

The relationship between complexity leadership and dynamic capabilities

Dewan Lombard

26211620

A research project submitted to the Gordon Institute of Business Science, University of Pretoria, in partial fulfilment of the requirements for the degree of Master of Business Administration.

07 November 2018

ABSTRACT

All organisations across all industries experience change with the rise of the fourth industrial revolution. Dynamic capabilities are pivotal for an organisation to sustain its competitive advantage when environments change. Leadership needs to establish these dynamic capabilities, and leadership styles such as complexity leadership could provide the needed behaviours. The aim of this study was to establish and explore the relationship between complexity leadership and an organisation's dynamic capabilities. A better understanding of this relationship will assist organisations to sustain competitive advantage when environments change.

A mono-method quantitative methodology was adopted to test the hypothesised relationships, as deduced from literature. Structured questionnaires were used to measure participants' perceptions of complexity leadership behaviours and dynamic capabilities observed within their current organisations. Cross-sectional data were gathered from 115 employees, employed at various organisational levels in a cross-section of organisations in South Africa. The validity and reliability of the scales used in the questionnaire were successfully tested, and linear regression was used to test the relationship between complexity leadership and an organisation's dynamic capabilities.

The results indicated a significant, positive, linear relationship between complexity leadership and an organisation's dynamic capabilities. The findings of this study provide insights to business and academics, emphasising the important role of complexity leadership in support of an organisation's dynamic capabilities, to develop and sustain competitive advantage in a changing environment introduced by the rise of the fourth industrial revolution.

Keywords

Complexity leadership, dynamic capabilities, sustained competitive advantage

DECLARATION

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

Dewan Lombard

07 November 2018

TABLE OF CONTENTS

ABSTRACT	II
DECLARATION.....	III
LIST OF FIGURES	VIII
LIST OF TABLES.....	X
1. CHAPTER 1: INTRODUCTION TO THE RESEARCH PROBLEM.....	1
1.1. Introduction.....	1
1.2. Research problem and purpose.....	2
1.3. Contribution to business	3
1.4. Contribution to theory.....	4
1.5. Research scope.....	4
1.6. Document structure.....	5
2. CHAPTER 2: LITERATURE REVIEW.....	6
2.1. Introduction.....	6
2.2. Complexity leadership.....	6
2.2.1. Background	6
2.2.1.1. General systems theory.....	6
2.2.1.2. Complexity theory.....	7
2.2.1.3. Complex adaptive systems	7
2.2.2. Complexity leadership theory.....	8
2.2.3. Complexity leadership types	8
2.2.4. Complexity leadership behaviours	9
2.3. Dynamic capabilities	10
2.3.1. Background	10
2.3.1.1. The resource-based view.....	10
2.3.2. Dynamic capabilities	11
2.3.3. Higher order dynamic capabilities	11
2.3.3.1. Sensing capabilities	12
2.3.3.2. Seizing capabilities	12
2.3.3.3. Transforming capabilities	13
2.3.4. Dynamic capabilities, competitive advantage and leadership.....	13
2.4. The relationship between complexity leadership and dynamic capabilities.....	14
2.5. Conclusion.....	15
3. CHAPTER 3: CONCEPTUAL FRAMEWORK AND HYPOTHESES	17
3.1. Conceptual framework	17

3.2.	Objective 1: Hypothesis	18
3.3.	Objective 2: Hypotheses	18
4.	CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY	20
4.1.	Introduction	20
4.2.	Research design	20
4.3.	Population	21
4.4.	Sampling method and size	22
4.5.	Unit of analysis	23
4.6.	Measurement instrument	23
4.6.1.	Participation consent	24
4.6.2.	Biographical information	24
4.6.3.	Control variables	24
4.6.4.	Research model and discussion of constructs	24
4.6.4.1.	Discussion of complexity leadership	25
4.6.4.2.	Discussion of dynamic capabilities	25
4.7.	Pretesting the questionnaire	26
4.8.	Data collection	26
4.8.1.	Type of data collected	27
4.9.	Data analysis procedure	27
4.9.1.	Editing	27
4.9.2.	Coding	28
4.9.3.	Analysis	28
4.9.3.1.	Normality of variables	29
4.9.3.2.	Response outliers	29
4.9.3.3.	Instrument validity and reliability	29
i.	Instrument validity	29
ii.	Instrument reliability	31
4.9.3.4.	Descriptive statistics	31
4.9.3.5.	Inferential statistics	32
4.10.	Limitations	32
5.	CHAPTER 5: RESULTS	33
5.1.	Introduction	33
5.2.	Preliminary analysis	33
5.2.1.	Normality of variables	33
5.2.2.	Response outliers	33
5.2.3.	Instrument validity	34
5.2.4.	Instrument reliability	36

5.3.	Biographical and control variables	37
5.3.1.	Gender.....	37
5.3.2.	Respondent tenure	38
5.3.3.	Respondent job level	39
5.3.4.	Organisation age, size and revenue.....	39
5.4.	Objective 1 and 2 results.....	41
5.4.1.	Assumptions	42
5.4.2.	Objective 1: Hypothesis 1 descriptive analysis	42
5.4.3.	Objective 1: Hypothesis 1 inferential results.....	43
5.4.4.	Objective 2: Hypothesis 2.1 descriptive analysis	45
5.4.5.	Objective 2: Hypothesis 2.1 inferential results.....	46
5.4.6.	Objective 2: Hypothesis 2.2 descriptive analysis	48
5.4.7.	Objective 2: Hypothesis 2.2 inferential results.....	49
5.4.8.	Objective 2: Hypothesis 2.3 descriptive analysis	51
5.4.9.	Objective 2: Hypothesis 2.3 inferential results.....	52
5.5.	Objective 1 and 2 conclusions	54
6.	DISCUSSION OF RESULTS	56
6.1.	Introduction.....	56
6.2.	Sample overview	57
6.3.	Variables overview.....	57
6.3.1.	Complexity leadership.....	58
6.3.2.	Dynamic capabilities	59
6.3.2.1.	Sensing.....	59
6.3.2.2.	Seizing.....	59
6.3.2.3.	Transforming	60
6.4.	Inferential results discussion	60
6.4.1.	Objective 1: Hypothesis 1 inferential results discussion	60
6.4.2.	Objective 2: Hypotheses 2.1, 2.2 and 2.3 inferential results discussion.....	62
6.5.	Summary of findings	63
7.	CONCLUSION AND RECOMMENDATIONS	64
7.1.	Introduction.....	64
7.2.	Main findings.....	64
7.3.	Implications for business.....	65
7.4.	Limitations and future research.....	66
7.5.	Conclusion.....	67
8.	REFERENCES	68
9.	APPENDIX A – MEASUREMENT INSTRUMENT	75

10.	APPENDIX B – GOOGLE FORMS SURVEY	77
11.	APPENDIX C – DATA ANALYSIS	86

LIST OF FIGURES

Figure 1 - Dynamic capabilities supported by micro-foundational components. Adapted from Teece, D. J. (2007, p.1342). Explicating dynamic capabilities: the nature and micro-foundations of (sustainable) enterprise performance. Strategic management journal, 28(13), 1319-1350.....	12
Figure 2 - Conceptual framework	18
Figure 3 - Objective 1 conceptual framework	18
Figure 4 - Objective 2 conceptual framework	19
Figure 5: Box plots depicting variable outliers	34
Figure 6: Respondent gender.....	38
Figure 7: Respondent tenure.....	38
Figure 8: Respondent job level.....	39
Figure 9: Organisation size	40
Figure 10: Age of organisation	40
Figure 11: Organisation revenue.....	41
Figure 12: Box plots depicting descriptive statistics of complexity leadership and dynamic capabilities	43
Figure 13: Scatter plot of complexity leadership and dynamic capabilities.....	44
Figure 14: Box plots depicting descriptive statistics of complexity leadership and sensing. .	46
Figure 15: Scatter plot of complexity leadership and sensing	47
Figure 16: Box plots for complexity leadership and seizing	49
Figure 17: Scatter plot of complexity leadership and seizing	50
Figure 18: Box plots for complexity leadership and transforming.....	52
Figure 19: Scatter plot of complexity leadership and transforming.....	53
Figure 20: Conceptual framework conclusion.....	63
Figure 21: Scree plot with two components.....	89
Figure 22: Histogram - Dynamic capabilities distributed data with normal curve (mean = 3.81, std. deviation = 0.90, N = 115)	91
Figure 23: Histogram - Complexity leadership distributed data with normal curve (mean = 3.51, std. deviation = 0.84, N = 115)	91
Figure 24: Histogram - Transforming distributed data with normal curve (mean = 3.70, std. deviation = 1.04, N = 115)	92
Figure 25: Histogram - Seizing distributed data with normal curve (mean = 3.69, std. deviation = 1.06, N = 115).....	92

Figure 26: Sensing distributed data with normal curve (mean = 4.05, std. deviation = 0.93, N = 115) 93

LIST OF TABLES

Table 1: Five-point Likert scale used for measuring complexity leadership.	23
Table 2: Five-point Likert scale used to measure dynamic capabilities.....	24
Table 3: Construct and observed variable acronyms.....	28
Table 4: Descriptive results to test data normality	33
Table 5: KMO and Bartlett's test results	35
Table 6: Cronbach's alpha test results	37
Table 7: Descriptive statistics for complexity leadership and dynamic capabilities	42
Table 8: Pearson correlation for complexity leadership and sensing	44
Table 9: Linear regression for H1 (a).....	45
Table 10: Linear regression for H1 (b).....	45
Table 11: Descriptive statistics for complexity leadership and sensing.....	46
Table 12: Pearson correlation for complexity leadership and sensing	47
Table 13: Linear regression results for H2.1 (a)	48
Table 14: Linear regression results for H2.1. (b)	48
Table 15: Descriptive statistics for complexity leadership and seizing.....	49
Table 16: Pearson correlation for complexity leadership and seizing	50
Table 17: Linear regression results for H2.2 (a)	51
Table 18: Linear regression results for H2.2 (b)	51
Table 19: Descriptive statistics for complexity leadership and transforming	52
Table 20: Pearson correlation for complexity leadership and transforming.....	53
Table 21: Linear regression results for H2.3 (a)	54
Table 22: Linear regression results for H2.3 (b)	54
Table 23: Descriptive statistic results	86
Table 24: Correlation matrix for complexity leadership variables.....	86
Table 25: Communalities for two factor extraction.....	87
Table 26: Total explained variance.....	88
Table 27: PCA with Varimax Kaiser Normalisation rotation results.....	89
Table 28: Communalities for three factor extraction	90
Table 29: Forced three factor PCA with Varimax Kaiser Normalisation rotation results:	90

1. CHAPTER 1: INTRODUCTION TO THE RESEARCH PROBLEM

1.1. Introduction

Schwab (2016) characterises the fourth industrial revolution as the continuous enhancement of technology, merging the boundaries between human and machine. The rise of the fourth industrial revolution and its effect on socio-economic and demographic factors is forcing change onto all industries, resulting in major disruptions (Schwab, 2016). In fact, the rate at which complexity itself is increasing is one of the biggest challenges leaders are facing today (Uhl bien, 2017).

The key to addressing complexity lies in the organisation and its leaders' ability to adapt to change (Uhl-Bien & Arena, 2017), managing constant adaptation to a complex context, whilst also maintaining the sustainability of the business as a whole. Uhl-Bien and Arena (2018) argue that leaders need to enable people (employees) and organisations to adapt to these changing environments to sustain organisational competitive advantage. For this sustained competitive advantage, organisations have to rely heavily on its own, as well as its leaders' capabilities to continuously adapt (Clarke, 2013; Uhl-Bien & Arena, 2017; Vogel and Güttel, 2013).

Pivotal in adapting to change, is leadership's role in enabling an organisation's dynamic capabilities which can be defined as well-practiced patterns of activity (Arndt, Pierce & Teece, 2017; Felin & Powell, 2016; Hermano & Cruz, 2016; Teece, 2014; Teece, Peteraf & Leih, 2016; Verreyne, Hine, Coote & Parker, 2016). Ahmed and Wang (2007) suggest that entities create core capabilities in response to market changes. These core capabilities constitute difficult to imitate capabilities and are ultimately what gives an organisation its competitive advantage (Teece, Pisano, & Shuen, 1997). As these capabilities extend into dynamic capabilities it becomes sources of sustained (long-term) competitive advantage, as it enables the organisation to continuously meet challenges posed by its dynamic environment (Besanko, Dranove, Shanley, & Schaefer, 2012; Karimi, 2015).

Top management (leadership) enables these dynamic capabilities in an organisation (Arndt, Pierce & Teece, 2017; Felin & Powell, 2016; Hermano & Cruz, 2016; Teece, 2014; Teece, Peteraf & Leih, 2016; Verreyne, Hine, Coote & Parker, 2016). Consequently, leadership can

ensure organisations have a sustained competitive advantage in a complex context by enabling dynamic capabilities.

1.2. Research problem and purpose

Key to sustaining competitive advantage is an organisation's capability to sense and seize opportunities and threats in its environment, and then transform tangible and intangible assets appropriately (dynamic capabilities) (Makkonen, Pohjola, Olkkonen, & Koponen, 2014). The organisation remains competitive as it is fully aware of, and adapts to its complex, changing environment. This is achieved through an organisation's higher order dynamic capabilities – sensing, seizing and transforming (Teece, 2007).

Leadership must ensure that organisations adapt (Uhl-Bien & Arena, 2018). To address leadership to adapt, Uhl-Bien and Arena (2018) identified three fundamental leadership styles that together aid an organisation's employees to adapt – operational, entrepreneurial and enabling leadership. These three leadership styles observed cooperatively are termed complexity leadership (Uhl-Bien & Arena 2018). Organisational leaders need to understand whether complexity leadership behaviours could drive dynamic capabilities (sensing, seizing and transforming). The purpose of this study was to establish whether complexity leadership has a positive relationship with South African organisations' dynamic capabilities within the private sector.

Dynamic capabilities are fundamental, and even more so in South African organisations. Bah et al. (2017) state that South Africa, although ranked 58th globally in information and communication technology (ICT) use, is not equipped to transition to a fourth industrial revolution economy. The fourth industrial revolution will only add more complexity to African countries' economies and employment (Bah et al., 2017). Since dynamic capabilities enable organisations to readily embrace, adapt to and enhance the latest in ICT, it will become pivotal to the future success of the country as a whole (Bah et al., 2017).

This study will further investigate whether complexity leadership has a positive relationship with an organisation's higher order dynamic capabilities i.e. sensing, seizing and transforming. Should a positive relationship between complexity leadership and dynamic capabilities be found, business leaders will have insight into which leadership behaviours to focus on, to enable an organisation's dynamic capabilities, sustaining its competitive advantage amidst changing environments.

1.3. Contribution to business

The fourth industrial revolution is forcing change onto all industries (Schwab, 2016). Global organisational leaders (including CEO's and senior executives) find it hard to comprehend or anticipate this change, mostly attributed to the pace of innovation and constant disruption (Schwab, 2016). Dynamic capabilities are central for organisations to succeed amidst this revolution which brings about change (Fainshmidt & Frazier, 2017; Hermano & Cruz, 2016; Laaksonen & Peltoniemi, 2018).

Organisations exhibiting dynamic capabilities are better equipped to adapt to changing environments (Arndt, Pierce & Teece, 2017; Felin & Powell, 2016; Hermano & Cruz, 2016; Teece, Peteraf & Leih, 2016; Verreyne, Hine, Coote & Parker, 2016). Superior dynamic capabilities can enable organisations to trigger and even manipulate change (Teece, 2014), adapting to the environmental changes as required. For this reason, dynamic capabilities are what gives organisations sustainable competitive advantage amidst changing environments (Fainshmidt & Frazier, 2017; Hermano & Cruz, 2016; Laaksonen & Peltoniemi, 2018; Uhl-Bien & Arena, 2018).

It is suggested that South Africa is not ready to adopt a fourth industrial revolution economy as stated by Bah et al. (2017). Uhl-Bien and Arena (2017) emphasise that increasing complexity in the business environment has pulled the very foundations of what we know about management (or leadership) from beneath us. This dynamic suggests that a new paradigm is required to help organisations manage the rapidly evolving complexity in an ever-changing and evolving global environment. The move away from the Industrial era to complexity leadership has become a necessity for sustained competitive advantage (Besanko, Dranove, Shanley, & Schaefer, 2012; Karimi, 2015; Uhl-Bien & Arena, 2018), as complexity leadership behaviours focus on enabling organisational effectiveness, and the ability to learn, create and adapt to complexity and change (Uhl-Bien, Marion & McKelvey, 2007).

This study aims to investigate whether complexity leadership has a positive relationship with dynamic capabilities. Practically, organisations could benefit from understanding, teaching and implementing complexity leadership theory to develop and support the organisation's dynamic capabilities and behaviour to sustain competitive advantage during change induced by the rise of the fourth industrial revolution. This study could further contribute to the understanding of these behaviours as leadership theory, as well as the relationship between complexity leadership and an organisation's higher order dynamic capabilities i.e. sensing, seizing and transforming (Teece, 2007).

1.4. Contribution to theory

Research on dynamic capabilities provide a strong viewpoint on organisational adaptability within organisation theory, strategy and entrepreneurship literature (Augier and Teece, 2009; Teece, Pisano, and Shuen, 1997; Winter, 2003). Uhl-Bien and Arena (2018) argue organisation dynamics, structure and process topics have customarily been the area of organisation theory and strategy researchers, who do not focus on leadership. Uhl-Bien and Arena (2018) further argue this to be problematic as leadership is pivotal in these processes and by excluding leadership, organisations' dynamic capabilities ultimately suffer.

Clarke (2013) suggests that leadership models focus mostly on heroic leadership (style with theories focused on the individual), and further argues that leadership fail to address the increase in complexity organisations are facing. Complexity leadership specifically has been identified by Dinh et al. (2014) as a "promising theory" in dealing with the ever-increasing complexity organisations are facing. Complexity leadership theory considers multiple relational constructs across various levels (Dinh et al., 2014), and was proposed as a leadership paradigm to address the complexity introduced by the knowledge economy (Uhl-Bien et al., 2007).

Uhl-Bien and Arena (2017) explain that by leadership acknowledging complexity and leveraging existing and new managerial knowledge in adapting to complex environments, complexity leadership can sustain competitive advantage through enabling dynamic capabilities. Beyond this statement, however, the researcher could not find any literature that has established or quantified the relationship between complexity leadership and dynamic capabilities. Thus, there exists an opportunity to investigate the relationship between complexity leadership behaviours and organisational dynamic capabilities, and higher-order dynamic capabilities.

1.5. Research scope

This study focused on two key constructs: Dynamic capabilities (dependent variable), and complexity leadership (independent variable). Within these key constructs, sub-constructs were identified and collectively used as observed variables, to measure the key constructs.

The study considered South African organisations operating in the private sector. The study may provide further insight into how South African organisations can sustain competitive advantage amidst major disruptions, considering the relationship between complexity leadership and dynamic capabilities.

