efforts in terms of added revenue to the business, owing to the use of big data in all the various areas of the business.

Since the quantitative research was restricted to Cape Town organisations, future research could be conducted on a country-wide basis, not only JSE-listed companies, but to small and medium organisations as well, to improve the sample composition. The research should be conducted by a research organisation or academic institution with credibility in large organisations in order to obtain responses from more

organisations; further research should also provide greater insight into how organisations collaborate and use big data to make data-driven decisions. The research methodology can be extended since online surveys have limitations to more personalised interviews from senior employees at multiple organisations from different industries.

Another possible area for further research could be to investigate how organisational culture can impact data-driven decision making. As an unanticipated finding of this research, the culture and structure of an organisation and how it influences data-driven decision making was not thoroughly explored. A qualitative study of in-depth interviews with employees at various levels of organisations and across different industries will shed some light on whether certain types of industry have similar cultures or if it is developed independently of the type of industry.

As a student researcher it was difficult to interview prominent executives at various organisations. An independent research organisation with credibility within the corporate environment could conduct a broader survey to ascertain the future of organisations in the era of big data and AI, much like the surveys conducted in the USA by NewVantage Partners.

A case study of the implementation of the model of collaboration at an organisation like Woolworths, investigating how the various stakeholders experience the collaboration process, should be undertaken. Such research can serve as a pilot of the possibilities a model of collaboration in the fourth industrial revolution in South Africa and possibly leading in this area on the global stage.

Another area for further research could be to investigate the implications of the POPI act on the optimal use of big data and the possible limitations in predicting customer's behaviour for use in marketing strategies in South Africa.

8.5 Final remarks

This study started by investigating how to foster collaboration among the business decision makers, the business intelligence specialists and statisticians and lead to the building of an integrated model of collaboration that can be implemented at large organisations in South Africa. The model incorporated the key stakeholders and unanticipated new stakeholders and factors that could influence effective collaboration.

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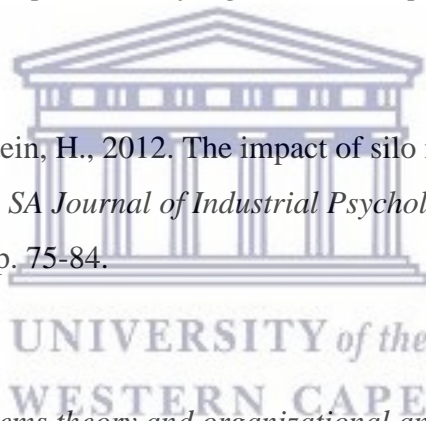
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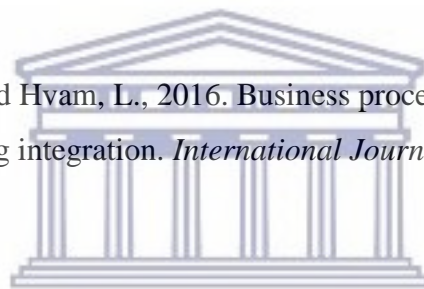
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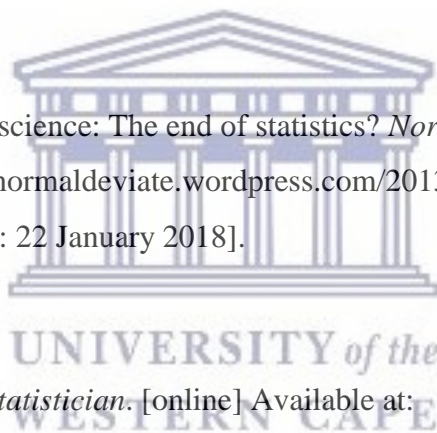
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APPENDICES

Appendix A

A questionnaire to the Connected Customer Council (CCC) at Woolworths.

Start by setting up 30 minute appointments with the various people on this team, sending the consent letter. Once a meeting has been confirmed and set up, start the meeting by explaining the PhD study.

Questions

General

1. Ask about the role of the customer connected council in the organisation.

2. Ask about the various members on the team.

3. a) What is the role of Marketing in the organisation?

   How can this role be improved to make the business more customer-focused?

   b) What is the Role of IT generally in the organisation?

   How can this role be improved to make the business more customer-focused?

   c) What is the Role of the Business decision maker (execs) generally in the organisation?

   How can this role be improved to make the business more customer-focused?

   d) How do these stakeholders currently work together in this organisation?

   Probing Examples - Project -by- project, ongoing, knowledge sharing, trust, conflict, organisation structure

Big Data

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4. a) Have you heard about big data?

If Yes….
b) How did you come to know about this term?

c) Please define this term- Big data - as you understand it.

- What type of data is considered as Big data?

- How do we use such data in the organisation?

- How is data captured, stored and accessed?

d) Interviewer then defines Big data in plain language

- **Big data is an evolving term that describes any voluminous amount of <u>structured</u>, semi-structured and <u>unstructured data</u> that has the potential to be mined for information.**
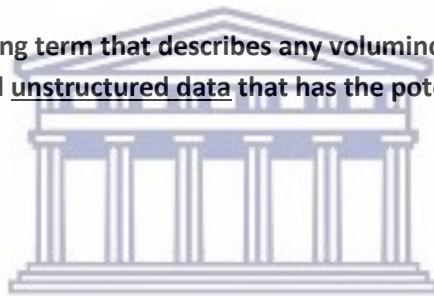
If No …

a) Explain using the google search example, data collected online, social media data, cell phone data
b) Interviewer then defines Big data in plain language
- **Big data is an evolving term that describes any voluminous amount of <u>structured</u>, semi-structured and <u>unstructured data</u> that has the potential to be mined for information.**

5 a) What should the role of Marketing be in the use of Big data for marketing strategies?

c) What should the role of IT be specifically in the use of Big data for marketing strategies?

d) What should the role of Business decision makers (product group execs) be specifically in the use of Big data in marketing strategies?

