Risking creativity in innovation

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ABSTRACT

Growing uncertainties, rapid technological advancements, globalisation and increased levels of competition are forcing organisations to find creative ways of addressing business strategies to survive. The rising importance of leveraging data for decision-making directs this study towards knowledge management processes which are fundamental to innovation initiatives and building dynamic capabilities. Innovation is a significant enabler to building competitive advantage and has been widely accepted and recommended as a strategic imperative in this era of change.

A principle characteristic of innovation, and significant enabler of knowledge management, is creativity. Creativity however introduces risk resulting in risk management practices to dilute its effect.

While, the challenge remains for organisations to successfully manage and execute innovation, this research aimed to understand if innovation outputs can be enhanced through the advancement of creativity in knowledge management processes. A quantitative study was used to measure the relationship between knowledge management, innovation and creativity using multivariate data analysis.

Results, herein, reported statistically significant positive correlations between knowledge management and innovation whilst demonstrating a positive moderating impact of creativity. Contrastingly, risk management reported negative moderation thus highlighting the research problem and introducing a new perspective for building dynamic capabilities and enhancing competitive advantage.

Key Words: Innovation, creativity, risk management, knowledge management, competitive advantage

DECLARATION

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other university. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

Janine Ho-Lin

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Chapter 1: Introduction

1.1 Research Problem

Through the process of knowledge management, in innovation, creativity is diluted to mitigate risk which negatively impacts organisations competitive advantage.

1.2 Research purpose

The world of business today is rapidly evolving as result of technological advancements, increased transparency and globalisation. Organisations face the challenges of risk and uncertainties which require novel and creative ways of conducting business, and as a result, innovation has become more vital than ever (Mathews, 2016).

Forbes, one of the world's leading finance, industry, investing and marketing business magazines acknowledges the importance of why businesses should innovate (Henderson, 2017). Henderson (2017) reports that an organisations ability to concern itself with innovation, assists in being more successful and efficient in growing, entering into emerging economies, improving business processes internally and being able to take advantage of greater opportunities that present themselves in this changing environment (Henderson, 2017).

Business are turning to solution driven, fail proof strategies by rethinking their approaches to business processes and considering the inevitable integration of man and machine. This necessity for business to adapt to the changing environment to survive, can be attributed to the manifestation and increasing focus of the Industry 4.0 phenomenon. Consulting firms, industry thought leaders, media and business professionals around the world have developed tools and frameworks to assist businesses in navigating the changing market landscapes. Through insights and frameworks that help to explain the disruption, businesses can expect to encounter, these approaches aim to provide guidance in adopting resilient strategies (Marr, 2018; KPMG, n.d.; Deliotte, n.d.).

As a result, the attention of business has turned more pertinently to innovation and consideration to the value it holds for advancing and guiding businesses through the trends and challenges of the 4th Industrial revolution. The question then arises, that if business are to survive in a rapidly changing environment, where innovation is an enabler to pursuing opportunities and a means to defend market position and competition, how should business approach innovation today? Importantly, consideration to the fact that the market

environment is changing, should the way businesses conduct innovation also evolve to enhance competitive advantage?

1.3 The business need for the study

Innovation is not a new process to the world of business, majority of companies struggle to unlock the full value from this strategic and necessary practice due to the complexities that have been briefly introduced (Tucker, 2001). It is also a process that has been proved to be an enabler in creating competitive advantage for organisations (Gentet, D., Mishra, B. and Mishra, J., 2014; Wrigley, Bucolo and Straker, 2016).

Leveraging data is a way businesses are able to unravel complexities, navigate the multitude of changing market variables and adopt innovation initiatives to delivers solutions for business strategies whilst enhancing competitiveness. (Zhan, Tan, Ji, Chung and Tseng, 2017); Davenport, Barth and Bean, 2012; Brynjolfsson, Hitt, and Kim, 2011; Cao and Duan, 2014; and Elgendy and Elragal, 2016).
Furthermore, the use of data has been empirically found to positively affect product innovation and highlights that organisations require capabilities for the application of data in decision making in order for the value of data to be beneficial (Zhan et al, 2017); Davenport, et al, 2012; Brynjolfsson et al, 2011; Cao and Duan, 2014; and Elgendy and Elragal, 2016).

This brings about a consideration of how employees apply sound decision-making in the process of innovation where authors García-Peñalvo and Conde (2014) identify that it is knowledge management processes and the respective employee capabilities that can either enable or inhibit the success of innovation initiatives through the application of data.

Creativity is the source of innovation (Amabile, 1988) and it is significantly related to knowledge management (Yang & Rui, 2017). Risk management is also prevalent in innovation (Bowers and Khorakian, 2014; Matthews, 2016; Chatzoglou and Chatzoudes, 2017) and it has been detailed that through the knowledge management process, data is most often used to manage risk to mitigate uncertainty (Amabile, 1996; Yang and Rui, 2009; Blomberg et al, 2017). However, creativity at its core, is about novel ideas and newness, which inherently introduces uncertainties. This paradox highlights the research problem in that innovators are constantly faced with deliberating these 2 variables and in so doing, risk management often takes preference.

It is important for organisations to recognise the contrasting characteristics of risk management and creativity in order to manage and inform dynamic capabilities to increase competitive advantage.

1.4 The theoretical need for the study

Dynamic capabilities are the core skills and abilities organisations hold that enable them to achieve competitive advantage (Eisenhardt & Martin, 2000). In the confines of this study, the focus on where dynamic capabilities direct towards, considers the acquisition and management of knowledge (Lin & Tsai, 2016) in decision-making to building competitive advantage for organisations during the process of innovation (Eisenhardt, and Martin, 2000).

The theoretical contribution of this study is to build a deeper understanding of how dynamic capabilities can be enhanced through addressing the outlined research problem and in so doing will identify key areas in the process of innovation and knowledge management where capability building can be addressed to improve the dynamic capabilities of organisations.

While the areas of innovation, knowledge management, competitive advantage, creativity and risk management have been widely considered, no study exists, that focused on all five of these concepts in one study, as well as their interconnected relationships. Namely, the role of leveraging knowledge in the process of innovation to enhance new product creativity in the presence of risk, and the effects this may have on an organisations resultant competitive advantage in market environment. This summarises the context in which dynamic capabilities can be considered and assessed as an academic and business contribution.

1.5 Research aim

The following report will address the importance of innovation and its ability to enhance organisations competitive advantage in the changing environment (Chatzoglou and Chatzoudes, 2017; Wrigley, Bucolo and Straker, 2016). It will outline factors associated with knowledge management highlighting risk management as a common practice to mitigate uncertainties when pursuing innovation efforts (Wang, Lin and Huang, 2010; Bowers and Khorakian, 2014).

This report positions creativity in the process of innovation as the impetus to unlocking organisations potential and enhancing competitive advantage (Chatzoglou & Chatzoudes,

2017; Wrigley, Bucolo & Straker, 2016) and in so doing, compares and contrasts creativity to that of risk management practices through a quantitative analysis.

The author of this research aimed to contribute to the literature by providing empirical evidence of the relationship between knowledge management, innovation and competitive advantage and to highlights the impact the moderating variables has on an organisations competitiveness.

Chapter 2: Literature review

2.1 Introduction

The contents of this literature review are focused at illustrating the role of knowledge management in the context of innovation, and how this impacts businesses' competitive standing. More pointedly, the factors of risk management and creativity are contrasted in the process of innovation, both of which are given rise to through the pursuit of knowledge management efforts. This report seeks to highlight the impact the aforementioned concepts have on competitive advantage as an organisation success measure, in the process of innovation for organisations.

The nature of this review is considered in four broad areas, including an introduction to the context of this study which is centred on innovation. Secondly, the decision-making concerned with pursuing innovation concepts and ideas are introduced through the processes in knowledge management, which will be elaborated on from its antecedent, data. Thirdly, consideration of big data transformation from its raw state into knowledge (the processing of data) introduces how knowledge management processes come to be. Lastly, this report then turns to the two principal concepts of this study, risk management and creativity, and how organisations tend to deliberate these through decision-making in innovation, and the how the outcomes of the decisions made impact performance.

Finally, the most significant concept in the context of this study is that of creativity and its importance in building competitive advantage for businesses through innovation. Creativity will be contrasted to traditional forms of knowledge management in an innovation context which tends to be, and for which empirical evidence supports, risk management. That is, risk management has a direct and negative influence on competitive advantage. This literature review aims to describe the foundation of this study, as it is intended to improve realisation of value from enhancing creativity in innovation for more effective competitive advantage than that of risk management practices.

A review of existing literature is presented herein is based on the above subdivisions, describing the innovation environment with a focus on characteristics of this concept. This is done to highlight the existing body of knowledge surrounding the concept of innovation and the imperatives it has on business successes. In doing so, this study aimed to advance the outcomes of innovation, being a strategic lever for businesses, in building dynamic capabilities and competitive advantage through the advancement of creativity.

2.2 Innovation

Herkema (2003) defined innovation as new ideas or behaviours adopted by organisations, and identified that it can exist as a product or new technology. An element of change is related to innovation and this can be radical or incremental (Herkema, 2003). Similarly, Apaydin and Crossan (2010) comprehensively defined innovation as:

> *"…the production or adoption, assimilation, and exploitation of a value-added novelty in economic and social spheres; renewal and enlargement of products, services, and markets; development of new methods of production; and establishment of new management systems." (p.1155).*

Furthermore, innovation is an organisational process that allows for the discovery of new ideas and strategies, enabling long-term success, enhancement of business model performance and the creation of competitive advantage (Chatzoglou & Chatzoudes, 2017; Wrigley et al, 2016). The importance of innovation lies in the ability of organisations to adapt and demonstrate flexibility to achieve sustainable and thriving operations through re-invention (Wrigley et al., 2016).

This highlights the imperative of innovation to businesses, in that innovation practices are not only pertinent to the rise of new products and services that can enhance the organisation's competitiveness in the market environment (discussed in further detail later in this chapter), but it can also bring about new way of improving processes and efficiencies through enhanced business practices, policies and procedures. These practices not only bring rise to competitiveness, but also enhance profitability and improved returns for businesses and stakeholders.

The innovation process is applied in various ways throughout organisations depending on the preferences of the users, as well as the industries for which innovation is applicable. Organisations may wish to apply innovation efforts to products, services, business models or even organisational processes and structure. Ways of approaching the innovation process and the management thereof have included the application of various methods which are complex to navigate and depending on the industry, innovation requirement or business preference, there is no universal approach to how organisations should approach the innovation process (Louw et al., 2018).

As an example the Stage Gate process generally considers product innovations and guides the users of this model from idea generation through to the launch gate where products enter the market. This process generally applies five stages which specifies that pre-defined

objectives are met before proceeding to the next stage. The decisions which govern whether or not the objectives have been met for a specific project are conducted at the gate stage of each phase. That is, innovation efforts can continue or be withdrawn at any of the 5 gates of the stage gate process. This report doesn't direct towards a particular model, but rather highlights the complexity and proliferation of approaches to innovation.

A thought leader in business and the concepts of innovation and disruptive innovation, Clayton Christensen, considered that there is increased failure of innovation to the market, which he explained was a result of innovations not considering what products/services should be targeted but rather which profiles of customers, which may not be applicable to their purchasing behaviours (Nobel, 2011). Additionally, there is a perspective that innovation efforts may fail due to internal structures, despondency and inadequate management of the innovation process and the absence of knowledge of innovation management (Louw et al., 2018). The aforementioned reasons for failed innovation efforts are important considerations of how innovation processes can be improved; however, this research report turns towards the underlying source of how innovators arrive at these failed attempts.

Innovation is a process that inherently introduces risk; where data has the ability to balance this risk through data-driven insights and knowledge (Wang, Lin & Huang, 2010; Bowers & Khorakian, 2014). Despite the importance of innovation, organisations tend to manage risk and clarify uncertainty through analysing and interpreting data and knowledge. In doing so, organisations tend to deliberate risk and creativity in order to achieve reduced uncertainty (Amabile, 1988; Bowers & Khorakian, 2014; Blomberg, Kallio, & Pohjanpää, 2017).

Creativity is an underpinning necessity to develop unique and differentiated innovation versus market competitors that creates competitive advantage (Amabile, 1988; Chatzoglou & Chatzoudes, 2017; Morais-Storz, Platou, & Norheim, 2018). Since innovation is a mechanism to aid competitive advantage, and is a possible mechanism to mitigate risk, this study aimed to investigate the chasm between innovation and competitive advantage, where creativity and risk are deliberated in the knowledge management process.

More specifically, this study aimed to quantify the benefit of enhancing creativity in innovation versus traditional risk practices. The aspect of creativity will be discussed later in this report to highlight it's imperative to both innovation and competitive advantage, and will be referred to as new product creativity (NPC) for consistency purposes. However, this study will not limit the research to only products but will include all outputs of innovation

processes as outlined earlier, which can include product, service, business model as well as process and organisational structure innovation.

2.2.1 Innovation and competitive advantage

Zhan et al. (2017) reported that the market environment within which organisations operate is rapidly changing and described it as a "product war" where innovation is a "strategic weapon" (p. 519). Bowers and Khorakian (2014) identified some of the drivers of the changing market environment including changing consumer needs, increased globalisation, connectivity, and heightened organisational investment into technology. The reality of ever-present qualities of the changing market complexity, turbulence and uncertainty influences organisations to find new ways to remain competitive, whilst withstanding environmental pressures in the pursuit of innovation efforts. The concept of innovation itself is arguably a market force that stimulates the existence of instability and increased market competition.

Barney (1991) defined competitive advantage as the result of organisations adopting strategies that focus on exploiting internal strengths, avoiding internal weaknesses whilst responding to external opportunities. O'Shannassy (2008) expanded on this definition to add that competitive advantage is only sustainable when a firm is able to foster long-term, differentiated and sustainable strategies that exploit market opportunities which set it apart from its competitors, simultaneously delivering superior traits of resultant products and services.

The process of innovation has been empirically proven to be the impetus to developing strategic resilience for organisations, even for those that are delivering positive results (Morais-Storz et al., 2018). Strategic resilience is an organisational performance indicator that arises from iterative problem solving and the ability for an organisation to reinvent itself in the mist of market threats (Morais-Storz et al., 2018). Similarly, Chatzoglou and Chatzoudes (2017) highlighted that the outputs of innovation enable competitive advantage for business.

Competitive advantage is achieved through an organisation making sound strategic decisions over time to withstand environmental uncertainty, cost reduction and the ability to provide products and/or services distinctly differentiated from those provided for by its competitors (O'Shannassy, 2008). Competitive advantage is different from organisation performance and clear distinctions between the two are drawn in that innovation is a mechanism to create competitive advantage, and competitive advantage is a precursor for positive organisational performance (O'Shannassy, 2008).

As per the aforementioned, it can be argued that the failure of organisations to institute organisational innovation processes would result in shortcomings of strategic resilience and ultimately forsakes opportunities to foster competitive advantage. Therefore, innovation processes continue to be a priority for organisations, regardless of current organisational performance, to ensure continued and sustainable innovations that enhance competitive advantage.

However, in seeking ways to exploit market opportunities and create competitive advantage, organisations are exposed to uncertainties. Such uncertainties include cost management which will determine profitability of a project an organisation undertakes, where the propensity for consumer adoption ultimately determines the viability of product and/or service in market, as well as the uncertainly regarding of the availability of data, information and knowledge that that are transformed to inform in decision-making (Bowers & Khorakian, 2014).

2.3 First data to information, then knowledge

Tuomi (1999) drew clear distinctions between data, information and knowledge, and outlined that data are simple, unfiltered facts used as a basis for reasoning or discussion, which require a transformation process converting data to information. Information is intelligence obtained through the examination of patterns that emerge from the data which leads to the creation of knowledge (Tuomi, 1999).