1.6. Document structure

The study addresses the key research problem, purpose and its objectives in the first introductory chapter. The second chapter reviews the latest literature on complexity leadership and dynamic capabilities, and the relationship between these constructs. The third chapter lists the deduced hypotheses. The fourth chapter details the research design and defines the research method which was used. The fifth chapter provides the relevant statistical analysis results. The sixth chapter discusses the results portrayed in the fifth chapter in light of chapter two. Lastly, the seventh chapter concludes the study.

2. CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

Most organisations fail to successfully adapt to changes in their environment (Birkinshaw, Zimmermann, & Raisch, 2016). The field of Strategic Management aims at assisting organisations in successfully adapting to these changes as it studies the fundamental question of how an organisation achieve and sustain competitive advantage (Teece et al., 1997). In successfully dealing with environmental changes and uncertainty, Teece et al. (1997) proffered the dynamic capabilities framework which aims to answer this question.

Fundamental to an organisation's dynamic capabilities, is the role of leadership, in sensing, seizing and transforming capabilities to adapt to changing environments (Birkinshaw, Zimmermann, & Raisch, 2016). Complexity leadership specifically has been identified as a 'promising theory' to deal with environmental changes and complexity (Dinh et al., 2014).

The initial discussion of this section focuses on the leading research understandings, addressing complexity leadership and dynamic capabilities. This is then followed by the predominant theoretical paradigms developed to explain these constructs. The central argument of this section aims at contextualising dynamic capabilities and complexity leadership, to underline that both aim to adapt to change to sustain competitive advantage. The chapter ends with a review of literature that assists in understanding the possible relationship between these constructs.

2.2. Complexity leadership

2.2.1. Background

2.2.1.1. General systems theory

In understanding the roots of complexity leadership, it is worth going back to Aristotle's statement that "the whole is other than the sum of its parts" (Goldstein, 1999). This statement formed the basis for general systems theory which was formulated by Ludwig von Bertalanffy (Drack, 2015). von Bertalanffy defined general systems theory as "a logico-mathematical field whose task is the formulation and derivation of those general principles that are applicable to systems in general" (von Bertalanffy, 1972, p.411).

Researchers then realised that general systems theory can be applied to organisations by viewing an organisation as a system and organism (Schneider and Somers, 2006). Organisations can be approached as a system as exhibited by Katz and Kahn (1978) in outlining characteristics of open systems. This view introduced systems, as well as contingency thinking as a concept into organisational and leadership research (Schneider and Somers, 2006).

2.2.1.2. Complexity theory

General systems theory, however, is not an all-encompassing system theory and fell short when applied to certain systems (Schneider and Somers, 2006), as not all complexity could be accounted for. This led to the general undertaking of complexity theory and the concept of complex adaptive systems (Pascale, 1999). Complexity theory aims at explaining non-linear relationships in and among complex systems and the effects they can have as a result, similar to the “butterfly effect”. In a complex system, certain actions, insignificant by themselves, can momentarily amplify each other and the end result. In contrast, the “domino effect” can be used to explain actions and outcomes in linear systems where it is far easier to predict and analyse outcomes (Osborn, Hunt and Jauch, 2002).

Similarly, traditional leadership theories fell short of meeting the needs of the knowledge era where great emphasis was placed on enabling innovation and the flow of information (Uhl-Bien et al., 2007). The shortcomings of traditional leadership theories (focusing on heroic top-down models) and limited system theories were accentuated by the growing need to better understand the increase in complexity organisations are facing (Pascale, 1999; Schneider and Somers, 2006; Uhl-Bien et al., 2007). Organisations need to be viewed and understood as complex systems.

2.2.1.3. Complex adaptive systems

Adopted from the field of physical science to social science, complex adaptive systems can recognise and interpret patterns which in turn can be applied to forestall and learn future changes (Pascale, 1999). Pascale (1999) defines organisations as complex adaptive systems as they: comprise of mediators in non-hierarchical arrangement, continuously change and evolve and require energy to sustain themselves, and are capable of recognising patterns and trends in anticipation of future change. Stated differently, an organisation, viewed as a complex adaptive system, is a system whereby the system as a whole exhibits different characteristics than its parts would exhibit individually.

This notion of complexity theory and its unit of analysis - complex adaptive systems - and its applicability to organisational and leadership theory in better understanding complex environments, laid the foundation for conceptualising complexity leadership theory (Uhl-Bien et al., 2007).

2.2.2. Complexity leadership theory

Uhl-Bien et al. (2007) proposed the leadership paradigm of complexity (devised complexity leadership theory) in aiding business and research to deal with the complexity introduced by the knowledge economy. Complexity leadership theory concentrates leadership effort towards behaviour that enables organisational effectiveness (ability to learn, create and adapt in a complex adaptive system) as opposed to determining or guiding effectiveness (Uhl-Bien et al., 2007).

Complexity leadership theory is based on several concepts as defined by Uhl-Bien et al. (2007). Firstly, the context in which an organisation finds itself in defines how the organisation acts and reacts to change and is specific to each individual organisation. Secondly, it differentiates between leaders and leadership. It defines leadership as the enablement of adaptive change through interactive dynamics and leaders as individuals influencing change through actions. This differentiation between leaders and leadership contrasts with traditional leadership, which focuses more on the individual and their actions. Thirdly, it differentiates leadership from management. Leadership is compared to a process which occurs throughout the organisation and not specifically through management interactions alone. Lastly, complexity is prominent amidst adaptive challenges. These challenges require learning, innovating and new patterns of behaviour as opposed to technical problems which can be solved by existing knowledge and procedures.

Overall, complexity leadership theory acknowledges organisations as complex adaptive systems, places leadership within that system and highlights the challenges faced during adaptive change. The complexity leadership framework overarches and describes the entanglement of different leadership styles (entrepreneurial, operational and enabling leadership) in complex adaptive systems (Uhl-Bien & Arena, 2018).

2.2.3. Complexity leadership types

Complexity leaders can rely on any three of these leadership styles (entrepreneurial, operational and enabling) to promote and protect the adaptive space (Uhl-Bien & Arena, 2017). Utilising these three leadership styles ensures that both the entrepreneurial and

operational systems within the organisation thrive and improve the overall organisational effectiveness (Uhl-Bien & Arena, 2017).

Operational leadership refers to individual managers, their authority and actions within an organisation (Uhl-Bien et al., 2007; Osborn & Hunt, 2007). This leadership style forms part of the traditional leadership style having a top-down heroic approach, focusing more on individual leaders and their actions. Within the context of complexity leadership, operational (also termed administrative) leadership aims at exercising its authority considering the organisation's need for creativity, learning and adaptability which is key to supporting adaptive leadership (Uhl-Bien & Arena, 2018; Uhl-Bien et al., 2007).

Entrepreneurial leadership creates novelty through recognising and exploiting opportunities within an organisation (Renko, Tarabishy, Carsrud, & Brännback, 2015; Uhl-Bien & Arena, 2018). It is responsible for creating new products, skills, ideas and processes enabling the organisation to change and stay competitive (Renko, Tarabishy, Carsrud, & Brännback, 2015; Uhl-Bien & Arena, 2018).

Enabling leadership claims the relationship between an organisation's abovementioned operational and entrepreneurial characteristics. Enabling leadership is responsible to nurture and sustain the adaptive space, where operational and entrepreneurial systems meet and co-exist (Uhl-Bien & Arena, 2018). Uhl-Bien and Arena (2018) explain enabling leadership to nurture and sustain the adaptive space by creating structures and processes to prompt and amplify emergence for the organisation to change and sustain competitive advantage.

2.2.4. Complexity leadership behaviours

Clarke (2013) identifies three fundamental sub-constructs of complexity leadership which promote and protect the adaptive space. These sub-constructs are patterning of attention, developing networks and contextual intelligence, and can be viewed as the behaviours of a leader that actions all three complexity leadership types (operational, entrepreneurial and enabling leadership) concurrently.

Patterning of attention is encouraging individuals to learn through interaction (Clarke, 2013). Leaders can influence an individual's behaviour and promote knowledge sharing and creation through utilising patterns of dialogue, highlighting what is important for the organisation (Osborn & Marion, 2009). Leadership sets the example of the correct type, level and method of communication, to ensure the correct level of interaction within the organisation.

Developing networks refers to an organisation and its employees' ability to interact with the environment and each other (Clarke 2013; Uhl-Bien, et al., 2007). Developing networks is essential as it stimulates needed collaboration between entrepreneurial and operational systems, and nurtures the adaptive system (Clarke 2013; Osborn & Marion, 2009), as enabling leadership. Organisational leadership should ensure the correct networks are developed.

Contextual intelligence refers to knowing the limitations of your own knowledge and having the ability to transform that knowledge to adapt to an environment different from that in which it was created (Khanna, 2014). It is having the ability to recognise, understand and adapt to multiple contextual aspects to align to a favoured future (Kutz, 2008). Given the complex context of the organisation, leadership requires strong contextual intelligence to act and enable change accordingly.

2.3. Dynamic capabilities

2.3.1. Background

2.3.1.1. The resource-based view

The resource-based view emphasises organisation resources and capabilities as fundamental to organisation performance and competitive advantage (Barney, 1991; Teece et al., 1997). Dutta, Narasimhan and Rajiv (1999) define resources as input factors organisations use to achieve desired objectives. Efficiently combining numerous resources to achieve an organisational goal, is termed a capability (Dutta, Narasimhan & Rajiv, 2005). Even though a resource might be able to translate into a service, a relevant capability is required to transform the service into a valuable output for the organisation (Matysiak, Rugman, & Bausch, 2018).

Not all resources and capabilities provide organisations with a competitive advantage. Barney (1991) argues, that resources and capabilities must be rare as well as valuable in order to provide a competitive advantage for an organisation. Teece (2007) and Teece et al. (1997) emphasises the importance of organisations focusing on entrepreneurial creation and exploitation of current and new competitive advantages as opposed to defending current competitive advantages against competitors.

The resource-based view, however, does not cater for changing environments, resources decaying, capabilities declining, and competitors finding their own competitive advantage (Wang and Ahmed, 2007). The resource-based view succeeds in explaining competitive advantage, however, it falls short at explaining how competitive advantage is sustained amidst

changing environments (Barney, Ketchen, & Wright, 2011). The concept of dynamic capabilities excels at explaining how competitive advantage can be sustained amidst changing environments (Teece et al., 1997).

2.3.2. Dynamic capabilities

Teece et al. (1997) argued that many successful organisations follow a resource-based view strategy, typically acquiring in-demand assets protected by intellectual property but become rigid and fail to successfully adapt to change. For this reason, the dynamic capabilities framework is based on three different paradigms: Michael Porter's competitive forces approach, the strategic conflict approach and building competitive advantage through capturing entrepreneurial rents - from which the resource-based view branches (Porter, 1980; Shapiro, 1989; Teece et al., 1997). Together, this framework is specifically relevant when applied to a Schumpeterian world, where the old or current environment is destroyed by creating a new environment (creative destruction) (Teece et al., 1997).

The concept of dynamic capabilities was termed in 1997 by David Teece, Gary Pisano and Amy Shuen in "Dynamic Capabilities and Strategic Management". The authors developed the dynamic capabilities framework in an attempt to explain why certain organisations create a competitive advantage when faced with environmental changes, whilst others do not. The authors defined dynamic capabilities as an organisation's ability to leverage existing capabilities to their economic rent advantage as well as create and assimilate new capabilities in adapting to changing environments for sustained competitive advantage.

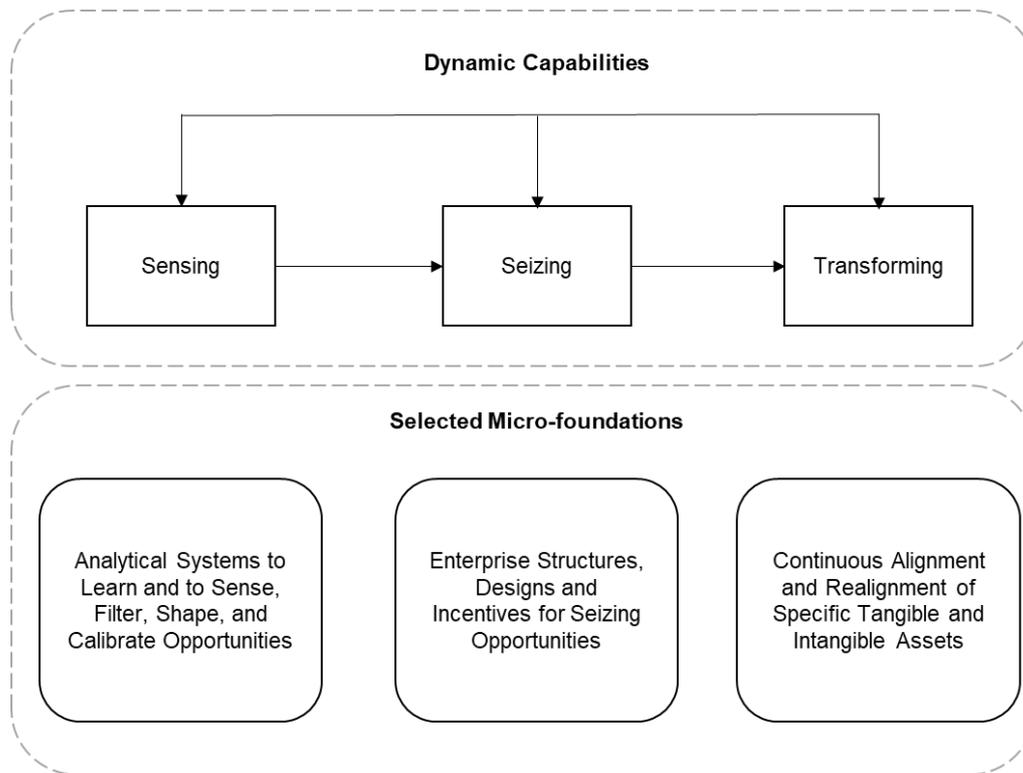
The dynamic capabilities framework was developed to clarify both the internal and external organisation-specific capabilities that lead to competitive advantage (Teece et al., 1997). These capabilities lead to a competitive advantage as they are difficult to imitate (Teece et al., 1997). Dynamic capabilities clarify how organisations can continuously develop and create new capabilities (or competencies) to cater for its changing environment. Three key categories of capabilities exist, business processes (organisational and managerial), market position (tangible and intangible assets) and strategic paths (opportunities) (Teece et al., 1997).

2.3.3. Higher order dynamic capabilities

Teece (2007) further simplified dynamic capabilities by introducing the concept of higher order dynamic capabilities, supported by micro-foundational components. Higher order dynamic capabilities are defined as an organisation's capacity to sense and seize opportunities (or threats), and to maintain competitiveness or even create new environments (creative destruction) through transforming and aligning tangible and intangible assets (Helfat & Martin,

2015; Helfat & Peteraf, 2015; Teece, 2007). These higher order capabilities are supported by micro-foundational components which are depicted in Figure 1. This research study will only focus on higher order dynamic capabilities.

Figure 1 - Dynamic capabilities supported by micro-foundational components. Adapted from Teece, D. J. (2007, p.1342). Explicating dynamic capabilities: the nature and micro-foundations of (sustainable) enterprise performance. Strategic management journal, 28(13), 1319-1350.



2.3.3.1. Sensing capabilities

Teece (2007) defines sensing opportunities (or threats) as a scanning, creating, learning and interpretive activity. Sensing opportunities can occur either by interpreting existing or new information (Teece, 2007). The activity of sensing includes investments in research and development, analysis of current customer needs and technologies, and understanding obscure demand as well as industry and market evolution (Teece, 2007). Teece (2007) encourage organisations to embed sensing capabilities into the organisation as opposed to relying on individuals with relevant skills.

2.3.3.2. Seizing capabilities

New products, services or processes are required to seize the relevant sensed opportunities (Teece, 2007). A strategy is pivotal to decide on which opportunity to address and how (Teece, 2007). Seizing opportunities also include the continuous maintenance and enhancement of

relevant competencies – such as technology – and heavily investing in those readily accepted by the market (Teece, 2007).

2.3.3.3. Transforming capabilities

By sensing and seizing the correct opportunities, organisations will be profitable and grow toward success (Teece, 2007). Once successful, organisations will implement relevant processes, acquire tangible and intangible assets and establish routines to operationalise efficiencies to sustain success (Teece, 2007). Environments change, and consequently, organisational routines, assets and processes should too if the organisation desires to remain successful (Teece, 2007). Changing of routines, processes and assets to adapt to new opportunities sensed and seized is what Teece (2007) refers to as transforming capabilities.

2.3.4. Dynamic capabilities, competitive advantage and leadership

Dynamic capabilities “enables a firm to alter how it currently makes a living” as opposed to operational capabilities which “enable a firm to make a living in the present” (Helfat and Winter, 2011, p. 1244). Organisations with dynamic capabilities continuously and reliably perform activities to change the organisation’s operational capabilities and resources (Helfat and Winter, 2011). O’Reilly & Tushman (2011) and Teece et al. (1997), as well as Wang & Ahmed (2007) explain dynamic capabilities to be tacit capabilities supported by processes and routines which emphasize management, integration, learning and reconfiguration.

Tracking the evolution of dynamic capabilities, recent trends in literature focuses on dynamic capability aspects of strategic learning, innovation and change capabilities, and relates them to organisation performance, integrating features of organisation theory and strategic management (Augier & Teece, 2009; Matysiak, Rugman, & Bausch, 2018; Teece, 2018; Vogel & Güttel, 2013).

The concept of dynamic capabilities argues – building on the resource-based view – that for an organisation to create or sustain its competitive advantage, it must transform, align and create new resources and capabilities to adapt to environmental changes, as merely acquiring scarce resources and capabilities is inadequate (Teece, 2007; Teece et al., 1997). Teece (2014) further explain dynamic capabilities’ ability to provide a sustained competitive advantage as opposed to competitive advantage lies in the rarity of the dynamic capability or difficulty to imitate, and the value created.

Key to sustaining an organisation’s competitive advantage is, therefore, its capacity, as well as its upper management’s (leadership) ability, to reconfigure and renew its capabilities to

adapt to and even create environmental changes (Fainshmidt & Frazier, 2017; Hermano & Cruz, 2016; Laaksonen & Peltoniemi, 2018). Leadership forms part of the dynamic capabilities framework and plays a pivotal role in observing the environment for new opportunities and change (sense), enabling the organisation to act upon these opportunities (seize) and continuously align assets (tangible and intangible) to adapt, and even create new environments (transform) to sustain competitive advantage (Arndt, Pierce & Teece, 2017; Felin & Powell, 2016; Hermano & Cruz, 2016; Teece, Peteraf & Leih, 2016; Verreyne, Hine, Coote & Parker, 2016). From this, it is evident that the abilities of the leadership of an organisation forms part of an organisation's dynamic capabilities, and ultimately its sustained competitive advantage.

2.4. The relationship between complexity leadership and dynamic capabilities

Dynamic capabilities are pivotal for an organisation to adapt to or create change to sustain its competitive advantage (Teece et al., 1997; Winter, 2003). Key to enabling dynamic capabilities is leadership (Dixon, Meyer, & Day, 2014; Teece, 2007; Teece et al., 1997; Uhl-Bien & Arena, 2018). Traditional leadership styles, however, fail at creating core processes to support dynamic capabilities – sensing, seizing and transforming opportunities and threats (Felin & Powell, 2016). Dynamic capabilities cannot be adequately achieved with traditional leadership styles.