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<u>Statistical analytics role within the organisation</u>

5. a) As part of your role, have you ever required statistical analysis for decision making?

    b) What type of analysis was needed?

    c) Who (which department) did the statistical analysis?

    d) Is this function important to have in the organisation? Is it a core function of Woolworths?

    e) Should all statistical analysis be done internally or should part of this be done externally (using Consultants)?

    f) If external consultants are used, how (if at all), should specific people (depts.) from the organisation collaborate with external consultant to produce statistical analysis?

    g) Are external parties used because of a lack of skills within the organisation and if so, should there be a boost of capacity internally?

<u>Questions around the Statistician</u>

- What is the role of a Statistician?

 If not known, then give an interpretation from literature of the role of a Statistician.

Statistician

The Oxford Dictionary (2015) defines a statistician as 'an expert in the preparation and analysis of statistics.'

Statistics

Although the term is widely known in the scientific domain, along the lines of big data, Statistics is defined by Kuonen (2015) as 'a science of 'learning from data' (or making sense out of data) and measuring, controlling and communicating uncertainty'.

   If known…

- Is there a role of the Statistician in your organisation?

- If yes, what is the role for the Statistician in the use of Big data in marketing strategies?

If no, give my understanding based on literature what the role of the statistician is.

Although the term is widely known in the scientific domain, along the lines of big data, Statistics is defined by Kuonen (2015) as 'a science of 'learning from data' (or making sense out of data) and measuring, controlling and communicating uncertainty'.

<u>Questions around future Collaboration (and the factors influencing it) –assuming CCC gets involved with Big Data in Marketing strategies</u>

a) What is the process the CCC will follow to ensure the decisions made will be implemented?

Eg interaction of management, Leadership style?

b) Do you think (in your own experience) there are trust issues to be resolved in effectively implementing the decisions of this council?

c) Do you think (in your own experience) knowledge sharing exists amongst those who have to effectively implement the decisions of this council?

d) Is the role of leadership to ensure effective collaboration amongst different groups in the organisation?
   i. If yes, how does this happen?

   ii. If no, why not?

Appendix B

Questionnaire to the CEO of Woolworths SA.

CCC

6. Ask about the role of the Connected Customer Council in the organisation.

7. Why the CCC was established? What was the intention and once established, has it lived up to the original intention?

Stakeholders

8. a) What is the role of Marketing in the organisation?

   How can this role be improved to make the business more customer-focused?

   b) What is the Role of IT generally in the organisation?

   How can this role be improved to make the business more customer-focused?

   c) What is the Role of the Business decision maker (execs) generally in the organisation?

   How can this role be improved to make the business more customer-focused?

Specific questions

9. How do these stakeholders currently work together in this organisation? **Probing Examples - Project -by- project, ongoing, knowledge sharing, trust, conflict, organisation structure.**

   In the book, competing on analytics, the authors feel that the CEO and executives are responsible for the analytics orientation and capability and setting an analytics culture at the organization. Do you agree? If so,

   Please list reasons why you think analytics and data science in important in an organization like Woolworths?

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Questions around Collaboration (and the factors influencing it)

e) What is the process the CCC will follow to ensure the decisions made will be implemented?

f) What is the role of the CEO in this process.

   Eg interaction of management, Leadership style?

g) Do you think there are trust issues amongst the different stakeholders that need to be resolved in order to effectively implementing decisions from this council?

h) Do you think knowledge sharing exists amongst those who have to effectively implement (middle managers) the decisions of this council?

i) Is the role of leadership to ensure effective collaboration amongst different groups in the organisation?
   iii. If yes, how does this happen?

   iv. If no, why not?

Do have a question or anything else to add to this discussion?

THANK YOU FOR YOUR PARTICIPATION

Appendix C

A questionnaire to Middle Managers.

<u>General</u>

10. a) What is the role of Marketing in the organisation?

   How can this role be improved to make the business more customer-focused?

   b) What is the Role of IT generally in the organisation?

   How can this role be improved to make the business more customer-focused?

   c) What is the Role of the Business decision maker (execs) generally in the organisation?

   How can this role be improved to make the business more customer-focused?

   e) How do these stakeholders currently work together in this organisation? **Probing Examples - Project -by- project, ongoing, knowledge sharing, trust, conflict, organisation structure**

<u>Big Data</u>

11. a) Have you heard about big data?

   If Yes….
   b) How did you come to know about this term?

   c) Please define this term- Big data - as you understand it.

   - What type of data is considered as Big data?

   - How do we use such data in the organisation?

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- How is data captured, stored and accessed?

d) Interviewer then defines Big data in plain language

- **Big data is an evolving term that describes any voluminous amount of <u>structured</u>, semi-structured and <u>unstructured data</u> that has the potential to be mined for information.**

If No …

e) Explain using the google search example, data collected online, social media data, cell phone data
f) Interviewer then defines Big data in plain language
- **Big data is an evolving term that describes any voluminous amount of <u>structured</u>, semi-structured and <u>unstructured data</u> that has the potential to be mined for information.**

6   a)   What should the role of Marketing be in the use of Big data for marketing strategies?

g)   What should the role of IT be specifically in the use of Big data for marketing strategies?