Data has evolved due to the rise in technology, and the prevalent dispersion and adoption of cellular devices, social media platforms, and the “Internet of Things’ (IoT) (Wamba, Akter, Edwards, Chopin, & Gnanzou, 2015; Zhan et al., 2017). As a result, data has increased in volume, veracity and now emerges from a variety of sources (Intezari & Gressel, 2017). This evolution of data was first termed “big data” by Roger Magoulas from O’Reilly Media in 2005, and is now widely known (Chaorasiya & Shrivastava, 2015). Magoulas did so in order to define a large amounts of data that traditional data management methods could not navigate, process or manage due to the extent and complexity of this data. This notion bears large implications to further studies as to how organisations receive and process big data such that it is usable in its knowledge base and contributes to the veracity upon which decision-making is subsequent to.

These large volumes, veracity and variety of data (big data) is unstructured and often difficult for companies to handle (Davenport et al, 2012). However, access to the influx of

big data presents the opportunity for businesses to conduct real-time analyses and insight gathering to inform decisions on trends and patterns that reveal themselves as and when they happen, as opposed to the traditional forms of data analysis that tends to be delayed (Davenport et al., 2012). Similarly, innovation efforts are enhanced due to a rise in the quantity of and access to big data, owing to valuable insights drawn and interpreted informing decisions, reducing lead times of innovation to market as well as cost reduction in the innovation process (Zhan et al., 2017). The transformation of data to information and then knowledge will be briefly discussed later in this chapter as it plays a vital role in the acquisition of information from which knowledge disseminates (Tuomi, 1999), and this process is a critical resource that informs innovation and decision-making known to be the knowledge management process.

2.4 Knowledge management and decision-making

Since this study directs towards knowledge management processes post the transformation of big data to information and then knowledge (Tuomi, 1999), the aspect of how organisations manage knowledge is an important construct to consider.

Saulais and Ermine (2012) outlined key stages in the knowledge management process and outlined the data transformation stages in innovation processes, where the activity of observation is the initial stage to the transformation of received indicators from perspectives into data. Once data has been captured, an activity deemed “structuration” is applied such that encoding of data into information occurs through conceptual filters (Saulais & Ermine, 2012). Through training and the application of models, information is transformed onto knowledge which forms the basis from which competencies are built and decisions are made (Saulais & Ermine, 2012).

This approach, however, does not consider that while transformation of knowledge is one aspect of data acquisition and is valuable, the aspect of knowledge dissemination after the aforementioned stages and subsequent processes, in innovation, is vital. As in any organisation, multi-stakeholder involvement throughout the process is ubiquitous and alignment to the understanding and interpretation of the data, information and knowledge available, is crucial as this is the basis from which decisions are ultimately made.

This brings about a consideration of how knowledge management processes can significantly enable or inhibit the ability of employees to apply sound decision-making (García-Peñalvo & Conde, 2014). It is argued that knowledge management effectiveness lies in the ability of organisations to identify and manage employee competencies (García-Peñalvo & Conde, 2014). Therefore, the significance of sound knowledge management

practices from which effective decisions are made in organisations, lies in the availability of data and knowledge management processes that enable users to uncover meaningful insights and ensuring the application of knowledge is for improved decision-making.

Decision-making has been characterised as being a choice or series of choices made by individuals or groups in the presence of uncertainty and risk, or a combination of both in the presence of knowledge (Luce & Raiffa, 1957: p. 269). The inherent nature of choices is that there is a trade-off between variables. In building dynamic capabilities, decision-making is one of the success factors to delivering competitive advantage (Eisenhardt, & Martin, 2000), and innovation is an enhancer of competitive advantage (Chatzoglou & Chatzoudes 2017). Dynamic capabilities are described as the competencies fundamental to an organisations competitive advantage, and it is for this reason the chosen theory to under pin this study is dynamic capabilities (Eisenhardt & Martin, 2000).

Furthermore, it is generally accepted that data improves the decision-making process (Brynjolfsson et al., 2011; Cao & Duan, 2014; Elgendy & Elragal, 2016), where much of the literature regarding leveraging data for decision-making in innovation focuses on the management of risks and the maximising opportunities that creates competitive advantage (Burroughs, Dahl, Moreau, Chattopadhyay & Gorn, 2011; Bowers & Khorankian, 2014).

However, little is known about the role of leveraging knowledge in the process of innovation to enhance new product creativity in the presence of risk, and the effects this may have on an organisations resultant competitive advantage in the market environment.

2.5 Knowledge management and innovation

Herkema (2003) positioned innovation as a process of knowledge with the purpose of fostering commercially viable solutions through the acquisition and integration of knowledge, which generates new knowledge and personifies the resultant products and services. Innovation, however, is not only concerned with organisational outputs but can also be solutions to internal processes and systems that enable an organisation to improve its operations such that it increases efficiencies, delivering competitive advantage for the organisation. This type of innovation relates specifically to business model advances. As outlined in the introduction of this research report, this research considers innovation as functional process and measured by the success of its outputs generated by organisations.

Organisations have adopted strategies to enhance their knowledge management capabilities internally by turning to external partners to gain competitive advantage through exploiting resources for innovation (Chesbrough & Crowther, 2006). This is the concept of

open innovation (OI) and has been a central topic to knowledge management in building competitive advantage through innovation. However, it has also been argued that the apprehensive attitudes towards taking risks, as a palpable necessity to avoid failure, have been critical factors in adopting knowledge management practices of this nature in many organisations (Huizingh, 2011). Despite this fact, it has been empirically found that knowledge management efforts in fact enhance the outcomes of innovation through OI in creating competitive advantage for organisations (Cheng & Shiu, 2015).

In the context of this study, it is known that the transformation of data leads to the creation of knowledge (Tuomi, 1999), and knowledge management has been empirically proven to enhance innovation (Obeidat, Al-Suradi, Masa'deh, & Tarhini, 2016), simultaneously balancing risk inherent in innovation (Mathews, 2016; Chatzoglou & Chatzoudes, 2017; Bowers & Khorakian, 2014). Nevertheless, today's organisations tend to leverage data and knowledge to manage risk, resulting in diminishing new product creativity which is a cornerstone to innovation (Bowers & Khorakian, 2014; Zhan et al., 2017). Hence, in the process of innovation where knowledge management processes are concerned, there are trade-offs between risk and new product creativity. The researcher aimed to discover the mediating effect risk management has in comparison to that of new product creativity and their respective outcomes of successful innovation as a measure of competitive advantage.

2.6 Knowledge management and risk in innovation

Risk management in innovation is a recent and relevant topic for business (Bowers & Khorakian, 2014; Mathews, 2016; Chatzoglou & Chatzoudes, 2017). Blomberg et al. (2017) outlined five themes underpinning risk management in innovation 1) management and leadership; 2) knowledge; 3) resources; 4) structure and systems; and 5) spatial or physical dimensions and organisational culture. The importance of knowledge has been made prevalent in managing risk during the innovation process as an attempt to mitigate uncertainties (Bowers & Khorakian, 2014; Mathews, 2016; Chatzoglou & Chatzoudes, 2017).

However, despite the presence of the uncertainties, organisations tend towards risk whilst investigating ways to remain relevant and competitive (Mathews, 2016). Bowers and Khorakian (2014) called for risk management systems during innovation projects which involves information gathering, analysis and the management activity thereof. As such, decisions based on data and information allow organisations to manage risk in determining if an innovation product/service is worth advancing or abandoning, as well as better inform

organisations of its products, customers, and the markets in which they operate (Zhan et al., 2017).

Khan and Vorley (2017) and Chatzoglou and Chatzoudes (2017) outlined that knowledge management, intellectual capital, organisational capabilities and organisational culture have a direct, positive correlation to the innovation process. In the process of risk management (a form of knowledge management) and the application of data-driven decisions is a reported method of mitigating risk (Bowers & Khorakian, 2014), having an effect on organisation innovation. Knowledge management constitutes the implementation of knowledge acquisition, knowledge storage, knowledge creation and knowledge sharing to enhance organisation innovation outputs (Chatzoglou & Chatzoudes, 2017).

While it is acknowledged that risk is an important factor that requires attention in managing innovation efforts, it cannot be ignored that innovation without creativity and uniqueness leads to ambivalent ideas. It can also be argued that innovation itself could be a mechanism to mitigating risk in the context outlined; however, from the literature, the extent to which knowledge management can enhance new product creativity in the process of innovation is not widely researched.

Bowers and Khorakian (2014) and Wang et al. (2010) further acknowledged that risk is central to the innovation process. According to the Hillson (2014), “an uncertain event or condition, that if it occurs, has a positive (opportunity) or negative (threat) impact on project objectives” (para.10). For the purposes of this study, risk relates to the probabilities and uncertainties organisations face, both positive and negative. Too much risk management, however, could suppress innovation efforts as it is often considered to discourage creativity and far-reaching ideas in the process of innovation, affecting resultant products/services (Bowers & Khorakian, 2014).

Resoundingly, Burroughs et al. (2011) recognised that creativity is a distinctive characteristic of innovation and at the point where risk management efforts are concerned, creativity can often problematic. Namely, the process of managing risk in the knowledge management processes is reported as a critical factor to creativity, where creativity is seen to be a barrier to risk management (Blomberg et al., 2017; Yang & Rui, 2009).

2.7 Knowledge management and new product creativity in innovation

Professor Amabile (1988), a thought leader on creativity, defined creativity as “the production of novel and useful ideas by an individual or small group of individuals working together” (p. 126). Amabile further detailed in a report concerning the importance of

creativity to organisations, the characteristics required on motivating organisations for enhancing creativity practices (Amabile, 1996). Of the six creativity stimulant scales identified in this report, freedom was indicated as a strong and significant trait required for higher outputs of creativity. The concept of freedom is described as individuals having control in deciding what work to do or how to do it (Amabile, 1996).

In the presence of risk management, the aforementioned characteristics of freedom often are controlled and managed through parameters in organisational processes in an attempt to mitigate potential failed efforts and seek to remove autonomy from one's ability to make their own decisions on how and what work to do (Amabile, 1996; Yang and Rui, 2009; Blomberg et al., 2017). This argument brings to light practical examples of how organisations tend to dilute new product creativity for the sake of avoiding failure through risk management processes.

However, the rise of creative ideas through organisations' innovation processes act as catalysts to enhance competitive advantage where an organisation is able to benefit from one innovation output to another (Amabile, 1988). While innovation and creativity are closely related and often used interchangeably, creativity as per the aforementioned definition is the production of ideas, whereas innovation processes are the converting of these ideas into outputs (Amabile, 1988; Gurteen, 1998; Blomberg et al., 2017).

By association, innovation and creativity inevitably bring about uncertainties and risk, where the possibility of failure exists. Thus, there is a need for an acceptance of failure, which should be considered inherent in the innovation process in order to enhance creativity at the organisation level (Bowers & Khorakian, 2014; Blomberg, et al. 2017).

The processes applied in transforming creativity into ideas requires the application of data transformation explained previously, where knowledge is important for enhancing creativity at the organisation level (Blomberg et al., 2017; Yang & Rui, 2017).

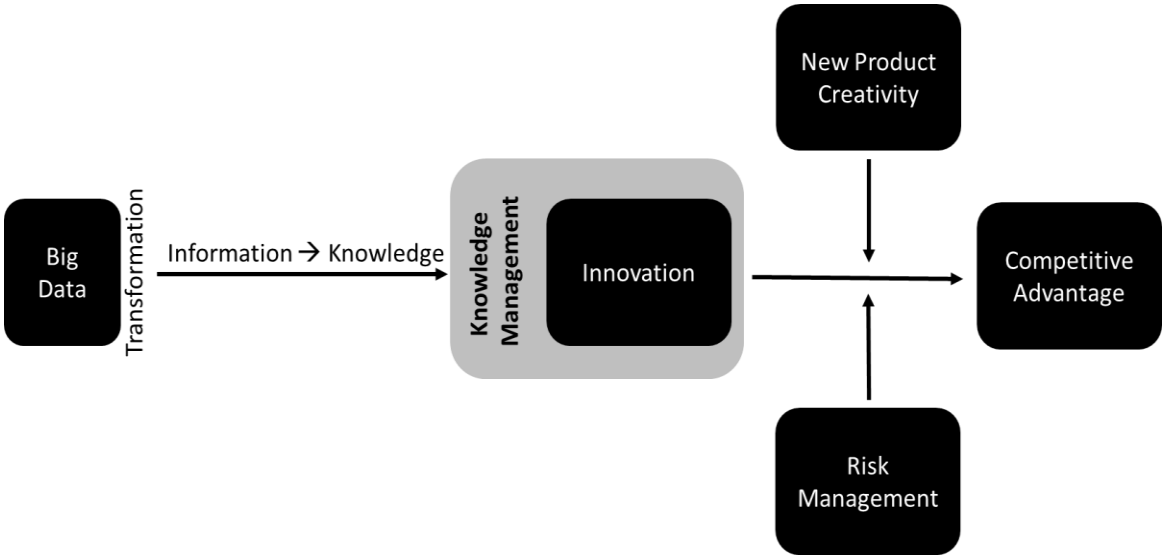
Saulais and Ermine (2012) identified the knowledge value chain (KVC) through an organisation which details the dissemination of data and information through the knowledge management (KM) process. They acknowledged that innovation does not happen by chance but rather through the application of a structured approach to managing the dissemination of knowledge and solicitation of creativity, which enables the emergence of new products, services and approaches (Saulais & Ermine, 2012).

The KVC is an approach to managing the dissemination of data through multifaceted aspects involved in bringing about innovation. KVC deliberates sources and methods of

data acquisition before entering the knowledge management value chain. It also outlines the strategic capabilities required to manage data such that its transformation into knowledge is of value to the organisation. Human capital and organisational competencies are some of the dynamic capabilities required in managing data in the process of innovation to ensure that knowledge acquisition and dissemination are embedded in organisations' innovative activity.

Creativity therefore becomes ever more important as it is acknowledged that it is a known factor not only in creating competitive advantage in innovation (Bowers & Khorakian, 2014; Chatzoglou & Chatzoudes, 2017), but also when applied to organisational strategies and processes to enhance dynamic capabilities (Eisenhardt & Martin, 2000). A research map has been included in the figure below to illustrate this point of intersection.

Figure 1: Graphical illustration of the research model.



2.8 Conclusion

The model is explained as knowledge management capabilities allowing for the effective use of big data which has been transformed from its raw state, to knowledge which is a valuable resource in the process of innovation. This allows organisations to leverage data from multiple sources and in vast quantities to inform decisions that need to be made concerning innovation. In order to achieve this, organisation's should address the contrasting characteristics of risk and creativity, both of which are inherently found in the introduction of innovative and novel ideas, processes, products and services.

The resultant measure explained in this study, and in the illustration above is competitive advantage. From the literature, it is evident that competitive advantage is a sound and widely accepted measure which businesses utilise to benchmark and measure themselves on growth, profitability, efficiency and its standing against competitors in its industry.

The outputs from this model aim to highlight the fact that the way we utilise data, how we chose to make decisions, with respect to risk and creativity, have relative and differentiated impacts on the levels of competitive advantage and ultimately firm performance.

In order to test the notion that there are differentiated impacts on competitive advantage in innovation with respect to risk and creativity, a series of hypotheses and respective research questions are outlined and discussed in Chapter 3.

Chapter 3: Research questions

3.1 Introduction

This study considered a multivariate analysis which refers to statistical techniques that concurrently analyses multiple constructs in a single relationship or set of relationships (Hair, Black, Bain, & Anderson, 2010: p. 3). Constructs from this study were considered in distinct assessments through outlining research questions, where each were addressed by individual hypotheses.

For multivariate analysis, the assumptions were that all variables are multivariate normal and the combined effect of two variables are multivariate normal. (Hair et al., 2010, p. 363)

The hypotheses applied are described below per research question with assumptions specific to each research question.

3.2 Research questions

Research Question 1: Is there a direct, positive relationship between knowledge management (independent variable) and innovation?

H_1: Knowledge management has a significant positive impact on innovation.

It is widely accepted that data improves the decision-making process (Brynjolfsson et al., 2011; Cao & Duan, 2014; Elgendy & Elragal, 2016), and that knowledge arises as a result of the transformation of data into information and then knowledge (Tuomi, 1999).

Additionally, the importance of knowledge in enhancing the innovation process at the organisation level exists (Cheng & Shiu, 2015; Obeidat et al., 2016; Wrigley et al., 2016; Chatzoglou & Chatzoudes, 2017). The knowledge management process has also been acknowledged to be the facilitating tool for the transformation of big data to information and unlocking the knowledge (Tuomi, 1999; Saulais & Ermine, 2012), and from which decision-making occurs (García-Peñalvo & Conde, 2014).