Complexity leadership addresses the increase in complexity emerging amidst the fourth industrial revolution and can support an organisation's dynamic capabilities through bridging operational, entrepreneurial and enabling leadership (Uhl-Bien & Arena, 2018). Both complexity leadership and dynamic capabilities attempt to ensure sustained competitive advantage, amidst increased complexity. How these concepts relate has however not been established. It is essential for future research to establish and clarify the relationship between complexity leadership and an organisation's dynamic capabilities to sustain competitive advantage (Fainshmidt & Frazier, 2017; Uhl-Bien & Arena, 2018). This research aims to address this.

The concept of dynamic capabilities is multifaceted (O'Reilly & Tushman, 2011; Teece et al. 1997; Wang and Ahmed, 2007). To ensure practical application, the separate relationships between complexity leadership and an organisation's higher order dynamic capabilities (i.e. sensing, seizing and transforming) should also be established and clarified.

Complexity leadership empowers organisations to adapt to environmental change by enabling learning and creative capacity (sensing) within the organisation (Uhl-Bien & Arena, 2018). Verreyne et al. (2016) use learning and patterning capabilities as key constructs in developing a scale to measure dynamic learning capabilities. Junfeng and Wei-ping (2017) measured the dynamic capabilities of organisations in high-technology industries, relating this to the organisation's external resources in its business network. The findings indicated that a business network influences the effect of its internal resources, specifically on the organisation's ability to sense opportunities, an essential dynamic capability.

By realising knowledge co-creation within an adaptive space, leaders establish system processes (seizing capability) associated with adaptation and innovation which are key behaviours of complexity leadership (Clarke, 2013). Fainshmidt and Frazier (2017) argue dynamic capabilities to rely on patterns of interpersonal relationships and collective learning among organisational members to influence seizing capabilities. Fainshmidt and Frazier (2017) explicate dynamic capabilities to be enabled by organisational context (contextual aspect). A leader with strong contextual intelligence can easily sense and seize opportunities from leveraging and exploiting contextual factors (Kutz, 2008).

Complexity leaders have strong entrepreneurial leadership skills and use these skills to create novelty in the form of new knowledge, skills, products and processes to sustain competitive advantage (transform) within an organisation (Uhl-Bien & Arena, 2017). In explicating dynamic capabilities, Teece (2007) describes the higher order dynamic capability, transforming, as an organisation's capability to change routines, processes and assets to sustain competitive advantage.

2.5. Conclusion

The literature review confirmed the importance of complexity leadership and dynamic capabilities within the context of organisational adaptability amidst the rise of the fourth industrial revolution. The review further elaborated on observed behaviours, that are potential sub-constructs, for measuring complexity leadership (patterning of attention, developing networks and contextual intelligence) and dynamic capabilities (sensing, seizing and transforming). Other than the importance of these two constructs, the literature review moreover indicated that the relationship between the two constructs have not been established quantitatively, although this could be inferred for application of the theory. Arising from the theory and literature presented in this chapter it is argued that, complexity leadership relate to

higher order dynamic capabilities of sensing, seizing and transforming as suggested by Uhl-Bien and Arena (2018), although these relationships have not been directly established.

3. CHAPTER 3: CONCEPTUAL FRAMEWORK AND HYPOTHESES

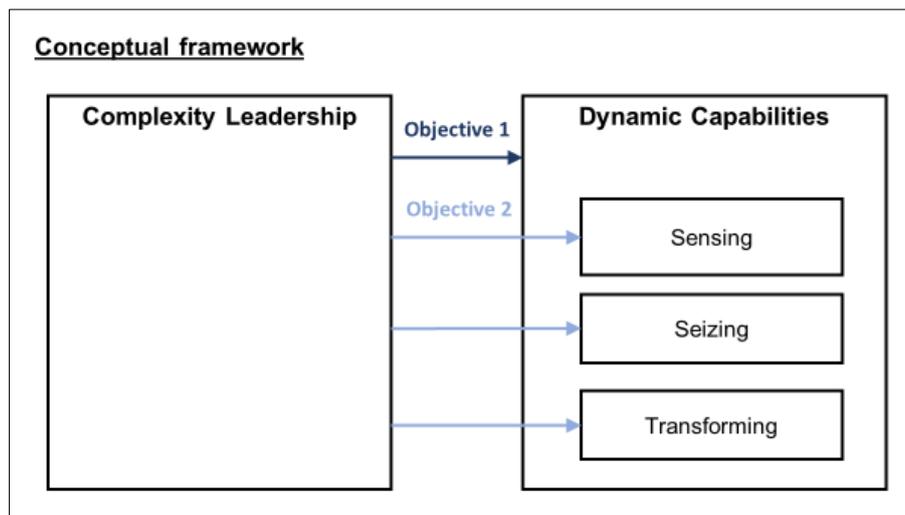
3.1. Conceptual framework

The previous chapters addressed the main aim of this study, which is to form a better understanding of the associations which enable an organisation's dynamic capabilities to sustain competitive advantage within changing environments. A review of the literature identified leadership as a pivotal association to dynamic capabilities (Dixon, Meyer, & Day, 2014; Teece et al., 1997; Teece, 2007). Felin and Powell (2016) however argue that traditional leadership styles fail at creating a sound foundation in support of an organisation's dynamic capabilities. Uhl-Bien and Arena (2018) propose complexity leadership as a suitable leadership style to support and enable an organisation's dynamic capabilities.

This chapter conceptualises the main aim of this study through postulated frameworks and hypotheses. A conceptual framework is a diagrammatic process that assists with the clarification of the research design, measurable variables and hypothesised relationships between these variables, which could be subjected to testing (Burns & Burns, 2008). The conceptual framework for this research is shown in Figure 2. It depicts the applicable constructs (variables) and the relationships (arrows) this research aims to investigate. Sub-constructs (observed variables) are listed that will be used to collectively define the key constructs (latent variables) as the identified constructs are not easily observed (Byrne, 2016).

This study aims to address two objectives. Firstly, it will determine if the key independent construct, complexity leadership, has a positive relationship with the key dependent variable dynamic capabilities. Secondly, it will investigate the positive relationship between complexity leadership and an organisation's higher order dynamic capabilities i.e. sensing, seizing and transforming.

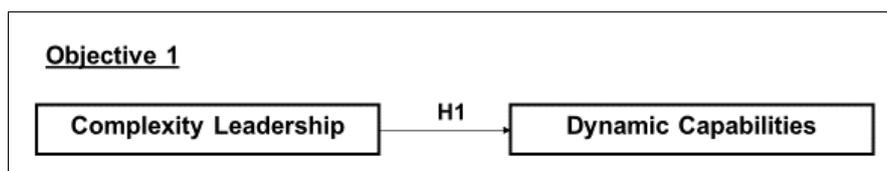
Figure 2 - Conceptual framework



3.2. Objective 1: Hypothesis

The first objective focused on the relationship between complexity leadership and an organisation's dynamic capabilities. This objective aimed to provide pragmatic evidence of the association between complexity leadership and an organisation's dynamic capabilities (Dixon, Meyer, & Day, 2014; Teece, 2007; Teece et al., 1997; Uhl-Bien & Arena, 2018). The first objective of this study is therefore to confirm the existence of a significant, positive, linear relationship between complexity leadership and dynamic capabilities as depicted in Figure 3.

Figure 3 - Objective 1 conceptual framework



Hypothesis 1:

H0: No linear relationship exists between complexity leadership and dynamic capabilities.

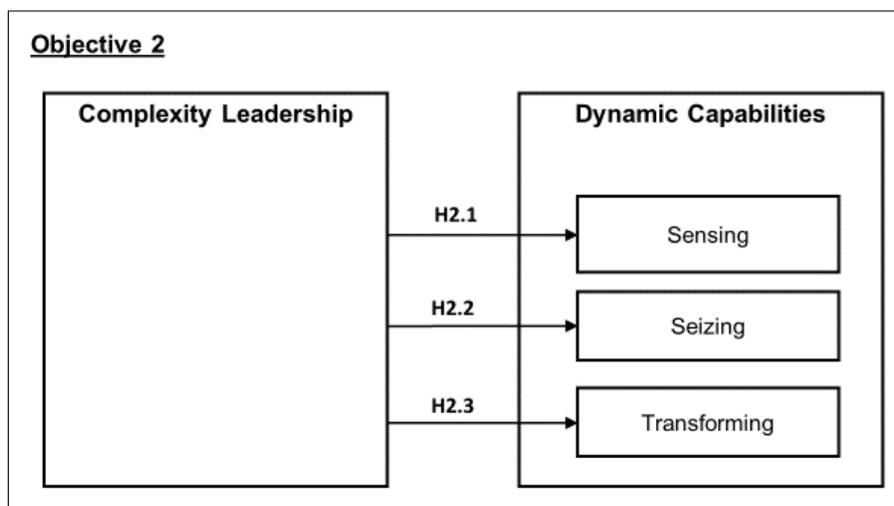
H1: A positive linear relationship exists between complexity leadership and dynamic capabilities.

3.3. Objective 2: Hypotheses

The second objective of this research delves deeper in understanding the relationship between complexity leadership and an organisation's dynamic capabilities. Specifically understanding complexity leadership's relationship with dynamic capabilities' higher order

capabilities – sensing, seizing and transforming. These higher order dynamic capabilities are cornerstone to an organisation’s ability to create and sustain competitive advantage within changing environments (Arndt, Pierce & Teece, 2017; Felin & Powell, 2016; Hermano & Cruz, 2016; Teece, Peteraf & Leih, 2016; Verreyne, Hine, Coote & Parker, 2016). Higher order capabilities are scarce, and most organisations are only adept in one or two of the three (Teece, 2007). Organisations however need to be adept in all three higher order capabilities to sustain competitive advantage (Arndt, Pierce & Teece, 2017; Felin & Powell, 2016; Hermano & Cruz, 2016; Laaksonen & Peltoniemi, 2018; Teece, Peteraf & Leih, 2016; Uhl-Bien & Arena, 2018; Verreyne, Hine, Coote & Parker, 2016). From the literature reviewed it has been deduced that complexity leadership could influence an organisation’s ability to sense, seize and transform. The second objective of this study is, therefore, to confirm that there exists a significant, positive, linear relationship between complexity leadership and an organisation’s higher order dynamic capabilities (sensing, seizing and transforming) as illustrated in Figure 4.

Figure 4 - Objective 2 conceptual framework



Hypothesis 2.1 (H2.1):

- H0: No linear relationship exists between complexity leadership and sensing.
- H1: A positive linear relationship exists between complexity leadership and sensing.

Hypothesis 2.2 (H2.2):

- H0: No linear relationship exists between complexity leadership and seizing.
- H1: A positive linear relationship exists between complexity leadership and seizing.

Hypothesis 2.3 (H2.3):

- H0: No linear relationship exists between complexity leadership and transforming.
- H1: A positive linear relationship exists between complexity leadership and transforming.

4. CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY

4.1. Introduction

The literature reviewed confirmed the importance of complexity leadership and dynamic capabilities for organisations to sustain competitive advantage. The review also highlighted the need for further research in defining the relationship between complexity leadership and dynamic capabilities. The objectives of this study were substantiated by the proposed conceptual framework and hypotheses discussed in the previous chapter. This chapter aims at defining the research methodology used to test mentioned hypotheses.

4.2. Research design

The nature of the relationships this research investigated, coincides with the eight major characteristics of quantitative research, as described by Creswell (2012). The eight characteristics can be summarised as; describing the research problem through a relationship among variables, narrow and measurable research statements (hypotheses), numeric data collected through instruments, statistically analysed data and the research report is presented in a standard fixed-structure manner (Creswell, 2012).

The overall research methodology approach selected was explanatory. Explanatory research designs are used when relationships or links between two or more variables are of interest (complexity leadership and dynamic capabilities). This research focused on the extent to which complexity leadership co-vary with dynamic capabilities and followed an explanatory correlational design which tested the relationship between these two variables (Creswell, 2012). Similar to this study, Fainshmidt and Frazier's (2017) quantitative study also followed an explanatory correlational research design in testing how a climate for trust enhances an organisation's dynamic capabilities.

This study made use of a pragmatic research philosophy. The research question; "What relationship does complexity leadership have with an organisation's dynamic capabilities?" was considered more important than either the method used or the worldview supposed to underlie the method. Tashakkori and Teddlie (1998, p.21) considers this a pragmatic research philosophy and emphasises most good researchers addresses their research questions through the pragmatist principle of "what works". The hypotheses of this study drove the appropriate, and practical research philosophy that is Pragmatism (Saunders & Lewis, 2012).

A deductive research approach was followed as literature formed the basis for the development of the research hypotheses (Saunders & Lewis, 2012). The literature review proposed the existence of these relationships. Uhl-Bien & Arena (2018) and Fainshmidt & Frazier (2017) highlighted the importance for future research to establish and clarify the relationship between complexity leadership and an organisation's dynamic capabilities to sustain competitive advantage.

The research strategy made use of a survey instrument. A self-administered, electronic survey was used to collect the quantitative data. The survey strategy is accepted amongst business and management researchers as it is common, easy to understand, inexpensive and provide reliable results (Saunders & Lewis, 2012, p.116). Given the existence of sub-constructs (observed variables), the constructs (latent variables) were collectively measured and quantified. The survey was distributed at a specific point in time and will reflect the respondents' perceptions at that time (Creswell, 2012) which embodies a cross-sectional time horizon.

A mono-method quantitative study was followed as the hypothesised relationships were tested using quantitative data only. The study made use of quantitative data analysis as the survey responses, collected with a Likert scale, was numerically coded and statistically analysed to accept or reject the null hypotheses (Creswell, 2012).

4.3. Population

Creswell (2012) and Zikmund (2003) defines a population as a collection of individuals or objects with the same characteristics. The relevant population parameters for this research are complexity leadership and dynamic capabilities.

Uhl-Bien et al. (2007) distinguish leadership (complexity leadership) from managerial positions and observes leadership as a process evident throughout the entire organisation. This requires the research population to consist of organisations with working employees.

Fainshmidt and Frazier (2017) argue dynamic capabilities to be key to an organisation's competitive advantage. Arguably, organisations require dynamic capabilities to stay competitive and be a going concern requiring the population of this research to entail organisations showing a going concern.

Bah et al. (2017) argue South Africa to not be equipped to adopt a fourth industrial revolution economy due to the lack of ICT use and research and development. South Africa consequently qualifies as a reasonable and practical population for this study. Accordingly, the population

for this research is defined as individual employees who work in South African organisations showing a going concern, and who are active on social media platforms. Organisations were included regardless of the number of employees employed by the organisation, the level of revenue, the number of years it is in business and the type of business conducted.

4.4. Sampling method and size

A large population was identified. Due to the practical implications faced when including all units of analysis (individual employees) within the entire population, a subgroup of the target population (a sample) is studied to generalise findings to the identified population (Creswell, 2012; Saunders & Lewis, 2012; Wegner, 2016). Creswell (2012) and Weiers (2010) suggests a minimum of 30 respondents for a correlational study relating variables. Burns and Burns (2008) however advise larger sample sizes, especially when conducting quantitative research, as larger data pools closer represent the population. As a bare minimum, a sample size of 100 responses would be acceptable for this study as recommended by Gorsuch (1983) and Kline (1994).

In testing the relational effect internal technological and human capital have on an organisation's dynamic capabilities, Junfeng and Wei-ping (2017) used a sample size of 130 respondents and achieved a 25% response rate. Similarly, Sheng (2017) utilised a sample size of 203 respondents and achieved a 24.17% response rate by testing the correlation between organisational sense and its dynamic capabilities. Deutskens, Ruyter, Wetzels and Oosterveld (2004) validates a 25% response rate for short surveys. In line with previous research and guidelines, the study aimed to receive 150 responses. Taking a 25% response rate into account, the survey targeted large social media platforms LinkedIn, Facebook and Whatsapp to be distributed to 600 individuals.

Cochran (2007) defines non-probability sampling as study subjects not having an equal chance of being selected to participate in the study. This study made use of non-probability convenience sampling as selected study participants were available, convenient and represented in part or full the characteristic of the identified population (Creswell, 2012). In addition to convenience sampling, snowball sampling was used to increase the sample size by asking respondents to expand the survey to employees falling into the same target population.

4.5. Unit of analysis

The level at which study participants are selected to participate in a study is termed the unit of analysis (Creswell, 2012). The unit of analysis for this study was defined as individual employees who work in South African organisations and are active on social media. Uhl-Bien et al., (2007) observe leadership as a process apparent throughout the entire organisation. Fainshmidt and Frazier (2017) argue dynamic capabilities to be key to any organisation's competitive advantage. Consequently, all levels of employment were considered for this study. Participants at both a junior, middle and senior level of employment were targeted to ensure a closer representation of the identified population.

4.6. Measurement instrument

The concepts of this study were assessed using a questionnaire. Quantitative data was collected at a specific point in time using a questionnaire. Electronic questionnaires were self-administered using Google Forms. The questionnaire consisted of four sections namely; participation consent, biographical information, control variables and constructs relevant to the study (Appendix B). Respondents responded by quantifying observed sub-constructs, collectively defined to measure the key constructs (latent variables) complexity leadership and dynamic capabilities. Respondents were required to rate each construct on a Likert scale. The Likert scale represents a scale that has theoretically equal intervals, and it is both a popular and well-tested method of measurement (Creswell, 2012). A five-point Likert scale ranging from positive to negative was used to measure complexity leadership and dynamic capabilities. The Likert scales ranged from one, which indicated never, to five, which indicated always, and one, which indicated not at all, to five, which indicated very much for complexity leadership and dynamic capabilities respectively as displayed in Table 1 and Table 2. The questionnaire items were serial order preference opinion questions in which the answers were ordinal or somewhat ordinal as shown in Table 1 and Table 2.

Table 1: Five-point Likert scale used for measuring complexity leadership.

5	Always
4	Often
3	Sometimes
2	Rarely
1	Never

Table 2: Five-point Likert scale used to measure dynamic capabilities

5	Very much
4	Somewhat
3	Undecided
2	Not really
1	Not at all

4.6.1. Participation consent

The rights of participants in the study were agreed with them before they participated. These rights specifically included voluntary participation, right of safety and freedom from harm, the right to be informed and the right to privacy and confidentiality (Burns & Burns, 2008). Confidence is conferred to the individual participants, the organisations and industries.

4.6.2. Biographical information

The biographical information refers to a participant's life data, i.e. date of birth, nationality, gender and race. Personal and organisation demographical information was requested from survey respondents. These included: gender, years worked at current organisation, level of employment within the organisation, size of organisation, years organisation been conducting business, organisation's primary business activity and latest annual reported revenue.

4.6.3. Control variables

Control variables are independent variables and are not necessary to explain the dependent variable or outcomes. Control variables were of secondary interest and were "neutralised" through statistical analysis (Creswell, 2012).

4.6.4. Research model and discussion of constructs

The main constructs for this study are complexity leadership and dynamic capabilities wherein complexity leadership is considered the independent variable and dynamic capabilities the dependent variable. Each construct was collectively defined by scales measuring sub-constructs (observed variables).

