

https://dspace.org/

An investigation of design thinking as a business tool for innovation

Kitunka, Jean Luc

2018
https://hdl.handle.net/10539/26414

Downloaded from a DSpace repository. https://dspace.org/

An investigation of design thinking as a business tool for innovation

Jean Luc Kitunka
712164

A research article submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Business Administration

Johannesburg, 2018

Protocol number: (WBS/BA712164/893)
(Version February 2018)

Declaration

I, Jean Luc Kitunka, declare that this research article is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration in the Graduate School of Business Administration, University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Jean Luc Kitunka

Signed at Johannesburg



On the 29th day of March 2018.

Dedication

For Ngoy Faila

Acknowledgements

Firstly, to God Almighty.

I would like to send my sincere appreciation to Adam Andani, my supervisor for a calm demeanour, support, guidance and encouragement, as well as his thorough feedback. I am also thankful for his perseverance and dedication as well as his firmness in his own unique way. Adam, I am grateful to have you as a supervisor.

I would like to send my gratitude to Prof. Anthony Stacey for his wisdom, sincerity and guidance during the boot camps.

Thanks to my late mother Ngoy Faila. You always told me to work hard and never take a day off. To my grandparents, Mr and Mrs Kapela, thank you for always being the source of inspiration and believing in me.

Thank you to my wife Mandisa W. Magwaza for your patience, support and assistance in the process of my research. You have been a blessing.

Lastly, I would like to thank my friends, old and new (too many to mention) for their continued support.

Supplementary information

Nominated journal:	The Southern African Journal of Entrepreneurship and Small Business Management (SAJESBM)
Supervisor:	Adam Andani
Word count †:	13164
Supplementary files:	Appendices: Annexure 1: data collection Annexure 2: Mathematica – Argand plane computations

List of Tables

Table 1: Summary of literature re node generation and linkages for the FCM 25
Table 2: The causal weights/quantitative estimations for the FCM links 27
Table 3: The nodes 29
Table 4: The adjacency matrix of fuzzy numbers assigned 30

List of Figures

Figure 1: Design thinking process 12
Figure 2: The Argand plane 28
Figure 3: Completed FCM (design thinking strategies, business and innovation) 32
Figure 4: Net Causal effects 34
Figure 5: Design thinking on innovation steady states 35

Abbreviations & Acronyms

FCM	Fuzzy Cognitive Maps
GEM	Global Entrepreneurial Monitor
SEDA	Small Enterprise Development Agency
SMMEs	Small, Medium and Micro Enterprises

Abstract

The lack of innovation has been argued to contribute to the failure of many start-ups. Performance of companies in many instances is undermined due to their inability to successfully combine business strategies and innovation tools to address the current needs of customers and clients to ensure growth. The fourth industrial revolution requires advancements in thinking and application, where companies move beyond investing in technology towards a designedly way of thinking about business, which has been argued to contribute towards disruptive innovation, profitability and rapid growth.

Against this context, this study sought to examine whether design thinking is a mechanism through which disruptive innovation can occur. The study examined the relationship and causal effects of design thinking strategies such as research, synthesis, ideation and implementation on disruptive and sustaining and efficient innovation, as well as business outcomes such as job creation and revenue. Organisational leadership and culture were part of the model, since design thinking, and innovation are intertwined and function in organisational environments.

The study adopted a qualitative methodology and drew on secondary literature to address the research objective and questions. The qualitative descriptive analysis used assisted in mapping out the relationships between the following variables: behavioural economics research, the fourth industrial revolution (Industry 4.0), strategic drift, strategic fit, organisational ambidexterity, capital utilisation, jobs Creation, scrum, disruptive and efficient innovation, time, competition and revenue. The relationships between the variables were explored to establish causal effects between the design thinking strategies, innovation and business outcomes through the use of fuzzy cognitive maps.

The results demonstrated that design thinking strategies had positive relationships with disruptive innovation. Sustainable innovation on the other hand, had only positive relationships with research and implementation and negative relationships with synthesis and ideation. Disruptive innovation also had stronger causal effects with synthesis, corporate culture and leadership as compared to sustaining innovation.

Furthermore, the findings provided support for the idea that design thinking can play a critical role in improving business outcomes in both start-ups pursuing disruptive innovation and more established companies that adopt an ambidextrous strategy.

Keywords: *Design Thinking, Innovation, SMMES, Start-Ups, Fuzzy Cognitive Mapping*

Introduction

Despite the long-standing government commitment and increased support for the business sector, South African Small, Medium, Micro, Enterprises (SMMEs) have not achieved the intended impact anticipated or desired by policy makers (Rogerson, 2004, 2008b; Timm, 2012). Mkandawire (2011) recalls Nyerere's call for 'Africa to run whilst others walk' and argues that development is not an abstract concept but a response to the wicked problems the continent is mired. Mkandawire (2011), further asserts that radical rethinking of institutions within society such as businesses and universities is imperative for the survival of its people and beyond. This study therefore argues that design thinking has potential a potential to be that radical innovative tool that could enhance business performance and achieve growth and development.

Against this backdrop, this study investigates the extent to which the adoption of design thinking strategies, as an integral part of a company's innovation process and strategy, can be used to enhance business outcomes and achieve growth. It aims to utilise fuzzy cognitive maps in determining the relationship between design thinking, innovation and business outcomes. The study thus attempts to unlock how design thinking strategies as tools for innovation can be used to mitigate the risk of business failure, since it is argued that design thinking has the potential to improve return on investment when it plays an integral part of the innovation process.

Context of the study

The South African SMME economy continues to experience high mortality rates as there are claims that several SMMEs are failing to grow sufficiently to create the expected employment opportunities (Herrington, Kew & Kew, 2010, 2011). The 2011 Global Entrepreneurial Monitor (GEM) report indicated that South Africa had one of the world's lowest SMME survival rates. The Small Enterprise Development Agency (SEDA[1]) (2012) estimated the failure rate of South African SMMEs to be 80% in their first year of existence. The GEM report rated South Africa's total early-stage entrepreneurial activity at 9.1 percent, which is arguably far lower than that of emerging economies such as Brazil, Chile and Malaysia (Herrington et al., 2011; Timm, 2012).

Some authors highlight that the liability of newness and the abnormal rate of creation of SMMEs, which far exceed economic requirements are some of the major contributors to SMME failure (Pinhold, 2008; Stinchcombe, 1965 cited in Fatoki, 2014). It is also argued that the cost of winning new markets exceeds that of preserving existing ones (Pinhold, 2008).

1 http://www.seda.org.za/Publications/Publications/The%20Small,%20Medium%20and%20Micro%20Enterprise%20Sector%20of%20South%20Africa%20Commissioned%20by%20Seda.pdf

It is yet important to note that, "poor market conditions, capitalisation, management strategy and the incompetence of critical people in a business, as well as the lack of management and technical skills, poor product design and inadequate capitalisation were found to play a critical role in business failure from the perspective of entrepreneurs and suppliers" (Boeker & Wiltbank, 2005 cited in Fatoki, 2014, p. 925). In addition, factors such as management experience, functional skills and project management skills (control of logistics, managing competition and finance), and the rising costs of running a business (Yrle, Hartman & Yrle, 2000; Temtime & Pansiri, 2004 cited in Fatoki, 2014), as well as staff training and attitude towards the customer were found to also play a pivotal role in SMME failure.

A critical factor in SMME success is therefore the ability of its leadership to continue to meet new challenges as the business evolves and know when to change their strategy (Valdiserri & Wilson, 2010). The lack of innovation seems to contribute to the failure of SMMEs today. Brown (2009, p. 40), argues that "the failure to innovate stems from companies not putting people first. He further remarks that conventional methods used in market research are only useful when seeking incremental changes but not innovation".

According to Sakkab (2007), innovation is a marriage of needs and possibilities. Thus, even though the sole driver of innovation in the past used to be defined as technology, the world is moving towards an era where design thinking plays a critical role in organisational success, illustrating the evolving nature of possibilities. Several authors argue that enterprises that have applied design thinking in their organisational strategies tend to be more innovative, profitable and have been shown to grow faster than those who do not (European Commission, 2009; Henderson & Whicher, 2015; Lawlor, O'Donoghue, Wafer & Commins, 2015).

Further, Lawlor, et al. (2015) highlight that studies have found a positive correlation between the application of design thinking and the national competitiveness of countries and data from Europe demonstrates that enterprises that have adopted design thinking tend to also be export oriented (Lawlor, et al., 2015).

It can therefore be argued that when design thinking plays an integral part of the innovation process, return on investment is greater than when design thinking is adopted as an add on. This study thus attempts to unlock how design thinking strategies can be used as innovative tools for business outcomes.

Problem statement

The gap between businesses that are excelling vis-a-vis those that are struggling is widening. The lack of innovation and complacency is a challenge for businesses in an ever-changing world (Reeves, Love & Tillmanns, 2012). Despite government's investment in SMMEs, through financial schemes, these programmes have not necessarily yielded the anticipated

results. It is evidenced that about 90% of start-ups fail during the first year of inception and large corporations arguably enjoyed a lifespan of about 30 years (Reeves, et al., 2012). Moreover, in the South African context, it is argued that a relatively high proportion of firms and/or SMMEs involved in innovative activities tend to have a low rate of success in bringing about innovative products or services into the market because they are boggled with old and conventional ways of thinking and implementing strategies. This study thus proposes for the adoption of design thinking as an innovative tool and uses fuzzy cognitive maps to highlight the causal relationships between design thinking, innovation and business outcomes.

Research Objectives and Questions

Objectives

The primary objective of this research is to assess the extent to which design thinking contributes to innovation and business outcomes and aims to use the findings to inform business development.

The study is driven by the following specific objectives:

1. To assess the link between design-thinking, innovation and business growth; and
2. To identify and discuss the elements of design thinking that have a significant influence on business outcomes.

Questions

Based on the above objectives, the primary question addressed by this study is: To what extent does design thinking contribute to innovation and successful business outcomes? Specifically, the research sought to address the following questions:

1. What is the relationship between design-thinking, innovation and business outcomes?
2. Which elements of design thinking have a significant causal effect on innovation?

Underlying assumption

The study is premised on the assumption that if business ventures adopt design thinking as an integral part of their innovation process and strategy, they will be able to enhance the performance of the business and ultimately achieve successful outcomes.

Significance of the study

While design thinking is regarded as a tool that has potential to increase the rate of successful innovations and achieve desired outcomes and growth, research on the role of design thinking in achieving business growth is anecdotal. Therefore, understanding the key elements of design thinking that facilitate innovation and enhance business outcomes is important for business managers.

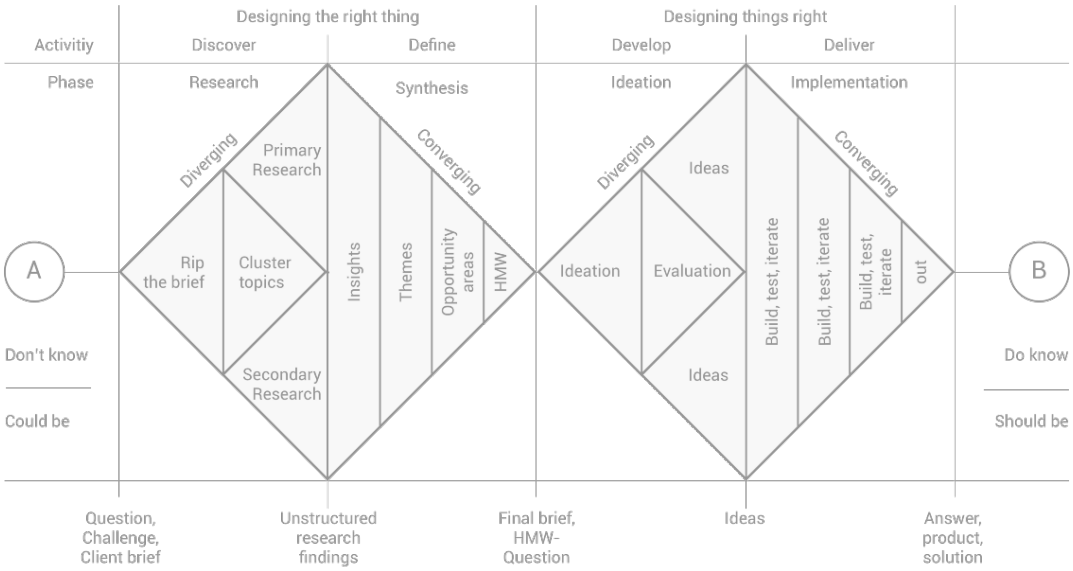
Brown (2009) argues that to unlock value for customers, a deep understanding of the customer and an acknowledgement of the changing roles of products and services are needed. This study thus explores design thinking elements as tools that can act as levers in unlocking the customer value. Studies investigating the value of design thinking as a strategic instrument for innovation and a tool for improving business outcomes are a scarcity, especially in the South African context. Studies also investigating the adoption of innovation have focused primarily on identifying environmental and organizational conditions than focusing on the role of innovation characteristics on innovation adoption. This study will thus assist in bridging these knowledge gaps.