This study concentrated on the process of knowledge management and its relationship in the context of innovation, and was therefore an important construct to measure. The researcher attempted to corroborate knowledge management processes in the confines of this study's sample data with relation to the context of innovation.

Research Question 2: Is there a direct, positive relationship between innovation and competitive advantage?

H_2: Innovation has a significant positive impact on competitive advantage.

As has been outlined from the literature regarding leveraging data for decision-making in innovation, much of this tends to focus on the management of risks and pursuing the feasible opportunities which present themselves to organisations and creates competitive advantage for these organisations in the market place (Burroughs et al., 2011; Bowers & Khorankian, 2014).

It has been empirically proven that knowledge management has a direct and positive relationship with innovation (Obeidat et al, 2016). Thus it can be deduced that should innovation be positively influenced as a result of knowledge management processes in the confines of this study, the outcomes regarding competitive advantage of an organisation will be subjected to similar results.

This notion supports literature which advocates that the application of innovation in organisations leads to strategic levers for an organisation to use in navigating volatile and changing market environments (Zhan et al., 2017). Innovation has also been stated to be the impetus to developing strategic resilience and will stand organisations in good stead for competitiveness, even if organisations are already delivering effective and positive results (Morais-Storz et al., 2018).

This research question aimed to ensure consistency in the outlined literature review and congruency with Research Question 1, from which strategic decision-making disseminates and enables innovation efforts. Research Question 2, however, turns specifically to the direct outcomes as a result of innovation and how this influences the organisation's competitive advantage.

Research Question 3: Does risk management moderate the relationship between innovation and competitive advantage?

H_3: Risk management moderates the relationship between innovation and competitive advantage.

Bowers and Khorakian (2014) stated that too much risk management could suppress innovation efforts as it often discourages creativity and far-reaching ideas in the process of innovation, affecting resultant products/services. Resoundingly, Amabile (1988), Gurteen (1998), Burroughs et al. (2011) and Blomberg et al. (2017) recognised that creativity is a

distinctive characteristic of innovation and at the point where risk management efforts are concerned, creativity can often be problematic. This research question aimed to seek if risk management does in fact have an effect on the relationship between innovation and competitive advantage. Furthermore, it sought out to measure the relative positive or negative effect it has on this aforementioned relationship.

The importance of this research question lies in the comparative findings that will be uncovered. It aims to draw an inference from the confines of the primary data collected for this study. The aim is not only to confirm the findings in line with the literature, but to contrast and compare risk and creativity more closely in the context of innovation.

Research Question 4: Does new product creativity moderate the relationship between innovation and competitive advantage?

> H_4: New product creativity moderates the relationship between innovation and competitive advantage.

Reiterating the underpinning concept to this study for which empirical evidence has been provided, creativity is a distinctive characteristic of innovation and at the point where risk management efforts are concerned, creativity can often be problematic (Amabile, 1996; Gurteen, 1988; Burroughs et al., 2011; Blomberg et al., 2017). Literature has also demonstrated that creativity is a known factor for creating competitive advantage through innovation (Bowers & Khorakian, 2014; Chatzoglou & Chatzoudes, 2017).

As was described in Research Question 1 where knowledge management is a tool and resource to build dynamic capabilities to enable organisations to enhance firm performance, creativity too has been identified as a key resource to building dynamic capabilities (Eisenhardt & Martin, 2000), and this is the point of interception where this study aimed to build deeper insight to both business and academic knowledge.

The importance of the results contained in Research Question 4 will allow business and academics to consider that while risk management practices are essential to mitigating potential failures from innovation projects, the possibility that advancing creativity efforts to a larger extent could benefit innovation projects and, in the long term, the competitiveness of organisations.

Chapter 4: Research methodology and design

4.1 Introduction

The purpose of this chapter is to outline the tools and techniques that were used to uncover the relationships between the variables as outlined in Chapter 3. A series of multivariate data analyses were applied in order to identify the outcomes and findings of this study that would not otherwise been observed (Hair et al., 2010). This chapter discusses the methodoly and the design employed in this study and includes the research philosophy which outlines the approach, research type and the strategy, as well as the the time horizon.

Following this is a discussion regarding the selection and application of population, sampling method and size, unit of analysis and the meaurement instrument selected for data gathering and analysis. The techniques and procedure to extrapolate this data from its raw state will be covered along with how data was coded, edited, and analysed.

Further discussion regarding the various statistical tests applied to ensure normaily, validity and reliability of the data are introduced and argued for reasoning and application. Finally the chapter turns to the application and requirement for factor analysis as well as outlines some of the limitations that were observed in the study.

4.2 Research methodology and design

The research methodology applied a layered design which was underpinned by a research approach and philosophy. This was important because the intention of the philosophy informed the research strategy and additionally the data collection methodology required for application (Saunders & Lewis, 2012). Thereafter, the methodological characteristics are outlined and rationalised for application in this study.

4.2.1 Research approach

In order to enable replication of the findings, a layered approach to the design of this research was adopted, where the research philosophy was used to inform the research approach, methodological choices, and strategy. This study was deductive research and aimed to address research questions that resulted from the vast body of literature that exists on innovation, risk management, big data, creativity, and competitive advantage (Saunders & Lewis, 2012).

This approach facilitated explanation of the underlying relationships and concept operationalisation of the topic in business, by testing and analysing existing theory through a series of hypotheses (Saunders, Lewis, & Thornhill, 2009).

This approach was demonstrated by outlining the parameters of the relationship between knowledge management and innovation. It drew evidence form literature to demonstrate this relationship being practical, achievable and measurable. Furthermore, insight and understanding of the comparative impacts risk and creativity have on competitive advantage in innovation were investigated and linked to the aforementioned constructs.

Given the number and complexity of factors influencing the innovation environment, an "entangle" view of knowledge management was assumed, wherein multiple interdependent dimensions were evaluated (Wamba et al., 2017).

Despite this, not all parameters could be accounted for. As a result, the chosen method for facilitating the measurement of the innovation environment was structured surveys as a quantitative method to be able to address as many aspects as was practically possible (Akter, Wamba, Gunasekaran, Dubey, & Childe, 2016; Saunders & Lewis, 2012; Wamba et al., 2017).

4.3 Research philosophy

The research intent, which was directed towards empirically investigating factors that influence the relationship between innovation and competitive advantage, was to assess and understand whether this relationship was moderated by two pertinent practices indicative of innovation processes. Taking this into account, as well as the approach adopted as a result of this, the research philosophy governing the study was centred on positivism (Saunders & Lewis, 2012; Wamba et al., 2017). Saunders and Lewis (2012) stated that a philosophy informs the research strategy and approach, and consequently culminates to inform the methodology which is to be applied. A researcher's philosophy is adopted based on the way they perceive the world (Saunders & Lewis, 2012: p. 104) where, in this study, the researcher was guided by a pragmatic position. Pragmatism means the researcher is directed by realistic interpretation of outcomes, and places significance on research questions and objectives and is guided by what is possible in reality and not just in the confines of the study (Saunders & Lewis, 2012: p. 107).

However, because the research aimed to identify key variables that can be statistically analysed based on constructs described in the literature review, the research philosophy was that of a positivist position which was guided by the law of cause and effect (Collins &

Hussey, 2014). This suggests that the research outcomes of this study are objective and can be measured through evaluating causal relationships in data, thus permitting findings to be stated rather than assumed (Straub, Boudreau, & Gefen, 2004).

Even though bias is inherent to all forms of philosophies, it is noted that due to the researcher's philosophy (pragmatic) being different from the research philosophy (positivist), this may have influenced the degree of bias in the interpretation of results and may be a limitation to the study.

4.3.1 Research type and strategy

This study was based on using a single data collection technique through the distribution of structured surveys to answer the research questions and objectives. This involved the collection of data through a structured, distributed survey to a sizable population (Saunders & Lewis, 2012). A parallel quantitative analysis technique, known as a mono method, was applied in the analysis which enabled the researcher to measure both the individual and collective influencing relationships that risk management and creativity had with competitive advantage in the innovation process (Akter et al., 2016; Wamba et al., 2017). This strategy ensured that the quantitative primary data yielded objectivity and empirically characterised the relationships assessed which led this research report to have a deductive approach.

4.3.2 Time-horizon

Due to time constraints in which this research report was completed, the time horizon approach is a snapshot of the chosen topic, rather than one that considers a prolonged diary approach. Therefore, the time horizon applicable to this research was a cross-sectional study (Saunders et al., 2009).

The cross-sectional study also assisted the researcher to compare variables simultaneously where the analyses of data was not subjected to differences in time, thereby eliminating assumptions relating to this factor.

4.4 Population

By definition, a population is a "complete group" that shares a common set of characteristics and should be pre-defined prior to the sampling process and data collection to ensure relevance (Zikmund, Bain, Carr & Griffin, 2013: p. 387). However, for this study the group was not limited to individuals only and included places and organisations (Saunders & Lewis, 2012)

The population for this study was organisations which involve innovation as part of their operations. As it was impossible to gain access to all organisations in this population, this study made use of non-probability sampling (Saunders & Lewis, 2012) and the sub-set of organisation responses served as a representitive of the larger population, otherwise known as the sample (Saunders & Lewis, 2012; Zikmund et al., 2013: p. 385).

4.4.1 Sampling method and size

Based on the pre-defined characteristics of the sample outlined above, the targeted number of organisations for this study was 120 – 150, from which generalised outcomes and patterns were sought.

The researcher had access to a network of organisations in the product and service innovation sector as a result of being employed across various multinational organisations spanning a ten year period. The survey was distributed to this network through a purposive (judgemental) sampling method by leveraging this network. However, due to the sizable number of respondents required, there was a need to apply a two-part sampling approach to access the appropriate or associated persons in the product and service innovation process, where snowball sampling was adopted. To achieve the sample size quota, alternative sourcing for responses was sought out via LinkedIn (an online business social media platform) and other networking sites to individuals who represent organisations.

4.5 Unit of analysis

The unit of analysis was defined as the “what” or “who” that will provide data (Zikmund et al., 2013). This pre-determined portion of data was defined as a single organisation. While the data was gathered from individuals concerned with product/service innovation within organisations, each respondent represented a single organisation and was the level of analysis from which data was coded from the online survey.

4.6 Measurement instrument

This study was based on using a single data collection technique through the distribution of structured surveys and a parallel quantitative analysis technique, known as a mono method (Saunders et al., 2009). The research design aimed to collect data from the surveys and code primary data into distinguished sets of categories. The constructs that emerged helped explain the relationships between big data, risk, creativity and competitive advantage in the innovation process.

The questionnaires that were distributed to the sample included pre-defined demographic characteristics including innovation type and tenure at the organisation. The construct questioning followed the demographic questions and consisted of 39 questions in total. The constructs measured (with respective numbers of questions): innovation (8), risk (6), competitive advantage (14), knowledge management (7) and new product creativity (4).

Each question allocated for the abovementioned constructs were sourced from various academic papers and a review of this list is included in the questionnaire example in Appendix B.

Through the sourcing of these questions, the researcher was able to identify sub-constructs in order for the questioning to be more relevant to the study. This was not possible for all constructs due to the limitation of pre-existing questions that were applicable to this study. Competitive advantage and knowledge management questions were subdivided to ensure respondents were guided through the surveying process and could identify with the area of focus. The subdivision, and respective question allocation, for each of these two constructs were identified in the literature review and assisted the researcher to ensure questions pertaining to these areas were included and clearly distinguishable in the questionnaire. This was helpful for respondents, and simplified coding and editing of the results later on.

Competitive advantage was subdivided into cost, marketing differentiation, service, strategic performance, and financial performance. In the survey, respondents were asked to select and answer from a seven point Likert scale. The respondents were prompted to compare their organisation's rating to that of competitors in the industry.

Similarly, the construct of knowledge management was subdivided (with its respective questions) per sub-construct which were categorised as knowledge acquisition (4) and knowledge dissemination (3).

Measurement was conducted using an interval ratio scale called the Likert scale. This scale allowed respondents to give a rating of how strongly they agreed or disagreed, based on a measure of their perspectives, with statements that were carefully constructed. The range of perspectives regarding each question arrayed from very positive to very negative (Zikmund et al., 2013: p. 316).

The advantage of using a Likert scale was that vast quantities are data could be measured and analysed, giving a wide response which could be discriminated across positive and negative attitudes. However, the disadvantage of this scale was that, should questions be ambiguous to a respondent or for whatever reason, the respondent did not answer a

question, thus the validity and reliability of the data may have been compromised (Zikmund et al., 2013: p. 317). In addition, the degree or difference in levels of the scale size assumes that each interval is exactly the same and the error that arises is an assumption that the difference between the distinct points are the same (Zikmund et al., 2013: p. 299).

4.6.1 Survey pre-testing

A pilot survey was run by distributing an online version of the questionnaire to approximately 16 organisations to assess inconsistencies in flow, legibility, grammatical errors, and ease of understanding relative to the researcher's intent, and was completed by a candidate with no prior history with this this research project.

4.7 Data gathering process

As it has been outlined above, a survey was the measurement instrument adopted for this study. This was an electronic questionnaire built on a user-friendly online platform accessible remotely by respondents, called SurveyMonkey.com, chosen because it allowed the researcher to design and customise the survey to meet the research requirements. The electronic survey collated data to a central point from which the researcher collected data and exported to SPSS software.

4.7.1 Technique and procedure

Due to the limitations of cost and time to complete the proposed research, coupled with the requirement to gather a sizable response of approximately 150 organisations, the most practical method to distribute the surveys was via an emailed link for self-completion (Fowler, 2014). Attempts to further extend the reach of the survey were taken and the use of networking platforms including LinkedIn, email, and WhatsApp were used to distribute the survey link.

4.8 Data analysis

For data analysis, there were three key steps to transforming raw data into information before it could be analysed which constituted raw data coding, editing and analysis. A data file was created prior to statistical analysis taking place (Zikmund et al., 2013). These processes are explained in detail below

4.8.1 Coding and editing

In performing data analysis, coding allowed the researcher to describe data from the constructs and sub-constructs that were pre-determined from the survey results. Since the sub-constructs were developed using terms drawn from the literature and included in the questionnaire, it ensured that a deductive approach to the findings of this research, enabling the results to be repeatable and generaliseable (Saunders & Lewis, 2012).

To resolve issues that came about due to missing data, editing of raw data constituted converting text answers (string data) to numeric values so that any missing data or respondent mistakes could be captured analytically.

In this study, there were a total of 124 respondents to the structured online survey. Hair et al. (2010) stated that if less than 50% of a questionnaire was complete by a respondent, then that respondent is to be disqualified and the data cannot be used in the total number of respondents for data analysis. Of the 124, 27 respondents had less than 50% completed, and so these respondents were disqualified.

This resulted in 97 useable responses from which data could be analysed. Only four respondents who didn't complete the survey, but had completed more than 50%, required data imputation.

Due to the nature of the descriptive question that requested respondents to specify the type of industry they are aligned to, this criteria was used as an aggregate for imputation to respondents who failed to answer a question(s).

4.8.2 Analysis approach

Since this study was a quantitative analysis using interval or ratio scaled data, a large data set was captured from the survey responses which needed to be organised, summarised, and the important information extracted. As a result, the use of descriptive statistics was applied in the analysis of this study

4.8.2.1 Descriptive statistics

Descriptive statistics are characterised by types of data, of which those important to this study include measure of location, measure of dispersion, and measure of skewness (Wegner, 2016: p. 7)

The measures of location considered the mean numeric data values from the survey results which aided in understanding the average response for a given research question (Wegner, 2016: p. 66). However, with regards to outliers in the data set responses, the measure of skewness considered the median numeric values which are not effected by outliers, resulting in more accurate measures of the central location versus the mean (Wegner, 2016: p. 70). For even narrower measures of the mean, a standard deviation analysis was used to estimate a more precise population mean (Wegner, 2016: p. 182).