4.6.4.1. Discussion of complexity leadership

Generally acceptable scales for complexity leadership does not exist. Defined scales on a sub-construct level was used consisting of patterning of attention, developing networks and contextual intelligence which collectively measured complexity leadership.

Osborn and Marion (2009) developed and confirmed the use of a six-item measure to quantify complexity leadership's ability for patterning of attention. Patterning of attention promotes the co-creation of knowledge through storytelling and encouraging the discussion of challenges experienced (Clarke, 2013).

Osborn and Marion (2009) also confirmed the use of a six-item scale and from this literature the scale was inferred to measure developing networks. Developing networks is an organisation and its employees' ability to interact with the environment and each other (Clarke 2013; Uhl-Bien et al., 2007).

Contextual intelligence is the ability to observe and adapt to multiple contextual facets to position self and others to a preferred future (Kutz, 2008). Kutz (2008) identifies a skill set of twelve meta-competencies as a suitable construct of contextual intelligence. The measurement instrument consists of seven observed questions.

4.6.4.2. Discussion of dynamic capabilities

Generally acceptable scales for measuring dynamic capabilities does not yet exist (Makkonen et al., 2014), and this research will use defined scales on a sub-construct level. Junfeng and Wei-ping (2017) developed measurement scales to quantify an organisation's sensing ability, based on the work of both Ma, Huang and Shenkar (2011) and Teece (2007). It comprised of four items that required respondents to evaluate how capable the organisation has been to detect and correctly identify new trends or possible opportunities. These measures were tested in 130 Chinese manufacturing organisations, all in high-technology industries. The measure's Cronbach's alpha was calculated as 0.86 (Junfeng & Wei-ping, 2017).

In the same study, Junfeng and Wei-ping (2017) also developed measurement scales to quantify an organisation's seizing ability, based on the work of Teece (2007), and combined with feedback gained in personal interviews with leaders. It consists of 4 items, that require respondents to quantify the organisation's ability to seize the opportunities it had sensed with its established organisation structures, procedures, designs and incentives. The measure's Cronbach's alpha was calculated as 0.91 (Junfeng & Wei-ping, 2017). Junfeng and Wei-ping (2017) also aggregated these measurements for an organisation's sensing and seizing

abilities to represent the organisation's overall dynamic capability. Similarly, this research collectively viewed the three sub-constructs as an aggregate measure of an organisation's dynamic capabilities.

Junfeng and Wei-ping (2017) did not measure the transforming aspect of an organisation's dynamic capabilities. Makkonen, Pohjola, Olkkonen, and Koponen (2014) however did measure an organisation's transforming (or reconfiguration) ability to quantify this aspect on an organisation's dynamic capabilities. For this, Makkonen et al. (2014) developed a three-item measurement scale that required respondents to quantify an organisation's capability to continuously and purposefully reconfigure its existing resources (tangible and intangible assets). This scale was developed based on the work of Alsos, Borch, Ljungren, and Madsen (2008), and thoroughly tested and refined during a process of set qualitative semi-structured interviews, a pilot survey, and finally in a pre-test among experts in the field.

4.7. Pretesting the questionnaire

Saunders and Lewis (2012) emphasise the importance of testing the questionnaire before final distribution. Saunders and Lewis (2012) explain how a pilot study can be used to give the researcher valuable feedback on how easy the questions are to be understood and answered. The questionnaire for this study contains 37 questions including personal and organisational demographic questions. The questionnaire was shared with five known individuals complying to the selected population criteria with work experience ranging from junior to senior levels. Responses to the pilot study provided specific information on whether the questionnaire instructions and questions were easily understood, easy to answer and how long it took to answer. The feedback was overwhelmingly positive. One suggestion to better clarify the last question was received. The researcher agreed to update the last question without altering the structure and context of the question.

4.8. Data collection

Random sampling was not feasible in this study. The participants were selected based on convenience through various social media platforms. Data was gathered through self-administered structured questionnaires using Google Forms. This method for data collection allowed for quick and easy distribution through social media channels, LinkedIn, Facebook and Whatsapp, which encouraged snowball sampling and reach the targeted 600 potential respondents.

Questionnaires were sent to individuals employed at organisations operating in South Africa, regardless of size and industry. Accordingly, data were recorded at the source (individuals employed in businesses operating in South Africa) and external to the organisation (not produced by internal business processes), resulting in responses retrieved from primary external sources (Wegner, 2016).

A total of 115 usable responses were received of which fifty (50) responses were received via Whatsapp groups, fifty-three (53) responses were received from LinkedIn and a further 12 responses were received from Facebook. The total of 115 responses is more than the minimum acceptable sample size as recommended by Gorsuch (1983) and Kline (1994). The initial LinkedIn post received 1359 views and only 54 from a follow-up post.

4.8.1. Type of data collected

Wegner (2016) defines four types of measurement scales; nominal, ordinal, interval and ratio. The scale used for this study determined the appropriate statistical method used on the data to produce valid statistical results (Wegner, 2016). This study made use of two Likert rating scales to retrieve survey responses. Likert rating scales represent respondents' attitudes or opinions towards a statement or phrase (Wegner, 2016). Likert rating scales produce Interval data as the responses from the rating scales are associated with numerical data and quantitative random variables as per Table 2 and 3 (Wegner, 2016). Interval data is similar to ordinal data in that it also has the numerical property of order, however, Interval data, in addition, comprises the distance between the categories, in example how much more or less a category is apart from the previous or next category (Wegner, 2016). Wegner (2016) further states Interval data having sufficient numerical properties to conduct a wide range of statistical analysis. Questionnaire responses were received as quantitative, numeric, interval data and were coded to continuous data before conducting statistical analysis.

4.9. Data analysis procedure

4.9.1. Editing

Burns and Burns (2008) advise larger sample sizes, especially when conducting quantitative research, as larger data pools closer represent the population. Participants for this study were therefore given as much time possible to respond. Considering the time constraint for this study, a total of four (4) weeks, including reminders, were allowed for participants to partake in the study. The first step was to clean the data once a satisfactory number of responses were received and the allowed timeframe expired. This consisted of scrutinising the completed

questionnaires to classify and minimise any errors, misclassification, incompleteness or gaps in the data received from the respondents (Kumar, 2011). Most of these problems were circumvented by the way the questionnaire was structured. The possibility of incomplete questionnaire responses was circumvented by making all the response categories mandatory to complete.

4.9.2. Coding

To conduct statistical analysis on the final questionnaire data, each response was coded i.e. numerical values assigned to each response (Kumar, 2011). Table 4 depicts the naming conventions used for each of the constructs making it easier to show statistical results.

Table 3: Construct and observed variable acronyms

	Acronym
Latent variable:	
Complexity Leadership	CL
Dynamic Capabilities	DC
Observed variable:	
Patterning of Attention	POA
Developing Networks	DN
Contextual Intelligence	CI
Sensing	SEN
Seizing	SEI
Transforming	TRA

4.9.3. Analysis

This section describes the various statistical procedures followed to ultimately prove or disprove the stated hypotheses. Microsoft Excel and Statistical Package for Social Sciences (SPSS), version 25, were deemed appropriate data analysis tools to be used for this study. Both these tools can be used to conduct basic and more advanced statistical tests. In similar studies, both Junfeng & Wei-ping (2017) and Sheng (2017) made use of SPSS for their statistical analysis. Two main procedures were followed; first, the validity and reliability of the data were calculated, and second, the data was analysed to support or disprove the hypotheses. This study followed similar methodologies to Junfeng & Wei-ping (2017) and Makkonen et al. (2014) where they explored various variable relationships with organisations' dynamic capabilities.

4.9.3.1. Normality of variables

Content validity must be established. An important consideration is the adequacy of measurement. Creswell (2012) proposes the data be tested for normality. Gravetter and Wallnau (2006) defines normal distributed data as presenting symmetrical, bell-shaped curves, with the majority of frequencies in the middle, and decreasing towards the outer limits.

To assess the normality of the data collected for this study, the explore option of the statistics menu in SPSS version 25 was used to calculate the descriptive results as shown in Table 23. To assess the normality of the collected data, the skewness, kurtosis and 5% trimmed mean were analysed. Skewness depicts the evenness of the data distribution whereas kurtosis the 'peakedness' (Pallant, 2011). The most commonly used critical skewness and kurtosis values are ± 1.96 and ± 7 respectively - corresponding to a 0.01 significance level - for data to be accepted as normally distributed (Hair, Black, Babin & Anderson, 2010). The 5% trimmed mean removes the top and bottom 5% of the data points and calculates a new mean (Pallant, 2011). Normally distributed data vary little between the mean and 5% trimmed mean (Pallant, 2011).

4.9.3.2. Response outliers

Outliers are data points well above or below the majority of data points (Pallant, 2011). Outliers are shown as circles on the box plot positioned outside the 'whiskers' (the majority of data points) of the graph. A data point was deemed an outlier if it extended more than 1.5 box lengths from the edge of the box and deemed extreme if extended more than 3 box lengths (Pallant, 2011). It is not uncommon to remove extreme outliers from the data set should the removal have a significant impact on the test results (Pallant, 2011).

4.9.3.3. Instrument validity and reliability

Among the most important factors for selecting a good instrument is reliability and validity. Reliability infers that scores from an instrument are consistent and free from random error as it is used multiple times over different time periods, whereas validity attains to the instrument scores of the construct which the test is supposed to measure and whether it matches its intended purpose (Creswell, 2012).

i. Instrument validity

The three main instrument validity types are content, criterion and construct validity (Pallant, 2011). DeVellis (2016) defines construct validity as specifically testing relationships between

constructs. This study used construct validity to test the relevant scales against the theoretical hypotheses concerning the observed variables or sub-construct questions (Pallant, 2011). Construct validity consists of two parts, convergent and divergent validity, both of which need to be established to prove construct validity (Dane, 2018). Convergent validity measures the extent to which observed variables correlate as theoretically suggested (Dane, 2018). Divergent validity measures the extent to which observed variables do not correlate (Dane, 2018). Proving construct validity ensures observed variables which should correlate, do, and those which should not, do not. This study used factor and correlational analysis similar to previous studies on dynamic capabilities to establish convergence and divergence respectively (Blaikie, 2003; Junfeng and Wei-ping, 2017; Spicer, 2005).

Factor analysis

A factor analysis is a statistical technique used to separate larger groups of continuous variables into smaller groups or factors, effectively summarising and reducing data which accounts for the most variance in the original set of observed variables (Blaikie, 2003). Exploratory Factor Analysis (EFA) was used to explore the interrelationships among complexity leadership's variables and made use of the Principle Component Analysis (PCA) method (Blaiki, 2003). Given complexity leadership's subconstructs having more than five variables per subconstruct, factor analysis could assist in reducing the number of variables to better represent complexity leadership. Generally acceptable scales for complexity leadership does not exist and exploratory factor analysis was used to explore how well the selected subscales collectively measured complexity leadership. Variables 'clumping' together and loading strongly onto relevant components (coefficients greater than 0.3) can be argued to represent the overarching construct (Pallant, 2011).

Factor analysis is sensitive to outliers, which are data points well above or below the mean of results (Pallant, 2011). SPSS's procedure for assessing normality using explore was followed to determine if any significant outliers is present in the results before conducting factor analysis. A correlation matrix was used to inspect variables which have very low or very high coefficients (Blaikie, 2003). Variables with low coefficients (less than 0.3) were excluded from the factor analysis and high coefficients consolidated (Pallant, 2011). The correlation matrix, Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity were used to test whether the data were suitable for factor analysis as proposed by Pallant (2011).

The following norms were considered before conducting factor analysis (Pallant, 2011):

- a. The relationship between the variables was assumed to be linear for correlation which factor analysis is based on.

- b. Factor analysis is sensitive to outliers. Pallant (2011) suggests either removing or recoding problematic outliers before conducting factor analysis. Before conducting factor analysis, SPSS's procedure for assessing normality using explore was followed to determine if any significant outliers were present in the results. No problematic outliers were identified in comparing the 5% Trimmed Mean to the Mean, as these values were similar to the main distribution (Pallant, 2011).
- c. Factor analysis should only be conducted with;
 - (1) a correlation matrix showing correlations of $r = 0.3$, or greater
 - (2) Bartlett's test of sphericity should be statistically significant at $p < 0.05$ and
 - (3) KMO value should be greater than 0.6.
- d. Field (2013) suggests an ideal sample size of 300 to be sufficient for a stable factor solution. Guadagnoli and Velicer (1988) however, argues factors having four or more loadings greater than 0.6 are dependable irrespective of sample size.

The correlation matrix for complexity leadership's variables was inspected for coefficients greater than 0.3 before conducting PCA (Pallant, 2011). SPSS's Dimension Reduction procedure was followed to conduct PCA.

ii. Instrument reliability

Various types of reliability tests exist, however for each version of the instrument administered to participants, testing for internal consistency is of most importance (Creswell, 2012). One of the most widely accepted tests for internal consistency is Cronbach's coefficient alpha test (Cortina, 1993), which this study made use of. For instrument scores as continuous variables (i.e. strongly agree to strongly disagree), Cronbach's alpha provides a coefficient determining the consistency of the scores used in the instrument (Creswell, 2012). Creswell (2012) defines a Cronbach's alpha of 0.6 as an acceptable level for determining internal consistency.

4.9.3.4. Descriptive statistics

Descriptive statistics provide a holistic summary of data results in terms of central tendency, variability and relative standing (Creswell, 2012). Central tendency is a summary of numbers that represent a single value in a distribution of scores and comprises of a mean (average score), median (middle of a range of scores) and mode (most frequently occurring score). Measures of variability indicate how the scores are spread out and whether the majority of responses tend toward a certain score. Variability consists of range, variance and standard deviation. Relative standing describes a score relative to a group of scores.

4.9.3.5. Inferential statistics

Inferential statistics compare and relate two or more variables to each other and the results can be used to draw inferences from the population which was sampled. The first objective of this study is to explore the relationship between complexity leadership and an organisation's dynamic capabilities. The first objective of this study is therefore to confirm the existence of a significant, positive, linear relationship between complexity leadership and dynamic capabilities. The second objective of this study is concerned with better understanding the relationship between complexity leadership and an organisation's dynamic capabilities. Specifically understanding complexity leadership's relationship with dynamic capabilities' higher order capabilities – sensing, seizing and transforming. Both objectives entail exploring associations between two variables. Correlation and linear regression analysis were therefore deemed appropriate statistical tests to test the relevant hypotheses put forward in chapter three.

Wegner (2016) defines simple linear regression as finding the relationship between two numeric variables, by finding a straight line representing the relationship between the two numeric variables and plotting it on an X-Y axis. Correlational analysis measures the strength of the linear relationship between the two numeric variables (Wegner, 2016). For a normal distribution of scores where the dependent and independent variables are both continuous and only one dependent variable is to be related to one independent variable, Creswell (2012) suggests a Pearson product moment correlation test be used for statistical analysis.

4.10. Limitations

It is important to note the limitations of this study as it indicates to what extent the results can be generalised (Creswell, 2012). The first limitation of this study was the selected sampling method in that non-probability, convenience sampling which cannot result in a true representation of the population. Due to time, money and access constraints, probability sampling was not pursued. A cross-sectional study was conducted given the time limitations. This limited the results to a specific point in time and did not consider changes over time which inhibits causal inference. Lastly, the sample size of 115 was less than the expected 150 responses. The ideal number of responses was considered at 300. The sample may have been subjected to random sampling error, which might possibly have skewed the test results (Zikmund, 2009).

5. CHAPTER 5: RESULTS

5.1. Introduction

The previous section described the design of the research study as well as the methods followed to conduct the study. This section presents the preliminary analysis results to conduct the appropriate statistical tests. This section further aims to describe the data received from the survey responses as well as report the relevant test results necessary to address the various hypotheses presented in chapter three. Throughout the statistical analyses, data were assumed to be normally distributed and a 95% confidence interval was selected.

5.2. Preliminary analysis

5.2.1. Normality of variables

The skewness and kurtosis results fell well within the limits (± 1.96 and ± 7 respectively) proposed by Hair, Black, Babin & Anderson (2010) as presented in Table 4. In addition, the 5% trimmed mean values do not differ significantly from the mean. The histograms of the variables' distributed data were also visually inspected for normality. Figure 22, 23, 24, 25 and 26 are shown in Appendix C. The histograms concur similar results to that of the skewness, kurtosis and 5% trimmed mean, showing approximately normal distributed data. The data collected for this study can be assumed to be normally distributed.

Table 4: Descriptive results to test data normality

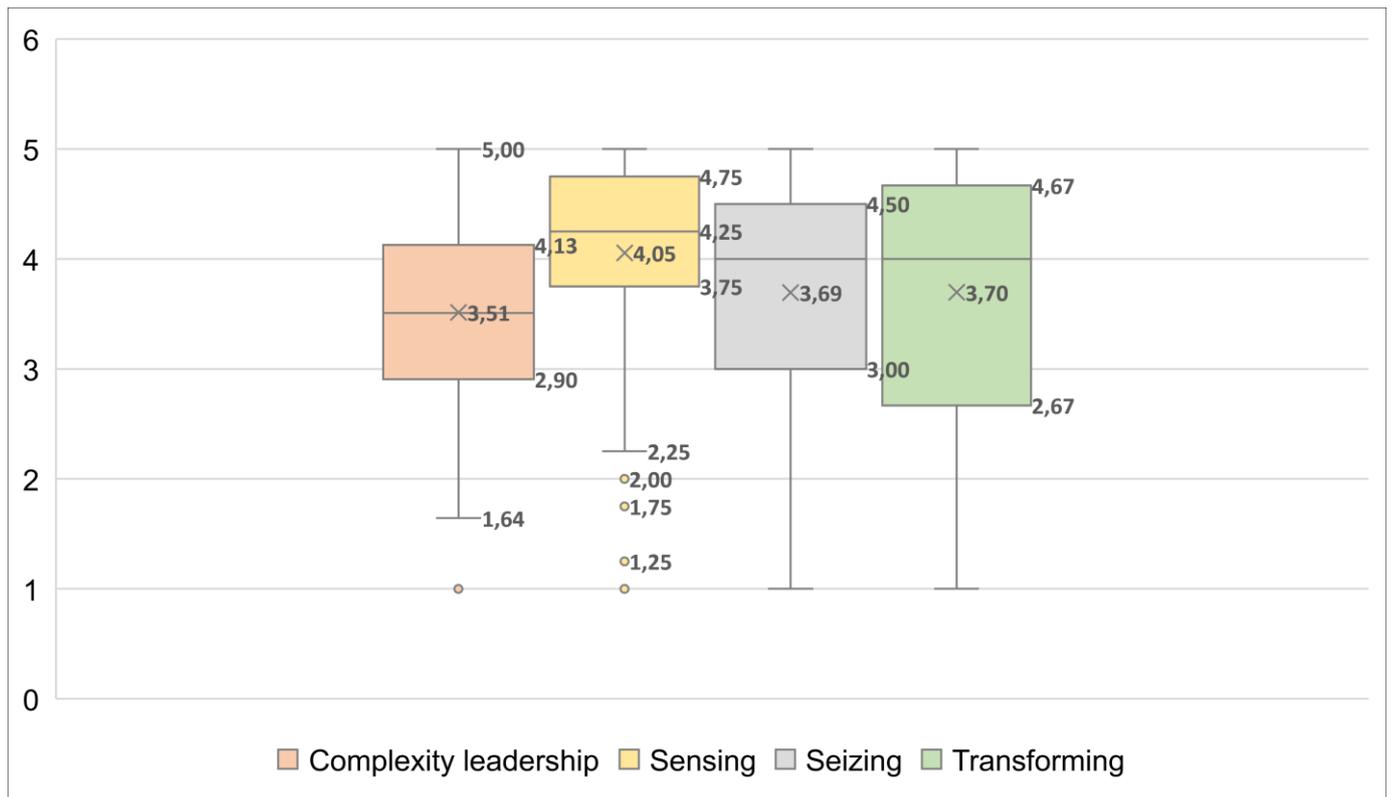
Variable N = 115	5% Trimmed Mean	Skewness	Kurtosis
Complexity leadership	3.53	-0,23	-0,29
Dynamic capabilities	3.87	-0.92	0,41
Sensing	4.14	-1.32	-1.47
Seizing	3.75	-0.73	-0,40
Transforming	3.74	-0,59	-0,48

5.2.2. Response outliers

Outliers are data points well above or below the majority of data points (Pallant, 2011). Figure 5 depicts box plots with relevant outliers for the observed variables. Outliers are shown as circles on the box plot. A data point was deemed an outlier if it extended more than 1.5 box

lengths from the edge of the box and deemed extreme if it extended more than 3 box lengths (Pallant, 2011). The identified outliers were left as part of the study as their numbers are minute in comparison as already proved by the normality tests. One borderline outlier was identified for the variable sensing at 1.00 where the mean is 4.05. The outlier was kept as part of the data set, as removing it didn't result in significant result changes. Consequently, no extreme outliers were removed.