Definition of key terms and concepts

Design thinking: Design thinking is defined as a human-centred approach to innovation that draws from the designer's toolkit to integrate the needs of people, the possibilities of technology, and the requirements for business outcomes (Brown, 2011).
The design thinking process can be better explained using the revamped double diamond approach illustrated below:

1. Research — insight into the problem (diverging)
3. Synthesis —the area to focus on (converging)
4. Ideation — potential solutions (diverging)
5. Implementation — solutions that work (converging)

Figure 1: Design thinking process



The diagram above is a representation of the design thinking process, which was developed by Nessler (2016) and has its origins in the work done by Brown (2009).

The graphic illustrates four phases of design thinking. The four phases of the double diamond may be simplified and merged into two main stages. Stage 1 is about doing the right things and stage 2 is about doing things right. Doing things right focuses on research and synthesis. It is about identifying the right problem to solve or asking the right question before doing something. Doing things right focuses on ideation and implementation, which speaks to how one goes about solving the problem or answering the question. Towards the end of an ideation phase, ideas are evaluated to select the plausible ones, which are then prototyped and tested in order to find the best answer or solution to the initial question or problem. Once a potential solution or set of ideas have been identified, it is crucial to evaluate the final idea to assess how it will be implemented or executed (Nessler, 2016).

Innovation: Innovation has a lack of a generally agreed upon definition. Some define it as "the search for, and the discovery, experimentation, development, imitation, and adoption of new products, new production processes and new organisational set-ups" (Dosi, 1988, p. 222). It is also defined as change that brings about new performance dimensions or the invention and/or implementation of new or altered systems, structures, products or services aimed at creating new value for a business and its customers (Andrew ,Sirkin , Haanæs & Michael, 2007). What is common with these definitions is that innovation results in the production of something that had not been invented and add value to firms and their customers.

This paper will adopt Maranville's (1992) definition, which perceives innovation as the application of solutions to meet new requirements and unarticulated and/or existing market needs (Maranville, 1992). Christensen's (2013) differentiation of innovation into disruptive and sustainable innovation will be used in the analysis. This differentiation is discussed under the topic: the innovator's dilemma.

Business outcomes: Business outcomes are defined as the result or achievements of a particular business initiative, which is tied up to top level funded initiatives and defined through the lens of the accounting officer. They can relate to interests of stakeholders, revenue, improved products, etc.

Literature Review

Introduction

This section provides a theoretical background on selected management theories, followed by an integrated summary of studies on design thinking, innovation and business outcomes. The overarching goal is to identify the key features of design thinking and the specific elements within this approach that contribute to innovation and improved business outcomes in the 21st century.

The major themes addressed in this review include:

- A review of management theories,
- A review of design thinking and innovation strategies,
- Identification of elements of design thinking that lead to sustainable innovation, and improved business outcomes, and
- Examples of design thinking and innovation studies that illustrate the applicability of these approaches in the ever-changing business environment.

Several articles, full-text documents, journals and books were reviewed using various search terms or keywords such as design thinking, design cognition, design behaviour, design studying, design reasoning, design process, user centricity, innovation, innovation process, business success, business growth, SMME success and failure, prototyping, cognitive maps and fuzzy cognitive maps, etc. The search was not limited to a date range or experimental studies, but slight preference was given to more recent articles. The inclusion criteria were based on whether the paper was relevant to the research question.

Archaic management theories

According to Weymes (2004), management theories can be traced to the concept of the bureaucratic organisation, which was introduced by Max Weber in the late fifties and later

classical theorists such as F.W. Taylor, Frank and Lillian Gilbreth, Henri Fayol, Henry Gantt and Mary Parker Follett, among others. During this period, organisations were characterized from an authoritative perspective, where hierarchy as well as impersonal rules, standard procedures and the division of labour governed work. This manner of running organizations was designed as a means or system to control behaviour (Weymes, 2004).

Bureaucracy was thus seen by Weber as capable of attaining efficiency and perceived as the most logical means of exercising authority over others. Taylor built on this philosophy in the early nineties and developed it into a scientific approach to management. This approach was based on the idea that jobs and ways of working could be specified, improved and rationalised through scientific analysis (Taylor, 1914). Efficiency was perceived as the driving force for increasing output and wealth, and to deliver on these, it was believed that stringent controls aimed at increasing productivity had to be instituted. This was the era of command and control; where human rights and environmental concerns were ignored. Workers were believed to be motivated by extrinsic rewards and punishment (Weymes, 2004).

The 1950s saw a rise in rejection of the scientific approach to management, there was a challenge to its impersonal approach to organizational design. Douglas McGregor wrote a book, titled 'the human side of enterprise' in the sixties which challenged the scientific approach, and an Institute in England called Tavistock and another in Sweden called Quality of Working Life challenged the mechanistic approach and questioned its effectiveness. They suggested that to improve efficiencies, organisations needed to increase worker involvement (Weymes, 2004). McGregor proposed that intrinsic motivation, driven by interesting work could be a driver to improved efficiencies. He perceived workers as having the ability of managing and directing their own behaviour (McGregor, 1960).

There are however, those who have criticised this form of management as 'soft management'. The refocus on soft management was fuelled by the threat of Western economies by Asia in the eighties but there is still a firm belief that specific systems and procedures would achieve efficiency and the bottom line (Weymes, 2004).

Modern management

The world today has evolved as the service economy and the knowledge economy replace the industrial economy, and as individuals create intellectual property for organisations. Organisations now 'buy brains not brawn!' (Weymes, 2004). Technology and the internationalisation of the world have transformed how business is done. Businesses are being influenced and influence social behaviour (Weymes, 2004). Those organisations that do not change and still function and manage organisations with the old mechanical and inhumane approaches will therefore, not survive in this dynamic world. Organisations are therefore,

motivated to create a sense of purpose and drive out 'fear', remove interdepartmental barriers and educate with the intention of instilling trust throughout the organisation (McGregor, 1960). This study therefore introduces a different angle in thinking about new strategies and forms of thinking that are argued to work in an environment of constant change.

The total quality management (TQM) approach, which emerged in the 1980s challenged the management philosophy from a mechanistic approach to one that was people-focused (Martínez-Lorente, Dewhurst, & Dale, 1998) and Peter Senge's (1990) fifth discipline publication and Von Bertalanffy (1973) also challenged the closed systems mentality of scientific management on the basis that it did not provide options for an interaction with the environment. Senge was able to demonstrate that organisations interact with the environment. Senge (1990) and Von Bertalanffy (1973) further proposed that organisation be treated as open systems since their approaches acknowledged the interaction of organizations with external environments and that the survival of organizations, similarly to that of living organism is dependent on the interactions with the environment. Von Bertalanffy (1973) believe that the survival of organisations in dynamic and ever-changing environments as well as the effectiveness and efficiency of organisations would be achieved in open systems.

Open systems

Open systems theory is grounded in the field of biology; mainly the theory of evolution by Darwin. Open systems theory is attributed to Ludwig Von Bertalanffy who adopted the term 'general systems theory' and differentiated it from closed systems thinking (Chikere & Nwoka, 2015).

Chikere and Nwoka (2015) proposed four distinguishing factors between closed and open systems, namely; relations with the external environment, variables considered, form of regulation or control and purpose of regulation. Open systems according to Chikere and Nwoka (2015), focus on the relationship between a system and its environment and deal with complex relationships between variables. Open systems are also anticipatory, meaning that they detect errors or problems before they manifest and put corrective measures or control errors before the final product is produced. Open systems do not drive or regulate systems toward a predetermined state that does not change but towards a dynamic path since they seek continuous improvement (Chikere & Nwoka, 2015).

As this study is aimed at understanding the use of design thinking in innovation and organisational outcomes and the use of qualitative methods and fuzzy cognitive maps take into effect the dynamism within person/ organisation and the environment, the systems theory seems applicable to the study at hand. Systems thinking, and innovation acknowledge environmental dynamics and constant and complex interchange between organizations

and the environment (Chikere & Nwoka, 2015). Brown (2009) defines design thinking as a good tool for innovation that can help tackle complex systemic challenges. Therefore, a management approach that takes into cognisance organisations as open systems will be adopted because it not only bridges the gap between the traditional management approaches and people centred approaches but also accommodates the design thinking approach since it acknowledges that organisations do not exist in vacuums and are dependent on larger systems to function at their optimal (Chikere & Nwoka, 2015).

Systems approach

Chikere and Nwoka (2015) classify the systems approach as a prescriptive approach. They argue that descriptive approaches, unlike prescriptive approaches are reductionist since they reduce any phenomena to its components. Descriptive approaches assert that breaking organisms into their individual parts and studying the properties of each element help one understand a phenomenon. The systems approach on the other hand, values the relationships between the parts or elements. It tries to understand how these parts are organised, function and interact with each other to contribute to the whole. It helps one to have a holistic understanding of a phenomenon (Chikere & Nwoka, 2015). It is therefore, aligned to the design thinking approach since it tries to approach business acumen holistically.

The systems approach is defined as a collection of objects that are interrelated to each other and the environment and which work together to create a whole (Schoderbek, Schoderbek & Kefalas, 1985 cited in Chikere & Nwoka, 2015). It is also defined as interrelated parts that act together to achieve a common goal and viewed as a network of interlinked highly complex parts that exhibiting synergistic properties. The systems theory perceives the whole to be greater than the sum of its parts (Flood & Jackson, 1991 cited in Chikere & Nwoka, 2015). Reflecting on the maps adopted as a graphic and analytical tool for this study; the FCM, the systems thinking approach integrates well into this study.

Systems from a management perspective

Chikere and Nwoka (2015) state that systems from a management perspective refer to different sets of independent parts which are interrelated and work together in synergy to contribute to the whole. They make an example of the different departments, units and sections in an organisation that are composed of independent groups and individuals that work towards a common goal (Chikere & Nwoka, 2015).

Organizational management systems, therefore encompass several internal subsystems that ought to be aligned on a continual basis, since as corporations grow, more and more complex subsystems develop. These subsystems coordinate with each

other and have interdependencies, which "can easily become so complex that a minor event in one subsystem may amplify into serious unintended consequences elsewhere in the organization" (McShane & Von Glinow, 2003 cited in Chikere & Nwoka, 2015, p. 2). Systems theory, design thinking and cognitive maps therefore, accommodate the interplay between organisations and the environment and the interconnectedness of components, as well as the human element as will be reflected in the sections that follow.

Design thinking

The global economy today continues to evolve at a rapid rate. Despite growth in industrial and knowledge economies, the service economy is also dominating. Employees create intellectual property for their businesses, while globalisation and the advancement of technology changed how business is conducted. The educational attainment of individuals has improved, which has influenced the way of life and life's perspectives (Weymes, 2004). In such a world, Weymes argues that international institutions that can support and invest in global science, research and innovation are required.