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h)   What should   the role of Business decision makers (product group execs) be specifically in the use of Big data in marketing strategies?

Statistical analytics role within the organisation

12. a) As part of your role, have you ever required statistical analysis for decision making?

h)   What type of analysis was needed? Do not prompt **Eg. Reporting (Summary statistics), Basket Analysis, Predictive analysis. etc**

i)   Who (which department) did the statistical analysis?

j) Is this function important to have in the organisation? Is it a core function of Woolworths?

k) Should all statistical analysis be done internally or should part of this be done externally (using Consultants)?

l) If internally, should the function be centralized or in each business unit?

m) If external consultants are used, how (if at all), should specific people (depts.) from the organisation collaborate with external consultant to produce statistical analysis?

n) Are external parties used because of a lack of skills within the organisation and if so, should there be a boost of capacity internally?

Questions around the Statistician

- What is the role of a Statistician? Who qualifies as a Statistician?

 If not known, then give an interpretation from literature of the role of a Statistician.

Statistician

The Oxford Dictionary (2015) defines a statistician as 'an expert in the preparation and analysis of statistics.'

Statistics

Although the term is widely known in the scientific domain, along the lines of big data, Statistics is defined by Kuonen (2015) as 'a science of 'learning from data' (or making sense out of data) and measuring, controlling and communicating uncertainty'.

If known…

- Is there a role of the Statistician in your organisation?

- If yes, what is the role for the Statistician in the use of Big data in marketing strategies?

If no, give my understanding based on literature what the role of the statistician is.

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Although the term is widely known in the scientific domain, along the lines of big data, Statistics is defined by Kuonen (2015) as 'a science of 'learning from data' (or making sense out of data) and measuring, controlling and communicating uncertainty'.

Questions around Collaboration (and the factors influencing it)

j)   What is the process that leadership teams like CCC should follow to implement the decisions made around data and specifically Big data in the future?

k)   Do you think (in your own experience) there are trust issues amongst the different stakeholders that need to be resolved before effectively implementing the decisions of this council?

l)   Do you think (in your own experience) knowledge sharing exists amongst those who have to effectively implement the decisions of this council?

m)   Is the role of leadership to ensure effective collaboration amongst different stakeholders in the organisation?

    v.   If yes, how does this happen?

    vi.   If no, why not?

n)   What role does middle management have to play to ensure effective collaboration amongst different stakeholders in the organisation?

Do have a question or anything else to add to this discussion?

THANK YOU FOR YOUR PARTICIPATION

Appendix D

Questionnaire – Online Survey

<u>Section 1:</u>

Please indicate your industry from the list below. **Select only one industry**

Retail
Financial Services
Banks
Life Assurance
Property Investment
Other, please
specify…………………………..

<u>Section 2:</u>

<u>Being a data driven organisation – Should the definition be paraphrased?</u>

Data-driven decision management (DDDM) is an approach to business governance that values decisions that can be backed up with verifiable data. The success of the data-driven approach is reliant upon the quality of the data gathered and the effectiveness of its analysis and interpretation.

1. On a scale from 1 to 10, in your opinion, how important is using data in decision making?

    Not important 1   2   3   4   5   6   7   8   9   10 Extremely important

2. Does your organisation use data to make business decisions? **Select only one**

        Yes, No, Don't know

3. If yes, then…

What type of data is used in making business decisions? (Select all that apply)

- Customer Data
- Sales Data
- Economic Data
- Environmental Data
- Other, please specify………..

4. Who does the data analysis for the organisation?

- External Consultants

- In-house Analysts
- Both in-house and consultants

5. If analysis is done within the organisation - List the people in the organisation who analyse and interpret the data for decision making purposes. (Select all that apply)

- Statistical Analysts
- Business Analysts
- Business Intelligence (IT)
- Managers
- Executives
- Others………..
- N/A

6. Where in the business are the data driven decisions used? (Select all that apply)
   - Financial Department
   - Marketing Department
   - Product Groups
   - Management Teams
   - Other …………..

7. Who are responsible for ensuring relevant data is available for use in decision making in the organisation? (Select all that apply)
   - Executives
   - Senior Management
   - Middle Management
   - Financial Department
   - IT Department
   - Marketing Department
   - Other ………..

Section 3

Big data

BIG DATA can be defined by the three V's: Volume, Velocity and Variety. Volume speaks of the amount of different types of data from transactional data and more recently, unstructured social media data. The second V, Velocity, talks to the speed at which this data is generated in almost real time and organisations are struggling to deal with this. Variety also defines big data because of the different types of data i.e. unstructured social media data, structured numeric data from traditional databases as well as text data.

1. Does the business have a big data strategy/vision? **Select only one**

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Yes, No, don't know

2. What type of data do you consider as big data? (Select all that apply)

Social Media Data
Transactional Data
Weather data
Customer response data
Customer Research Data
Other ……………………..