Figure 5: Box plots depicting variable outliers



5.2.3. Instrument validity

Factor analysis is sensitive to outliers (Pallant, 2011). SPSS's procedure for assessing normality using explore was followed to determine if any significant outliers were present in the results before conducting factor analysis. A correlation matrix was used to inspect variables which have very low or very high coefficients (Blaikie, 2003). Variables with low coefficients (less than 0.3) were excluded from the factor analysis and high coefficients consolidated (Pallant, 2011).

The correlation matrix, Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity were used to test whether the data were suitable for factor analysis as proposed by Pallant (2011). The correlation matrix for complexity leadership's variables was inspected for coefficients greater

than 0.3 before conducting PCA (Pallant, 2011). SPSS's dimension reduction procedure was followed to conduct PCA. All the correlation coefficients highlighted in green were greater than 0.3 as displayed in Table 24. Each variable correlated sufficiently (greater than 0.3) with at least one other variable indicating sufficient intercorrelation strengths exist among complexity leadership's data set for conducting PCA (Pallant, 2011).

Following on the correlation matrix, KMO measure of sampling adequacy and Bartlett's test of sphericity were conducted on complexity leadership's variables to establish appropriateness for PCA. The KMO value was calculated as 0.927, far exceeding the recommended value of 0.6 and Bartlett's test of sphericity reached statistical significance, supporting the factorability of the correlation matrix as displayed in Table 5. From the correlation matrix, KMO measure of sampling adequacy and Bartlett's test of sphericity results, it was concluded appropriate to conduct factor analysis on complexity leadership's variables.

Table 5: KMO and Bartlett's test results

Test	Result	
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.927	
Bartlett's test of sphericity	Approx. Chi-Square	1636.812
	Sig.	0.000

The nineteen items of complexity leadership were subjected to PCA using SPSS version 25. PCA confirmed the presence of two components with eigenvalues greater than one, explaining 56.7 and 6.70 % of the variance respectively and a total of 63.4%. Reducing the number of components reduces the total variance explained by 6.7% and adding an additional component (three in total) adds an additional 4.6% in variance explained.

The Varimax with Kaiser Normalisation rotation method was followed to see on which components the variables loaded the highest, as displayed in Table 27. Positive factor loadings below 0.3 were discarded as too weak and significant loadings were considered above 0.5, considering the sample size of 115 responses (Hair, Black, Babin & Anderson, 2010). Component 1 and 2 sufficiently justify a sample size of 115 responses as both contain more than four loadings greater than 0.6 (Guadagnoli and Velicer, 1988). The survey items were sorted by their loadings on each factor. All the items loaded significantly onto a component.

Not all communalities were greater than 0.5 when extracting only two factors. This suggests CL_CI_04 and 07 inadequately represents the variance accounted for by the factor solution

as shown in Table 25 and Table 28 (Hair, Black, Babin & Anderson, 2010). In comparing the rotated component matrix solutions in Table 27 and Table 29, it is important to note the number of strong loadings (greater than 0.6) in the two factor solution (eight for component one and five for component two) compared to the forced three-factor solution (seven, five and three respectively for component one, two and three).

A Scree plot was used in addition to the explained variance and rotated matrix solutions to assist in comparing the number of components to best fit the underlying data structure of complexity leadership. In interpreting a scree plot, one must look for the inflection point where the gradient of the curve evens out horizontally (Pallant, 2011). Pallant (2011) advises to only consider components above the inflection point. The scree plot depicted in Figure 21 displayed a change in gradient from a negative to a horizontal slope at component point three, supporting two as opposed to three components. The rotated three-factor solution depicted in Table 29 showcases a sufficient number of items (more than three) loaded onto each component, justifying the use of three components to represent complexity leadership's underlying data set (Pallant, 2011).

Three subconstructs were theorised in the literature review as a measure of complexity leadership as a construct. These subconstructs are developing networks, patterning of attention and contextual intelligence. Considering three extracted components as depicted in Table 29, all communalities are calculated to be greater than 0.5 with sufficient loadings per factor, indicating a better fit to the underlying set of data explaining complexity leadership in view of the theory proffered. Component one can be themed around developing networks as the majority of these items are concerned with organisations and employees' interaction with each other and the surrounding environment (Clarke 2013; Uhl-Bien et al., 2007). The second component is strongly themed around patterning of attention, promoting the co-creation of knowledge through storytelling and encouraging the discussion of challenges experienced (Clarke, 2013). The third component can be themed around contextual intelligence which is the ability to observe and adapt to multiple contextual facets to position self and others to a preferred future (Kutz, 2008).

5.2.4. Instrument reliability

Table 6 depicts the Cronbach's alpha test results for the observed and latent variables and was calculated using the reliability analysis function in SPSS.

Table 6: Cronbach's alpha test results

Construct	Cronbach's α
Complexity leadership:	0.957
<i>Patterning of attention</i>	0.913
<i>Developing networks</i>	0.870
<i>Contextual intelligence</i>	0.905
Dynamic capabilities:	0.948
<i>Sensing</i>	0.916
<i>Seizing</i>	0.926
<i>Transforming</i>	0.909

The three latent variables used to measure complexity leadership together resulted in a high level of reliability of 0.957, well above the acceptable 0.6 as stated by Creswell (2012). The same was found for dynamic capabilities, with a Cronbach's alpha of 0.948 which closely correlates to that of Fainshmidt & Frazier (2017) and Junfeng & Wei-ping (2017) who conducted similar studies with regards to dynamic capabilities.

Apart from DC_TRA_03 "Enable employees to utilise their existing knowledge or skills", all the questions for the relevant constructs were found to be appropriate as deleting any one of them would not improve the overall Cronbach's alpha for the respective constructs. Removing DC_TRA_03's Cronbach's alpha from the observable variable Transforming will increase the variable's Cronbach's alpha from 0.909 to 0.938. Since a Cronbach's alpha of 0.909 is already high, it was decided to leave DC_TRA_03 as part of Transforming's observable variables. The instruments were found to be consistent and reliable.

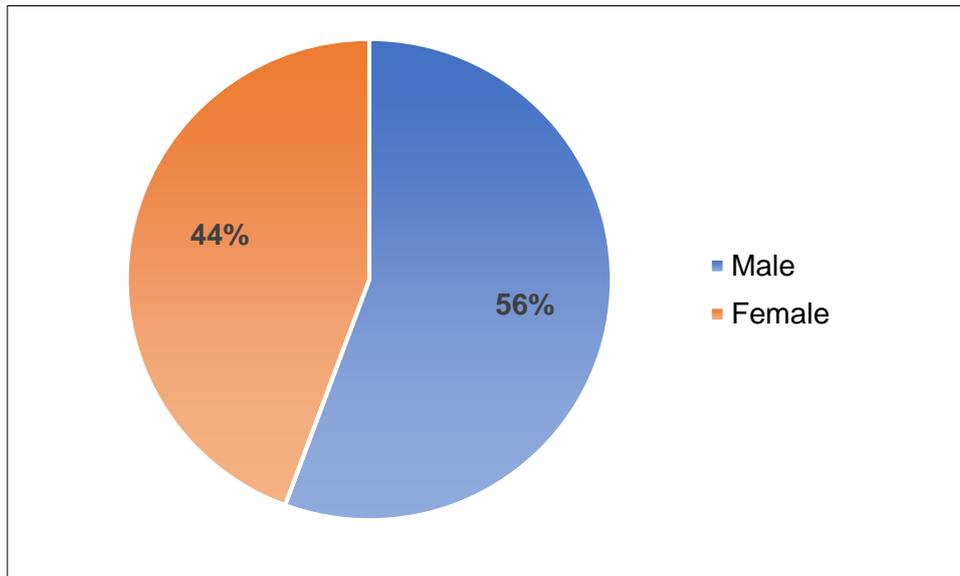
The data collected for this study have successfully been tested for instrument reliability and validity as well as normality. This concludes the preliminary test requirements to conduct descriptive and inferential statistics to prove or disprove the relevant hypotheses.

5.3. Biographical and control variables

5.3.1. Gender

Figure 6 depicts the gender split of respondents. Out of a total of 115 responses, 64 (56%) were male and 51 were female.

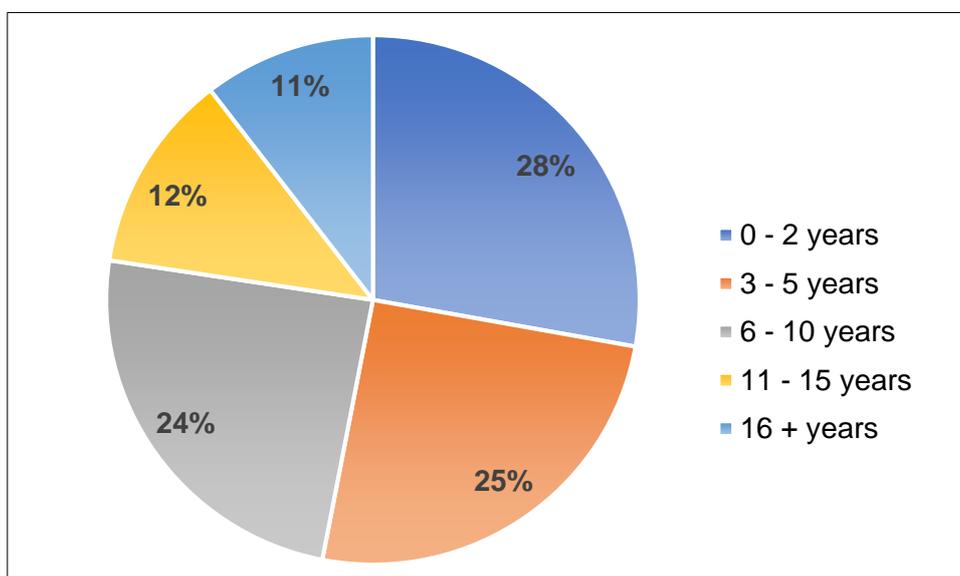
Figure 6: Respondent gender



5.3.2. Respondent tenure

The tenure of respondents at their current organisation was deemed important to establish an understanding of respondents' context regarding their current organisation and the relevant environmental changes which they have been a part of. Figure 7 depicts the tenure of respondents. Years of service from zero to two, three to five and six to ten years represent most of the respondents with fairly even splits at 28, 25 and 24 % respectively. Important to note is the percentage of respondents employed for more than ten years (23% in total) at their current organisation. These respondents would have experienced numerous environmental, capability and leadership changes during their tenure at their organisation.

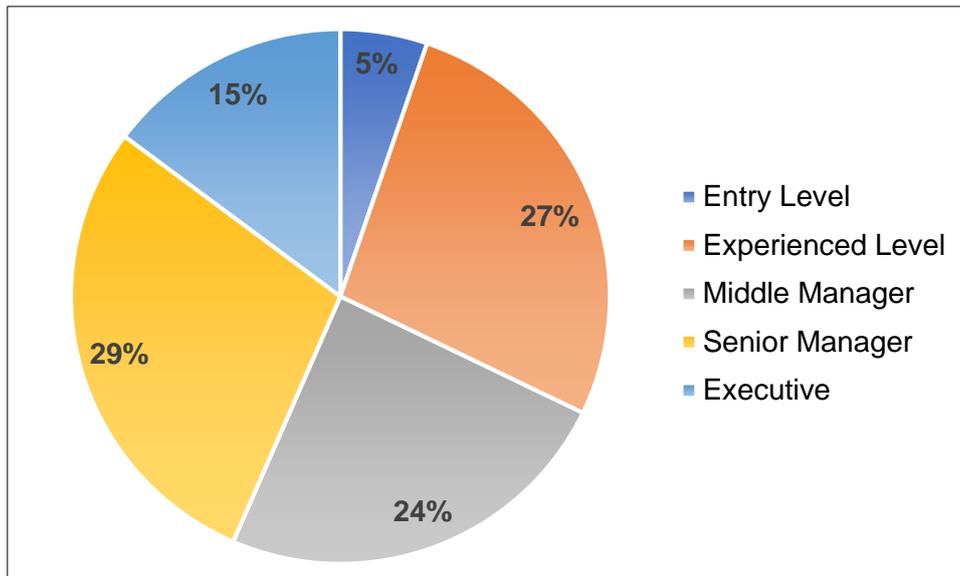
Figure 7: Respondent tenure



5.3.3. Respondent job level

Figure 8 highlights the diverse distribution of respondents' management levels within their organisation with similar splits between experienced (27%), middle (24%) and senior managers (29%).

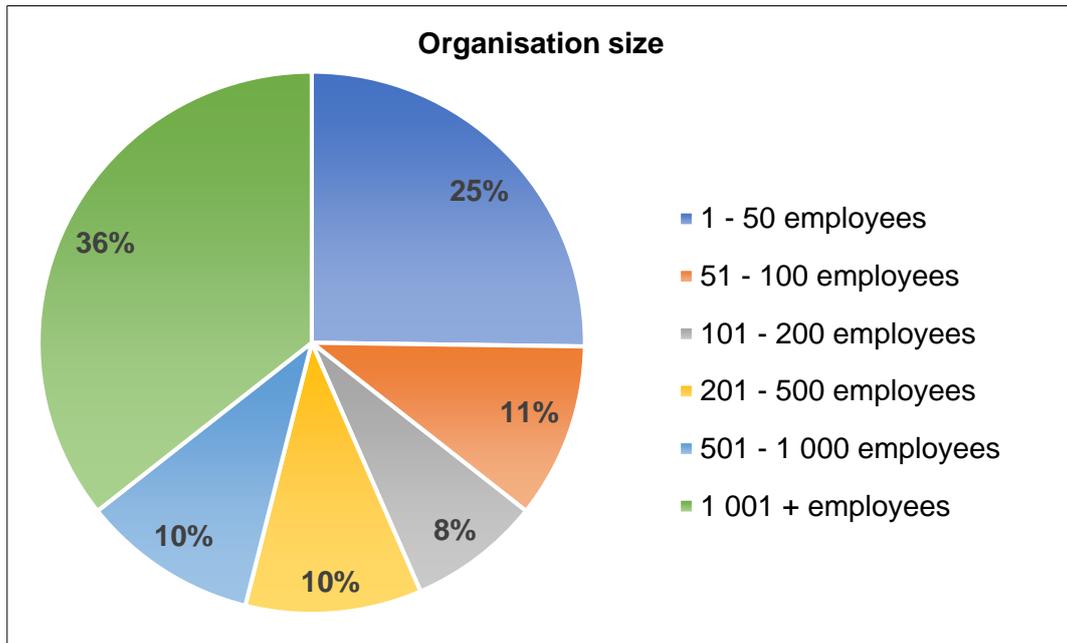
Figure 8: Respondent job level



5.3.4. Organisation age, size and revenue

Figure 9 depicts the size of the organisations where the respondents are employed. The majority (36%) of respondents work at large organisations with more than a thousand employees. A quarter (25%) of the respondents work at small organisations with between 1 and 50 employees.

Figure 9: Organisation size



The organisations where the respondents are employed at are well established with the majority (60%) of the organisations being older than 21 years, as depicted in Figure 10.

Figure 10: Age of organisation

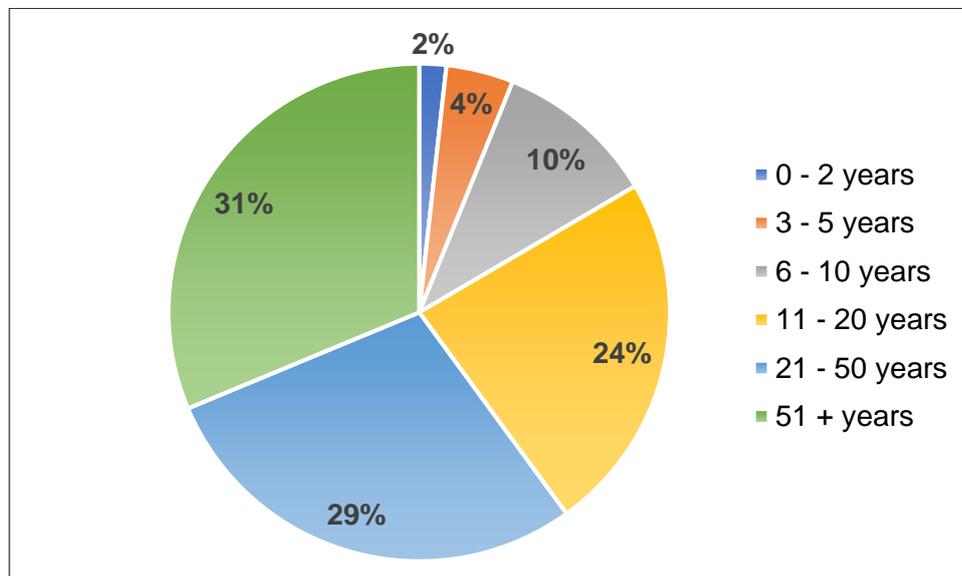
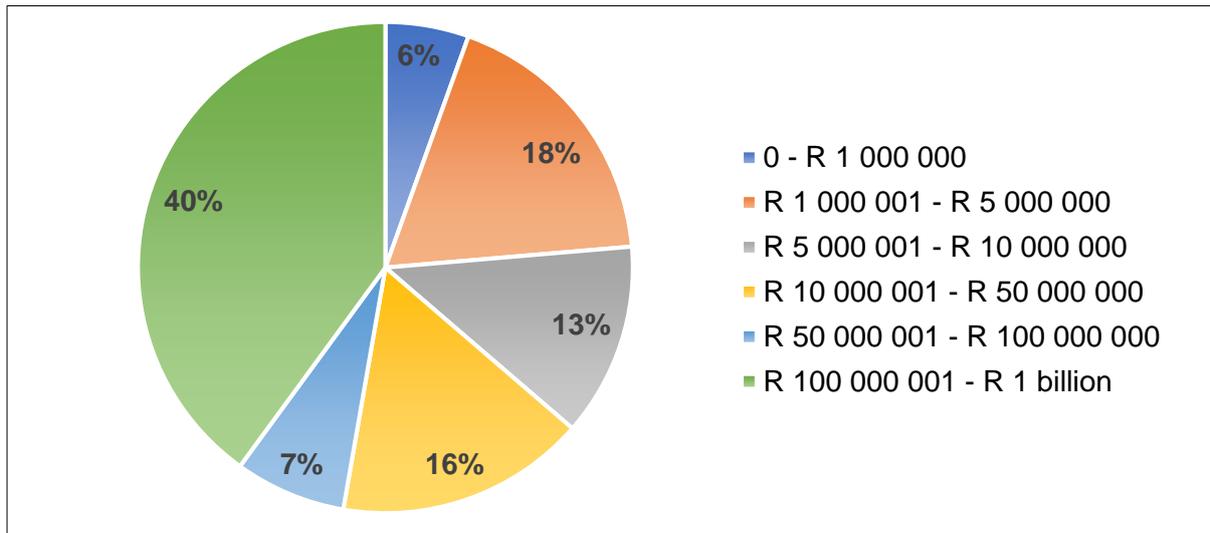


Figure 11 shows the annual revenue split of the various organisations of the respondents. The majority (40%) of the organisations where respondents work, earn in excess of R100 million annually. The second largest percentage of respondents by organisation revenue account for 18% of the respondents and are employed at organisations earning between one (1) and five (5) million rand annually.