Brown (2009) argues that the days of using efficiency as part of the CEO's role for optimising business is insufficient and over. He states that whilst the old competencies of delivering solid returns still matter, the old method of achieving this is now threatened as it is not capable of preparing organisations for the volatile and disruptive business climate of today (Brown, 2009). He further argues that CEOs will need evolutionary skills to compete in today's ever-changing business climate. They are therefore expected to set up a culture that is design-friendly; 'in which the very metabolism of the organization runs faster' (Brown, 2009). In addition, Brown (2009) posits that business fitness in today's terms means being agile, resilient, and creative, and being adaptable to market changes in hasty generational cycles. He further argues that a brave new leadership brand that will be able to think like a designer is required (Brown, 2009).

Kaplan and Norton published the balanced scorecard, which measured organisational performance based on four dimensions, namely; customer service; process management; knowledge generation; and financial performance. Kaplan and Norton (2005) postulated that if organisations meet customer expectations and monitor their process efficiencies and encouraged knowledge creation, then the financial results would emerge. The intentions of Kaplan and Norton were however, clouded by executive expectations as they tended to view the scorecard as a metric for measuring performance and controlling behaviour. Therefore, whilst return on investment was conceived as an outcome for executives, it remained an input measure; used for controlling behaviour (Kaplan & Norton, 2005).

Corporate scandals such as Enron in the United State, Parmalat in Europe, KPMG and Mckinsey in South Africa (Hogg, 2017), as well as the collapse of Arthur Andersen,

have reduced worldwide public trust in corporations (weforum.org, 2017). A survey conducted in the 2004 World Economic Forum found that only 7% of the participants considered global companies to operate in the best interests of society. Corporate entities were perceived to focus on profit- generation and wealth-creation for a few. This contributed to the growing concern for companies to invest in corporate citizenship. The Occupy 'Wall Street movement' is one such movement that stands against unethical behaviour and emphasises the importance of corporate citizenship and responsible investment (Weymes, 2004). Cooperrider and Fry (2010) posit that a creative design attitude can help transform corporate citizenship of the twenty first century into a potential business opportunity and is an intriguing core competence for managers of these age.

Customer obsession, agility and resilience are argued to be core competencies that should be intrinsic to the designer's craft. Brown (2009) posits that designing a new service, product, or experience for businesses that thrive will require building in design as a core competency. It will also require the identification of customers' needs and desires, prototyped solutions, and the inculcation of a certain level of flexibility that can quickly swivel as needs change to ensure continued relevance and provide insight on what works and/or does not work (Brown, 2009).

> *It "means giving all levels of the company, from interns to managers to VPs, empowerment and autonomy— the permission to shift when they can see farther than you can. It means creating a safe environment in which they can fail without fear. It means telling them a compelling story about the purpose of your company and getting them invested in that story. You are working together to create something magnificent and will walk into an unknown future side by side, together" (Brown, 2009, p. 6).*

Sakkab (2007) posits that an integration of design thinking in organisational strategy would imply the integration of sensorial elements, costs and creating superior, holistic experience for consumers which would emanate from a good grasp of consumers' needs. Design thinking therefore, has an emphasis on the central being and affirms human dignity and the person in society, and acknowledges the usability of product or service as an element of human centred design (Yomaami, 2016).

Buchanan was the first to really take a perspective on design thinking by building on Rittel and Webber's (1973) wicked problem approach as an alternative to the step-by-step model of the design process; an analytic step of problem definition, followed by a synthetic sequence of solutions to problems. Buchanan introduced the concept of placements to describe the process of contextualization. This describes the 'tools' used for intuitively or deliberately shape a design situation by identifying the views of participants and the issues

of concern, as well as the intervention. The intervention becomes a working hypothesis for exploration and development, and assists in formulating the problem and solution, which go hand in hand rather than as sequential steps. Wylant (2010) therefore, describes design thinking as the discipline of cycling through many contextual exercises of placements to understand how sense can be made. The designer is then in a better position to choose the context that should dominate (Wylant, 2010).

Design thinking is defined as an approach to innovation that is human-centred and draws from the designer's toolkit to integrate people's needs, technological possibilities and business requirements for success (Brown, 2011). It is also defined as a process that engages an individual analytically and creatively "in opportunities to experiment, create and prototype models, gather feedback and redesign" (Razzouk & Shute, 2012, p. 330). Design thinking can also be defined as an approach that can be used to consider issues with the intention of resolving them. It can be applied outside of the professional design field and has been used in business, government and in addressing social issues (Dorst, 2015).

Even though a clear-cut definition of design thinking does not seem to exist, there however, is a growing awareness and use of design thinking in many industries. Some have argued that the term is not different from creativity, innovation and systems thinking. Even so, there is still a growing focus on design thinking among managers because of a quest for an alternatives approach to the conventional - 'linear, analytical, and quantitative approach to innovation' (Hassi & Laakso, 2011). Established businesses try to incorporate problem-solving techniques within design to innovative businesses processes (Kupp, Anderson & Reckhenrich, 2017).

Hassi and Laakso (2011) assert that there are two different discourses on design thinking. One focuses on the design discourse and deals with how designers think as they work, and the other focuses on the management discourse, which deals with design thinking as a method for innovation and value creation (Hassi & Laakso, 2011). The design discourse is regarded as an academic discourse that is more than 50 years in existent and the management discourse is regarded as a new; millennial development that focuses on improving management design thinking skills with the intention to improve business outcomes (Hassi & Laakso, 2011). Considering that this study aims to investigate design thinking as a tool for innovation improve business outcomes, the management discourse to design thinking will be the one adopted for the study.

Some of the critical elements of the design thinking methodology include "fast iterations; early and frequent interaction with customers; agile process design with less hierarchy; and a learning-by-doing approach that involves building prototypes and creating mock-ups of any kind as early as possible in the process" (Kupp, et al., 2017, p. 1). Kupp, et al. (2017) illustrate how initiatives of design thinking unfold in business settings. They indicate that the innovation challenge has to be clearly defined and presented to a design

thinking trained team, which then conducts research that will help it better understand the innovation challenge and use the research insight to propose different solutions and begin to develop prototypes, which will help in the identification of new and profitable business opportunities (Kupp, et al., 2017).

Lawlor, et al. (2015) challenge the perception of design as a separate process of product development or a 'silver-bullet' for domestic and international challenges facing enterprise development. They propose that it should be considered as a tool in the innovation ecosystem and should be perceived and associated with strategic management techniques and processes (Lawlor, et al., 2015).

Innovation in the 21st century

The 21st century economic power lies in disruptive innovation. The lack of "creative destruction" and effective innovation strategies has contributed to the inability of even the best performing companies to sustain performance for more than ten to fifteen years (Miller, 2006). Design thinking could therefore be used as a tool for innovation and a catalyst for 'creative destruction' since it challenges conventional businesses processes. Kerr (2015) argues that organisations that are not only able to recognise complexity and sustainability as key business components but are also able to foster and harness them will thrive in the twenty-first century.

Innovation within the design thinking framework therefore tends to conflict "with established processes, structures, and corporate cultures" because "most companies' successes are built on delivering predictable products by repeatable means". Design thinking therefore challenges organizations to bring in 'fuzzy, messy, and abstract vision into their equation' (Kupp, etal., 2017, par 2- 3). Kupp, et al. (2017) state that the understanding of the inherently messy process of innovation can help one avoid the pitfalls of failure.

The antipathy with design thinking has been illustrated in how employees try to avoid or shy away from design thinking habits and methodology since design thinking calls for egalitarianism and self-organized teams. Individuals that successfully operate in such environments surpass organisational learning as they build adaptive and innovative capabilities that can bring about competitive advantage (Kerr, 2015). Moses, Sithole, Blankley, Labadarios, Makelane and Nkobole (2012) claim that innovation gives enterprises their competitive advantage.

The South African National Innovation Survey, revealed the that 65.4% of enterprises in South Africa engaged in innovation activities and 1.7% spent their turnover on innovation activities in between 2005 and 2007. A sum of R57 billion was reported to have contributed to significant turnover because of innovations. Service-based industries spent more than industrial enterprises on innovation (Moses et al., 2012). Out of a total of 14 934 innovative

enterprises, 4.4% of these reported innovations were not only new to the market but also new to the world, while 23.1% indicated that their innovations were new to the market and new to South Africa. They reported that the majority of expenditure was on ongoing innovation activities and indicated that most innovations take more than a year to develop (Moses et al., 2012). This time dimension is therefore an important consideration for policymakers and investors and will be explored in the study.

The 2003 annual PricewaterhouseCoopers (PWC) survey of CEOs[2] found that 79% of participants indicated that sustainability was vital for profitability and 71% indicated that long-term shareholder value would increase, and short-term profits would be sacrificed if corporations invested responsibly.

"Building sustainable development into business processes is the ultimate opportunity. By its very nature the journey towards sustainability requires the kind of breakthrough thinking that results in true innovation. It calls for partnerships and cooperation as well as open honest dialogue with stakeholders inside and outside the company" (PricewaterhouseCoopers, 2003).

Design thinking can deliver innovation. Lockwood and Walton (2008, p. 47) advocate that innovation be perceived as a value proposition or business offering. They propose three pillars from which one can innovate, namely; visceral, which focuses on instinctive feeling, the reflective, which focuses on conveying a sense of identity, and the behavioural, which focuses on functionality. Most innovations tend to focus on functionality but Lockwood and Walton (2008) propose that a consideration of the three pillars can help improve the success and sustainability of the value proposition. They argue that focusing on functionality limits the potential for market success.

The innovator's dilemma

The innovator's dilemma occurs when there is a pattern of decline in a company such that capable executives with great managerial techniques put so much emphasis on serving current customers at the expense of investing in future markets (Christensen, 2013). Good management can thus be the key reason for a company not to remain at the top because they are caught in the innovator's dilemma.

The innovator's dilemma comes into play when management is caught between deciding between investing cautiously, such that the most profitable part of a business is protected and sustained, or investing in disruptive innovation (Christensen, 2013). Management ask themselves whether they should invest to protect the least profitable end of business to retain the least loyal, most price-sensitive customers or invest to strengthen their position in the most profitable tiers of business, with customers who reward them with

2 https://www.pwc.co.za

premium prices for better products. The dilemma happens because firms have adopted an approach that focuses more on the current customer and aggressively investment in new technologies targeted at improving efficiencies for current customers at the expense of investing in disruptive innovation (Christensen, 2013).

Disruption occurs when smaller or so called 'insignificant' companies with fewer resources challenge and shake up well established and successful businesses because they decided to think out of the box. Disruptive innovation therefore occurs when an industry is shaken up and previously successful incumbents stumble (Christensen, Raynor & McDonald, 2015). Whilst well established companies chase profitability in more-demanding segments and focus on improving efficiencies of current products and services for the most demanding and usually, most profitable customers, they ignore the needs of other segments. Companies that bring about disruption in the market, therefore tend to target that overlooked segments and gain a foothold in delivery and pricing. Disruptive companies are therefore able to bring about a balanced approach by having access to up markets and delivering to the needs of incumbents' mainstream customers whilst preserving the advantages that drove their early success. When mainstream customers start adopting the entrants' offerings in volumes, disruption occurs (Christensen, et al., 2015).

Even potentially disruptive innovation can be rejected. Firms with a strong customer focus can therefore, be deterred by such a response, and if they struggle to identify new markets and attract a new cohort of customers, they may allow their innovation to languish. The fear of rejection may influence companies to sacrifice potential growth and succumb to nimble, entrepreneurial competitors to catch the next great wave of industry growth (Christensen, 2013).

Research methods and design

Introduction

This chapter explores the philosophical assumptions of and research principles underpinning the study. It gives a description of the chronological sequence in researching the relationship between design thinking, innovation and business outcomes and provides a justification for choosing fuzzy cognitive maps as the tool to illustrate the causal relationships.

Qualitative design

The primary objective of this research was to explore the interconnectedness between design-thinking, innovation and business outcomes and identify the elements of design thinking which have a significant influence on business outcomes. The study adopted a qualitative

design to address this objective. Specifically, in line with the qualitative approach, the interpretive paradigm was adopted. This approach perceives of knowledge as subjective acts of interpretation that are socially constructed through shared meaning, language, tools and documents, to name a few (Neuman, 1994; Walsham, 1993). Document analysis, which is based on how the researcher makes sense of text, embraces the interpretive paradigm.