Section 2:

Collaboration

1. Do the business units at the organisation work together on projects? **Select only one**

   Yes, No, Not sure, Don't know

2. If yes, how frequently does such collaboration happen? **Select only one**
   - Often
   - Sometimes
   - Infrequently

3. Are there common or shared key performance indicators across the different business units that ensure collaboration amongst the business units? **Select only one**

   Yes, No, Not sure, Don't know

4. Is collaboration with peers across business units encouraged from the top management in the organisation? **Select only one**
   - Yes
   - No
   - Don't know

5. In your opinion, does a culture of collaboration exist at your organisation? **Select only one**

   Yes, No, Don't know

6. If collaboration exists within your organisation, how effective do you think it is on a scale from 1 to 10? **Select only one**

Not effective 1   2   3   4   5   6   7   8   9   10 Extremely effective

7. What do you consider aspects or characteristics that may hinder or promote effective collaboration? **Multiple selection**
    - Organisational Culture
    - Leadership
    - **Communication**
    - Knowledge Sharing
    - Organisational Hierarchy
    - Trust
    - Other (please specify) …………………………………………

Section 3

The next section will take you to some of the influencing aspects of collaboration, leadership, trust and knowledge sharing.

Leadership

1. Does the leadership team influence how business units collaboration in your organisation? **Select only one**

    Yes, No , Don't know

2. Does the leadership team encourage data innovation in your organisation? **Select only one**

    Yes, No , Don't know

Trust

Trust amongst co-workers from different business units is important in coordinated efforts or teamwork in various situations. Trust is usually easy to talk about and it always assumed that it already exists in organisations but it is often vague and frequently misinterpreted.

With this definition of trust in mind, please answer the following question on trust.

1. Are there trust issues amongst the different business units' ito data use? **Select only one**

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Always, most of the time, sometimes, seldom, never

Knowledge Sharing

Knowledge can be defined as 'a combination of experience, values, contextual information and expert insight'. Use this definition to answer the following question. **Select only one**

1. Do the different business units share knowledge generally amongst themselves?
- Yes
- No
- I don't know

2. On a scale from 1 to 10, how would your rate knowledge sharing amongst the different business units' ito data use at your organisation? **Select only one**

    Bad   1   2   3   4   5   6   7   8   9   10 Great

Thank you for completing the survey.

Please submit only one survey.

Submit!

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Appendix E

1. How frequently does such collaboration happen?

The FREQ Procedure

Industry	Q11			
Frequency	Infrequen	Often	Sometimes	Total
Int Retailer	0	1	4	5
Retail	1	10	1	12
Total	1	11	5	17

2. Rate how collaboration with peers across business units is encouraged by top management in the organisation?

The FREQ Procedure

business units is encouraged by top management in the organisation?

Industry	Q13				
Frequency	Always	Often	Rarely	Sometimes	Total
Int Retailer	0	3	1	1	5
Retail	5	4	0	3	12
Total	5	7	1	4	17

3. In your opinion, does a culture of collaboration exist at your organisation?

The FREQ Procedure

Table of Industry by Q14: In your opinion, does a culture of collaboration exist at your organisation?

Industry	Q14		
Frequency	No	Yes	Total
Int Retailer	2	3	5
Retail	3	9	12
Total	5	12	17

4. If collaboration exists at your organisation, how effective do you think it is on a scale of 1 to 10?

The FREQ Procedure

on a scale of 1 to 10?

Industry	Q15						
Frequency	3	4	5	6	7	8	Total
Int Retailer	2	1	1	0	0	1	5
Retail	0	0	3	1	2	6	12
Total	2	1	4	1	2	7	17

5. Are there trust issues amongst the different business units with regard to data use?

The FREQ Procedure

Table of Industry by Q19: Are there trust issues amongst the different business units with regard to data use?

Industry	Q19					
Frequency	Always	t of the time	Never	Seldom	Sometimes	Total
Int Retailer	0	1	0	1	3	5
Retail	1	2	2	3	4	12
Total	1	3	2	4	7	17

6. On a scale of 1 to 10, how would you rate knowledge sharing amongst the different business units in terms of data use at your organisation?

The FREQ Procedure

Table of Industry by Q21: On a scale of 1 to 10, how would you rate knowledge sharing amongst the different business units in terms of data use at your organisation?

Industry	Q21						
Frequency	4	5	6	7	8	9	Total
Int Retailer	1	2	0	1	1	0	5
SA Retailer	1	1	3	4	2	1	12
Total	2	3	3	5	3	1	17

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Appendix F

Fostering collaboration amongst business intelligence, business decision makers and statisticians for the optimal use of big data in marketing strategies.

A study conducted in selected companies in Cape Town, 2015.

Identification………….(for computer use)

Place…………………………

Name of researcher: Louise De Koker

CONSENT FORM

1. I confirm that I have read or received all the details pertaining to the study and understand the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason.
3. I hereby agree to voluntarily participate in this study.
4. I understand that data collected during the study may be looked at by the supervisor of the researcher; I give permission to this individual to have access to the data collected from me.
5. I understand that if I choose to withdraw from the study; I will need to inform the researcher.
6. I am not expecting to get any benefit from being on this research study.

Signature of participant………………….. Date………………………….

Appendix G

Fostering collaboration amongst business intelligence, business decision makers and statisticians for the optimal use of big data in marketing strategies.

A survey conducted at Woolworths in Cape Town, 2016.

 Identification…………. (Anonymous code only known to the Principal investigator)

Place…………………………

<u>STRICTLY CONFIDENTIAL</u>

To be read verbatim to all respondents before the beginning of the interview

Good day Sir/Madame. My name is Louise De Koker. I am a student of the University of the Western Cape.   I am currently working on my research project for a PhD degree and part of it is a qualitative case study of the Woolworths experience regarding fostering collaboration amongst business intelligence, business decision makers and statisticians for the optimal use of big data in marketing strategies.