Due to the use of the Likert scale, the type of data received are continuous measures assigning values along a range used to assess the intensity of constructs (Zikmund et al., 2013). With regards to missing data from survey responses, as informed by King, Honaker, Joseph and Scheve (2001), missing data from surveys was filled in through imputation using averaged responses. Averaging responses per question from groups of respondents who portray similar characteristics. Where applicable, graphical representation of the data was illustrated through the use of pie graphs.

4.8.2.1 Shapiro-Wilk test for normality

Though Kurtosis and skewness of data represented the distribution of data, a more effective measure is the Shapiro-Wilk test for normality, and allows for the assumption of data distribution to be statistically verified (Shapiro & Wilk, 1965). Additionally, the sample size from this study was larger than 50 and less than 200, which permits the Shapiro-Wilk statistical test to be assumed for testing normality of variances ($p < 0.05$) (Laerd Statistics, 2018).

4.8.2.2 Internal reliability of items and constructs (Cronbach's Alpha)

For the findings of this study to be repeatable and generalisable for academic and business application, the reliability of statistical data requires credibility. Validity in this study was important as helped establish whether data was an accurate measure and truly representative of the results produced. Factors that may have influenced the validity of data were thought out and eliminated prior to analysis (Saunders & Lewis, 2012).

The explicit valuation or measure in relation to a population is frequently impossible (Bland & Altman, 1997). Instead of an explicit measure, the researcher posed a set of questions and consolidated answers to arrive at a single numerical value which became the representation of the final response (Bland & Altman, 1997). As questions were put forward and assessed using a scale, each item measured the same item, correlated to one another (Bland & Altman, 1997; Cronbach, 1951). As a result of internal correlation, reliability was

obtained in the measure, such that the measurement instrument produced consistent results that are repeatable (Cronbach, 1951; Saunders & Lewis, 2012).

Cronbach's Alpha is the most frequently applied coefficient for assessing internal consistency, and is described by the following formula:

$$a = \frac{k}{k-1}\left(1 - \frac{\sum s_1^2}{s_T^2}\right)$$

Where k represents the number of items, s_i^2 the variance of the i^{th} item, and s_T^2 the variance of sum of all the items (Bland & Altman, 1997). In this study, multiple Likert questions were present in one survey, where data was used to formulate the construct most often used (Kline, 2016). This aided in facilitating consistency where data reduction techniques were applied (Kline, 2016).

4.8.2.3 Internal validity of items and constructs

Validity ensures that the measurement instrument accurately measures that which was intended to be measured, and that the results are reflective of what was intended to be measured (Hair et al., 2010; Zikmund et al., 2012). This analysis is critical and provides confirmation that, together with reliability, the assumption is that the data collected is representative, and can therefore be applied within analyses.

Construct validity is mostly concerned when dealing with quantitative studies, such that the construct defines the hypothesis, and that in turn determines the data that should be gathered, as well as how it is gathered (Cronbach & Meehl, 1955). Researchers who apply this method interplay between data and construct to "validate" their investigation (Cronbach & Meehl, 1955). By applying a bi-variate correlation (Pearson or Spearman), internal validity can be explained. The Pearson correlation *r values > 0.35* confirm convergent validity and discriminant validity with *r values < 0.7* (Cortina, 1993). These two validity measures necessitate that each construct being measured highly correlate to each other, and less so with other constructs in the study (Lehmann, 1988). Once this verification has been conducted, observed relationships can be interpreted and will be put forward in the study findings. When conducting these bi-variate correlations, the assumptions applied are for multiple linear regressions, and state that data is normally distribution and that the linearity of relationships exists.

4.8.2.4 Factor analysis of the data

The quantity of variables or items in a construct can be condensed by way of statistical assessment to measure the interdependence between the variables through a technique called factory analysis (Zikmund et al., 2012; Williams, Onsman, and Brown, 1996). The purpose of conducting such an assessment is to determine the underlying structure among the items being assessed, through the questions that have been included in a survey (Hair et al., 2010). This technique has been applied and has allowed the researcher to simplify the analyses through a series of statistical test that possess related methodologies and usability (Beavers, Lounsbury, Richards, Huck, Skolits, & Esquivel, 2013). Additionally, this group of statistical methods assisted in gaining a deeper understanding of the interrelationship between the variables and increases the quantity of variables that were considered (Hair et al., 2010).

There are two categories of factor analysis, the first being exploratory factor analysis (EFA) which was applied in this study. The EFA is a variable reduction technique which constituted a group of statistical analyses taking into account the sample size and Kaiser-Meyer-Olkin test (KMO) to validate the adequacy of the sample (Williams et al., 1996). This was followed with a correlation matrix assessment being conducted prior to factorising the variables using Pearson's *r* correlations values and determined the strength of the relationships and linear relationships between the constructs. A Bartlett's test for sphericity was also considered to determine if the linear combinations exists within the relationships (Beavers et al., 2013; Williams et al., 1996).

Once the above tests were run, factoring the matrix took place through extraction of the linear combinations. This enabled the researcher to understand where the largest amount of variance was amongst the items. The extracted linear combinations presented the items containing the highest amount of variance and were termed factors. This process was done amongst the five constructs and allowed for the researcher to analyse each factor. This study focused predominantly on common factor analysis, as opposed to component analysis, as the researcher aimed to explore the underlying constructs through the items or questions that were reflective of each construct (Beavers et al., 2013)

As with EFA, the second type of factor analysis, confirmatory factor analysis (CFA), requires on multiple tests to determine the acceptability of the model fit and internal convergence and discriminant validity of the constructs. It assisted the researcher in testing the hypotheses included in this study such that the relationship of the items or questions as well as their underlying constructs were in fact present (Suhr, 2006). The chi-square test was

run to understand the variance of the covariance matrices observed and requires a value close to zero to indicate that there is little difference between what was observed and what was expected.

The chi-squared test must deliver a probability level greater than or equal to 0.05 in order for this test to be deemed acceptable (Suhr, 2006). The CFA requires an assessment of model fit, which is conducted via two tests. The first model fit indicator of the CFA technique is the comparative fit index (CFI), which is achieved if the value is greater than or equal to 0.09 (Suhr, 2006; Hu & Bentler, 1999). The root mean square error of approximation (RMSEA) is the second model fit test which is indicated through values that range from 0 to 1 where the smaller this number, the better the model fit (Suhr, 2006).

It is noted, however, that while the CFA was tested, it did not deliver an adequate model fit making it an unacceptable measure for analyses considerations. In this instance, the researcher reverted to interpretation of the results in Chapter 6 by utilising results from the EFA methods (Suhr, 2006; Beavers et al., 2013)

In doing so, the researcher applied a range of underlying assumptions in using EFA outcomes. Some of the assumptions underlying EFA included that the data measured was at an interval or ratio level. The method of the sampling process was random. In observing the relationships between the variables, it is to be considered linear and that each variable is of normal distribution. In the case of combinations of observed variables, a bi-variate normal distribution was assumed as well as the presence of multivariate normality (Suhr, 2006)

4.9 Limitations

While no research study comes without ambiguity, it was acknowledged that validity may be compromised due to the philosophy of the study being underpinned by the law of cause and effect (that is positivist), where ambiguity about the causal direction could threaten the validity of the research finding (Saunders & Lewis, 2012).

Inconsistencies could have resulted due to self-completed surveys leading to misinterpretation of questions by respondents and leading to compromised data.

The use of snowball sampling may have led to respondents having similar characteristics and lead to low levels of variance in the sample.

With the nature of the study, being cross-sectional, it may have introduced bias as it was conducted over a short period of time. This aspect made it impossible to interpret the impact of the constructs over an extended period and to a broader sample size.

Chapter 5: Research results

5.1 Introduction

Chapter 5 explains the results of this study. The sample set will be characterised by introducing descriptive statistics as well as providing context to the data from the survey. Reliability and validity of the data will be explained, followed by subsequent statistical analyses and interpretation of the findings to be presented and described in Chapter 6. The aim of the following chapters is to interpret the constructs underpinning this study and address the research questions described in Chapter 3.

The primary aim of this study was to gain a deeper understanding of whether creativity in the innovation process has a significant influence on the competitive advantage, in comparison to the traditional practices of risk management processes in innovation. This includes understanding the influence of the latter individual moderating relationships on innovation. Since knowledge management is the antecedent to both creativity and risk management, understanding the correlation of knowledge management and these focal constructs are vital to interpreting the results of this study.

The expected outcomes from this study are that the levels of influence which risk management has on innovation in comparison to creativity on competitive advantage are of a negative nature. Conversely, creativity is expected to deliver a positive significant relationship to competitive advantage in innovation.

5.2 Descriptive characteristics of sample data

As outlined by Knofczynski and Mundfrom (2008), the minimum sample size for a multiple regression analysis using two independent variables required is 120. For the purposes of this study, a sample size of 150 was initially sought out, however, despite extensive efforts to gain a larger sample size, this proved very challenging. While the total number of surveys sent out cannot be accurately listed due to the distribution of the survey via multiple online platforms including networking sites, social media, email, and mobile phone communications, a total of 124 responses were collected.

There were no initial screening questions to be considered by respondents prior to answering the survey, however there were two demographic questions that allowed the researcher to identify the type of innovation that respondents were involved with, as well as how long they had worked at their organisation. As reported, there were 124 respondents in total. Of this, a total of 93 were qualified based on the minimum completion rate of 50%.

This equated to 21.77% of the total respondents, or 27 single responses being disqualified as a result of completing less than 50% of the questionnaire.

There were, however, four respondents who completed more than the minimum 50% rate requirement but did to complete the survey 100%. For the purpose of including these four respondents, data was imputed based on an average of responses for the question. The imputed data for the descriptive statistics accounted for 0,04% where only one response was missing. Of the data set responses to the construct questions, a total of 1017 data points were missing accounting for 21.03% and were also imputed prior to data analyses. Once the data for these four respondents was imputed, they were included into the final data set number and the final number of respondents considered for this study was 97.

Table 1: Summary of data collected and data imputed for application in analyses.

	Total	%
Total respondents	124	100%
Disqualified respondents (< 50% completion)	27	21.77%
Respondents with 100% completion	93	75.00%
Respondents with > 50% and less than 100% completion	4	3.23%
Imputed respondents	4	3.23%
Maximum descriptive responses	248	100%
Maximum construct data responses	5580	100%
Missing descriptive responses	1	0.40%
Missing construct data responses	1017	21.03%

While the demographic statistical questions in the survey were few, it enabled the researcher to gain insight and an overview of the type of innovation that respondents were involved with, as well as their respective tenure at their organisation. It was seen that the responses were diverse across both measures but the skewness of the data enabled the researcher to understand some basic inferences. For the purposes of reporting on the sample data's descriptive statistics, the following question was coded into four distinct categories during data editing: "*How many years have you worked at your organisation?*"

The following four categories were termed as follows: 0 – 5 years, 6 – 10 years, 11 – 15 years and > 15 years. Of the 97 respondents, the highest frequency was at 0 – 5 years with 62% of respondents falling within this tenure. The assumption that was applied in this case, based on their time at an organisation, that respondents were relatively new to the

organisation and tended to be middle to senior management. A key trait of such employees would be operationally and execution orientated with some level of strategic input.

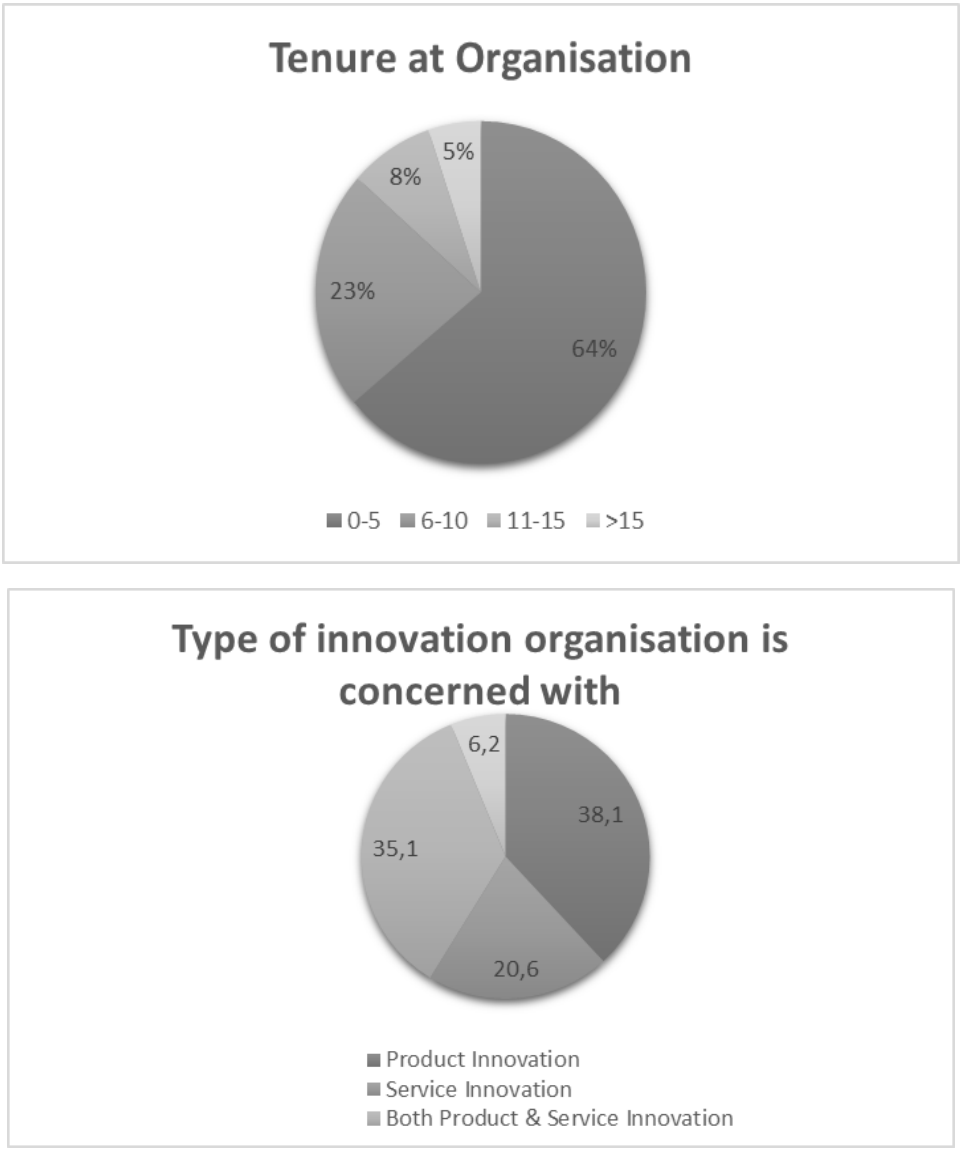
The next largest grouping of respondents held a tenure of 6 – 10 years, representing 22% of the sample set. Similar to the assumptions made of middle to senior management respondents, the assumptions made for respondents in this classification could likely be senior to executive level managers who would be concerned with operational responsibilities but could also be more influential in the decision-making processes at a strategic level. Having been at an organisation for longer they would also hold more intellectual property and know-how of the organisations, and could therefore be assumed to be in a position to contribute to higher order decisions. The mean for this question was 1.55 with a standard deviation of 0.854 and variance of 0.73.

The second grouping of demographic statistics question from the survey sought to identify the type of innovation each respondent was involved with. Pre-determined answers were made available to the respondents for selection. It was found that 38.1% of the respondents were involved with product innovation. Based on the network of respondents the researcher utilised to distribute the survey, it could be assumed that these results align the respondents to the manufacturing industry of consumer goods and consumables, technology, automotive and other product centric industries.

Closely followed was 35.1% of respondents who indicated that they were involved with both product and service innovation. Those that were concerned only with service innovation represented 20.6% of the sample data. Based on the network of respondents the researcher utilised to distribute the survey, it could be assumed that these results align respondents with the services industry such as banking, healthcare, insurance, agency, consulting and other service focused outputs. In both instances, this validated that respondents had interaction and involvement and/or exposure with an innovation process internal to their organisation, allowing for interpretation of feedback to be aligned to this context.

As was outlined in the methodology section, each respondent would represent a single organisation and the level at which analysis will be interpreted.