The interpretive approach has its philosophical base in hermeneutics and phenomenology. It concerns itself with understanding the subjective nature of the experience of the social world, which is complex and ever changing (Burrell & Morgan, 2017; Thomas, 2003; Willis & Jost, 2007). Interpretive studies do not have predefined dependent and independent variables, but the focus is on the complexity of human sense-making as the situation emerges (Kaplan & Maxwell, 2005) hence the use of FCMs to explore links between variables. Those who espouse this approach claim that social phenomenon must be understood in the social context in which it is constructed and reproduced. In other words, the understanding of social action must include the meaning that social actors give to their deeds through the creation of cultural artefacts (Burrell & Morgan, 2017; Willis & Jost, 2007).

Burrell and Morgan (2017) posit that institutions, works of art, literature, language and religions are examples of objectified artefacts. Perceiving of the work from this angle reinforces the advantage in design thinking because as in hermeneutics, design thinking seeks a deeper understanding of the human being and/or organisation and in turn forms the foundation for the development of products or services that address unmet needs of individuals and organisations (Burrell & Morgan, 2017, p. 236). Therefore, adopting an interpretivist paradigm enables an increased understanding of the critical, social and organisational issues related to the adaptation and adoption of design thinking in organisations.

According to Thanh and Thanh (2015) an interpretive paradigm allows researchers to view the world through the perceptions and experiences of its participants and use those experiences to build and interpret their understanding from data gathered. The interpretive paradigm is argued to be gaining considerable influence since it can accommodate multiple perspectives and truths. This approach asks ‘why’ and ‘how’ questions and provide a greater scope for addressing issues of influence (Boland, 1986; Deetz, 1996; Orlikowski & Baroudi, 1991). The data collection methodology used in the study accommodates the interpretive approach as documents will be reviewed, examined and interpreted to guide the building of the cognitive maps. The FCM is convenient for this study because it considers the fuzzy nature of human interaction with the world, which in interpretive language, accommodates the multiple interpretations used to construct the world (Burrell & Morgan, 2017).

Neuman’s third order interpretation was adopted to reflect on the results. The third order interpretation involves firstly understanding meaning attached to behaviour or

relations, interpretation and motives for actions and using the researcher's interpretive leg to understand the underlying meaning of the actions and lastly, linking these with existing theory (Neuman, 1994). The study thus utilised content analysis to review literature related to the study in an effort to understand the relations that were graphically plotted in the fuzzy cognitive maps (FCM). Existing literature and the systems theory was used to understand the underlying meaning and ground the findings.

Data collection

Document analysis and Literature review

Literature review and document analysis were used to collect data to address the objectives of the study. Document analysis is a procedure used for reviewing or evaluating documents systematically. It requires one to examine and interpret data to draw meaning and understanding (Corbin & Strauss, 2008 cited in Bowen 2009). It can yield data—excerpts, quotations, or entire passages—that are then organised into major themes, categories, and case examples specifically through content analysis (Labuschagne, 2003 cited in Bowen 2009, p. 28).

Different types of documents were therefore, used to help derive meaning and uncover insights that addressed the research problem (Bowen, 2009). Insight into the factors that contribute to business outcomes and the relationship between this and design thinking and innovation was collated through document analysis. This assisted in mapping out the relationships that were further tested through the FCMs and steady states.

Bowen (2009) asserts that document analysis can be useful as a stand-alone method for specialised forms of qualitative research. Since the current study aimed at defining the strength and direction of the relationships and causal effects between variables, reviewed documents became the data source for mapping proposed relationships (Bowen, 2009). Document analysis has the ability to provide context, suggest aspects that need to be observed, help supplement and add insight. It can also facilitate the tracking of change and help verify or corroborate evidence. Some of its advantages are efficiency, cost- effectiveness and unobtrusiveness and some of its disadvantages are a lack of detailed overview, low retrievability and bias in document selection. The disadvantages are however, said to outweigh the advantages (Bowen, 2009).

Document analysis was not only used for this study because of its ability to be a stand-alone method and its insightful nature but also because of its supplementary nature and its strength in corroborating evidence; a property required in the development of fuzzy cognitive maps (Stacey, 2016).

Table 1: Summary of literature re node generation and linkages for the FCM

	Research (References)	**Causal** links	**Research** (References)	**Strength of** Relationship
0	Design thinking and Fuzzy Cognitive Maps (FCMs)		Johansson□Sköldberg, Woodilla & Çetinkaya (2013) Martin (2009) Brown (2009) Kosko (1986) Groumpos (2010). Papageorgiou & Stylios (2008). Stacey, A. (2016, May).	
1	Research	Customer intimacy	Etches, A. (2013). Chi Kin (Bennett) Yim, Tse, D., & Chan, K. (2008). Akçura, M. T., & Srinivasan, K. (2005).	medium
		Behavioural Economics	Ariely, D., & Taylor, M. (2010). Hindriks, J., & Myles, G. (2013). Gino, F., Norton, M., & Ariely, D. (2010). Ariely, D. (2009). Martin, R. L. (2009).	strong
		Industry 4.0	Schwab, K. (2017).	weak

The table above illustrates a sample of the literature collated through document analysis and the complete collation is found in the Appendix 1.

Data analysis, interpretation and presentation

Fuzzy cognitive mapping

A Fuzzy Cognitive Map (FCM) is an instrument that is used for data mapping and analysis. It has its roots in concept mapping and cognitive mapping (Gray, Zanre & Gray, 2014) and has been used by different managers to solve early product development challenges, develop systematic approaches and for product planning, analysis, and decision support. It was adopted in this study because of its ability to graphically or visually represent constructs of an individual's 'mental model' and its potential of being a decision support tool that can assist in identifying market needs (Papageorgiou & Salmeron, 2013).

Cognitive maps also known as concept maps reflect "mental processing, which is comprised of collected information and a series of cognitive abstractions by which individuals filter, code, store, refine and recall information about physical phenomena and experiences" (Gray, et al., 2014, p. 32). They are visual representations of the constructs of an individual's 'mental model' and represent structured knowledge or beliefs. Mental models mediate between the knowledge kept in the long-term and constructed in short-term

memory and are relied on to "structure understanding, explain the world, and at times to make decisions that reflect this internal process of reasoning" (Gray, et al., 2014, p. 33). Mental models are considered to provide the structures that forms the basis of reasoning and are the backdrop in which individuals and organisations make sense of their world and influence decisions and actions (Gray, et al., 2014).

Mental models are social constructs, hence interpretive in nature. The inability of mental models to always reflect the sum of aggregated individual mental models, reflect their fuzziness (Klimoski & Mohammed, 1994 cited in Gray, et al., 2014). FCMs can however, assist in aggregating diverse knowledge sources (cited in Gray, et al., 2014) and represent shared knowledge in the form of "social cognitive map" or graphic representations (Gray, Chan, Clark & Jordan, 2012 cited in Gray, et al., 2014). FCMs are therefore a shared mental model that illustrates the areas where individuals' mental models coincide (Harris & Woolley, 2009; Gray, et al., 2014). Their ability to aggregate diverse knowledge and constructs was one of the reasons they were adopted for this study.

FCMs are therefore an extension of mental models, presented graphically to illustrate shared knowledge (Gray, et al., 2014). Mental models exist in the mind but cognitive maps are physical constructs represented graphically (Gray, et al., 2014). Employing FCMs as representations of mental models can therefore, generate an understanding of how different people filter, process and store information, and also elucidate how perceptions may guide individual decisions and actions in different contexts (Biggs, Abel, Knight, Leitch, Langston & Ban, 2011 cited in Gray, et al., 2014).

FCMs are powerful soft computing modelling tools which are an extension of cognitive maps that emerged from the combination of fuzzy logic and neural networks (Gray, et al., 2014). FCMs enable one to interpret and express environmental complexities and experiences by integrating quantitative estimations of the perceived relationships between components with knowledge, preferences and values (Gray, et al., 2014, p. 34). They are indistinct graphs that help represent causal reasoning or infer causal relationships between a range of factor represented by indefinite degrees of causality and systematic chains of 'to and fro' causal extensions (Kosko, 1986).

The quantitative estimations of the perceived relationships between variables were assigned weights and the direction of the relationships. The table below provides a glimpse of the estimations used in the study; illustrating the strength and direction (positive and negative values) of the relationships.

Table 2: The causal weights/quantitative estimations for the FCM links

Causal weights for the FCM	None	Low	Mid	High
Fuzzy numerical weights	0,0	0,10	0,25	0,50
Fuzzy numerical weights (negative)		-0,10	-0,25	-0,50

As illustrated in the table, the strength of the relationships ranges from 0 to 0.50; from no relationship to strong relationship. The negative values illustrate that there is a negative relationship between variables. Even though the information that informed the development of FCMs was gathered qualitatively through document analysis, the assigning of estimated weights and direction of influence between nodes to create links between variables brings about the quantitative side of FCMs (Gray, et al., 2014, p. 34).

Stacey (2016) advocates for a semi-quantitative approach. He argues that it helps analyse the convergence and stability of FCMs. Gray, et al. (2014) asserts that an understanding of the nature and appropriateness of FCM aggregation is necessary in ensuring theoretically sound interpretations. They further propose that this can be achieved by understanding the "meaning of 'shared' knowledge and establishing data collection protocols based on common FCM research goal typologies" (Gray, et al., 2014, p. 34). The main objective of building a cognitive map around a problem is to be able to predict the outcome by letting the relevant issues interact, which can assist in ascertaining the consistency of the entire collection of stated causal assertions.

Multi-step FCM approach

Data analysis for this study followed a multi-step FCM approach proposed by Özesmi and Özesmi (2004). A modified version of Özesmi was however, applied in this study, which considered the recent advancements in FCM analysis as proposed by Stacey (2016).

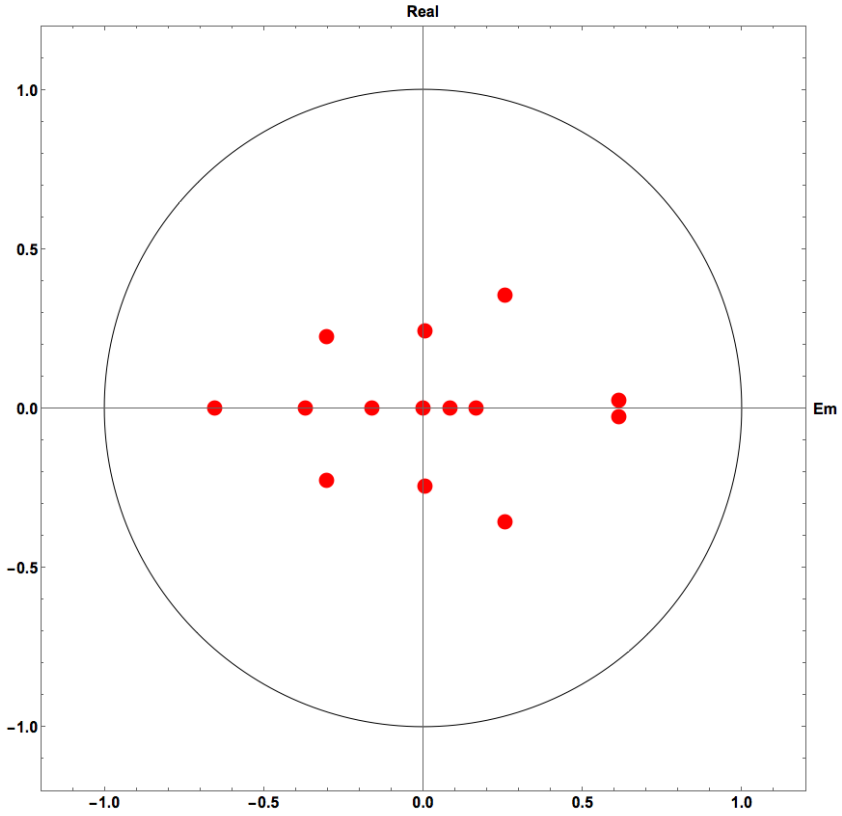
According to Stacey (2016), FCMs have been traditionally analysed by coding the map into an adjacency matrix, where the value of each variable would be iteratively calculated and recalculated until a steady state is reached. The extent to which the system represented by the map convergences and stabilises does not depend on the inputs to the system but by the causal relationships between the elements of the system (Stacey, 2016). The calculation incorporates a threshold function, like the sigmoid function, where the system's steady state can be calculated algebraically for any combination of input nodes. This function "applies the untested and questionable assumption that causal effects will all mitigate equally to prevent system divergence and instability" (Stacey, 2016, p. 279). The computation for FCMs is illustrated by this formula: yn+1=ts+ynb.