The information from the interview will not reveal your identity and your responses will be kept confidential. Please be as accurate as possible as the success of the research depends partly on the accuracy of your response to the questions asked in the interview. Also remember that you are free to answer questions or to stop the interview at any time.

For any other queries on this project, you may contact me on 084 6965825.

The interview should take no longer than 30 minutes.

Are you ready to go ahead?

Signature of the Respondent……………………………………

Signature of interviewer……………………..   Date……………………….

Appendix H

A transcript of one of the respondents of the qualitative study

A questionnaire to Middle Managers at Woolworths.

General

13. a) What is the role of Marketing in the organisation?
   A. I think marketing is quite a broad role. Marketing builds the brand, it builds the brand standing, it builds the brand in terms of the mind of the consumer as well as the internal and external stakeholder grips, so there is a whole brand … this perception role that marketing does. Marketing also plays a very clear role in driving commercial value to the business even in engaging with your consumers, driving them into the business to drive value and revenue effectively and then I think marketing also drives the perception of people and measures the perception of people, so in there promote a score is measured but it's under the marketing perception of what a customer or a stakeholder will have of the brand, so it is a very diverse role.

   How can this role be improved to make the business more customer-focused?
   A. I think again you would need to look at marketing from two perspectives, you would look at it from an internal perspective and you will look at it from an external perspective. Marketing should drive personification of our different customer sets and segments very much into our business to become a customer led business so that in whatever we do from a business is always through a customer lens with a specific intent in mind. I think also on an external stakeholder grouping the customers, it is how you engage with that customer and really making it very very personal and almost close the gap between a brand standing and the customers' understanding of that brand.

   b) What is the Role of IT generally in the organisation?
   A. For me IT is an enabler and often also a disabler but IT's intention should be to enable the business to meet current needs and future needs. IT is also there to drive the infrastructural component that keeps the business operational, but IT should also be very clear and understand what the future needs of customers would be and how that translates is for an example would be that the whole world is moving towards digital. If you are not digitalizing your business and you are not enabling your business through IT, you can't meet the customer needs so if I had to summarise what is the role of IT … IT is there to enable businesses meeting their customer needs better.

   How can this role be improved to make the business more customer-focused?

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A. I think IT in terms of the way we reporting business at the moment is very much driven from a product sales perspective, from a business looking at the customer through the lens of what are we selling to the customer, whereas if you place the customer central to your business and all your reporting supports that engagement that enablement of driving more value to the customer and also getting more value from the customer, that is in very different layers, that mean the IT enabling focus is to whatever you do is to make the life of the customer simpler, more convenient and easier to engage and also to access the business in different ways … so for me that is a very different approach, its placing the customer at the heart of an organisation, building your infrastructure around that rather than putting product in the center of the business and then try to marry that with the customer data that sit outside of that world.

c) What is the Role of the Business decision maker (execs) generally in the organisation?

A. Let me just clarify the question … if you asking what are the head of product doing with customer information or ….*not the customer, just what their role is, so the product groups and like Myschool would be part of …and so it's that hat but that is also a product that we are selling …*the product head, the role of that head is to actually get more customers using more of our product on a more frequent basis to maximize the value for the business so the aim for the product head is really selling more merchandise more often at better margins and lower markdowns and meeting the customer needs, so I am really putting that as a ??? because I think very often that is the way we look at it. We firstly look at how do we do all of these thing that the business need and basically what does the customer need, so for me it would be the old four P's effectively that the product heads would bring in, there is the other three P's which we can cover if want.

How can this role be improved to make the business more customer-focused?

A. I think if a buying head truly understands who they are buying for, what are their customer segments in the broader market place that they are buying merchandise for, they would be able to actually meet their needs better, they will be able to provide merchandise that is more acceptable and invariably drive more sales … so this role should know their customer extensively well at every point of that customer's life stage or life location because it is about meeting their needs where they at and being able to provide through the product when and where they need it.

f) How do these stakeholders currently work together in this organisation? **Probing Examples - Project -by- project, ongoing, knowledge sharing, trust, conflict, organisation structure**

A. I think if we have to look at what are the things we using as product in level person, we would use the customer information, we would shape our strategies to drive greater commercial value and we would use the customer information to try and meet their needs to the best of our ability. How are they working together … I think when you are a product head and you look at marketing, you look at it sometimes just with the lens of 'what can marketing do for me to sell more merchandise', 'how can IT enable me to meet the need of the customer better' rather than 'how do we work in collaboration

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to drive the right message at the right time with the right product offer when the customer needs it. *So what you are saying or I am going to summarise it and you can correct me … it is almost like the business decision makers they use marketing but it sounds like a one directional and they use IT, are they giving back, are they proactive, do you have views of how that working relationship goes the other way …*I think often your service areas are purely seen as that, as a service area rather than a complete business partner building a path or a journey together that deliver success, so it is often seen in the old way of marketing, IT, HR are all service areas rather than being a true partner that moves the business forward. *Is that what you think it should be?* I think if you see organisations that really work well together is where all of those key functions are working against a common strategy together to deliver the best value to the business. *So it is all of them working together with a common strategy…*yeah that is my view and each of those different areas would have different building blocks that they need to provide to meet the strategy of the business.