Figure 2: Descriptive statistics results of sample set regarding demographics



5.3 Normality of survey data

Though Kurtosis and skewness of data represent the distribution of data, a more effective measure is the Shapiro-Wilk test for normality, and allows for the assumption of data distribution to be statistically verified (Shapiro & Wilk, 1965). Additionally, the sample size from this study was larger than 50 and less than 200, which permits the Shapiro-Wilk statistical test to be assumed for testing normality of variances ($p < 0.05$) (Laerd Statistics, 2018). As such, normality in the distribution of individual questions was measured, with each item delivering a significance level < 0.05. Results for the individual measures delivered an average skweness of -0.473 and standard error of 0.245. A detailed table has been included in Appendix11.

5.4 Descriptive statistics of survey constructs

The descriptive statistics reported on in section 5.2 were not included in the following question's assessment, which related to the study's constructs and were assessed via a Likert scale as ordinal variables.

5.4.1 Internal validity of data set (convergent and discriminant validity tests)

The constructs resulting from Cronbach's Alpha, were assessed for internal validity as an additional confirmation prior to further application in analyses. This was done to ensure constructs gathered from the literature review, from multiple sources, retained validity. A Pearson's correlation was conducted, where all questions tested displayed significance within their respective constructs, thus confirming construct validity. Results are summarised in Appendix 12.

5.4.2 Internal reliability of data set (Cronbach's Alpha)

In an attempt to measure the internal consistency of the constructs included in the survey, the Cronbach Alpha was used to explain how closely related the items are within the constructs. For this measure to be deemed reliable and acceptable, the statistical test must be $p > 0.65$ (Zikmund et al., 2013). With reference to the summarised table below, it is evident that all constructs assessed returned Cronbach Alpha scores in excess of 0.7, thus all constructs were reliable (Kline, 2016). More detailed tables of each constructs reliability measures are included the appendix in Table 11.

For the innovation construct, one item was removed as it correlated strongly with another question. Doing so improved not only the Cronbach Alpha but also the KMO.

Table 2: Cronbach Alpha results for internal reliability of constructs.

Construct	Cronbach Alpha	Cronbach Alpha after	Items before	Items after
Innovation (INN)	0.861	0.863	8	7
Risk management (RM)	0.767	N/A	6	6
Competitive advantage (CA)	0.894	N/A	14	14
Knowledge management (KmanALL)	0.916	N/A	7	7
New product creativity (NPC)	0.886	N/A	4	4

5.4.3 Confirmatory factor analyses (CFA)

A CFA was conducted to confirm the convergence and discriminant validity of the study's model. This was completed for the respective constructs. Results of the CFA are summarised in Table 3, and elaborated on in detail in Chapter 6.

All constructs measured were at the acceptable level of 0.05 for chi-squared. The result for the respective constructs identified acceptable root mean square error of approximations (RMSEA) below 0.08 for innovation (INN) and new product creativity (NPC). However this measure for risk management (RM), competitive advantage (CA), and knowledge management (KM) were unacceptable above 0.08. The comparative fit index (CFI) measure for all constructs yielded acceptably above 0.08.

Factor loading outputs ranged from $\lambda = 0.26$ to 1.70. This suggests that factors share a substantial amount of variance with their own items and are loaded more on their own than on other constructs (Akter et al., 2016). This provides evidence of validity of constructs as CFA provides a method for measuring construct validity by comparing how well the literature study supports the factors of the model correlating with observations (Zikmund et al., 2012). A diagrammatic representation of each of the constructs can be referred to in Appendix A.

Table 3: Summary result for confirmatory factor analysis (CFA) per construct.

Construct	SRMR	RMSEA	CFI	Chi-square probability
Innovation (INN)	0.04	0.072	0.972	0.103
Risk management (RM)	0.1269	0.193	0.914	0
Competitive advantage (CA)	0.094	0.114	0.914	0
Knowledge management (KmanALL)	0.066	0.171	0.932	0
New product creativity (NPC)	0.0134	0	1	0.497

Due to the fact that the sample size for application of this technique was insufficient as well as missing criteria for a good model, the researcher was required to conduct an exploratory factor analysis (EFA) to continue assessing the study results and interpretation (Beavers et al., 2013).

5.4.4 Exploratory factor analyses (EFA)

Constructs were designed through the question selection process for the development of the survey, and the data gathered from these were utilised to perform the EFA. Results of EFA by measure are summarised in Table 4 below, and discussed thereafter. Theoretical constructs compiled by the researcher were assessed in relation to the initial model were and comprised of a total of 8, 16, 14, 7 and 4 questions for INN, RM, CA, KM and NPC respectively. In each instance, the questions were extracted from literature, relating to each specific component being assessed. While constructs were pre-existing to the survey, they were not posed as such in the setup of the questionnaire. Additionally, the pre-defined sub-constructs, in some cases, were irrelevant due to a restriction in the number of questions that could be asked as well as questions being of direct interest to this study. While constructs were well established as a result of the questionnaire, a direct comparison of each of the study's constructs means, from literature, was not possible in relation to these data.

Table 4: Results of the exploratory factor analysis

Construct	KMO		SIG	Bartlett	Component extracted	% Variance extracted
Innovation*	0.831	Meritorious	0.0	PCA suitable	2	65.63
Innovation**	0.865	Meritorious	0.0	PCA Suitable	1	55.28
Risk management	0.666	Mediocre	0.0	PCA Suitable	1	46.36
Competitive advantage*	0.842	Meritorious	0.0	PCA Suitable	4	78.36
Competitive advantage**	0.84	Meritorious	0.0	PCA suitable	4	81.11
Knowledge management	0.844	Meritorious	0.0	PCA Suitable	2	81.37
New product creativity	0.833	Meritorious	0.0	PCA Suitable	1	74.62

* before component extracted

** after component extracted

The innovation (INN) construct upon initial EFA test delivered suitable measures across all scales. A meritorious KMO of 0.865 with a suitable Bartlett's test for sphericity at $p = 0.00$ shows significance and that data is factorisable, allowing for PCA analysis (Hair et al., 2010; Zikmund et al., 2012); however, two components were extracted for innovation. Subsequent tests were run when question INN7 was removed.

The correlation of this question with the rest of the questions included in the innovation construct were significantly low. The component matrix shows that the values of the rest of the questions increase as soon as question seven is removed. Once this step was undertaken, the KMO improved slightly, remaining meritorious but now a value of 0.865. The analysis, therefore, was conducted excluding this question. As introduced above, the first EFA for innovation extracted two components which represented 65.63% of the sample variance. Upon running the second analyses which excluded INV7, one component was present and explained 55.282% of the sample variance (Hair et al., 2010; Williams et al., 1996).

The risk management (RM) construct delivered a middling KMO of 0.666 (Williams et al., 1996). The Bartlett's test for sphericity was suitable at 0 and one component extracted that explained 46.36% of the sample variance. This small variance can be explained due to the relatively small sample size of survey respondents (Williams et al., 1996).

The competitive advantage (CA) construct yielded a meritorious KMO of 0.842 and a suitable Bartlett's value was suitable below 0.05 at 0 with four components extracted. Questions CA1 – CA3 representing a sub-construct of cost (C), CA4 – CA6 representing marketing differentiation (MD), and CA7 – CA8 representing service (S).

The sub-constructs' strategic and financial performance were strongly correlated to each other in EFA testing and therefore were consolidated into one sub-constructed termed firm performance. To such effect, CA9, CA11 and CA12 – CA14 represent firm performance (FP). The variance of the abovementioned measure delivered an extracted variance of 78.362%. However, CA10 was showing insignificant correlation to a different sub-construct within competitive advantage and was therefore removed to improve the model fit performance measures. Once removed, the new variance extracted for CA was 81.112%.

The knowledge management (KM) construct yielded a meritorious KMO of 0.844 and a Bartlett's value which was suitable below 0.05 at 0, with two components extracted. Questions KM1 – KM4 characterised knowledge acquisition with KM4 – KM7 characterising knowledge dissemination. The questions from these sub-constructs were strongly correlated with each other and the sub-constructs knowledge acquisition and knowledge dissemination are appropriate for categorising as such. The variance extracted for KM was 81.376%

Similarly, the new product creativity (NPC) construct yielded a meritorious KMO value of 0.833 and like all other constructs, the Bartlett was suitable with a $p < 0.05$ and significant at 0. NPC extracted one component of the questions that were included from the survey and yielded an extracted variance which explained 74.622% of the sample.

5.5 Conclusion

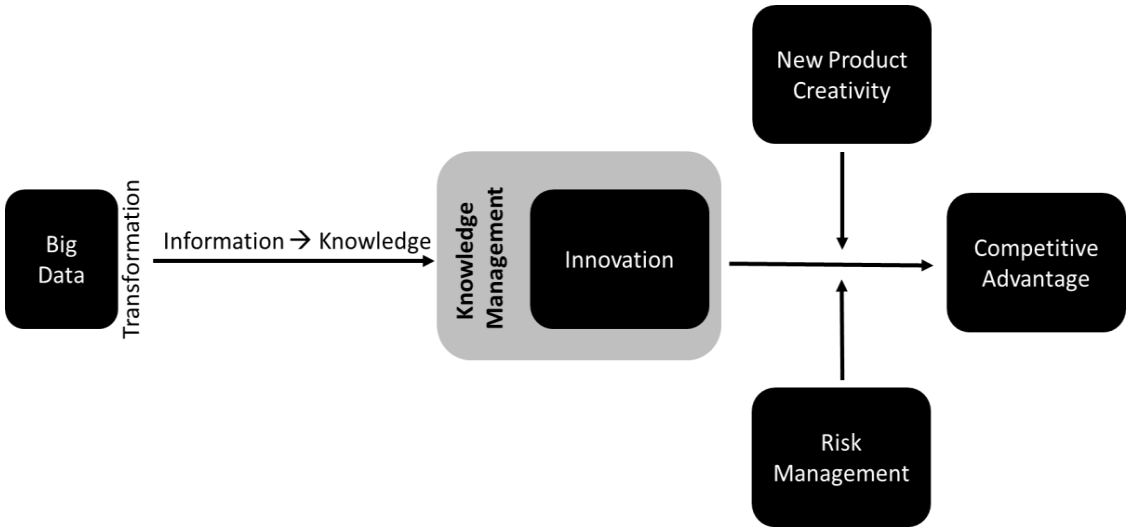
In summary, the research results explained in this chapter allowed the researcher to conduct further analysis and interpretation of the data outputs. Importantly, the moderating effects of RM and NPC on the KM and INN relationship will help to explain the research problem and answer the research questions outlined in chapter 3.

Chapter 6: Results Analysis

6.1 Introduction

The primary aim of this study was to gain a deeper understanding of whether new product creativity (NPC) in the process of innovation (INN) has a greater, significant influence on competitive advantage (CA) in comparison to that of risk management (RM) outlined in the figure below.

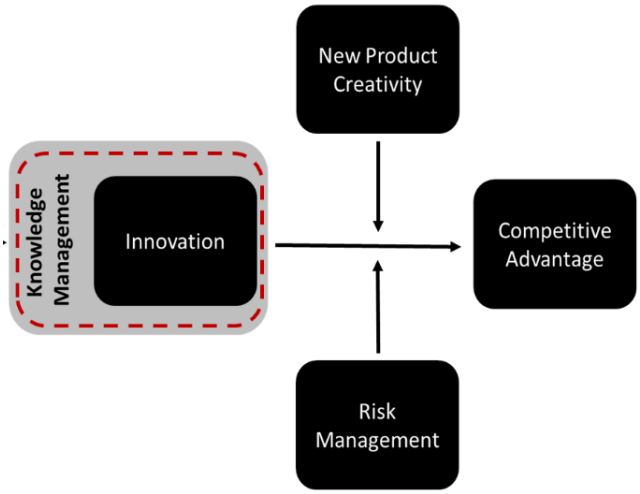
Figure 3: Research study overview.



The approach to arriving at the aforementioned result of the study is introduced by analysing the independent variable, knowledge management, identified as a key capability applied in organisations to facilitate the acquisition and dissemination of data.

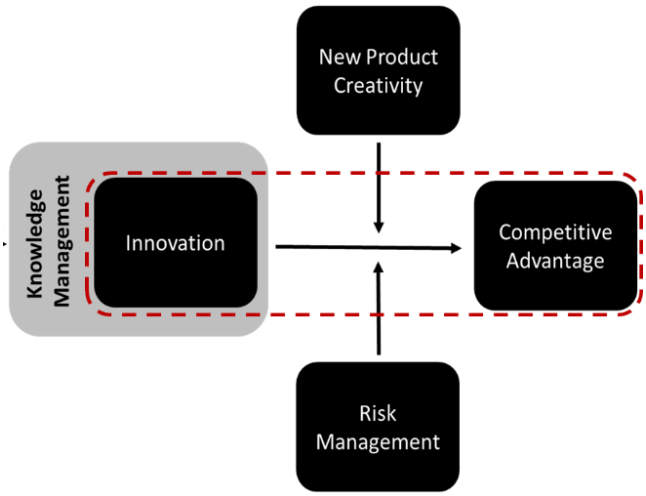
The knowledge management process as described in the literature review is aimed at facilitating the creation and management of knowledge through the organisation for decision-making, in the context of innovation. As a result, the influence of the relationship knowledge management has with innovation will be discussed in Research Question 1 outlined in the figure below.

Figure 4: Research Question 1 overview.



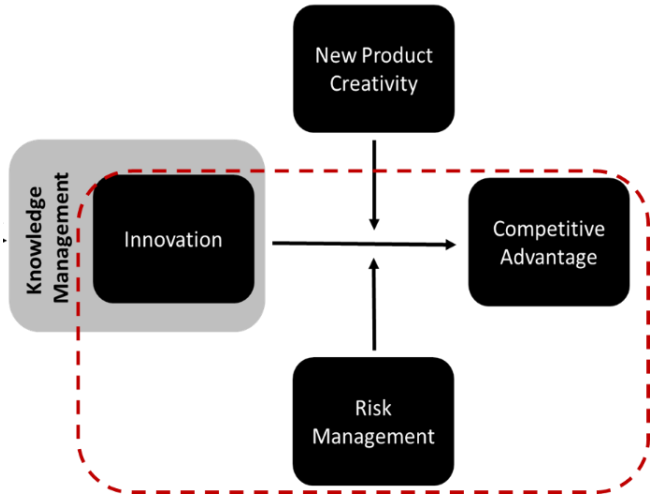
The researcher then concentrated on the relationship innovation (INN) has with competitive advantage (CA), a strategic consideration for organisations ensuring market competitiveness and business success. Significantly, competitive advantage (CA) is the indicator of innovation market success. As such, the aforementioned results are discussed in line with Research Question 2 outlined in the figure below.

Figure 5: Research Question 2 overview.



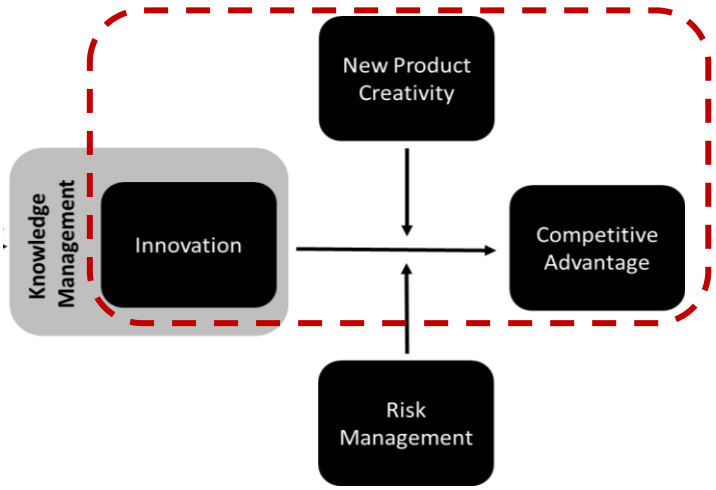
Competitive advantage (CA) was applied as the common output variable and used for comparative purposes when assessing the impact of risk management (RM) in the process of INN, addressed in Research Question 3.

Figure 6: Research Question 3 overview.