A steady state of scenarios can be presented once a steady state has been reached. The scenarios do not depend on the initial nodes but mainly on the interaction between

variables. To analyse a cognitive map, the number of variables and the number connections among the variables can be counted and the clustering of these can determine the density or clustering coefficient of a fuzzy cognitive map, which illustrates the interconnectedness of the nodes (Özesmi & Özesmi, 2004).

Once the net causal effect is reached, the convergence and system stability are verified and illustrated by the Argand plane below.

Figure 2: The Argand plane



The modulus of the Argand plane shows that all pairs are less than 1 indicating that the system is stable and the steady states, valid. As illustrated in figure 2 above, none of the points in the modulus of the Argand plane are outside of the unit circle, it means that the results of the results of the study can be trusted (Stacey, 2016).

Results

The goal of this paper was to answer the key research question of the study, which sought to investigate the extent to which design thinking contributes to disruptive innovation and business outcomes. This section presents the results of the study by firstly providing a sample of the literature consulted, which informed the nodes and relationships identified in the study. It will then identify the strength and direction of the relationships using the adjacency matrix and the FCM. It will also illustrate the results, which will identify the main determinants and depict the steady state.

Summary of literature covered in document analysis

Literature review and document analysis were employed as key tools in the identification of literature for mapping out the relationships between the variables explored in this study. The table below illustrates a list of the variables that were explored in the study.

Table 3: The nodes

Design thinking (Transmitter nodes)	Business and Innovation (Receiver Nodes)
Research	Behavioural economics research
Synthesis	The fourth industrial revolution (Industry 4.0)
Ideation	Strategic Drift
Implementation	Strategic Fit
Culture	Organizational Ambidexterity
Leadership	Capital Utilization
	Jobs Creation
	Scrum
	Disruptive Innovation
	Sustaining Innovation
	Time
	Competition
	Revenue
	Disruptive innovation
	Sustaining innovation

The variables explored are thus the four elements of design thinking, which are research, synthesis, ideation and implementation, the two types of innovation; disruptive and sustaining/efficient innovation as well as organisational aspects such as culture, leadership, strategy, etc. Niskanen (2005) proposes that before the simulation of FCMs, one ought to stipulate the variables to be investigated in the model and then assign interrelationships between the variables. Various academic resources, such as books, papers, and journals which investigated the links between design thinking, innovation and business outcomes were therefore explored to stipulate the relationship between variables, and a sample of them are presented in the table below.

The adjacency matrix

Before the simulation of FCMs, an adjacency matrix stipulating the interrelationships between variables was defined. The matrix is a representation of the relationships stipulated in literature and further illustrated below in the FCM. The adjacency matrix simulates the model to explain and predict the phenomena under study. The weights written in black identify the positive relationships and the red identify negative relationships between variables.

Table 4: The adjacency matrix of fuzzy numbers assigned

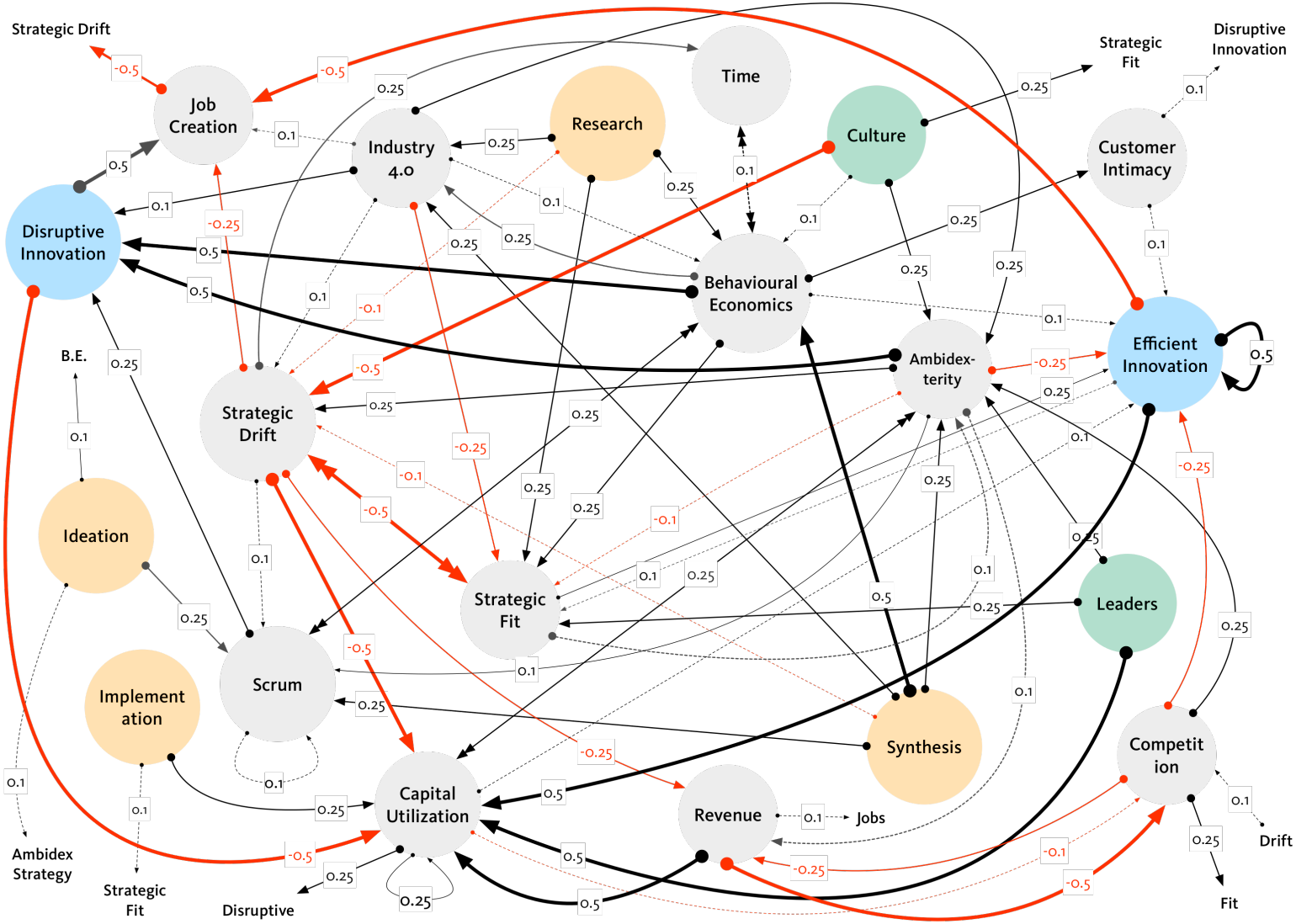
	B.E.	Industry 4.0	Strategic Drift	Strategic Fit	Ambidextrous	Capital	Jobs	Scrum	Disruptive	Sustaining	Competition	Revenue	Time	Customer intimacy
Research	0.25	0.10	-0.10	0.25										
Synthesis	0.50	0.25	-0.10		0.25			0.25						
Ideation	0.25				0.10			0.25						
Delivery				0.10		0.25								
Culture	0.10		-0.50	0.25	0.25									
Leadership				0.25	0.25	0.50								
B.E.		0.25		0.25				0.25	0.50				0.10	0.25
Industry 4.0	0.10		0.10	-0.25	0.25		-0.10		0.10					
Strategic Drift				-0.50		-0.50	-0.25	-0.10			0.10	-0.25	0.10	
Strategic Fit			-0.50		0.10					0.50		0.10		
Ambidextrous			0.25	-0.10		0.25		0.10	0.50	-0.25	-0.25	-0.10		
Capital					0.25				0.25	0.10	-0.10			
Jobs												-0.50		
Scrum	0.25							0.10	0.25					
Disruptive						-0.50	0.50						0.50	
Sustaining				0.10		0.50	-0.50		-0.10	0.10				
Competition			0.25	-0.25						-0.25		-0.25		
Revenue						0.50	0.10				-0.50			
Time	0.10								0.25	-0.10				
Customer intimacy									0.10	0.10				

Results presented above indicate that from the literature, 21 nodes were established, with design thinking (research, synthesis, ideation implementation) nodes, leadership and corporate culture as the transmitter nodes. What is illustrated in the adjacency matrix above is also illustrated below by the FCM diagrammatically.

The Fuzzy Cognitive Map (FCM) and the steady state scenarios

The FCM is a generic tool for organizing and comparing knowledge about hypothesized causal (inter) relationships. It may be employed wherever there are potential differing perspectives of a system or issue.

Figure 3: Completed FCM (design thinking strategies, business and innovation)



As illustrated in the FCM above, research had a moderate positive relationship (value= 0.5) with behavioural economics, industry 4.0 and strategic fit and but a weak negative relationship (value= -0.1) with strategic drift. Synthesis was found to have strong positive relationships (value= 0.5) with behavioural economics, moderate positive relationships (value= 0.25) with organisational ambidexterity and scrum and a minor negative relationship (value= -0.1) with strategic drift.

Ideation had a moderate positive relationship with scrum (value= 0.25) and minor positive relationships with behavioural economics and organizational ambidextrous (value= 0.1), whilst implementation had moderate positive relationships with capital (value= 0.25) and minor positive relationships with strategic fit (value= 0.1).

Strong positive relationships were found between disruptive innovation, organisational ambidexterity, behavioural economics and job creation (value= 0.5) and strong negative relationship were found between disruptive innovation and capital (value= -0.5) but strong positive relationships between efficient innovation and capital (value= 0.5). It is also clear from the diagram above that efficient innovation and job creation had strong negative relationships (value= -0.5) whilst disruptive innovation had strong positive relationships with job creation (value= 0.5) but strong negative relationship with capital (value= -0.5).

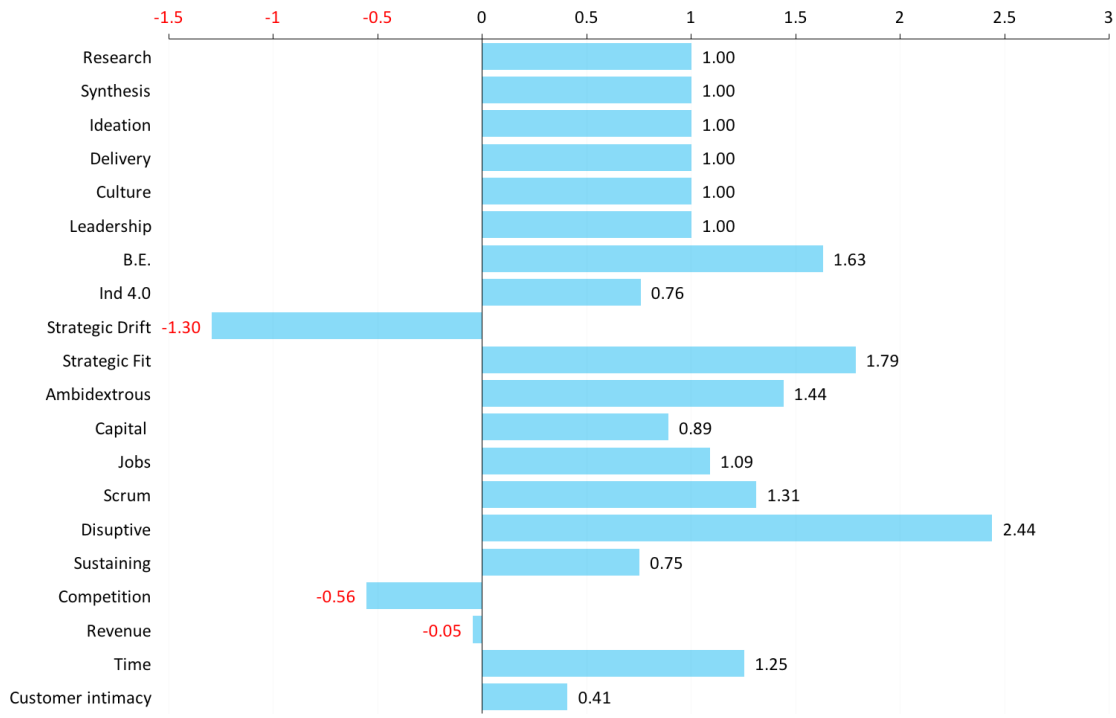
Organisational ambidexterity was also found to have strong positive relationship with disruptive innovation (value= 0.5) and moderate positive relationship with strategic drift (value= 0.25), but moderate negative relationships with efficient innovation (value= -0.25) and a weak negative relationship with strategic drift (value= -0.1). Strong negative relationships were also found between strategic drift and capital (value= -0.5), but no direct relationship was found between strategic fit and capital.