Big Data

14. a) Have you heard about big data?
   A. Yes,

   If Yes….
   b) How did you come to know about this term?
   A.   I think Big data is pretty much one of the key buzz words in the industry or in the world today, I don't think everybody has the same understanding of what Big Data really truly is.

   c) Please define this term- Big data - as you understand it.
   A.   Big Data is essentially what information individuals are creating in the world through every single interaction every single day, be it through your engagement with the business and buying on a credit card, buying on cash, swiping a loyalty card linked into your social media communication, linked into our marketing, linked into how you use websites on your phone, what areas you are actually visiting … it is really a magnitude of your foot print as an individual rolled across every channel of engagement that you use on a daily basis and Big Data is trying to bring all of that together in a structured way that you actually able to mind information from that, that can derive value for the organisation but also for the individual.

   - What type of data is considered as Big data?
     - A.   Your footprint on the website, where you go … on your navigation on your phone, it actually touches and leaves a footprint as to where you have been. Your cell phone has a tracking device wherever you move when it's on, whether you on youtube, on Wi-Fi, all of these things are leaving a footprint so it is a magnitude of different interactions and often it is ….it is conscious and subconscious footprints because some of these you just do, you draw

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money from a ATM it leaves a footprint, you walk through a bank and you leave a footprint, you on a website going to Media24 reading a news clip you leave a footprint … *and I think it is better understood now by people than it was before we did this and we didn't know, but now people are more aware of the data that they leave behind. I think like ten years ago we didn't think and even from the 80's since the ATM was there since the store cards were there, that was something that we could track you on and we could tell something about you ….*and it is millions and millions of transactions that you are doing consciously or subconsciously, the fact that you click to open an email onto something, the mere fact that you are responding to an email leaves a foot print …*yeh that sound very interesting the data just … but know the thing is how do we use such data, do you think we have a handle on it?* I don't think we have. I think we have a better understanding. Are we really optimizing the data that is available, I don't think so. Have we go the tools that allows us to optimize this full picture into air and a 360 view of the consumer, no we don't, so I think it is a journey of discovery and some people are better at it. You are getting tools that is enriching your data but unless you can structurally mind that data in a proper format with the right tools, the fact is that you are going derive very little value from it if you do it in the traditional single minded approach.

- How do we use such data in the organisation?
  A. I think it is about what you set out to gather and you need to very clear as to what strategy you want to meet and again understand that these strategies are evolving far quicker than ever before. So your strategy of gathering and bringing in data that your require, so for instance attitudinal data, comments on face book, you need to very clear that when you bring that data in is how are you going to use it, you need to have a strict intent of 'I want to be engaging with my customer in a far more relevant tone on a relevant content and there for build your data gathering and your data tools to enable that and then to actually be agile enough to be able to change this because consumers will change with all new trends coming in, they change continuously.

- How is data captured, stored and accessed?

d) Interviewer then defines Big data in plain language

- **Big data is an evolving term that describes any voluminous amount of <u>structured</u>, semi-structured and <u>unstructured data</u> that has the potential to be mined for information.**

If No …

i) Explain using the google search example, data collected online, social media data, cell phone data
j) Interviewer then defines Big data in plain language
- **Big data is an evolving term that describes any voluminous amount of <u>structured</u>, semi-structured and <u>unstructured data</u> that has the potential to be mined for information.**

7   a) What should the role of Marketing be in the use of Big data for marketing strategies?
    A. I think marketing should play a leading role, marketing should have their ears on the ground and have the understanding of the change in customer environment and the change in world environment, the stage that we engage with and marketing should play a leading role taking the rest of the business on a journey. Decision makers need to understand how this change in world and change in engagement with consumers are going to impact their business and what does it mean for them. The fact that they would need to make decisions a lot quicker against the set strategy from a customer perspective. Marketing really is the voice of the customer in an organisation. IT is there to help and to enable through technology because they got the expert knowledge and they are generally the people who looks after processes and tool sets and so forth but they need to be very closely aligned with the change in trends and the lead that marketing is providing. At the same time they play a leadership role in technology, so therefore they need to be providing that back into marketing to say this is how we believe we can best meet the need that you identify.

    k) What should the role of IT be specifically in the use of Big data for marketing strategies?

    l) What should   the role of Business decision makers (product group execs) be specifically in the use of Big data in marketing strategies?

<u>Statistical analytics role within the organisation</u>

15. a) As part of your role, have you ever required statistical analysis for decision making?
    A. All the time.

    o) What type of analysis was needed? Do not prompt **Eg. Reporting (Summary statistics), Basket Analysis, Predictive analysis. Etc**
    A. I think just for my personal use if I say from the role that I play, which is product ??? as well as the loyalty practitioner if I can put it that way … for me to really understand our

consumer base, how they engage us, where they engage us, what are their needs, the information the data often helps me understand what those customers are requiring, what they want to be engaged on and how we can sell more merchandise, keep customers more engaged, so analysis for me often confirms an intuition that you have from commercially engaging with the customer and that statistical analysis often can show the gaps where there is opportunities or where there is threats, so data for me is a critical part of what I do.

p) Who (which department) did the statistical analysis?
A. At the moment we working obviously with customer insight analysis team quite extensively (indistinct) teams we use BI to a lot of our reports and a lot of our static reports are automated from BI. The more in-depth analysis is done from the internal analytical team and there is often more questions than what the teams can produce answers quick enough, so I think it is getting the basic reports through BI but then using other analytics to actually compliment what we thinking or trying to understand.