Figure 11: Organisation revenue



5.4. Objective 1 and 2 results

The following section aims at statistically analysing the results of the study with regards to the constructs, subconstructs and relationships hypothesised in objective one and two. The first objective of this study was to confirm the existence of a significant, positive, linear relationship between complexity leadership and dynamic capabilities as hypothesised in Hypothesis 1.

Hypothesis 1:

H0: No linear relationship exists between complexity leadership and dynamic capabilities.

H1: A positive linear relationship exists between complexity leadership and dynamic capabilities.

The second objective of this study delved deeper in understanding the relationship between complexity leadership and an organisation's dynamic capabilities. Specifically understanding complexity leadership's relationship with dynamic capabilities' higher order capabilities – sensing, seizing and transforming as hypothesised in Hypothesis 2.1, 2.2 and 2.3.

Hypothesis 2.1 (H2.1):

H0: No linear relationship exists between complexity leadership and sensing.

H1: A positive linear relationship exists between complexity leadership and sensing.

Hypothesis 2.2 (H2.2):

H0: No linear relationship exists between complexity leadership and seizing.

H1: A positive linear relationship exists between complexity leadership and seizing.

Hypothesis 2.3 (H2.3):

H0: No linear relationship exists between complexity leadership and transforming.

H1: A positive linear relationship exists between complexity leadership and transforming.

SPSS version 25 was used to conduct the various correlation and regression analyses. The independent (complexity leadership) and dependent (dynamic capabilities) observable variable responses are described in the following sub-sections using descriptive statistics which is followed by inferential results per objective.

5.4.1. Assumptions

To conduct correlation and regression analysis the sample results were accepted as normally distributed as per the conducted tests for normality. In addition, a 95% confidence interval was selected for all tests conducted.

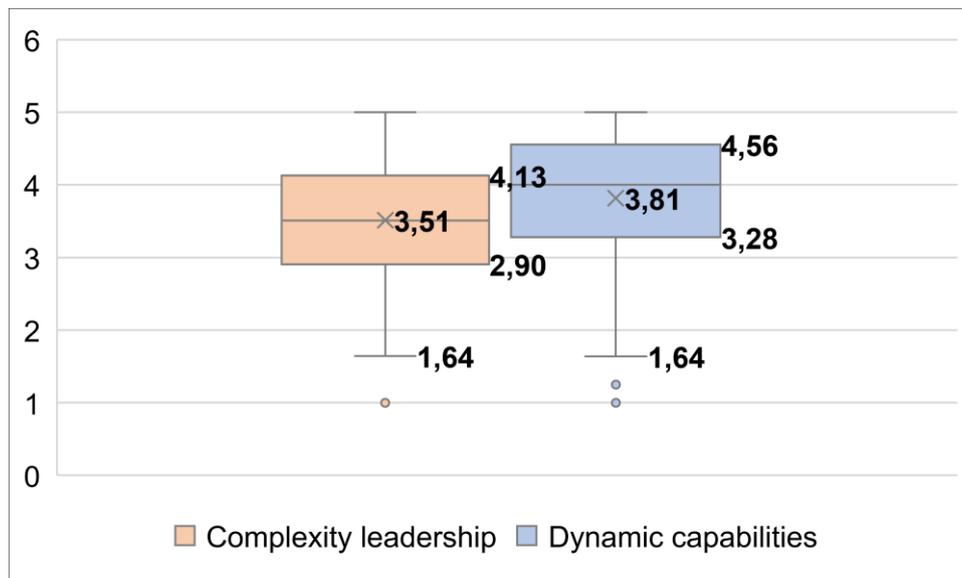
5.4.2. Objective 1: Hypothesis 1 descriptive analysis

The averages per subconstruct were taken per respondent to form the relevant constructs, complexity leadership and dynamic capabilities. Descriptive statistics were carried out on both constructs and are summarised in Figure 12 and Table 7. Complexity leadership showed a negative kurtosis, indicating a platykurtic (flatter) distribution whereas dynamic capabilities a positive kurtosis, indicating a leptokurtic (peakier) distribution (Hair et al., 2010). All the results for skewness were negative, which indicates a rightward shift and majority of responses to be positive as per the used Likert scales (Hair et al., 2010). The mean of the responses tended towards respondents’ organisations ‘often’ displaying complexity leadership styles whilst ‘somewhat’ displaying dynamic capabilities. Complexity leadership responses displayed a relatively low standard deviation at 0.84, with dynamic capability responses displaying a slightly higher deviation at 0.90. Figure 12 shows the box plot whiskers for dynamic capabilities and complexity leadership stretching from 1.64 to 5. The inter-quartiles range from 2.90 to 4.13 for complexity leadership and from 3.28 to 4.56 for dynamic capabilities. No significant outliers (more than three box lengths) were observed.

Table 7: Descriptive statistics for complexity leadership and dynamic capabilities

Variable N = 115	Minimum	Maximum	Mean	5% Trimmed Mean	Std. Deviation	Skewness	Kurtosis
Complexity leadership	1	5	3.51	3.53	0.84	-0,23	-0,29
Dynamic capabilities	1	5	3.81	3.87	0.90	-0.92	0,41

Figure 12: Box plots depicting descriptive statistics of complexity leadership and dynamic capabilities



5.4.3. Objective 1: Hypothesis 1 inferential results

The first objective of this research was to confirm that there exists a significant, positive, linear relationship between complexity leadership and dynamic capabilities. Pallant (2011) suggests generating a scatterplot before conducting a correlation to check for linearity and homoscedasticity (variance in 'X' should be similar at all 'Y' values) assumption violations. Linear regression analysis was used to test if complexity leadership could significantly predict an organisation's dynamic capabilities.

Hypothesis 1:

H0: No linear relationship exists between complexity leadership and dynamic capabilities.

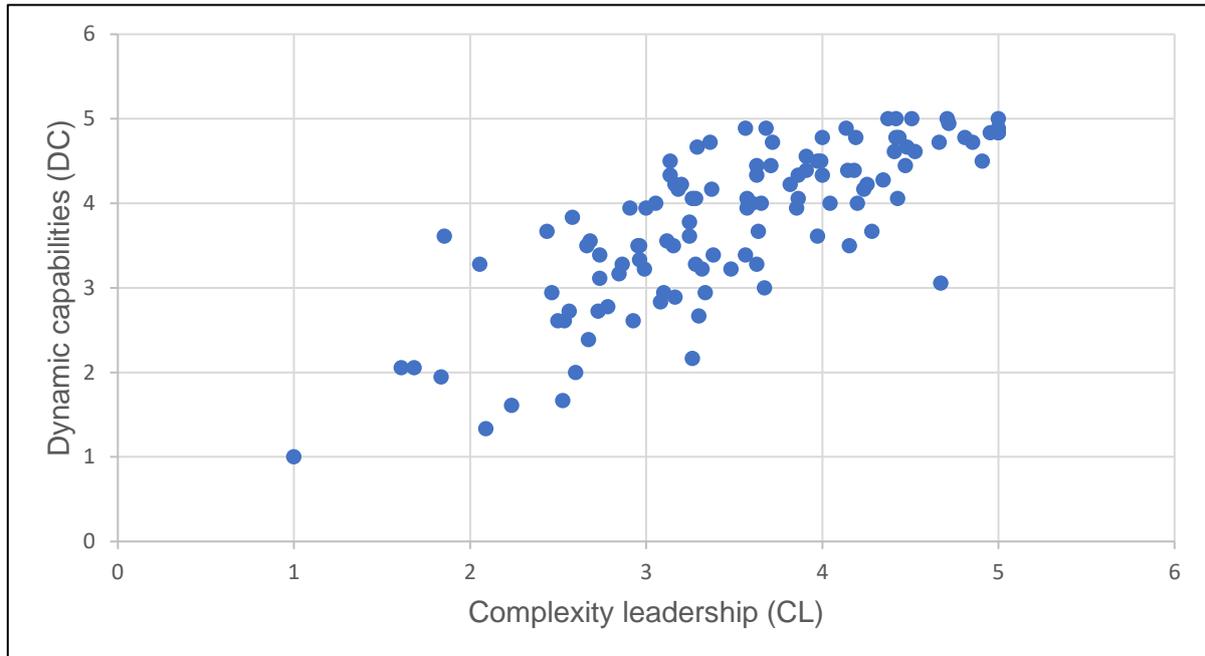
H1: A positive linear relationship exists between complexity leadership and dynamic capabilities.

A scatter plot was first created from complexity leadership (independent variable displayed on the x-axis, Figure 13) and dynamic capabilities' response data to test for linearity and direction (positive or negative). Next, a Pearson moment correlation was conducted to determine the strength of the correlation between complexity leadership and dynamic capabilities.

The means of developing networks, patterning of attention and contextual intelligence responses per respondent were calculated and represented the construct complexity

leadership. Similarly, the means of sensing, seizing and transforming responses were calculated to represent the construct dynamic capabilities. Figure 13 shows how the independent variable (complexity leadership) associates to the dependent variable (dynamic capabilities) in the form of a scatter plot.

Figure 13: Scatter plot of complexity leadership and dynamic capabilities



The correlation between complexity leadership and dynamic capabilities was investigated using SPSS' Pearson product-moment correlation coefficient as presented in Table 8. A strong, significant, positive correlation between the two variables was found, $r=0.78$, $N=115$, $P<0.5$ (Wegner, 2016). The Sig-value (P-value) was calculated to be 0.000 which is far less than 0.05, indicating significance between complexity leadership and dynamic capabilities.

Table 8: Pearson correlation for complexity leadership and sensing

Pearson correlation		CL
DC	Pearson Correlation -r	.784**
	Sig. (2-tailed)	0,000
	N	115

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

The linear regression output is indicated in Table 9 and Table 10. The correlation coefficient r of 0.78 indicates a strong correlation between the independent and dependent variable. The adjusted R square indicates that complexity leadership explains 61.1% of the variance of

dynamic capabilities. The regression coefficient is significant with a P-value of less than 0,001, far below 0.05 (Wegner, 2016). The dynamic capability predictor equation for the relationship equates to [dynamic capabilities] = 0.864 + 0.840 [complexity leadership], indicating that dynamic capabilities increases by 0.840 for every unit complexity leadership increases by.

Table 9: Linear regression for H1 (a)

Coefficients^a				
Model		Unstandardized Coefficients	Standardized Coefficients	Sig.
		B	Beta	
1	(Constant)	0,864		0,000
	Complexity leadership	0,840	0,784	0,000
a. Dependent Variable: DC				

Table 10: Linear regression for H1 (b)

Model Summary^b		
Model	R Square	Adjusted R Square
1	0,615	0,611
a. Predictors: (Constant), Complexity leadership		
b. Dependent Variable: Dynamic capabilities		

5.4.4. Objective 2: Hypothesis 2.1 descriptive analysis

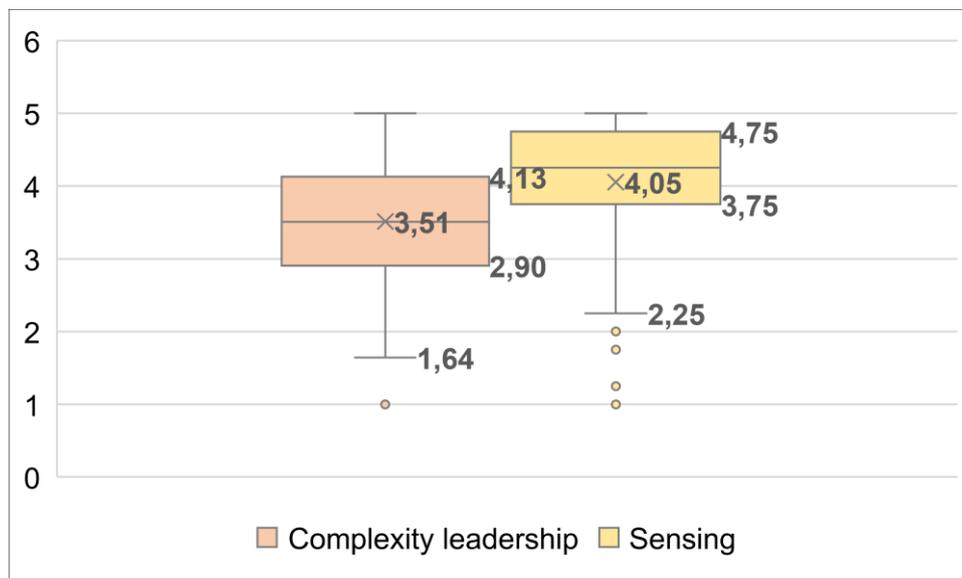
Figure 14 and Table 11 displays the descriptive statistics for complexity leadership and sensing. All the measured variables showed a negative kurtosis, indicating a platykurtic (flatter) distribution as described by Hair et al., 2010. All the skewness results were negative, which indicated a rightward shift and majority of responses to be positive as per the used Likert scales (Hair et al., 2010). The mean of the responses tended towards respondents' organisations 'often' displaying complexity leadership styles whilst 'somewhat' displaying sensing capabilities. Complexity leadership responses displayed a relatively low standard deviation at 0.84, with sensing capability responses displaying a slightly higher deviation at 0.93. The box plot whiskers for complexity leadership and sensing stretches from 1.64 to 5 and 2.25 to 5 respectively. The inter-quartiles range from 2.90 to 4.13 for complexity

leadership and 3.75 to 4.75 for sensing. Four outliers for sensing can be observed, all except one for sensing within three box lengths from the mean.

Table 11: Descriptive statistics for complexity leadership and sensing

Variable N = 115	Minimum	Maximum	Mean	5% Trimmed Mean	Std. Deviation	Skewness	Kurtosis
Complexity leadership	1	5	3.51	3.53	0.84	-0,23	-0,29
Sensing	1	5	4.05	4.14	0.93	-1.32	-1.47

Figure 14: Box plots depicting descriptive statistics of complexity leadership and sensing.



5.4.5. Objective 2: Hypothesis 2.1 inferential results

The second objective of this study was to confirm that there exists a significant, positive, linear relationship between complexity leadership and each of dynamic capabilities' higher order capabilities – sensing, seizing and transforming.

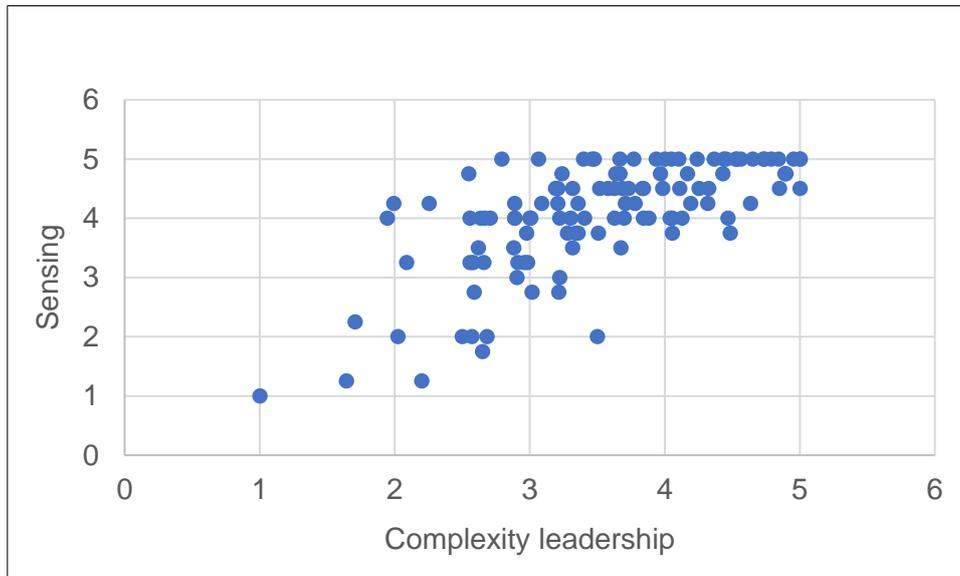
Hypothesis 2.1:

H0: No linear relationship exists between complexity leadership and sensing.

H1: A positive linear relationship exists between complexity leadership and sensing.

Figure 15 shows how the independent variable (complexity leadership) associates to the dependent variable (sensing) in the form of a scatter plot.

Figure 15: Scatter plot of complexity leadership and sensing



The correlation between complexity leadership and sensing capabilities was investigated using SPSS' Pearson product-moment correlation coefficient as presented in Table 12. A strong, significant, positive correlation between the two variables was found, $r=0.685$, $N=115$, $P<0.5$ (Wegner, 2016). The Sig-value (P-value) was calculated to be 0.000 which is far less than 0.05, indicating significance between complexity leadership and sensing capabilities.

Table 12: Pearson correlation for complexity leadership and sensing

Pearson correlation		CL
Sensing	Pearson Correlation -r	.685**
	Sig. (2-tailed)	0,000
	N	115

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

The linear regression output is indicated in Table 13 and Table 14. The correlation coefficient R of 0.685 indicates a strong correlation between the independent (complexity leadership) and dependent variable (dynamic capabilities). The adjusted R square indicates that complexity leadership explains 47 % of the variance of sensing capabilities. The regression coefficient is significant with a P-value of less than 0,001, far below 0.05 (Wegner, 2016). The sensing capability predictor equation for the relationship equates to $[\text{Sensing}] = 1.389 + 0.759 [\text{Complexity leadership}]$, indicating that sensing capabilities increases by 0.759 for every unit complexity leadership increases by.