It is therefore, noteworthy that the strength of the FCM lies not only in the transmitter nodes but in the relationships among other nodes that affect other areas of the system.

The net causal effect

After the cognitive maps were derived and the adjacency matrix coded, a model was run to ascertain the system's steady state. This was done through the auto - associative neural network method (Stacey, 2016). The graph below presents the steady states.

Figure 4: Net Causal effects

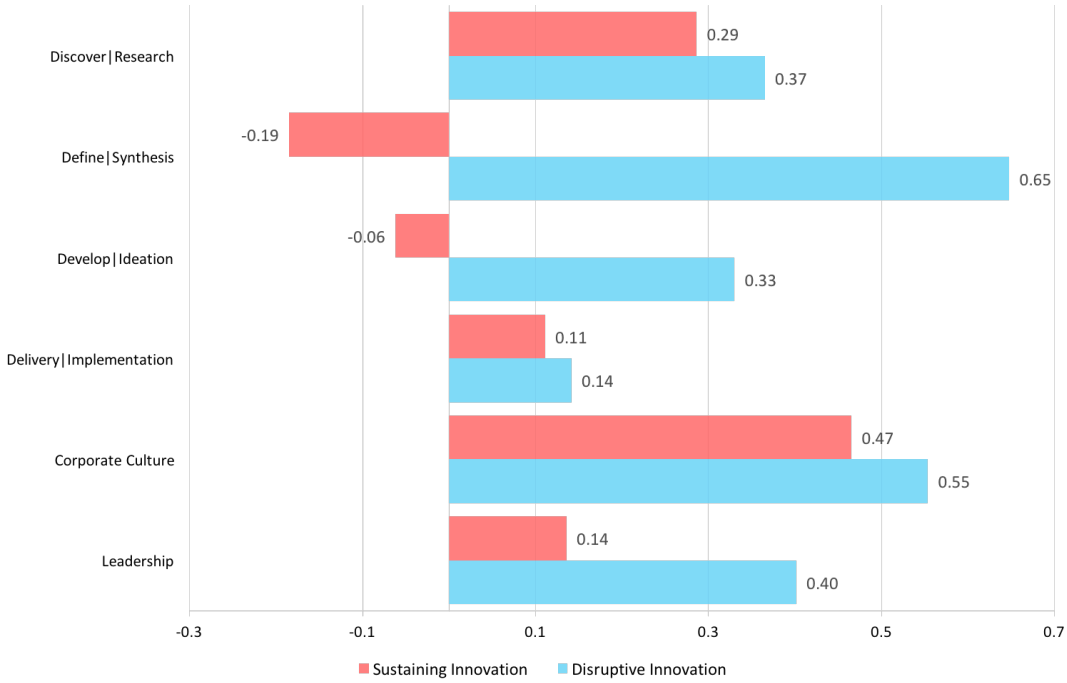


The diagram above illustrates the net causal effects, which identified six strong positive [above 1] relationships within the FCM, namely; behavioural economics (value = 1.63), strategic fit (value = 1.79), organisational ambidexterity (value = 1.44), scrum (value = 1.31), the time factor (value = 1.25), and job creation (value = 1.09). Positive moderate relationships were also found within the FCM, namely; capital utilisation (value = 0.89) and customer intimacy research (value = 0.41). Three weak negative relationships were also identified, namely; strategic drift (value = -1.30), competition (value = -0.56) and revenue (value = -0.05).

The steady states scenarios of the FCM

The scenario in situ is the causal effect of design thinking on disruptive innovation and sustaining/efficient innovation.

Figure 5: Design thinking on innovation steady states



The effects of design thinking, disruptive and sustaining/efficient innovation

As reflected in the steady state scenario above, the element of design thinking that had a high causal effect on disruptive innovation was synthesis (value = 0.65). Research (value = 0.37) and ideation (value = 0.33) had moderate effects and implementation (value = 0.14) had the lowest causal effect. Negative causal effects were however, identified between sustaining innovation and synthesis (value= -0.19) and ideation (value= -0.06) as illustrated in the scenario above. The link between design thinking and sustaining innovation is counterintuitive, whilst the opposite is true for disruptive innovation.

Disruptive innovation (value = 0.55) and sustaining innovation (value= 0.47) had moderately high causal effects on corporate culture. Minor causal effects were however, found between sustaining innovation (value= 0.14) and leadership as compared to disruptive innovation and leadership (value = 0.40).

Limitations

It should be noted that data collection for this study was qualitative and there was no empirical data collected since data was collected through document analysis. Therefore, the results of the study have limitations associated with qualitative studies. Results of the study can therefore not be generalised because of there was no empirical evidence. The study can therefore provide insight into the links of design thinking, innovation and

business outcomes through the researcher's narrative. Evidence based systemic research methods can however, improve the trustworthiness of the study.
The study was done using document analysis through the selection of literature identified by the researcher. Furthermore, the links, weights and nodes between the different concepts were established by the researcher. Qualitative studies may therefore introduce the biases of the investigator and the researcher therefore, has a responsibility to be reflexive.

Summary of key findings and discussion

The lack of innovation, conventional methods and approaches to implement strategy, and the lack of new ways of thinking have been argued to contribute to the failure of small businesses. It is asserted that companies lack focus in disruptive innovation and focus on incremental change (Brown, 2009; Valdiserri & Wilson, 2010). These assertions are aligned with the results of the study as it was found that design thinking strategies had positive causal effects on disruptive innovation. Synthesis had the strongest causal effect with disruptive innovation and research and ideation had moderate casual effects and the lowest effects were with implementation.

Leadership is challenged to adapt and change their strategies as the business landscape evolves. Christensen (2013) coins this challenge as the innovator's dilemma; where management battles between sustaining innovation (improving efficiencies through advancements in technologies) or investing in disruptive innovation, which has a great potential of increasing revenues and creating jobs.

The results of the study illustrate that disruptive innovation requires capital utilisation, whilst efficient innovation increases revenue. The argument to invest in disruptive innovation seems counterintuitive, unless management is aware that being on a sustaining path is short-lived and builds risk in the coming future. The sole strategy in investing in technology as a means of building efficiencies has become a thing of the past. It enslaves companies in incremental growth, which can easily be disrupted (Christensen, 2013; Lawlor, et al., 2015; Sakkab, 2007).

It is also noteworthy that disruptive innovation was found to positively contribute to job creation whilst efficient innovations was not found to positively contribute to job creation. Disruptive innovation provides the potential for new developments which favour job creation whilst sustaining innovation has the potential to even reduce jobs as companies focus on improving efficiencies through the adoption of new technologies. Even though companies may require capital to start an innovation, in the long run, that innovation may bring revenue into the company.

Disruptive innovation seems to be advocated as an approach that positively contributes to business outcomes. Enterprises that apply design thinking strategies tend to be

more innovative, profitable and have been found to grow faster. Design thinking therefore, plays a critical role in organisational success (European Commission, 2009; Henderson & Whicher, 2015; Lawlor, et al, 2015) and the role of leadership is therefore critical.

Disruptive innovation was found to have positive relationships with organisational ambidexterity and behavioural economics. Organisational ambidexterity also had positive relationship with strategic drift but negative relationships with strategic fit and efficient innovation. Disruptive innovation requires a shift in thinking and a certain level of willingness to take risks, hence the positive relationships with organisational ambidexterity. Organisational ambidexterity is a strategy that requires organisations to maintain their current strategy whilst pursuing a completely different strategy on the side, which requires a level of adaptation and willingness to invest in new developments, some of which may not be entirely aligned to current organisational strategies (Christensen, 2013; Johnson, Scholes & Whittington, 2008). This would require a change in corporate culture and committed leadership, which were interestingly found to have strong causal effects with disruptive innovation in the current study.

Throughout history, the evolution of management theory has demonstrated advancement in management through systematic research, and Ariely (2009) argues that if design thinking strategies are to succeed in a world far less rational than standard economic theory suggests, behavioural economics would need to be applied as a new lens of researching business, people, environments and their interactions.

The results of the study found that synthesis of an unmet need had a positive relationship with behavioural economics. Behavioural economics also had positive relationships with disruptive innovation, industry 4.0 and strategic fit but a weak negative relationship with strategic drift. These relationships illustrate the critical role played by the synthesis of unmet needs via behavioural economics ethos to inform and pursue disruptive innovation. The disruption is thus informed and not a result of random thought, hence aligns to the new proposed strategy.

Ideation was found to have moderate positive relationship with scrum. Ideation is the generation of ideas to tackle the problem defined during synthesis and scrum involves the management of the generated ideas, rapid prototyping, testing and managing of feedback loops (Sutherland & Sutherland, 2014). It is therefore, clear that the strength of ideation to cause disruptive innovation is through scrum hence the positive relationship.

Implementation as the final product in a design thinking processes seemed to have moderate positive relationships with capital and minor positive relationships with strategic fit. Implementation is a critical phase that feeds directly into further research, synthesis and ideation to achieve minimum viable products or prototypes (MVP) that solve the end users' unmet needs. The MVP allows the design thinking practitioner to further understand the interaction between the product/service and stakeholders.

In conclusion, there is an increasing discourse that pins the problem of the South African economy to the low rate of growth and survival of small business. SMMEs are a catalyst to economic growth but a relatively high proportion of them have a low rate of survival as they are boggled with old and conventional ways of thinking and implementing strategies. This study therefore proposed design thinking as a tool to enhance business outcomes and improve survival rate of SMMEs. The underlying assumption was that when design thinking plays an integral part of the innovation process, return on investment is greater. This study was thus an attempt to unlock how design thinking strategies can be used as innovative tools for improving business outcomes.

Conclusion

This study therefore aimed to identify the relationship between design-thinking, innovation and business growth; and identify the elements of design thinking and innovation that influenced business outcomes. To ascertain this, a qualitative method approach was adopted. Data was collected through document analysis, which assisted in mapping out the relationships between variables and identify possible relationships, which would be explored using fuzzy cognitive maps, which assisted in identifying causal effects and steady states. The model was also tested for stability, which ascertained validity of the model.

This paper advocated design thinking strategies as a means of contributing to innovation and business outcomes and even though it found that design thinking strategies had a relationship with innovation, it was found more so to have stronger positive relationships with disruptive innovation than efficient innovation. The innovator's dilemma articulates this conundrum as a challenge faced by modern leaders; the choice between innovating in disruption and in efficiency.

Disruptive innovation as illustrated in the results requires capital investment even though in the long term, it contributes to significantly to job creation and revenue, whilst efficient innovation increases revenue without contributing to job creation. SMMEs investment in disruptive innovation therefore has great potential for improving survival rates. One can then infer that the failure of SMMEs could be because of not pursuing disruptive innovative strategies and replicating strategies of established monopolies. Disruptive innovation seems counterintuitive, unless leadership is aware that being on a sustaining path is short-lived and builds risk in the coming future.