q) Is this function important to have in the organisation? Is it a core function of Woolworths?
A. Critical!   I think is it a core function in our business, very much in my mindset –yes. But if you ask a person selling apples in a store in a rural area it probably would not be as clear to them – at Woolworths. The criticalness of the information although it is lot more important now that what it was a couple of years ago, I think it depends on where you sit in the organisation and your usage of the information and data. *I like the example of someone you use in the rural area with apples, selling apples, it is not important to them. Is it not an indictment on the decision makers for not having gone that far because if he or she understood the importance of data in selling apples they would use that information?* You have intuitive retailers that can sell a lot of merchandise but they go through a process of analyzing their trading environments very effectively on rands and cents and engagements from customers. They do not see enough of the real opportunities so the interconnectedness of a customer and I am going to use my example again … if you know that a customer who is buying apples is also buying most of your lingerie, what are the opportunities … and that you can only get through data insight, so have we driven these insights down to every part of our business, I don't think we have*. So is it we didn't do it because we don't have the tools or there is not enough education and they don't find it useful because they don't understand it or lack of leadership?* I don't think it is a lack of leadership, I think the lack of education of how to use information, the translation of a report into an action is often lacking the insights, so what you finding is that you have people that can read the report but are not able to make the right insight deductions of that and say this is how … interpretation… that whole interpretation – so is there a leadership role? Absolutely!, so as a business we need to be driving information into our core business more and more so that the right information is driven out for the right decision making. *So I know from knowing you, you are a merchant at heart and you like to substantiate with data, so it is almost like we shouldn't lose the gut but we can*

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*complement it … * I think it is very much … and again you have true traders that use information very effectively, too often leapfrog the competition and work quicker with the decision whereas not true traders without information will grow but very small incremental steps so it does not allow you to move ahead quickly if you don't have the opportunity in the information and in the data. *It is almost like if you have good traders and you have good information the combination could be a lot better …*so I would use the synergy definition of exactly that if traders is one, information is another one which is one plus one, if you combine that you are going to get three, if you don't have the ability to bring the two pieces together, because what is the synergy definition … it is really taking this information with your trading ability and coming up with that opportunity that take you forward much quicker which is why I said it leapfrogs, otherwise you will just have reports and traders and they will look at how much have we sold, we sold x lets grow it by another 5% and that will go … whereas if you used your information you would know … but you know what there is another 15 or 20% out there and what is the quickest way and where do we go *let's put the apples with the lingerie and they will pick it up – just to follow up on what you said.*

r) Should all statistical analysis be done internally or should part of this be done externally (using Consultants)?

A. I think there is a combination of the requirement of both. I think you always and I have always have the philosophy that you have to have a strong internal competence but you also need people with the right tool sets and are data scientists and can do a lot more with the data in the consulting world or in an enabled IT world where you got all these tools doing these churning of information and coming out with the key hypostasis, that needs to be fed back into your specialist in your organisation and combined with business, so I always see this as a collaboration … it's a partnership

s) If internally, should the function be centralized or in each business unit?
So you believe it should be a combo so internally it should be strong – should the function be centralized or should it be decentralized within the business units ?

A. I think for me it is a very interesting question because centralized you get the core competency being built in one single place and you have similar people doing similar work constantly engaging with each other and therefore they learn more, having them decentralized to be in the product area meets the need of that product area because that person's focus is very much as to how do I make this part of the business better, so a very in-depth knowledge of that trading area brought together by the knowledge that if you had to push me where would I see it like to be sitting, I think I would probably go with a centralized model with dedicated support analyst for different trading parts of our business so that you get the combined skills sets together but you also have people working specifically on portions of the business that they get to know very well and that you again have a partnership role with the trading part of the

business so that you get the combined skills sets together but you also have people working specifically on portions of the business that they get to know very well and that you again have a partnership role with the trading part of the business.

t) If external consultants are used, how (if at all), should specific people (depts.) from the organisation collaborate with external consultant to produce statistical analysis?

A. I think if I had my preference I would boost capacity internally and I would use consultants to help guide and move the business forward into newer thinking newer opportunities, so it is a guidance role rather than a reliance role.

u) Are external parties used because of a lack of skills within the organisation and if so, should there be a boost of capacity internally?

Questions around the Statistician

- What is the role of a Statistician? Who qualifies as a Statistician?
  A. A statistician for me is often and individual that got all the knowhow of how to use statistics in a very clever way to confirm or to identify opportunities. Often what I find with statisticians and Louise this is not focused at you ☺ it can be very theoretical and the practical application is lacking and therefore I think it is always good that you have a very good statistician working with a very good trading insights person, that they can co-develop opportunities together so have we got enough of them – no I don't think so. Have we got enough confidence in the business to meet our needs, we got way more questions than we got people to answer them. *I like what you said and I agree completely that I am a statistician and I am quite theoretical, my age and my experience help me to be a little bit more practical, I hope, but what do you think the qualifications of such a persons, just that theoretical person, and I like that you need to work with other people but that person …is there a requirement for someone with that theoretical and what would that be in terms of qualifications* …You know what I think, depending on your needs from a business you can have an actuary levelled up individual doing very high level strategic business decisions about for instance acquiring a new business, or what is the value of a data base or what is … whereas a statistician could probably be just a level below that and has the ability to mind that statistics in a way that it now has business value, but it would be agreed that just business need would depend on where that individual engages in the business.

If not known, then give an interpretation from literature of the role of a Statistician.

Statistician

The Oxford Dictionary (2015) defines a statistician as 'an expert in the preparation and analysis of statistics.'

Statistics

Although the term is widely known in the scientific domain, along the lines of big data, Statistics is defined by Kuonen (2015) as 'a science of 'learning from data' (or making sense out of data) and measuring, controlling and communicating uncertainty'.