Table 13: Linear regression results for H2.1 (a)

Coefficients^a				
Model		Unstandardized Coefficients	Standardized Coefficients	Sig.
		B	Beta	
1	(Constant)	1,389		0,000
	Complexity leadership	0,759	0,685	0,000
a. Dependent Variable: Sensing				

Table 14: Linear regression results for H2.1. (b)

Model Summary^b			
Model	R	R Square	Adjusted R Square
1	0,685 ^a	0,470	0,465
a. Predictors: (Constant), Complexity leadership			
b. Dependent Variable: Sensing			

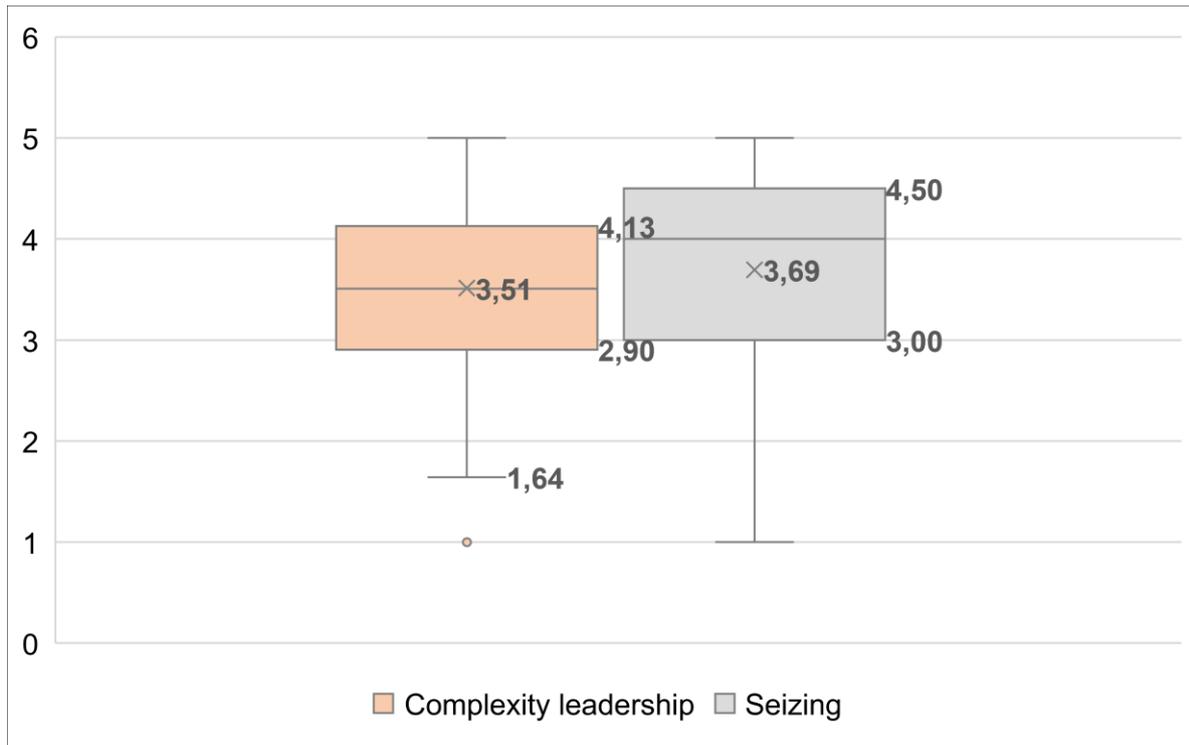
5.4.6. Objective 2: Hypothesis 2.2 descriptive analysis

Table 15 and Figure 16 displays the descriptive statistics for complexity leadership and seizing. All the measured variables showed a negative kurtosis, indicating a platykurtic (flatter) distribution (Hair et al., 2010). Likewise, all the skewness results were negative, which indicated a rightward shift and majority of responses to be positive as per the used Likert scales (Hair et al., 2010). The mean of the responses tended towards respondents' organisations 'often' displaying complexity leadership styles whilst 'somewhat' displaying seizing capabilities. Complexity leadership responses displayed a relatively low standard deviation at 0.84, with seizing capability responses displaying a higher deviation at 1.06. The box plot whiskers for complexity leadership and seizing stretches from 1.64 to 5 and 1 to 5 respectively. The inter-quartiles range from 2.90 to 4.13 for complexity leadership and 3.00 to 4.50 for seizing capabilities.

Table 15: Descriptive statistics for complexity leadership and seizing

Variable N = 115	Minimum	Maximum	Mean	5% Trimmed Mean	Std. Deviation	Skewness	Kurtosis
Complexity leadership	1	5	3.51	3.53	0.84	-0,23	-0,29
Seizing	1	5	3.69	3.75	1.06	-0.73	-0,40

Figure 16: Box plots for complexity leadership and seizing



5.4.7. Objective 2: Hypothesis 2.2 inferential results

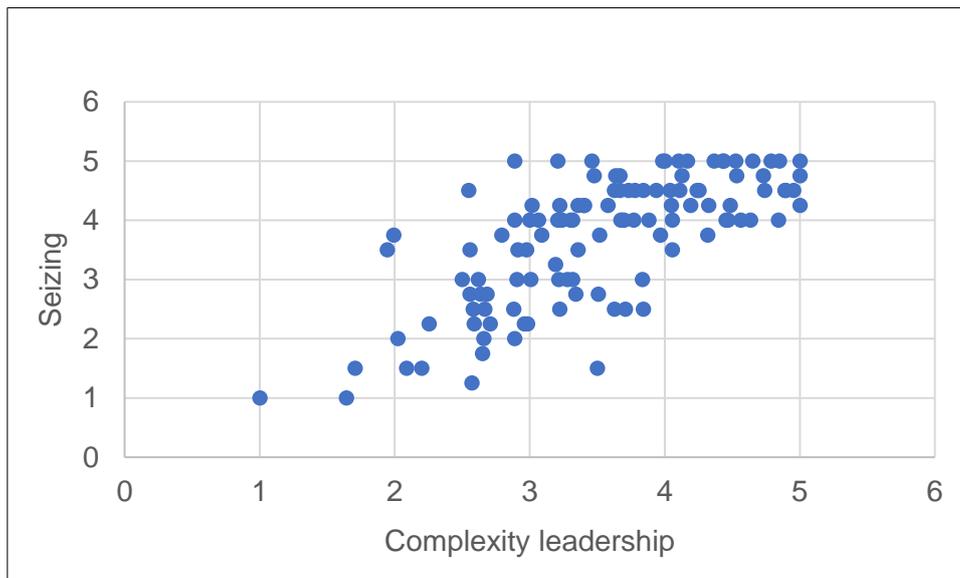
Hypothesis 2.2:

H0: No linear relationship exists between complexity leadership and seizing.

H1: A positive linear relationship exists between complexity leadership and seizing.

Figure 17 shows how the independent variable (complexity leadership) associates to the dependent variable (seizing) in the form a scatter plot.

Figure 17: Scatter plot of complexity leadership and seizing



The correlation between complexity leadership and seizing capabilities was investigated using SPSS' Pearson product-moment correlation coefficient as presented in Table 16. A strong, significant, positive correlation between the two variables was found, $r=0.713$, $N=115$, $P<0.5$ (Wegner, 2016). The Sig-value (P-value) was calculated to be 0.000 which is far less than 0.05, indicating significance between complexity leadership and seizing capabilities.

Table 16: Pearson correlation for complexity leadership and seizing

Pearson correlation		
		CL
Seizing	Pearson Correlation -r	.713**
	Sig. (2-tailed)	0,000
	N	115

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

The linear regression output is indicated in Table 17 and Table 18. The correlation coefficient R of 0.713 indicates a strong correlation between the independent (complexity leadership) and dependent variable (seizing). The adjusted R square indicates that complexity leadership explains 50.3 % of the variance of seizing capabilities. The regression coefficient is significant with a P-value of less than 0,001, far below 0.05 (Wegner, 2016). The seizing capability predictor equation for the relationship equates to $[\text{Seizing}] = 0.536 + 0.899 [\text{Complexity leadership}]$, indicating that seizing capabilities increase by 0.899 for every unit complexity leadership increases by.

Table 17: Linear regression results for H2.2 (a)

Coefficients^a				
Model		Unstandardized Coefficients	Standardized Coefficients	Sig.
		B	Beta	
1	(Constant)	0.536		0,000
	Complexity leadership	0,899	0,713	0,000
a. Dependent Variable: Seizing				

Table 18: Linear regression results for H2.2 (b)

Model Summary^b			
Model	R	R Square	Adjusted R Square
1	0,713 ^a	0,508	0,503
a. Predictors: (Constant), Complexity leadership			
b. Dependent Variable: Seizing			

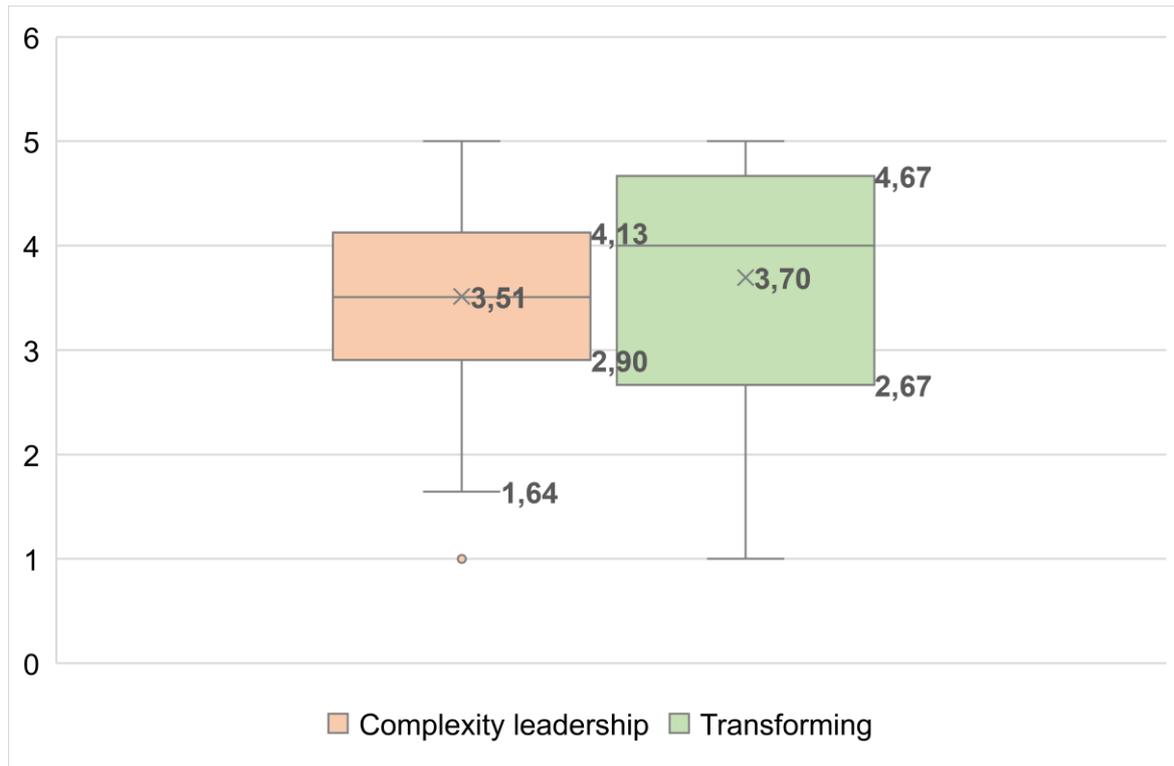
5.4.8. Objective 2: Hypothesis 2.3 descriptive analysis

Table 19 and Figure 18 displays the descriptive statistics for complexity leadership and transforming. All the measured variables showed a negative kurtosis, indicating a platykurtic (flatter) distribution (Hair et al., 2010). Likewise, all the skewness results were negative, which indicated a rightward shift and majority of responses to be positive as per the used Likert scales (Hair et al., 2010). The mean of the responses tended towards respondents' organisations 'often' displaying complexity leadership styles whilst 'somewhat' displaying transforming capabilities. Complexity leadership responses displayed a relatively low standard deviation at 0.84, with transforming capability responses displaying a higher deviation at 1.04. The box plot whiskers for complexity leadership and transforming stretches from 1.64 to 5 and 1 to 5 respectively. The inter-quartiles range from 2.90 to 4.13 for complexity leadership and 2.67 to 4.67 for transforming capabilities.

Table 19: Descriptive statistics for complexity leadership and transforming

Variable N = 115	Minimum	Maximum	Mean	5% Trimmed Mean	Std. Deviation	Skewness	Kurtosis
Complexity leadership	1	5	3.51	3.53	0.84	-0,23	-0,29
Transforming	1	5	3,70	3.74	1.04	-0,59	-0,48

Figure 18: Box plots for complexity leadership and transforming



5.4.9. Objective 2: Hypothesis 2.3 inferential results

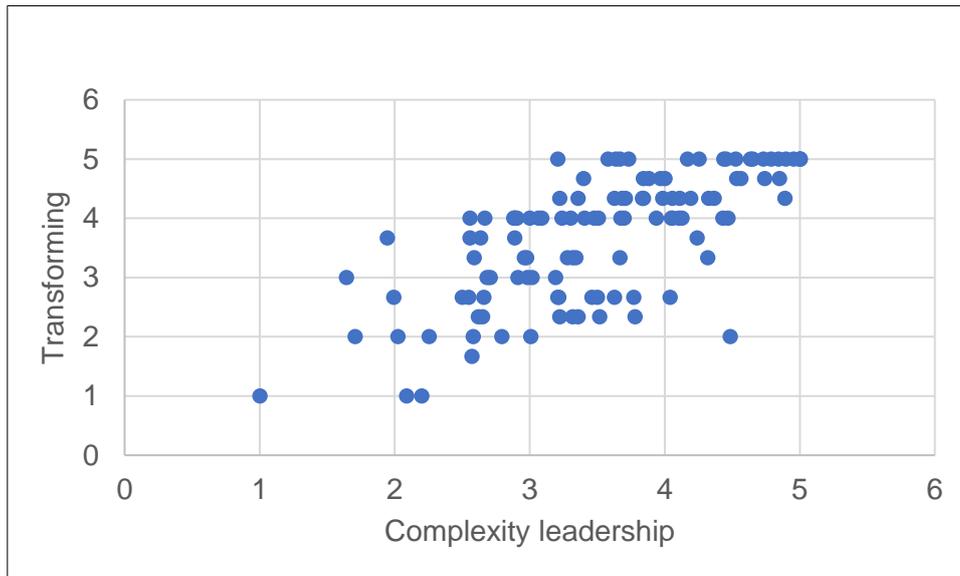
Hypothesis 2.3:

H0: No linear relationship exists between complexity leadership and transforming.

H1: A positive linear relationship exists between complexity leadership and transforming.

Figure 19 shows how the independent variable (complexity leadership) associates to the dependent variable (transforming) in the form a scatter plot.

Figure 19: Scatter plot of complexity leadership and transforming



The correlation between complexity leadership and transforming capabilities was investigated using SPSS' Pearson product-moment correlation coefficient as presented in Table 20. A strong, significant, positive correlation between the two variables was found, $r=0.694$, $N=115$, $P<0.5$ (Wegner, 2016). c. The Sig-value (P-value) was calculated to be 0.000 which is far less than 0.05, indicating significance between complexity leadership and transforming capabilities.

Table 20: Pearson correlation for complexity leadership and transforming

Pearson correlation		CL
Transforming	Pearson Correlation -r	.694**
	Sig. (2-tailed)	0,000
	N	115

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

The linear regression output is indicated in Table 21 and Table 22. The correlation coefficient R of 0.694 indicates a strong correlation between the independent (complexity leadership) and dependent variable (transforming). The adjusted R square indicates that complexity leadership explains 47.7 % of the variance of transforming capabilities. The regression coefficient is significant with a P-value of less than 0,001, far below 0.05 (Wegner, 2016). The transforming capability predictor equation for the relationship equates to [Transforming] = $0.668 + 0.862$ [Complexity leadership], indicating that transforming capabilities increase by 0.862 for every unit complexity leadership increases by.

Table 21: Linear regression results for H2.3 (a)

Coefficients^a				
Model		Unstandardized Coefficients	Standardized Coefficients	Sig.
		B	Beta	
1	(Constant)	0.668		0,000
	Complexity leadership	0,862	0,694	0,000
a. Dependent Variable: Transforming				

Table 22: Linear regression results for H2.3 (b)

Model Summary^b			
Model	R	R Square	Adjusted R Square
1	0,694 ^a	0,482	0,477
a. Predictors: (Constant), Complexity leadership			
b. Dependent Variable: Transforming			

5.5. Objective 1 and 2 conclusions

Linear regression was used to investigate objective 1 and test hypothesis 1. A significant positive relationship between complexity leadership and an organisation's dynamic capabilities was found with 95% confidence, rejecting the null hypothesis with a 5% level of significance. Linear regression was also used to investigate the second objective and test hypothesis 2.1, 2.2. and 2.3:

For hypothesis 2.1, a significant positive relationship between complexity leadership and an organisation's sensing capabilities was found with 95% confidence, rejecting the null hypothesis with a 5% level of significance.

For hypothesis 2.2, a significant positive relationship between complexity leadership and an organisation's seizing capabilities was found with 95% confidence, also rejecting the null hypothesis with a 5% level of significance.

For hypothesis 2.3, a significant positive relationship between complexity leadership and an organisation's seizing capabilities was found with 95% confidence, also rejecting the null hypothesis with a 5% level of significance. Chapter six discusses the relevancy of the results obtained in this chapter.

6. DISCUSSION OF RESULTS

6.1. Introduction

The main aim of this study was to develop a better understanding of the relationship between complexity leadership and an organisation's dynamic capabilities based on the statistical analysis required to achieve the set objectives for this study. Chapter three showcases two objectives with their respective hypotheses to accomplish this. The previous chapter reported the statistical analysis and results of the study. This chapter contextualises the results reported in chapter five considering the literature reviewed in chapter two and the hypotheses proffered in chapter three.

The first objective of this study was to confirm the existence of a significant, positive, linear relationship between complexity leadership and dynamic capabilities as set out in hypothesis one.

Hypothesis 1:

H0: No linear relationship exists between complexity leadership and dynamic capabilities.

H1: A positive linear relationship exists between complexity leadership and dynamic capabilities.

The second objective of this study was, therefore, to confirm that there exists a significant, positive, linear relationship between complexity leadership and an organisation's higher order dynamic capabilities – sensing, seizing and transforming as set out in hypotheses 2.1, 2.2 and 2.3.

Hypothesis 2.1:

H0: No linear relationship exists between complexity leadership and sensing.

H1: A positive linear relationship exists between complexity leadership and sensing.

Hypothesis 2.2:

H0: No linear relationship exists between complexity leadership and seizing.

H1: A positive linear relationship exists between complexity leadership and seizing.

Hypothesis 2.3:

H0: No linear relationship exists between complexity leadership and transforming.

H1: A positive linear relationship exists between complexity leadership and transforming.