When an organisation encounters strategic drift, it is a sign of misalignment unless it is informed. An ambidextrous strategy is an intentional decision by organisations to slightly drift from their core strategy to pursue innovative endeavours. From the analysis, it became clear that the adoption of behavioural economics research and an insight into the fourth industrial revolution (industry 4.0), anchored by design thinking strategies, has

the potential to contribute towards disruptive innovation, which has the potential to not only improve business outcomes but also contribute towards the job creation. A fostering corporate culture and committed leadership becomes the sine qua non for disruptive innovation.

Growth therefore is not anathema to South Africa or the continent at large. Design thinking strategies can be the panacea for SMMEs and organisations pursuing ambidextrous strategies. The findings provide support for the general idea that design thinking can play a critical role in improving business outcomes in both start-ups pursuing disruptive innovation and more established companies.

Areas for further research

Further research could be done to check how to mitigate the absence of certain concepts for instance: an organisation with a bad culture, which components of design thinking can mitigate such anomalies

There is also opportunity to explore and understand unmet customer needs that are not yet served.

References

Andrew J. P., Sirkin, H. L., Haanæs, K., & Michael, D. C. (2007). *Measuring innovation*. USA: Boston Consulting Group, Inc.

Ariely, D. (2009). *Predictably irrational*. New York: HarperCollins.

Boland Jr, R. J. (1986). *Phenomenology: a preferred approach to research on information systems. In Trends in information systems.* Amsterdam: North-Holland Publishing Co.

Bowen, G. A. (2009). Document analysis as a qualitative research method. *Qualitative Research Journal*, 9 (2), pp. 27-40.

Brown, T. (2009). Change by design: How design thinking transforms organization and inspires innovation. USA: Harper Collins.

Brown, T., & Katz, B. (2011). *Change by design. Journal of Product Innovation Management, 28* (3), pp. 381-383.

Burrell, G., & Morgan, G. (2017). *Sociological paradigms and organisational analysis: Elements of the sociology of corporate life*. London: Routledge.

Chikere, C. C., & Nwoka, J. (2015). The systems theory of management in modern day organizations: A study of Aldgate Congress Resort Limited Port Harcourt. *International Journal of Scientific and Research Publications, 5* (9), pp. 1-7.

Christensen, C. (2013). *The innovator's dilemma: when new technologies cause great firms to fail.* USA: Harvard Business Review Press.

Christensen, C. M., Raynor, M. E. & McDonald, R. (2015). What is disruptive innovation. *Harvard Business Review, 93* (12), pp. 44-53.

Cooperrider, D. L., & Fry, R. (2010). Design-inspired corporate citizenship. *Journal of Corporate Citizenship, 37*, pp. 3-6.

Deetz, S. (1996). Crossroads—Describing differences in approaches to organization science: Rethinking Burrell and Morgan and their legacy. *Organization Science, 7* (2), pp. 191-207.

Dorst, K. (2015). *Frame innovation: Create new thinking by design*. USA: MIT Press.

Dosi, G. (1988). Sources, procedures, and microeconomic effects of innovation. *Journal of Economic Literature, 26* (3), pp. 1120-1171.

European Commission (2009). *Design as a driver of user-centred innovation: Commission Staff Working Document.* Retrieved on July 27, 2017 from, http://ec.europa.eu/DocsRoom/documents/2583/attachments/1/translations/en/renditions/native.

Fatoki, O. (2014). The causes of the failure of new small and medium enterprises in South Africa. *Mediterranean Journal of Social Sciences, 5* (20), pp. 922-927.

Gray, S. A., Zanre, E., & Gray, S. R. J. (2014). Fuzzy cognitive maps as representations of mental models and group beliefs. Fuzzy cognitive maps for applied sciences and engineering. In E. I. Papageorgiou (ed.). *Fuzzy Cognitive Maps for Applied Sciences and Engineering*, pp. 29-48. Berlin: Springer Heidelberg.

Harris, E., & Woolley, R. (2009). Facilitating innovation through cognitive mapping of uncertainty. *International Studies of Management & Organization, 39* (1), pp. 70-100.

Hassi, L., & Laakso, M. (2011). Making sense of design thinking. *IDBM papers,* 1, pp. 51-62.

Henderson, D., & Whicher, A. (2015). *A study of the role and importance of design in Irish-based firms in non design-intensive sectors.* Retrieved on July 27, 2017 from, https://dbei.gov.ie/en/Publications/Publication-files/Design-in-Non-Intensive-Design-Sectors.pdf.

Herrington, M., Kew, J., & Kew, P. (2010). *Global entrepreneurship monitor.* Retrieved on July 27, 2017 from, https://www.researchgate.net/profile/Jacqui_Kew/publication/317566357_GEM_South_Africa_2010_Report/links/593ff95f458515a6218843c9/GEM-South-Africa-2010-Report.pdf.

Hogg, A. (2017). *Another day, another KPMG scandal: Even unforgiving clients have their limits.* Retrieved September 24, 2017 from, https://www.biznews.com/undictated/2017/08/17/another-kpmg-scandal/.

Kaplan, B., & Maxwell, J. A. (2005). Qualitative research methods for evaluating computer information systems. In J.G. Anderson and C. Aydin (Eds.), *Evaluating the organizational impact of healthcare information systems*, pp. 30-55. New York: Springer.

Kaplan, R. S., & Norton, D. P. (2005). *The balanced scorecard: measures that drive performance.* Retrieved on September 12, 2017 from, https://umei007-fall10.wikispaces.com/file/view/Kaplan%26Nortonbalanced+scorecard.pdf.

Kerr, F. (2015). Operationalising innovation: Hotwiring the creative organisation. In G. Roos and A. O'Connor (Eds.), *Integrating Innovation: South Australian Entrepreneurship Systems and Strategies*, pp. 159-204. South Australia: University of Adelaide Press.

Kosko, B. (1986). Fuzzy cognitive maps. *International Journal of Man-machine Studies, 24* (1), pp. 65-75.

Kupp, M., Anderson, J., & Reckhenrich, J. (2017). Why design thinking in business needs a rethink. *MIT Sloan Management Review, 59* (1), pp. 42-47.

Lawlor, P., ODonoghue, A., Wafer, B., & Commins, E. (2015). *Design driven innovation: why it matters for SME competitiveness.* Retrieved on October 11, 2017 from, https://www.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/Design-Driven%20Innovation-Why%20it%20Matters%20for%20SME%20Competitiveness.pdf.

Lockwood, T., & Walton, T. (2008). *Building design strategy. Using Design to Achieve Key Business.* New York: Allworth Press.

Maranville, S. (1992). Entrepreneurship in the business curriculum. *Journal of Education for Business, 68* (1), pp. 27-31.

Martínez-Lorente, A. R., Dewhurst, F., & Dale, B. G. (1998). Total quality management: origins and evolution of the term. *The TQM Magazine, 10* (5), pp. 378-386.

McGregor, D. (2006). *The human side of enterprise.* USA: McGraw Hill Professional.

Miller, W. L. (2006). Innovation rules. *Research-Technology Management, 49* (2), pp. 8-14.

Mkandawire, T. (2011). Running while others walk: Knowledge and the challenge of Africa's development. *Africa Development, 36* (2), pp. 1-36.

Moses, C., Sithole, M. M., Blankley, W., Labadarios, D., Makelane, H., & Nkobole, N. (2012). The state of innovation in South Africa: findings from the South African National Innovation Survey: commentary. *South African Journal of Science, 108* (8), pp. 1-5.

Nessler, D. (2016). *How to apply a design thinking, HCD, UX or any creative process from scratch.* Retrieved on October 20, 2017 from, https://medium.com/digital-experience-design/how-to-apply-a-design-thinking-hcd-ux-or-any-creative-process-from-scratch-b8786efbf812.

Neuman, L. W. (1994). *Social research methods: Qualitative and quantitative approaches*. London: Pearson international edition.

Niskanen, V. (2006). Application of fuzzy linguistic cognitive maps to prisoner's dilemma. *International Journal of Innovative Computing, Information and Control, 2* (1), pp.139-152.

Orlikowski, W. J., & Baroudi, J. J. (1991). Studying information technology in organizations: Research approaches and assumptions. *Information Systems Research, 2* (1), pp. 1-28.

Özesmi, U., & Özesmi, S. L. (2004). Ecological models based on people's knowledge: a multi-step fuzzy cognitive mapping approach. *Ecological Modelling, 176* (1), pp. 43-64.

Papageorgiou, E. I., & Salmeron, J. L. (2013). A review of fuzzy cognitive maps research during the last decade. *IEEE Transactions on Fuzzy Systems, 21* (1), pp. 66-79.

Pinhold, J. (2008). *The nature of new firms.* Retrieved on July 20, 2017 from, http://commerce.massey.ac.nz/research-output/2002/20002022.pdf.

Razzouk, R., & Shute, V. (2012). What is design thinking and why is it important? *Review of Educational Research, 82* (3), pp. 330-348.

Reeves, M., Love, C., & Tillmanns, P. (2012). Your strategy needs a strategy. *Harvard Business Review, 90* (9), 76-83.

Rittel, H. W., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy sciences, 4* (2), pp. 155-169.

Rogerson 1, C. M. (2004). The impact of the South African government's SMME programmes: A ten-year review 1994–2003. *Development Southern Africa, 21* (5), pp. 765-784.

Sakkab, N. Y. (2007). Growing through innovation. *Research-Technology Management, 50* (6), pp. 59-64.

Senge, P. (1990). *The fifth discipline: The art and science of the learning organization.* New York: Currency Doubleday.

Stacey, A. (2016). Semi-quantitative Systems Analysis Using Fuzzy Cognitive Maps. In V. Benson and F. Filippaios (Eds.), ECRM. Paper presented at *Proceedings of the 15th European Conference on Research Methodology for Business Management.* UK: Academic Conferences and publishing limited, 9-10 June, pp. 275-284.

Sutherland, J., & Sutherland, J. J. (2014). *Scrum: the art of doing twice the work in half the time.* New York: Random House.

Taylor, F. W. (1914). *The principles of scientific management*. New York: Harper & Brothers.

Thanh, N. C., & Thanh, T. T. (2015). The interconnection between interpretivist paradigm and qualitative methods in Education. *American Journal of Educational Science, 1* (2), pp. 24-27.

Thomas, R. M. (2003). *Blending qualitative and quantitative research methods in theses and dissertations.* California: Corwin Press.

Timm, S. (2011). *How South Africa can boost support to small businesses: Lessons from Brazil and India*. Retrieved on November 20, 2017 from https://www.smallbusinessinsight.org/uploads/2/5/7/4/25746706/tips-lessons_from_brazil_and_india_summary_report_2011.pdf.

Valdiserri, G. A., & Wilson, J. L. (2010). The study of leadership in small business organizations: Impact on profitability and organizational success. *Entrepreneurial Executive*, 15, pp. 47-71.

Von Bertalanffy, L., & Sutherland, J. W. (1974). General systems theory: Foundations, developments, applications. I*EEE Transactions on Systems, Man, and Cybernetics, 4* (6), pp. 592-592.

Walsham, G. (1993). *Interpreting information systems in organizations*. New York: John Wiley & Sons, Inc.

Weymes, E. (2004). A challenge to traditional management theory. *Foresight, 6* (6), pp. 338-348.

Willis, J. W., Jost, M., & Nilakanta, R. (2007). *Foundations of qualitative research: Interpretive and critical approaches*. USA: Sage.

Wylant, B. (2010). Design thinking and the question of modernity. *The Design Journal, 13* (2), pp. 217-231.

Yomaani. (2016, February 13). *Human Centred Design – Yomaami – Medium*. Retrieved on July 20, 2017 from https://medium.com/@yomaami/human-centred-design-94a8068ec5e4.

Yrle, A. C., Hartman, S.J., & Yrle-Frou, A.R. (2000). Economic Factors: Examining Why Small Businesses Fail. Journal o*f Business and Entrepreneurship, 12* (3), pp. 67-0_13.