Furthermore, competitive advantage was applied in assessing the impact new product creativity (NPC) has in the innovation process outlined in the figure below.

Figure 7: Research Question 4 overview.



The results from Research Question 3 and 4 are compared and contrasted to inform the objective of the study, from which inferences are drawn.

6.2 Research questions

This study considered a multivariate analysis constituting statistical techniques that concurrently analysed multiple constructs in a single relationship or set of relationships (Hair et al., 2010: p. 3). It is important that this approach be considered as the constructs simultaneously form part of the innovation process and the dynamic nature of these

relationships are to be sought out. Constructs from this study were considered in distinct assessments through outlining research questions, where each were addressed by individual hypotheses.

For multivariate analysis, the assumptions were that all variables are multivariate normal and the combined effect of two variables are multivariate normal. (Hair et al., 2010: p. 363).

The hypotheses applied are described and the results discussed below with specific assumptions relating to each research question as outlined in the introduction of this section.

6.2.1 Discussion of Research Question 1

Is there a direct, positive relationship between knowledge management (independent variable) and innovation (dependent variables)?

Research Question 1 sought to identify what the respondents' perceived the relationship is between knowledge management (KM) and innovation. This was essential to the study as it established the causal link between the capability and output of organisations in this context.

As such, KM, from which the two core constructs, risk management (RM) and new product creativity disseminate (NPC), could be assessed in the context of innovation and from which inferences could be drawn in the parameters of this study. The strength of the relationship between KM and INN was also considered in Research Question 1, so as for the latter assessments to be interpreted later in Research Question 2 and 3.

To ensure the constituent parts of KM were accounted for in the research results, the KM construct was formed from two distinct sub-constructs, namely knowledge acquisition and knowledge dissemination. The output data for each of these sub-constructs were defined in distinctive categories in the data editing and coding processes. However, in order for this study to consider the process of KM encompassing both of these sub-constructs, the results were combined to form one representative construct, "knowledge management all" (Kmanall).

From the literature it is widely accepted that data improves the decision-making process (Brynjolfsson et al., 2011; Cao & Duan, 2014; Elgendy & Elragal, 2016), and that knowledge arises as a result of the transformation of data into information and then knowledge (Tuomi, 1999).

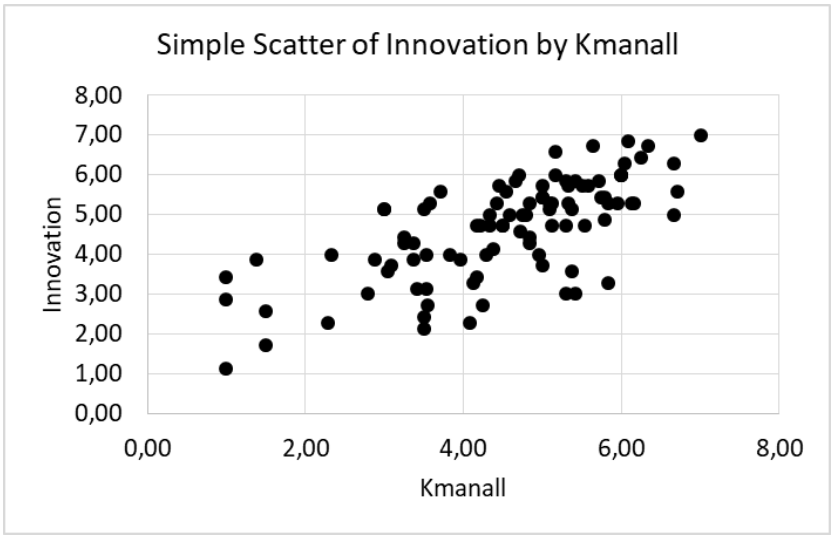
Additionally, the importance of knowledge in enhancing the innovation process at the organisation level exists (Cheng & Shiu, 2015; Obeidat et al., 2016; Wrigley et al., 2016; Chatzoglou & Chatzoudes, 2017). The knowledge management process has also been acknowledged to be the facilitating tool for the transformation of big data to information and unlocking the knowledge (Tuomi, 1999; Saulais & Ermine, 2012), and from which decision-making occurs (García-Peñalvo & Conde, 2014). Therefore, the process of knowledge management and its relationship to innovation, is a central construct to measure. The aim of this research question was to ensure, relative to findings in the literature review, that knowledge management processes in the context of innovation exists in the confined of this study and the respective data outputs from respondents that were captured, are consistent.

Four key assumptions were considered in the interpretation of the aforementioned relationship in Research Question 1 and are outlined below:

Assumption 1 was that both variables in this test were ordinal variables and transcend from the outputs of a Likert scale surveying method.

Assumption 2 was that there is a monotonic relationship, which is that as one variable increases so the other variable increases (refer to scatter plot output results demonstrated in the figure below).

Figure 8: Scatterplot illustrating the positive relationship between Kmanall and INN



Assumption 3 was that a Spearman correlation was applied to establish convergent validity as the data output from these results were not a normal distribution and therefore a Spearman correlation was deemed necessary.

Lastly, the fourth assumption was that there were no significant outliers. Even though a Spearman correlation is not sensitive to outliers, this was tested, albeit the premise was to apply a Pearson correlation. However, the assumption for normality was violated. Refer to section 5.3 for a justification on application of Shapiro-Wilk tests for the normality of survey data.

6.2.2 Findings of Research Question 1

H_1: Knowledge management has a significant positive impact on innovation.

In congruence with Cheng and Shiu (2015), Obeidat et al. (2016), Wrigley et al. (2016), and Chatzoglou and Chatzoudes (2017), Kmanall was found to be strongly correlated to INN with a significant positive relationship between Kmanall and INN at 0.01 significance level. This establishes that a large effect of this relationship exists based on the Coens D result of 0.686 (Zikmund et al., 2013). This thus confirms the base capability and assumption that KM does have a significant and a positive impact of INN. A summary of the result of the assessment of this relationship are included in the table below.

Table 5: Assessment results of the relationship between Kmanall and INN.

Correlations

			Kmanall	Innovation
Spearman's rho	Kmanall	**Correlation Coefficient**	1.000	.686**
		Sig. (2-tailed)		0.000
		N	97	97

**. Correlation is significant at the 0.01 level (2-tailed).

Given the preceding results, it can, therefore, be inferred that KM in the innovation process enables competitive advantage (CA) efforts (Cheng & Shiu, 2015). However, as with Research Question 1, the researcher intended to ensure consistency with literature in the study's sample data, which led to the need for testing and measurement of Research Question 2.

6.2.3 Research Question 2

Is there a direct, positive relationship between innovation (independent variable) and competitive advantage (dependent variables)?

As has been outlined form the literature regarding leveraging data for decision-making in innovation, much of this tends to focus on the management of risks and pursuit of feasible opportunities which present themselves to organisations, which creates competitive advantages for these organisations in the market place (Burroughs et al., 2011; Bowers & Khorankian, 2014).

It has been found, in this study, that KM has a direct and positive relationship with INN. The deduction as a result is that should innovation be positively influenced as a result of KM processes, the outcomes regarding CA of an organisation will be subjected to similar results.

This notion supports literature which advocates that the application of innovation in organisations leads to strategic levers for an organisation to use in navigating volatile and changing market environments (Zhan et al., 2017). Innovation has also been stated to be the impetus to developing strategic resilience and will stand organisations in good stead for competitiveness, even if organisations are already delivering effective and positive results (Morais-Storz et al., 2018).

This research question aimed to ensure consistency in the outlined literature review and in congruence with Research Question 1 from which strategic decision-making disseminates and enables innovation efforts. Research Question 2, however, turns specifically to the direct outcomes as a result of innovation and how this influences the organisations' competitive advantage as a result.

6.2.4 Findings of Research Question 2

H_2: Innovation has a significant positive impact on competitive advantage.

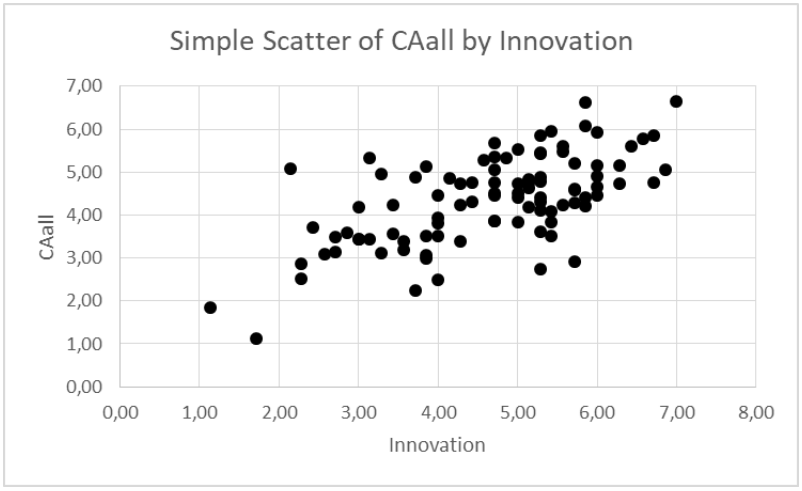
As outlined in the literature review and discussion regarding Research Question 2, this study sought out to measure the relationship between innovation and competitive advantage to establish a causal link with Research Question 1. Theoretically, this relationship has demonstrated significant positive results and the intention herein is to ensure consistency with the literature in the confines of this sample data.

Prior to extrapolating the findings and in drawing inferences from the statistics, a number of assumptions were deduced which underpin these results which were applied and are outlined below.

Assumption 1 considers that both variables measured in this research question are ordinal variables as a result of data outputs received form the surveying method using a Likert scale from respondents.

Assumption 2 is that there is monotonic relationship between these two variables and this has been illustrated in scatter plot graph below: that is, as one variable increases the other variable increases in relation.

Figure 9: Scatterplot illustrating the positive impact on CA by INN.



Assumption 3 was that in order to establish convergent validity, a Spearman correlation was applied as the data output from these results were not a normal distribution and therefore a Spearman correlation was deemed necessary.

Lastly, the fourth assumption was that there were no significant outliers. Even though a Spearman correlation is not sensitive to outliers this was tested, albeit the premise was to apply a Pearson correlation. However, the assumption for normality was violated. Refer to section 5.3 for a justification on application of Shapiro-Wilk tests for the normality of survey data.

The findings show that there is a significant positive relationship between KM and innovation at 0.01 significance level where a large effect was measured via the output of 0.686 Coen's D. The results of these tests are tabulated and summarised below.

Table 6: The relationship between KM and innovation.

Correlations				
			Innovation	CAall
Spearman's rho	Innovation	**Correlation Coefficient**	1.000	.564**
		Sig. (2-tailed)		0.000
		N	97	97
**. Correlation is significant at the 0.01 level (2-tailed).				

The findings of this research question accept the null hypothesis and are in line with the findings in existing literature as outlined in the discussion of this study and question. It can therefore be concluded that innovation does in fact yield higher levels of competitive advantage for organisations. In drawing a linear, causal inferences together with Research Question 1, in can also be suggested that through knowledge management practices innovation efforts yield higher, positive levels of competitive advantage.

Drawing further insight into the first two research questions, dynamic capabilities regarding competitive advantage lie in an organisation's ability to foster sound knowledge management practices from which decisions are made.

6.2.5 Research Question 3

Does risk management (predictor variable) moderate the relationship between innovation (independent variable) and competitive advantage (dependent variable)?

Bowers and Khorakian (2014) state that too much risk management could suppress innovation efforts as it is often considered to discourage creativity and far-reaching ideas in the process of innovation, affecting resultant conceptualised products/services.

Resoundingly, Amabile (1988), Gurteen (1998), Burroughs et al. (2011) and Blomberg et al. (2017) recognise that creativity is a distinctive characteristic of innovation and at the point where risk management efforts are concerned, creativity can often be problematic. This research question aimed to seek if risk management in fact has an effect on the relationship between innovation and competitive advantage. Furthermore, it sought to establish the relative positive or negative effect it has on this aforementioned relationship.

The importance of this research question lies in the comparative findings that are discussed later. It aims to draw an inference from the confines of the data collected which have been formed from this study's sample of respondents. The aim is not only to confirm the findings as has been sought out in the literature of the various topics discussed, but to contrast and compare risk and creativity more closely in the context of innovation.

6.2.6 Findings of Research Question 3

> H_3: Risk management moderates the relationship between innovation and competitive advantage.

Detailed in the literature review and discussion regarding Research Question 3, this assessment pursued to measure the moderating effect RM relationship between INN and CA to establish a causal link with Research Question 1. Theoretically, this relationship has demonstrated significant, negative outcomes (Amabile, 1996; Yang & Rui, 2009; Blomberg et al., 2017) and the intention herein is to ensure consistency with the literature in the confines of this sample of respondents.

Prior to generalising the findings, and in drawing inferences from the statistical outputs, a number of assumptions were presumed which underpinned and applied to these results which are outlined below.

Similarly to Research Questions 1 and 2, the first assumption for Research Question 3 was that there is a linear relationship between the variables. That is that both variables measured in this research question are ordinal variables as a result of data outputs received form the surveying method using a Likert scale from respondents.

Assumption 2 was applied and measured in order for the presence of multicollinearity to be established and for assessing the independent variable to identify if autocorrelation exists. In doing so, the Durbin-Watson test was applicable (Hair et al., 2010). The range of the Durbin-Watson test is 1.5 to 2.5 however the Durbin-Watson test for this analysis was 2.166 (Hair et al., 2010).

Additionally, the variance inflation factor (VIF) requirement is to be < 10 (Glynn & Woodside, 2009); where in this analysis the value is below 10. From the results which are included in Table 7 below, there was no multi-collinearity which is based on the Durban-Watson test outputs. A summarised view of this is tabulated in the model summary in Table 8.

Table 7: Relationship between innovation and risk management.

Coefficients[a]								
		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	3,171	0,365		8,681	0,000		
	CINN	0,481	0,067	0,584	7,153	0,000	0,905	1,105
	CRM	-0,153	0,073	-0,172	-2,102	0,038	0,905	1,105
2	(Constant)	4,461	0,686		6,502	0,000		
	CINN	0,136	0,170	0,165	0,799	0,426	0,136	7,338
	CRM	-0,542	0,190	-0,610	-2,847	0,005	0,127	7,904
	INTRm	0,108	0,049	0,532	2,205	0,030	0,100	10,027
a. Dependent Variable: CAall								

It was found that the R squared change increased by 0.028 with a significance of 0.03 for the moderation effect of RM to the relationship between INN and CA. The total adjusted R squared value resulted at 0.443. This translates to an improvement in the model with the addition of the predicator variable (RM) more than would be expected by chance, even though the significance has demonstrated a slight decrease.

Possible reasons for the decrease of the significance can be attributed to relatively small sample size, the need for more accurate questioning pertaining to risk management, as well as the fact that the study was not confined to only one industry thus terminology included in the survey questionnaire may have been interpreted differently from respondent to respondent.

However, the outcome of an improved R squared value together with an assessment of the correlation coefficient results assisted the researcher to draw an inference that while the relationship between INN and CA is significant and positive, the introduction of RM impacts this relationship to that of a negative result.

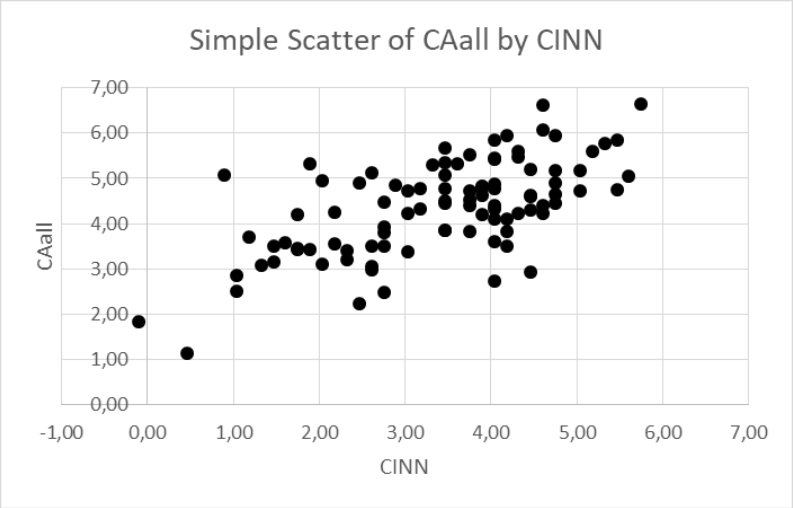
The results from the correlation coefficients table outlining the impact RM has on the relationship between INN and CA is significant at 0.005 with a negative correlation of -2.847.