If known…

- Is there a role of the Statistician in your organisation?

- If yes, what is the role for the Statistician in the use of Big data in marketing strategies?
- A. I think a statistician should be able to bring very complex sets of data together in a way that you can drive out insights that is simple enough for the lowest trader to understand. So it is not just about making it very complex it is also the ability to dilute it into key actions that is stating these are the key opportunities that the data is telling us and these are the things that we should be worried about, so it is using that ability to take data and translate it into insight which then can be developed into strategies to drive value into the business with trading or the product heads.

If no, give my understanding based on literature what the role of the statistician is.

> **Although the term is widely known in the scientific domain, along the lines of big data, Statistics is defined by Kuonen (2015) as 'a science of 'learning from data' (or making sense out of data) and measuring, controlling and communicating uncertainty'.**

A. Well if you look at my previous statements it actually confirms exactly what you just said ….*I just wanted to confirm that so I am glad that my thinking around what a statistician would want to do so I like what you said that there is that theoretical person but in terms of Big data there is different part of your statistical brain need to be used for that …*

Questions around Collaboration (and the factors influencing it)

o) What is the process that leadership teams like CCC should follow to implement the decisions made around data and specifically Big data in the future?
A. I think firstly any decision made at a customer council level should be grounded in a very clear understanding of what Big data needs, with a very clear understanding is to the impact and the opportunity of implementing that what was found in the data in correct way, if we had that in a solid foundation and we prepared to put the necessary resources behind implementation of it, then effectively it will

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confirm your strategic intent of what you discovered in the data to a strategy that is then fully implemented and measured, so for me it is not just about identifying the opportunity, it is also about enabling the rest of the business to successfully implement it.

p) Do you think (in your own experience) there are trust issues amongst the different stakeholders that need to be resolved before effectively implementing the decisions of this council?

A. I think if you take any business at any type of level, not just at a decision making level but also at an implementation level. The level of trust and support or the broad stakeholder group as well as the trust and support for the strategy or the intent that you set out to do is the foundation for success. because the enablers won't work together well enough to deliver at the best possible way for the business, so for me it is a foundation of trust and support of each other against the bricklayer strategy. *Do you think that it exist or there is a value we want to believe in or how far along are we in getting there – no ones perfect* ☺ Firstly I don't thing trust is always 100%, I think trust also evolves because trust is such an emotional, personal thing … you can have 100% trust today and tomorrow 20%, it depends on how that evolvement happens and often trust is built and I like the Coronation ad that says 'trust is earned', based on what you built over time and what you have actually done and you will find that customers move up and down but at minimum you should have a fairly high level of trust across the organisation to be able to deliver …*and amongst the stakeholders ?* Absolutely! So I think you always trust transparency, all of these values can only deliver results if there is a high level of trust amongst those stakeholders that the individuals that are engaged are going to deliver what they said and will do. *On a scale from 1 – 10 where do you rate Woolworths now* ? across which, the Customer Council or …*just as a value amongst stakeholders …*I think it will vary from area to area, I think if you look at Woolworths holistically I would probably say the best case scenario and there is no science behind it, it is probably 7 at best case, I think if you look at group like foods who for years have had a really successful business, the trust would probably be high or depends on how they work together but a lot depends on the leadership … the leadership sets the tone for trust. *Oh perfect! That is exactly what I wanted to hear… but WFS.* Is that a trick question now … so if you ask the question between Woolworths and Financial Services, I think there is a relatively low level of trust and would probably see it (indistinct) because as a business that don't work in a collaborate way, with the same end in mind, and why am I saying the same end in mind is that there end of mind is purely to build a financial services book and a business around it, whereas our end of mind is the customer and making Woolworths better from a customer perspective. If this is an enabler and as an enabler they need to play the role of an enabler rather than dictating the pace for Woolworths. *Whose fault is that?* I think it is a leadership fault.

q) Do you think (in your own experience) knowledge sharing exists amongst those who have to effectively implement the decisions of this council?

A. I think it can be more effective, I think it has improved significantly, I think this whole piece of work we are busy with on nodal analysis and really addressing business challenges and trade issues are forcing people to share information in a collaborative way and looking for solutions that is cross business which is the only way we can resolve some of these big challenges.

r) Is the role of leadership to ensure effective collaboration amongst different stakeholders in the organisation?

    vii. If yes, how does this happen?

        A. I would say it is one of the roles that they have. I think it has to be a structured approach, structured is probably not the right word, but it has to be a conscious approach to work in a collaborative way cross business silos to meet the end in mind of what the Council is intending to develop.

    viii. If no, why not?

s) What role does middle management have to play to ensure effective collaboration amongst different stakeholders in the organisation?

A. It is an openness to share, an openness to collaborate, an openness to mutually agree a plan and deliver it.
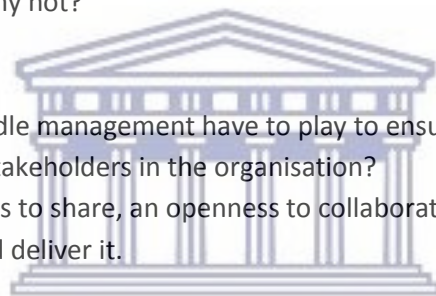
Do have a question or anything else to add to this discussion?

A. It would be interesting to know why you lifted out FS specifically. *No it just came to mind, I just wanted to probe trust issues ☺ and I wanted your view that is not part of the question, I just wanted to know and we can have a discussion ……..*

End

THANK YOU FOR YOUR PARTICIPATION