Annexure 1: data collection

	Research (References)	Link (Causal links)	Research (References)	Strength of relationship
0	Design thinking and Fuzzy Cognitive Maps (FCMs)			
			Johansson□Sköldberg, Woodilla, & Çetinkaya (2013)	
			Martin (2009)	
			Brown (2009)	
			Kosko (1986)	
			Groumpos (2010).	
			Papageorgiou & Stylios (2008).	
			Stacey (2016).	
1	Research			
		Customer intimacy	Etches, A. (2013)	medium
			Chi Kin (Bennett) Yim, Tse, & Chan (2008).	
			Akçura & Srinivasan (2005).	
		Behavioural Economics	Ariely & Taylor (2010).	strong
			Hindriks & Myles (2013).	
			Gino, Norton & Ariely (2010).	

	Research (References)	Link (Causal links)	Research (References)	Strength of relation-ship
			Ariely (2009).	
			Martin (2009).	
		Industry 4.0	Schwab (2017).	weak
			Brynjolfsson & McAfee (2014).	
			Martin (2017).	
		Strategic Fit	Martin (2009)	weak
			Porter (1996).	
			Johnson, Whittington, Scholes, Angwin & Regner (2013).	
		Strategic Drift	Akçura & Srinivasan (2005)	(weak)
			Porter (1996).	
			Johnson, Whittington, Scholes, Angwin & Regner (2013).	
2	Synthesis/Define			
	Dorst (2011).			
	Martin, R. L. (2009).			
	Brown, T. (2009).			
		Behavioural Economics		Medium
		Strategic Drift		(weak)
		Organisational Ambidexterity		Medium

	Research (References)	Link (Causal links)	Research (References)	Strength of relation-ship
		Scrum	Sutherland, J., & Sutherland, J. J. (2014)	weak
			Schwaber, K. (2004)	
3	Ideation			
	Dorst (2011).			
	Martin (2009).			
	Brown (2009)			
		Behavioural Economics		Medium
		Industry 4.0		Medium
		Organisational Ambidexterity		Medium
		Scrum		Strong
4	Delivery			
	Dorst (2011).			
	Martin (2009).			
	Brown (2009).			
		Strategic Fit		Weak
		Capital	Ross, Westerfield, Jordan & Firer (2000).	Medium
5	Culture			
	McLaughlin, P., Bessant, J., & Smart, P. (2008).			
	Nooteboom, B., & Went, R. (2008)			

	Research (References)	Link (Causal links)	Research (References)	Strength of relationship
	Johnson, Whittington, Scholes, Angwin & Regner (2013).			
		Behavioural Economics		Weak
		Strategic Fit		Medium
		Strategic Drift		Medium
		Organisational Ambidexterity		Medium
6	Leadership			
	Morieux & Tollman (2014).			
	Jordan, Miller & Dolvin (2015).			
	Johnson, Whittington, Scholes, Angwin & Regner (2013)			
	Reeves, Love & Tillmanns (2012).			
	Reeves, Haanaes & Sinha (2015).			
		Strategic Fit		Medium
		Capital		Strong
		Organisational Ambidexterity		Medium
7	Behavioural Economics	Strategic Fit		Medium
		Industry 4.0		Medium
		Scrum		Medium

	Research (References)	Link (Causal links)	Research (References)	Strength of relationship
		Disruptive Innovation	Christensen (2013).	Strong
			Christensen & Raynor (2013).	
			Porter (2011).	
		Sustaining (Efficiency) Innovation	Christensen (2013).	Weak
			Christensen & Raynor (2013).	
			Porter (2011).	
8	The fourth industrial revolution (Industry 4.0)	Behavioural Economics		Weak
		Strategic Drift		weak
		Strategic Fit		(Medium)
		Organisational Ambidexterity		Mdium
		Jobs	Christensen (2013).	(Weak)
			Christensen & Raynor (2013).	
			Porter (2011).	
		Disruptive Innovation		Weak
9	Strategic Drift	Strategic Fit		(Strong)
		Capital		(Strong)
		Jobs		(Medium)

	Research (References)	Link (Causal links)	Research (References)	Strength of relationship
		Scrum		(weak)
10	Strategic Fit	Strategic Drift		(Strong)
		Organisational Ambidexterity		Weak
		Sustaining (Efficiency) Innovation		Medium
11	Organisational Ambidexterity O'Reilly III, C. A., & Tushman, M. L. (2008). Reeves, Haanaes & Sinha. (2015).			
		Strategic Drift		Medium
		Strategic Fit		(weak)
		Scrum		weak
		Capital		Medium
		Sustaining (Efficiency) Innovation		(Medium)
		Disruptive Innovation		Strong
12	Revenue Christensen (2013) Christensen & Raynor (2013).			

	Research (References)	Link (Causal links)	Research (References)	Strength of relationship
	Porter (2011).			
	Ross, Westerfield, Jordan & Firer (2000)			
	Jordan, Miller & Dolvin (2015).			
		Capital		Strong
		Jobs		weak
		Competition		(Strong)
13	Capital			
	Ross, Westerfield, Jordan & Firer (2000).			
	Jordan, Miller & Dolvin (2015)			
		Organisational Ambidexterity		(Strong)
		Disruptive Innovation		
		Sustaining (Efficiency) Innovation		
14	Jobs			
	Christensen (2013).			
	Ross, Westerfield, Jordan & Firer(2000).			
		Capital		(Strong)
15	Scrum			

	Research (References)	Link (Causal links)	Research (References)	Strength of relationship
	Takeuchi & Nonaka (1998).			
	Sutherland & Sutherland (2014).			
		Behavioural Economics		Medium
		Scrum		Weak
		Disruptive Innovation		Medium
16	Competition			
	Christensen (2013)			
	Christensen & Raynor (2013).			
	Porter (2011).			
	Reeves, Haanaes & Sinha (2015).			
		Strategic Drift		Medium
		Strategic Fit		(Medium)
		Sustaining (Efficiency) Innovation		(Medium)
		Revenue		(Medium)
17	Time			
	Christensen & Raynor (2013).			
		Behavioural Economics		Weak
		Disruptive Innovation		Medium

	Research (References)	Link (Causal links)	Research (References)	Strength of relationship
		Sustaining (Efficiency) Innovation		(Weak)
18	Revenue			
	Christensen & Raynor (2013).			
	Ross, Westerfield, Jordan & Firer (2000)			
	Jordan, Miller & Dolvin (2015)			
		Capital		Strong
		Jobs		Weak
		Competition		(Strong)
19	Customer Intimacy			
		Disruptive Innovation		Weak
		Sustaining (Efficiency) Innovation		Weak
20	Sustaining Innovation			
	Christensen (2013)			
	Christensen & Raynor (2013)			
	Johansson□Sköldberg, Woodilla & Çetinkaya (2013)			
	Martin (2009)			
	Brown (2009)			
		Strategic Fit		Weak

	Research (References)	Link (Causal links)	Research (References)	Strength of relationship
		Capital		Strong
		Jobs		(Strong)
		Disruptive Innovation		(Weak)
		Sustaining (Efficiency) Innovation		Weak
21	Disruptive Innovation	Organisational Ambidexterity		Medium
	Christensen, C. (2013).			
	Christensen & Raynor (2013)			
	Johansson Sköldberg, Woodilla & Çetinkaya (2013)			
	Martin(2009			
	Brown (2009)			
		Capital		(Strong)
		Jobs		Strong
		Time		Strong

Annexure 2: data collection references

Akçura, M. T., & Srinivasan, K. (2005). Research note: customer intimacy and cross-selling strategy. Management Science, 51(6), pp. 1007-1012.

Ariely, D. (2009). Predictably irrational. New York: HarperCollins.

Ariely, D., & Taylor, M. (2010). Better the devil you know. RSA Journal, 156(5544), pp. 30-33.

Brown, T. (2009). Change by design. USA: Harper Collins.

Brynjolfsson, E., & McAfee, A. (2014). The second machine age: Work, progress, and prosperity in a time of brilliant technologies. New York: WW Norton & Company.

Chi Kin (Bennett) Yim, Tse, D., & Chan, K. (2008). Strengthening Customer Loyalty through Intimacy and Passion: Roles of Customer—Firm Affection and Customer—Staff Relationships in Services. Journal of Marketing Research, 45(6), pp. 741-756.

Christensen, C. (2013). The innovator's dilemma: when new technologies cause great firms to fail. USA: Harvard Business Review Press.

Christensen, C., & Raynor, M. (2013). The innovator's solution: Creating and sustaining successful growth. USA: Harvard Business Review Press.

Dorst, K. (2011). The core of design thinking and its application. Design studies, 32(6), pp. 521-532.

Etches, A. (2013). Know thy users. Reference & User Services Quarterly, 53(1), pp. 13.

Gino, F., Norton, M., & Ariely, D. (2010). The Counterfeit Self: The Deceptive Costs of Faking It. Psychological Science, 21(5), pp. 712-720.

Groumpos, P. P. (2010). Fuzzy cognitive maps: basic theories and their application to complex systems. In Fuzzy cognitive maps, pp. 1-22. Berlin: Springer.

Hindriks, J., & Myles, G. D. (2013). Intermediate public economics. Massachusetts: MIT Press.

Johansson Sköldberg, U., Woodilla, J., & Çetinkaya, M. (2013). Design thinking: past, present and possible futures. Creativity and Innovation Management, 22(2), pp. 121-146.

Johnson, G., Whittington, R., Scholes, K., Angwin, D., & Regner, P. (2013). Exploring Strategy Text & Cases. London: Pearson.

Jordan, B. D., Miller, T. W., & Dolvin, S. D. (2015). Fundamentals of investments: Valuation and management. New York: McGraw-Hill International Edition.

Kosko, B. (1986). Fuzzy cognitive maps. International journal of man-machine studies, 24(1), pp. 65-75.

Martin, J. P. (2017). Policies to expand digital skills for the machine age, GLO Discussion Paper, 42. Pp. 1-18

Martin, R. L. (2009). The design of business: Why design thinking is the next competitive advantage. USA: Harvard Business Press.

McLaughlin, P., Bessant, J., & Smart, P. (2008). Developing an organisation culture to facilitate radical innovation. International Journal of Technology Management, 44(3-4), pp. 298-323.

Morieux, Y., & Tollman, P. (2014). Six simple rules: how to manage complexity without getting complicated. USA: Harvard Business Review Press.

Nooteboom, B., & Went, R. (2008). INNOVATION AND ORGANISATION. In Nooteboom B. & Stam E. (Eds.), Micro-foundations for Innovation Policy (pp. 219-248). Amsterdam: Amsterdam University Press.

O'Reilly III, C. A., & Tushman, M. L. (2008). Ambidexterity as a dynamic capability: Resolving the innovator's dilemma. Research in Organizational Behavior, 28, pp.185-206.

Papageorgiou, E. I., & Stylios, C. D. (2008). Fuzzy cognitive maps. Handbook of granular computing, 123, pp. 755-775.

Porter, M. E. (1996). What is strategy. London: Sage.

Porter, M. E. (2011). Competitive advantage of nations: creating and sustaining superior performance, New York: Simon and Schuster.

Reeves, M., Haanaes, K., & Sinha, J. (2015). Your strategy needs a strategy: How to choose and execute the right approach. USA: Harvard Business Press.

Reeves, M., Love, C., & Tillmanns, P. (2012). Your strategy needs a strategy. Harvard Business Review, 90(9), pp. 76-83.

Ross, S. A., Westerfield, R., Jordan, B. D., & Firer, C. (2000). Fundamentals of corporate finance. Massachusetts: Irwin/McGraw-Hill.

Schwab, K. (2017). The fourth industrial revolution. New York: Crown Business.

Schwaber, K. (2004). Agile project management with Scrum. USA: Microsoft press.

Stacey, A. (2016). Semi-quantitative Systems Analysis Using Fuzzy Cognitive Maps. In V. Benson and F. Filippaios (Eds.), ECRM. Paper presented at Proceedings of the 15th European Conference on Research Methodology for Business Management. UK: Academic Conferences and publishing limited, 9-10 June, pp. 275-284.

Sutherland, J., & Sutherland, J. J. (2014). Scrum: the art of doing twice the work in half the time. New York: Random House.

Takeuchi, H., & Nonaka, I. (1998). The new new product development game. Harvard Business Review, 64(1), pp. 321.