Table 8: Model summary.

Model Summary[c]										
					Change Statistics					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.658[a]	0,432	0,420	0,78368	0,432	35,812	2	94	0,000	
2	.679[b]	0,461	0,443	0,76806	0,028	4,862	1	93	0,030	2,166
a. Predictors: (Constant), CRM, CINN										
b. Predictors: (Constant), CRM, CINN, INTRm										
c. Dependent Variable: CAall										

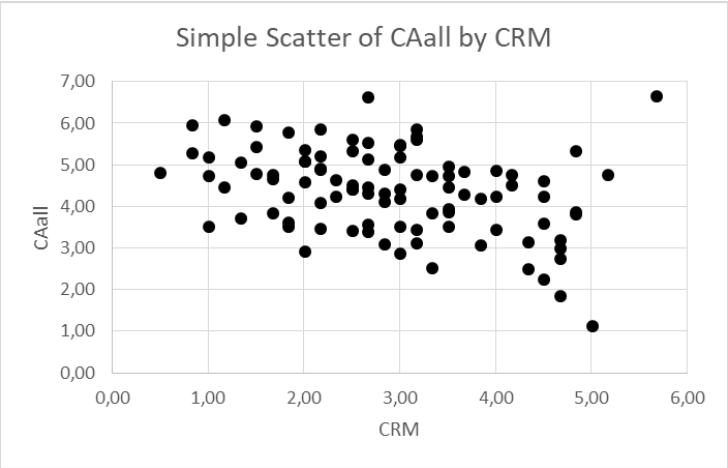
This regression model assessment reconfirms the null hypothesis that RM does in fact have a significant, moderating and negative effect on the relationship between INN and CA. Furthermore, the relationship with INN and CA was extrapolated to illustrate the linear effect of this moderation displaying a positive upward trend and a confirmation of the existence of multicollinearity.

Figure 10: Scatterplot illustrating the positive relationship between CA and INN.



The opposite, however, has been illustrated in the correlation coefficient table and scatter plot diagram below, where the effect RM has on the relationship between INN and CA is negative. This finding is pivotal to the study and will be a focal assessment to consider in the findings for Research Question 4.

Figure 11: Scatterplot illustrating the negative impact on CA by RM



6.2.7 Research Question 4

Does new product creativity moderate the relationship between innovation and competitive advantage?

Reiterating the underpinning concept to this study for which empirical evidence has been reported, that creativity is a distinctive characteristic of innovation and the point where risk management efforts are concerned, creativity can often be problematic (Amabile, 1996; Gurteen, 1988; Burroughs et al., 2011 and Blomberg et al., 2017). Literature has also demonstrated that creativity is a known factor to creating competitive advantage in innovation (Bowers & Khorakian, 2014; Chatzoglou & Chatzoudes, 2017).

As was described in Research Question 1 where KM is a tool and resource to building dynamic capabilities to enable organisations to enhance firm performance, creativity too has been identified as a key resource to building dynamic capabilities (Eisenhardt & Martin, 2000). This is the point of interception where this study aims to build deeper insight to both business and academic knowledge.

The importance of the results contained in Research Question 4 will allow businesses and academics to consider that while risk management practices are essential to mitigating potential failures from innovation projects, the possibility that advancing creativity efforts to a larger extent could benefit innovation projects, and ultimately the competitiveness of organisations, immensely.

For the purpose of Research Question 4, the researcher sought to measure creativity across a diverse range of innovation projects and did not confine the questioning to a particular set of parameters pertaining to a specific industry, country or type of innovation.

However, for the purposes of reporting on the results, a consolidated acronym for the questions encompassing creativity in innovation was termed “new product creativity” (NPC) even though this was not limited purely to product innovation.

6.2.8 Findings of Research Question 4

> H_4: New product creativity (NPC) moderates the relationship between innovation and competitive advantage.

As with each of the research questions included herein, the concluding research question presumed assumptions that were applicable prior to generalising the findings, and in drawing inferences from the statistical outputs. The assumptions underpinning Research Question 4 are outlined below.

Corresponding to all other research questions, the first assumption was that there is a linear relationship between the constructs measured in this analysis. Assumption 2 was applied and measured in order for the presence of multicollinearity to be established and for assessing the independent variable to identify if autocorrelation exists. In doing so, the Durbin-Watson test was applicable (Hair et al., 2010). The range of the Durbin-Watson test is 1.5 to 2.5, however the Durbin-Watson test for this analysis was 2.218 (Hair et al., 2010).

Additionally, the VIF requirement is to be < 10 (Glynn & Woodside, 2009); where in this analysis the value is below 10.

Table 9: The relationship between innovation and new product development

Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.718[a]	0,516	0,506	0,72373	0,516	50,098	2	94	0,000	
2	.730[b]	0,533	0,538	0,71472	0,042	3,385	1	93	0,039	2,218

a. Predictors: (Constant), CNPC, CINN

b. Predictors: (Constant), CNPC, CINN, INTnpc

c. Dependent Variable: CAall

The findings show that the R squared change increased by 0.04 with a significance of 0.039 for the moderation effect of NPC to the relationship between INN and CA. The total adjusted R squared value resulted at 0.538. This translates to an improvement in the model with the addition of the predicator variable (NPC) more than would be expected by chance, even though the significance has demonstrated a slight decrease.

Possible reasons for the decrease of the significance can be attributed to relatively small sample size, the need for more accurate questioning pertaining to creativity in the context of innovation, as well as the fact that the study was not confined to only one industry thus terminology included in the survey questionnaire may have been interpreted differently from respondent to respondent.

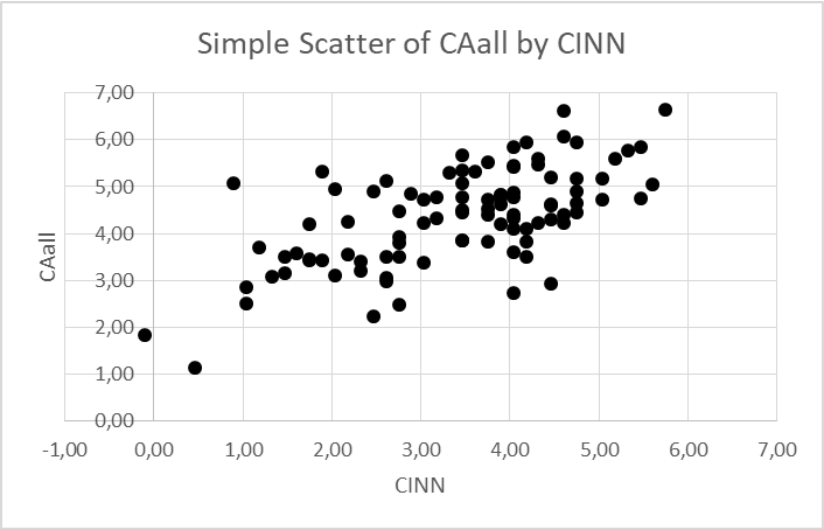
However, the outcome of an improved R squared value along with the results analysed in the correlation coefficients table below show that the introduction of NPC assisted the researcher to draw an inference that while the relationship between INN and CA is significant and positive, the introduction of NPC improves this model due to its positive impact on the relationship.

Table 10: The relationship between innovation and new product development.

Coefficients[a]								
		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	2,104	0,237		8,860	0,000		
	CINN	0,279	0,079	0,339	3,509	0,001	0,553	1,808
	CNPC	0,360	0,078	0,446	4,626	0,000	0,553	1,808
2	(Constant)	1,472	0,416		3,541	0,001		
	CINN	0,523	0,154	0,634	3,394	0,001	0,144	6,960
	CNPC	0,565	0,135	0,700	4,177	0,000	0,179	5,592
	INTnpc	0,136	0,138	0,165	2,199	0,039	0,136	7,338
a. Dependent Variable: CAall								

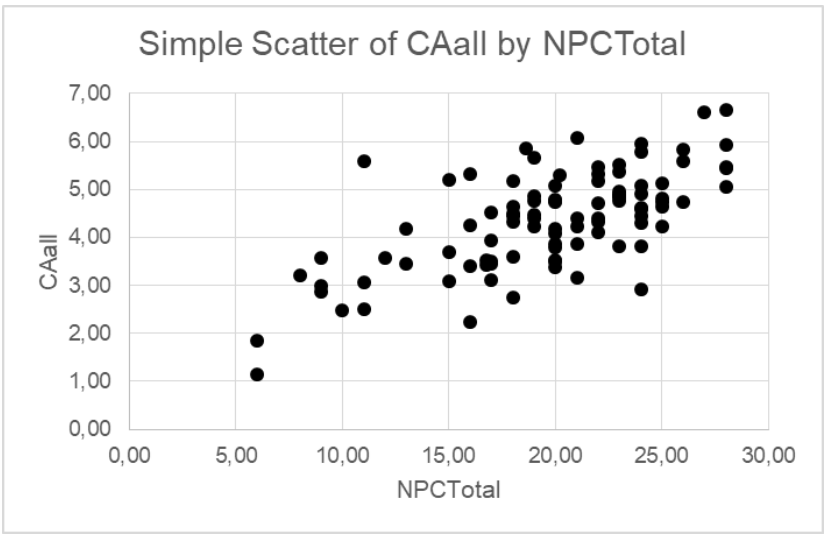
This regression model assessment reconfirms the null hypothesis that NPC does in fact have a positive, moderating effect on the relationship between INN and CA. Furthermore, the relationship with INN and CA was extrapolated to illustrate the linear effect of this moderation, displaying a positive upward trend and a confirmation of the existence of multicollinearity as was outlined in Research Question 3, which is applicable for comparative findings to be conducted.

Figure 12: Scatterplot illustrating the positive relationship between CA and INN.



Similarly, the below scatter plot illustrating the effect NPC has on CA accepts the null hypothesis for Research Question 4 and contributes towards the literature based on the confines of this study. As a result of the structure of this study, this research finding sets the foundation from which a consolidated approach to deliberate the relative, moderating impacts creativity and risk have on organisations performance, on the said relationship.

Figure 13: Scatterplot illustrating the positive impact on CA by NPC.



6.3 Conclusion

The results from this Chapter have confirmed the null hypotheses for each of the research questions presented in Chapter 3 and in doing so the study has not only been able to verify existing findings, but it has contributed to the body of knowledge by consolidating a multitude of independent variables under one model illustrated in Figure 1.

The business of business today is rapidly evolving due to the rise of technologies, increased transparency and globalisation, where organisations face the challenge of managing risk and uncertainties whilst attempting to create competitive advantage and deliver profitable solutions to the market.

The presence of large volumes of data present an opportunity for organisations to leverage various sources of information and knowledge to inform business decisions. An area of business that has become an increasingly strategic tool to employ for creating competitive advantage, is innovation.

However, when considering the foundational aspects that constitute innovation, it would appear that organisations tend to be trivialise creativity for the sake of mitigating risk in the process of innovation, and by doing so the potential output of competitive advantage for those organisations, is diminished.

Chapter 7: Conclusion

7.1 Introduction

The purpose of this chapter is to consolidate the findings of this study and contextualise the statements outlined in the research problem and research statement in Chapter 1. Acknowledgement of the rapid environmental changes organisations find themselves in with increased competition, advances in technology and market dynamics, draws attention to the findings in this study, and how the innovation process, internal to organisations, can be enhanced through consideration of risk management practices and creativity.

This study is unique in that is has been able to draw from an existing body of knowledge across multiple areas involved in the process of innovation to infer results of current topics in business and academics today. While no particular industry or type of innovation was concentrated on for this study, it was the intention to draw inferences at a conceptual level, whilst contextualising the study in innovation relating to business processes.

Competitive advantage was applied as the success measure of an organisation's ability to deliver results through the innovation process where knowledge management practices form a critical tool to facilitate the management of data, information and knowledge through an organisation.

The introduction of risk and creativity to the aforementioned constructs focused the study on the deliberation organisations face when making decisions about which ideas and concepts to implement into the market, or internal to the organisation.

While no causation can be proved, it is important to highlight that this study was aimed at the way in which organisations manage knowledge and extrapolate big data to create this valuable resource. This requires consideration as to how creativity can enhance decision-making for more effective innovation initiatives, both internal and external to the organisation.

Pertinently, the study aimed to highlight the fact that risk management is a prominent consideration present in the context of innovation where organisations tend to deliberate the risk introduced by creativity. In doing so, the study also aimed to highlight the importance of the decision-making process linked in literature and for consideration in further research.

7.2 Principal findings of the study

Statistical results from this study show that organisations consider innovation to be part of their business processes and, based on the rate of response, it can be inferred that the majority consider it an important and strategic initiative that drives business competitiveness. It must, however, be recognised by organisations that the importance of fostering creativity in innovation is a possible method to enhance the competitive advantage both internal and external to the organisation.

To allow for simple interpretation and a pragmatic approach to the factors considered with enhancing competitive advantage in the process of innovation, an enabling tool to facilitate decision-making has been identified in this study which must be recognised as a source from which value can be extrapolated in forging innovation, which is knowledge management. Furthermore, the preceding process of transforming big data into information from which knowledge emanates, can enhance the outcomes of innovation. It is the process of managing knowledge post this transformation stage which has been reaffirmed in the confines of this study, and is a significant enabler to decision-making in innovation initiatives.

As a result of knowledge management, managing risk has been reported as a focal area of this process. However, based on literature and the findings in this study, this could be an inhibitor to unlocking the full potential of innovation ideas. It must be recognised that the concept of risk management is not entirely the root cause of innovation not yielding positive results and can be a source of eliminating failure.

Conversely, it has been identified as a factor that shows a moderating and negative impact on competitive advantage, simultaneous to the positive impact creativity has on competitive advantage in the process of innovation. This insight brings forth the uniqueness of this study which consideration the point in the innovation process where risk and creativity coincide and decision-making tends towards managing risk and not fostering creativity.

7.3 Considerations for management

The findings in this study direct business practitioners, who are concerned with innovation initiatives, towards knowledge management processes. It highlights the requirement for heightened awareness to the approach of risk management practises. Creativity is the focal area of this study and has been highlighted as a result of bringing the pre-existing definition

of innovation to the fore. Additionally, it compares its impact on the success measures of organisations' competitive advantage with that of risk management.

This comparison leads to critical areas in innovation that can be useful in developing teams and the considerations between managing risk and creativity. However, the considerations to managing these factors are not for one or the other to be eliminated but rather that risk management practices are not necessarily the most optimal approach to creating success and enhancing firm performance.

The aspect of knowledge management processes also requires attention to not only be a business process existing as a peripheral tool, but should be considered as a tangible and strategic process that requires deliberate consideration and adoption by associates. Increased understanding and application of knowledge management processes, by its users, holds potential for innovation processes to unlock competitive advantage.

The way in which innovation is measured can also be addressed. While this study applied success measures through the lens of competitive advantage, these measures can be vast and possibly not confined to narrow parameters such as profit driving results or market share performance. Rather, managers could consider that innovation success, and its respective competitive advantage enhancements, could be measured as a firm's ability to defy the risks presented in innovation through advancing creativity.

The above consideration would require management to turn to organisational culture and the way in which organisations foster environments that allow for employees to practice freedom in order to embrace a shift towards a creativity framed perspective.

Furthermore, this aspect addresses the principle theory that underpins this study of managers' ability to influence and positively contribute to building and cultivating dynamic capabilities in teams and organisations.

7.4 Limitations of this study

Several limitations were observed during this study in addition to the reported limitations stated in Chapter 4, and are outlined below:

The reported sample size, N = 97, was identified as a limitation of this study. The validity of test results are considered to be dependent on the size of the sample where larger samples are considered to yield more accurate results (Zikmund et al., 2013). It is for this reason that the results of this study may be considered to be skewed.

Pre-designed questions per construct, which were drawn from existing literature to compile the survey, limited the study constructs to not be specific in the context of innovation. More directly, the constructs of risk management and creativity were more generalised areas of questioning than related to the context of innovation. This could have reduced the outcomes and significance of the relationships found herein. Since the area of innovation is rapidly changing, consideration to the aforementioned constructs require to be redefined.

While the field of innovation is a widely researched field, the concept of creativity is inherently a constituent from which innovations arise. The literature review reported a multitude of definitions for the creativity construct, however, it was found in this report that these characterisations were somewhat outdated in the context of the innovation landscape today. This observation may have limited the scope of this study, where a more accurate assessment and definition of creativity in this context could have yielded more explicit findings.

7.5 Recommendations for future research

While this study found significant results in the area of knowledge management relative to the outcomes of competitive advantage in innovation, it can be suggested that the concept of creativity requires much needed attention in its definition and applicability in innovation. Creativity definitions, and its foundational meaning, was found to be dated in relation to innovation. It is recommended that this principle concept of creativity, in light of the changing innovation environment, be reviewed and updated for more current application.

Additionally, the questions included in the survey, specifically relating to the risk management construct, may have been too broad for the intention to contrast outcomes in innovation. Considerations of formulating valid and reliable questions for more accurate measures of this construct in the innovation context can clarify findings in this report which tended to take a more generic approach to risk management.

The theory underpinning this study, dynamic capabilities, directs towards the ability to unlock potential within teams and associates who are concerned with innovation processes, knowledge management and creating value for organisations from which value can be derived. In doing so, recognition of organisational culture poses a possible area that this study can extend to, to consider the environments that are ideal for fostering creativity.

7.6 Conclusion

With the world evolving and gaining momentum into the fourth industrial revolution, organisations require a new approach to remain competitive and relevant. With everything around us changing, from the way the world communicates, consumes and engages, the way we innovate too needs to evolve.

“Taking risks” has become a phrase popular with motivational speakers, thought leaders entrepreneurs, and successful business people, however it could be time for the world of business to turn to “creativity” as the source of motivation for unlocking true potential for organisations.

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Appendix A: Data analysis results

Table 11: Cronbach-Alpha test for internal reliability by construct

Innovation		
Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0,863	0,864	7

Comp adv		
Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0,894	0,895	14

KM		
Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0,916	0,916	7

NPC		
Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0,885	0,886	4

Table 122: Shapiro-Wilk Test for normality (skewness) and Kurtosis.

Descriptive Statistics					
	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
IN1	97	-0,597	0,245	-0,758	0,485
IN2	97	-0,323	0,245	-1,085	0,485
IN3	97	-0,152	0,245	-1,111	0,485
IN4	97	-0,451	0,245	-0,775	0,485
IN5	97	-0,673	0,245	-0,630	0,485
IN6	97	-0,878	0,245	-0,065	0,485
IN8	97	-0,221	0,245	-1,038	0,485
RM1	97	-0,870	0,245	0,345	0,485
RM2	97	-1,097	0,245	0,525	0,485
RM3	97	-0,878	0,245	-0,233	0,485
RM4	97	-0,950	0,245	0,286	0,485
RM5	97	-0,080	0,245	-1,314	0,485
RM6	97	-0,939	0,245	-0,078	0,485
CA1	97	-0,321	0,245	-0,017	0,485
CA2	97	0,120	0,245	-0,173	0,485
CA3	97	0,076	0,245	-0,460	0,485
CA4	97	-0,121	0,245	-0,612	0,485
CA5	97	-0,373	0,245	-0,848	0,485
CA6	97	-0,054	0,245	-0,882	0,485
CA7	97	0,040	0,245	-0,925	0,485
CA8	97	-0,215	0,245	-0,839	0,485
CA9	97	-0,429	0,245	-0,611	0,485
CA10	97	-0,609	0,245	-0,762	0,485
CA11	97	-0,351	0,245	-0,932	0,485
CA12	97	-0,148	0,245	-0,875	0,485
CA13	97	-0,166	0,245	-0,625	0,485
CA14	97	-0,259	0,245	-0,215	0,485
KM1	97	-0,529	0,245	-0,597	0,485
KM2	97	-0,159	0,245	-1,043	0,485
KM3	97	-0,893	0,245	0,247	0,485

KM4	97	-1,028	0,245	0,414	0,485
KM5	97	-0,702	0,245	-0,715	0,485
KM6	97	-0,535	0,245	-0,772	0,485
KM7	97	-0,368	0,245	-0,542	0,485
NPC1	97	-0,886	0,245	0,380	0,485
NPC2	97	-1,004	0,245	0,677	0,485
NPC3	97	-0,943	0,245	0,790	0,485
NPC4	97	-0,837	0,245	-0,034	0,485

Table 133: Pearson Correlation Matrix – Test for construct validity.

		INNTotal	IN1	IN2	IN3	IN4	IN5	IN6	IN7	IN8
INV Total	Pearson Correlation	1	.763**	.750**	.677**	.743**	.653**	.784**	.584**	.756**
	Sig. (2-tailed)		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	97	97	97	97	97	97	97	97	97

		RMTotal	RM1	RM2	RM3	RM4	RM5	RM6
RM Total	Pearson Correlation	1	.684**	.500**	.596**	.639**	.632**	.589**
	Sig. (2-tailed)		0,000	0,000	0,000	0,000	0,000	0,000
	N	97	97	97	97	97	97	97

		CAdvTotal	CA1	CA2	CA3	CA4	CA5	CA6	CA7	CA8	CA9	CA10	CA11	CA12	CA13	CA14
CA Total	Pearson Correlation	1	.372**	.490**	.600**	.703**	.710**	.665**	.509**	.666**	.782**	.452**	.809**	.763**	.813**	.767**
	Sig. (2-tailed)		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97

		KMTotal	KM1	KM2	KM3	KM4	KM5	KM6	KM7
KM Total	Pearson Correlation	1	.813**	.835**	.818**	.812**	.823**	.793**	.816**
	Sig. (2-tailed)		0,000	0,000	0,000	0,000	0,000	0,000	0,000
	N	97	97	97	97	97	97	97	97

		NPCTotal	NPC1	NPC2	NPC3	NPC4
NPCTotal	Pearson Correlation	1	.878**	.873**	.874**	.828**
	Sig. (2-tailed)		0,000	0,000	0,000	0,000
	N	97	97	97	97	97

Appendix B: Questionnaire example

The following questionnaire is an example of the types of questions and sources of reference they have been retrieved. As outlined, a Likert scale measure will be made available to respondents of the survey and have been prescribed in the table below.

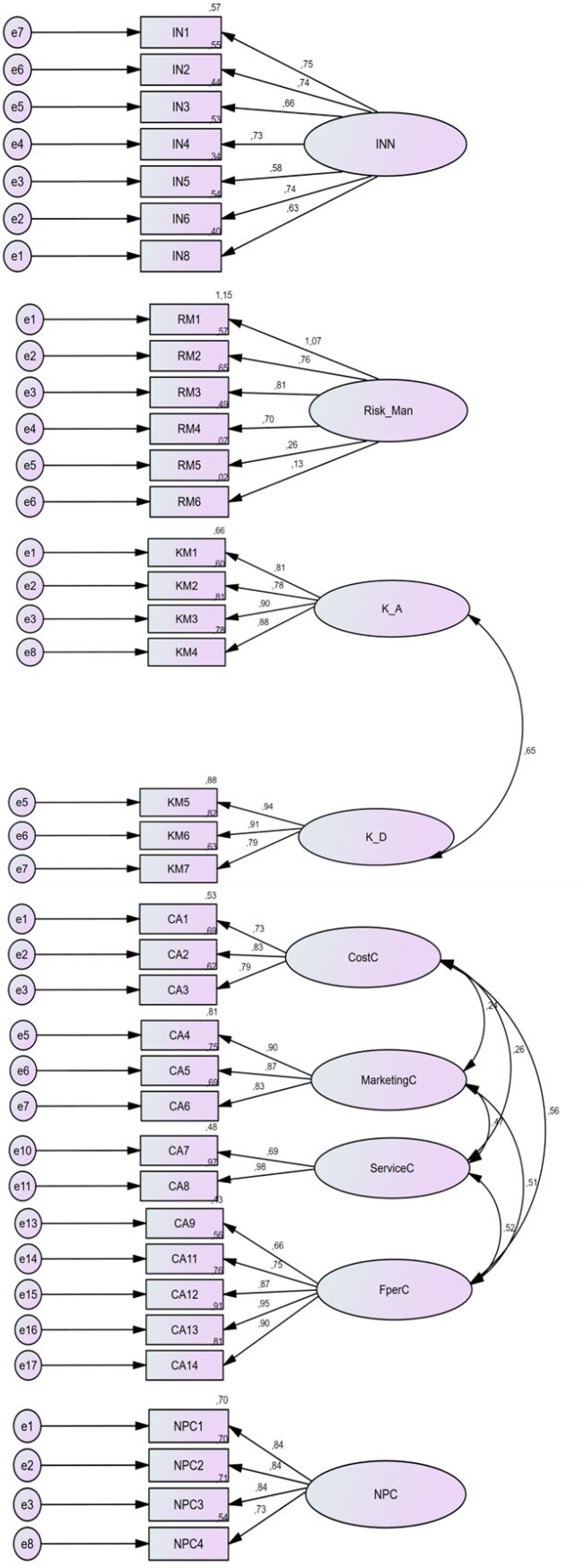
Table 14: Sample questionnaire measuring innovation, risk, competitive advantage, knowledge and creativity using a Likert scale measure.

		Innovation	Measure	Reference
1	INV1	My organisation regularly challenges it's assumptions about customers, businesses models and the competition in its formal planning and product development process	On a scale of 1 to 7, where 1 is strongly disagree and 7 is strongly agree ***compared with competitors***	Govindarajan, V., and Kopalle, P. K. (2006). The usefulness of measuring disruptiveness of innovations ex post in making ex ante predictions. Journal of Product Innovation Management, 23(1), 12–18. https://doi.org/10.1111/j.1540-5885.2005.00176.x
2	INV2	My organisation has a systematic process for actively monitoring emerging trends and developing alternative scenarios that represent either threats or opportunities		
3	INV3	My organisation directly involves customers (existing or potential) in the innovation process as a strategy for identifying articulated and unarticulated needs		
4	INV4	My organisations strategy development processes engage key internal stakeholders, customers, suppliers and outside thought leaders as a way of identifying new opportunities and creating unique business models and strategies		
5	INV5	My organisation has goals and measures stating X% of revenue will come from new products and / services introduced less than Y years ago		
6	INV6	My organisation clearly understands its core competencies and has explicitly outlined the linkage between its long-term strategic goals and its short-medium term innovation investments and technology strategies		
7	INV7	My organisation has adequate staffing, funding, leadership and cross-functional management support to successfully identify and implement new ideas		
8	INV8	My organisation has dedicated resources and formalised processes focused on identifying and developing both incremental and breakthrough innovations		
		Risk	Measure	Reference
9	RM1	Immature risk management processes and lack of accountability impact fulfilment of the company's key priorities.	On a scale of 1 to 7, where 1 is strongly disagree	The Institute of Internal Auditors, North America https://na.theiia.org/stand

10	RM2	The company's product development processes (testing, change control and development methodology) result in the creation of products that customers do not want, are unnecessarily late in reaching the market, or lack integrity.	and 7 is strongly agree	ards-guidance/Public%20Documents/Risk%20Assessment%20Questionnaire.xls
11	RM3	The risk that information technology, hardware, networks, software, people, and processes do not effectively and efficiently support the current and future processing needs of the business.		
12	RM4	The company's technology controls are ineffective in ensuring only approved application programs are loaded into the production environment in accordance with the intentions of management.		
13	RM5	The company's access controls are not effective in preventing inappropriate access to data or systems.		
14	RM6	Lack of relevant and/or reliable information about existing contract commitments may preclude decision makers from making informed decisions about potential incremental commitments and may result in decisions that are not in the best interest of the company.		
Competitive Advantage			Measure	Reference
Cost			On a scale of 1 to 7, where 1 is much worse and 7 is much better ***compared with competitors***	Morgan, N., Kaleka, A., Katsikeas, C.s., 2004. Antecedents of export venture performance: A theoretical model and empirical assessment, *Journal of Marketing*, 68(1), 90-108.
15	CA1	Cost of raw materials		
16	CA2	Production cost per unit		
17	CA3	Cost of goods sold		
Marketing Differentiation				
18	CA4	Improving / maintaining advertising and promotion		
19	CA5	Building brand identification in the market		
20	CA6	Adopting new/innovative marketing techniques and methods		
Service				
21	CA7	Achieving/maintaining quick product delivery		
22	CA8	Achieving/maintaining prompt response to customer orders		
Strategic Performance			On a scale of 1 to 7, where 1 is	Schilke, O., 2013. On the contingent value of
23	CA9	We have gained strategic advantages over our competitors		

24	CA10	We have a large market share	strongly disagree and 7 is strongly agree ***compared with competitors***	dynamic capabilities for competitive advantage: The nonlinear moderating effect of environmental dynamism. Strategic Management Journal, 35, 179-203.
25	CA11	Overall, we are more successful than our largest competitors		
Financial Performance				
26	CA12	Our company EBIT (earnings before interest and taxes) is continuously above industry average		
27	CA13	Our company ROI (return on investment) is continuously above industry average		
28	CA14	Our company ROS (return on sales) is continuously above industry average		
KNOWLEDGE MANAGEMENT			Measure	Reference
Knowledge acquisition			'On a scale of 1 to 7, where 1 is strongly disagree and 7 is strongly agree	Yang, J., and Rui, M. (2009). Turning knowledge into new product crativity: An empirical study, *Industrial Management and Data Systems*, 109(9), 1197-1210.
29	KM1	Your firm encourages all employees to pursue new knowledge pertinent to innovation projects		
30	KM2	User-friendly tools are available to aid you to acquire new knowledge pertinent to innovation projects		
31	KM3	As a result of this innovation project, you have improved existing/ developed new knowledge management skills		
32	KM4	As a result of this innovation project, you have improved existing/developed new technical skills		
Knowledge dissemination				
33	KM5	Your firm disseminates knowledge about the innovation project through formal meetings		
34	KM6	Your firm disseminates knowledge about the innovation project		
35	KM7	Your firm crossly trained individuals on key tasks relating to the innovation project		
NEW PRODUCT CREATIVITY				
36	NPC1	Your firm challenged existing ideas for the product / service category		
37	NPC2	Your firm offered new ideas to the product / service category		
38	NPC3	Your firm was creative in new product / service development		
39	NPC4	Your firm produced ideas for other products / services in its industry		

Figure 14: Confirmatory factor analysis factor loadings.



Appendix C: Ethical clearance confirmation and copyright declaration

Gordon Institute of Business Science
University of Pretoria

07 June 2018

Ho-Lin Janine

Dear Janine

Please be advised that your application for Ethical Clearance has been approved.

You are therefore allowed to continue collecting your data.

Please note that approval is granted based on the methodology and research instruments provided in the application. If there is any deviation change or addition to the research method or tools, a supplementary application for approval must be obtained

We wish you everything of the best for the rest of the project.

Kind Regards

GIBS MBA Research Ethical Clearance Committee

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COPYRIGHT DECLARATION

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Signature:	Date:7th November 2018
Supervisor signature:	Date: 7th November 2018

CERTIFICATION OF ADDITIONAL SUPPORT

Please note that failure to comply and report on this honestly will result in disciplinary action

I hereby certify that (please indicate which statement applies):

• I DID NOT RECEIVE any additional/outside assistance (i.e. statistical, transcriptional, thematic, coding, and/or editorial services) on my research report:
…….

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2. Setting up of quantitative tests

If any additional services were retained– please indicate below which:

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□ Coding (quantitative and qualitative)

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Please provide the name(s) and contact details of all retained:

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TYPE OF SERVICE: Document editing

I hereby declare that all interpretations (statistical and/or thematic) arising from the analysis; and write-up of the results for my study was completed by myself without outside assistance

NAME OF STUDENT: **Janine Chantel Ho-Lin**
……..

SIGNATURE:

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