6.2. Sample overview

A typical respondent for this study would be male, employed at their current organisation for up to 10 years, with middle to senior management experience, at a large mature organisation (1000+ employees and conducting business for more than 21 years) with annual revenue of more than R100 million.

With most respondents employed for up to 10 years at their current organisation, a clear understanding of the organisation's capabilities and leadership would have been formed. It is also long enough for the respondents to have experienced at least one environmental change and the impact it had on the organisation.

The sample represented a range of job levels. Uhl-Bien et al. (2007) observes leadership (complexity leadership) as a process evident throughout the entire organisation and not specific to senior or top-level management. Having a mixture of job level experiences from experienced to executive, broadens the opinions of leadership style both in being a leader and being led.

Most of the organisations represented in the sample are large, mature with high annual turnovers. This indicates that these organisations are competitive with some certainly exhibiting sustained competitive advantage through enabled dynamic capabilities (Laaksonen & Peltoniemi, 2018; Teece, 2014).

One can conclude that the sample of respondents experienced at least to some extent both elements of complexity leadership, explicated by the diverse range of job levels of respondents, and dynamic capabilities as deduced from the age, size and annual revenue of the organisations.

6.3. Variables overview

Sensing and contextual intelligence emerged as the strongest dynamic capability and complexity leadership factors respectively. The means for complexity leadership's patterning of attention, developing networks and contextual intelligence and dynamic capabilities' sensing, seizing and transforming were calculated as 3.50, 3.43, 3.60 and 4.05, 3.69 and 3.70 respectively. This indicated most of the respondents leaned towards "often" observing complexity leadership behaviours and perceived their organisations "somewhat" exhibiting dynamic capabilities.

6.3.1. Complexity leadership

Complexity leadership was measured by three defined scales on a subconstruct level as proposed by Clarke (2013) being the patterning of attention, developing networks and contextual intelligence. Complexity leaders embody three leadership styles according to Uhl-Bien and Arena (2017). The leadership styles are entrepreneurial, operational and enabling. These leadership styles promote and protect the adaptive space as argued by Uhl-Bien and Arena (2017). Clarke (2013) explains patterning of attention, developing networks and contextual intelligence conducts as pivotal elements for complexity leaders exhibiting entrepreneurial, operational and enabling leadership styles.

EFA was used to validate the underlying structure of complexity leadership as proposed by Clarke (2013). The strong loadings and relevant groupings in each component show developing networks, patterning of attention and contextual intelligence to sufficiently support complexity leadership as a construct. The internal consistency of the scales was also tested using Cronbach's alpha. The coefficients were calculated to be greater than 0.6 proving the selected scales to be reliable.

The box plot for complexity leadership displayed in Figure 12 indicates respondents' views varied across the most agreeable (always) and disagreeable (rarely) quartile groups, from looking at the whiskers. The box plot further indicates respondents' views on observing complexity leadership behaviours within their organisation to be more similar towards the agreeable part of the scale, displaying a mean of 3.51 and inter-quartile ranging from 2.90 to 4.13.

The respondents rated the patterning of attention leadership exhibited as they perceive it within their organisation as often encouraging individuals to learn through interaction both with the environment and each other. Respondents also observed their organisation's leaders as often knowing the limitations of their own knowledge and having the ability to transform that knowledge to adapt to an environment different to that in which it was created.

Uhl-Bien and Arena (2017) describe strong complexity leaders as having the ability to operate with entrepreneurial, enabling and operational thinking interchangeably, to sense and seize, adapt and transform innovative ideas into the organisation to create a more sustainable new environment. This suggests the leaders within the respondents' organisations exhibit strong forms of complexity leadership behaviours, enabling their organisation to sustainably adapt and transform to new environments.

6.3.2. Dynamic capabilities

Dynamic capabilities as a construct was measured through the combination of subconstructs sensing, seizing and transforming as defined by Teece (2007). The scales used to measure sensing and seizing were developed by Junfeng and Wei-ping (2017), and the scale used to measure transforming were developed by Makkonen et al. (2014). The internal consistency of the scales was tested using Cronbach's alpha. The coefficients were calculated to be greater than 0.6 proving the selected scales to be reliable. The box plots in Figure 5 for sensing, seizing and transforming show similarity in mean and median with all of the inter-quartiles leaning towards the "very much" side of the scale.

Teece et al. (1997) developed the dynamic capabilities framework to clarify why some organisations create a competitive advantage when confronted with a changing environment and others do not. To simplify dynamic capabilities, Teece (2007) introduced the concept of higher-order dynamic capabilities (sense, seize and transform) which are supported by micro-foundational concepts. To create competitive advantage, sustainably, organisations have to constantly scan, create, learn and interpret (sense) old and new information which then need to be seized through implementing new products, services or processes which are finally transformed by changing the implemented products, services or processes to adapt to changing environments (Helfat & Martin, 2015; Helfat & Peteraf, 2015; Teece, 2007).

6.3.2.1. Sensing

Sensing has the tightest distribution (closest to each other) of responses compared to the other observable variables, seizing and transforming. Sensing's inter-quartile ranges from 3.75 to 4.75 and whiskers from 2.25 to 5.00 indicating a concentrated shift towards the higher end of the scale (very much). In rating their organisation's sensing capability, most respondents perceived their organisation to 'very much' be able to sense (scan, create, learn and interpret) new trends and opportunities.

6.3.2.2. Seizing

Respondents were more variable in their view of their organisations being able to seize opportunities as opposed to sensing. Respondents perceived their organisations to 'somewhat' be able to seize new opportunities through implementing new products, services and processes.

6.3.2.3. Transforming

With the largest inter-quartile range (2.67 to 4.67), compared to sensing and seizing, respondents varied most in their views of their organisation's transforming capability. In rating their organisation's transforming capability, the majority perceived it to 'somewhat' be able to continuously transform new products, processes and services to adapt to change.

6.4. Inferential results discussion

Dynamic capabilities enable an organisation to adapt to change (Teece et al., 1997; Winter, 2003). Leadership plays a pivotal role in enabling an organisation's dynamic capabilities (Dixon, Meyer, & Day, 2014; Helfat & Martin, 2015; Helfat & Peteraf, 2015; Teece, 2007; Teece et al., 1997; Uhl-Bien & Arena, 2018). Felin and Powell (2016) however emphasise traditional leadership styles' shortfall in supporting an organisation's dynamic capabilities. Uhl-Bien and Arena (2018) propose complexity leadership to support an organisation's dynamic capabilities, amidst increased complexity. This research aimed at exploring the relationship between complexity leadership and an organisation's dynamic capabilities (first objective) as well as the relationships between complexity leadership and the various higher order dynamic capabilities (second objective) – sensing, seizing and transforming.

6.4.1. Objective 1: Hypothesis 1 inferential results discussion

The first objective of this study was to confirm that there exists a significant, positive, linear relationship between complexity leadership and an organisation's dynamic capabilities. To do this, hypothesis one in chapter three of this study was proffered:

H0: No linear relationship exists between complexity leadership and dynamic capabilities.

H1: A positive linear relationship exists between complexity leadership and dynamic capabilities.

Linear regression analysis was used to test the hypothesis. The results showed a significant positive relationship between complexity leadership and an organisation's dynamic capabilities exists with 95% confidence, rejecting the null hypothesis with a 5% level of significance. The adjusted R square of the regression analysis showed that complexity leadership explained 61.1% of the variability of an organisation's dynamic capabilities. These results suggest high complexity leadership scores can be associated with high scores of an organisation's dynamic capabilities. Similarly, low scores of complexity leadership can be associated with low scores of an organisation's dynamic capabilities.

Pivotal for an organisation to sustain competitive advantage is its dynamic capabilities (Fainshmidt & Frazier, 2017; Hermano & Cruz, 2016; Laaksonen & Peltoniemi, 2018; Teece, 2014; Winter, 2003). Dynamic capabilities enable an organisation to adapt to or create necessary change for sustained competitive advantage (Teece et al., 1997; Winter, 2003). Dixon, Meyer & Day (2014) and Fainshmidt & Frazier (2017) and Teece (2007) and Teece et al. (1997), as well as Uhl-Bien & Arena (2018), argues leadership to be key in enabling an organisation's dynamic capabilities. However, Felin and Powell (2016) argue that traditional leadership styles fail at creating a sound foundation to support an organisation's dynamic capabilities.

Uhl-Bien and Arena (2018) propose complexity leadership to adequately support and enable an organisation's dynamic capabilities through bridging operational, entrepreneurial and enabling leadership styles. Fainshmidt & Frazier (2017) and Uhl-Bien & Arena (2018) stresses the need for future research to establish and clarify the relationship between complexity leadership and an organisation's dynamic capabilities.

The first objective of this research, therefore, hypothesised that a positive linear relationship exists between complexity leadership and an organisation's dynamic capabilities. Within the fields of organisation theory, strategy and entrepreneurship literature, the findings confirmed the relationship between complexity leadership and an organisation's dynamic capabilities as pondered by Fainshmidt & Frazier (2017) and Uhl-Bien & Arena (2018). The findings, however, do not imply causality.

Understanding the association (relationship) between complexity leadership and an organisation's dynamic capabilities is pivotal in sustaining competitive advantage within the era of the fourth industrial revolution. The fourth industrial revolution is forcing change onto all industries, accelerating innovation and disruption, making it difficult to comprehend and anticipate change, exacerbating the complexity in which organisations must operate in (Schwab, 2016). Organisations possessing dynamic capabilities are better armed against continuous environmental change, able to not only adapt but also create change within the relevant industry or industries.

The findings suggest to organisations that teaching and implementing complexity leadership behaviours within the organisation could support the organisation's dynamic capabilities in successfully adapting to changing environments and even create change within the relevant industry or industries, sustaining competitive advantage. The converse also holds as the findings suggest that neglecting to nurture complexity leadership behaviours within the

organisation could negatively impact the organisation's dynamic capabilities and its ability to adapt to change and falter in sustaining competitive advantage.

6.4.2. Objective 2: Hypotheses 2.1, 2.2 and 2.3 inferential results discussion

The second objective of this study was to confirm that there exists a significant, positive, linear relationship between complexity leadership and dynamic capabilities' higher order capabilities – sensing, seizing and transforming. To do this, hypothesis 2.1, 2.2 and 2.3 in chapter three of this study was proffered:

Hypothesis 2.1:

H0: No linear relationship exists between complexity leadership and sensing.

H1: A positive linear relationship exists between complexity leadership and sensing.

Hypothesis 2.2:

H0: No linear relationship exists between complexity leadership and seizing.

H1: A positive linear relationship exists between complexity leadership and seizing.

Hypothesis 2.3:

H0: No linear relationship exists between complexity leadership and transforming.

H1: A positive linear relationship exists between complexity leadership and transforming.

Linear regression analysis was used to test the hypotheses separately. The results showed a significant positive relationship between complexity leadership and an organisation's higher order dynamic capabilities exists with 95% confidence, rejecting all three null hypotheses with a 5% level of significance. The adjusted R square of the regression analysis showed that complexity leadership explained 46.5, 50.3 and 47.7% of the variability of sensing, seizing and transforming respectively. These results suggest high complexity leadership scores can be associated with high scores of an organisation's higher order dynamic capabilities, sensing, seizing and transforming. Similarly, low scores of complexity leadership can be associated with low scores of an organisation's higher order dynamic capabilities.

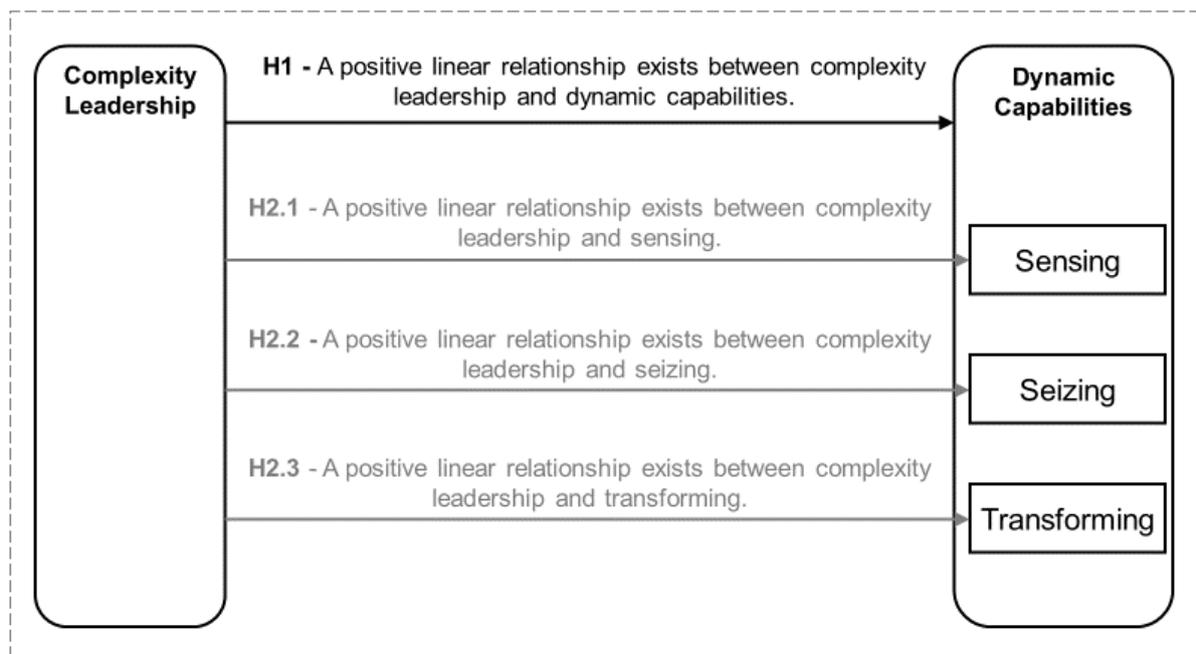
Higher order dynamic capabilities are difficult to acquire, and it is common for organisations to only be adept in one or two of the three capabilities (Teece, 2007). For an organisation to sustain its competitive advantage, it must be adept in all three higher order capabilities (Arndt, Pierce & Teece, 2017; Felin & Powell, 2016; Hermano & Cruz, 2016; Laaksonen & Peltoniemi, 2018; Teece, Peteraf & Leih, 2016; Uhl-Bien & Arena, 2018; Verreyne, Hine, Coote & Parker, 2016). The results indicate complexity leadership to have a significant positive relationship to an organisation's higher order dynamic capabilities. Furthermore, complexity leadership

explained the variability of sensing, seizing and transforming to a similar extent. This indicates that nurturing complexity leadership behaviours within the organisation could strengthen sensing, seizing and transforming capabilities together, leading to sustained competitive advantage.

6.5. Summary of findings

Both the first and second objectives of this study have been met. The results, supported by literature, conclude that a positive linear relationship exists between complexity leadership and an organisation’s dynamic capabilities. The results further found that positive linear relationships exist between an organisation’s higher order dynamic capabilities – sensing, seizing and transforming.

Figure 20: Conceptual framework conclusion



The main findings, implications for business, limitations to research and recommendations for future research are discussed in the next chapter.

7. CONCLUSION AND RECOMMENDATIONS

7.1. Introduction

This chapter contextualises the findings of this study in light of the research problem presented and contribution this study may make to business and theory. The purpose of this study was to establish whether there is a relationship between complexity leadership and an organisation's dynamic capabilities. Recent literature conducted by Fainshmidt & Frazier (2017) and Uhl-Bien & Arena (2018) highlights the need for research to explore the relationship between complexity leadership and an organisation's dynamic capabilities in sustaining competitive advantage. This study made an attempt at exploring this relationship.

The need for this study is further supported by the complexity the fourth industrial revolution is introducing to efficient-driven African countries such as South Africa (Bah et al., 2017). Complexity can be dealt with through sustaining competitive advantage which is brought about by higher order dynamic capabilities – sensing, seizing and transforming (Uhl-Bien & Arena, 2018). In better understanding the relationship between complexity leadership and an organisation's dynamic capabilities, complexity can be dealt with through enabling sustained competitive advantage (Fainshmidt & Frazier, 2017; Uhl-Bien & Arena, 2018).

This study made use of two objectives to address the identified problem. The first objective was to explore the relationship between complexity leadership and an organisation's dynamic capabilities. The second objective of this study was to further explore this relationship in better understanding the relationships between complexity leadership and an organisation's higher order dynamic capabilities – sensing, seizing and transforming. This chapter concludes this study and presents the main findings, implications for business, research limitations and recommendations for future research.

7.2. Main findings

The first objective of this study was to explore the relationship between complexity leadership and an organisation's dynamic capabilities. A significant, positive linear relationship was found between complexity leadership and dynamic capabilities. This means that stronger complexity leadership behaviours within an organisation will result in stronger organisational dynamic capabilities, sustaining competitive advantage. The opposite also holds true, where weaker

complexity leadership behaviours will result in weaker organisational dynamic capabilities, diminishing competitive advantage.

The second objective of this study was to further explore the relationship between complexity leadership and an organisation's higher order dynamic capabilities – sensing, seizing and transforming. Significant, positive linear relationships between complexity leadership and sensing, seizing and transforming were found respectively. This means that respondents were highly likely to believe that stronger complexity leadership behaviours resulted in their organisations being better equipped to sense and seize opportunities and threats, and to transform routines, processes and assets to adapt to new opportunities and threats sensed and seized.

In addition to the main objectives, complexity leadership can be measured through the known sub-scales patterning of attention, developing networks and contextual intelligence.

7.3. Implications for business

Change is forced onto all industries with the rise of the fourth industrial revolution (Schwab, 2016). Bah et al. (2017) elaborate on the complexity the fourth industrial revolution introduces specifically to African countries and how South Africa is not equipped to transition to a fourth industrial revolution economy.

An organisation's dynamic capabilities are key for an organisation to adapt to changing environments to sustain competitive advantage (Fainshmidt & Frazier, 2017; Hermano & Cruz, 2016; Laaksonen & Peltoniemi, 2018). Leadership is pivotal in enabling an organisation's dynamic capabilities (Arndt, Pierce & Teece, 2017; Felin & Powell, 2016; Hermano & Cruz, 2016; Teece, Peteraf & Leih, 2016; Verreyne, Hine, Coote & Parker, 2016).

The findings of this study imply that traditional leadership styles might be inadequate in supporting an organisation's dynamic capabilities, as suggested by Felin and Powell (2016). Uhl-Bien and Arena (2018) propose complexity leadership as an adequate leadership style to support an organisation's dynamic capabilities. The results of this study appear to support the propositions of Uhl-Bien and Arena (2018). It does appear that a better understanding of the relationship between complexity leadership and an organisation's dynamic capabilities is pivotal for business to sustain competitive advantage amidst the rise of the fourth industrial revolution.

The main findings of this research suggest to businesses operating within South Africa, that complexity leadership does have a positive relationship with the dynamic capabilities of an

organisation. South African businesses teaching and nurturing complexity leadership behaviours, could positively support and enable the organisation's dynamic capabilities (sensing, seizing and transforming) to develop and sustain competitive advantage amidst change enforced by the fourth industrial revolution.

By teaching and nurturing complexity leadership behaviours, South African organisations could experience improved scanning, creating, learning and interpreting of opportunities (or threats). Organisations could also be more adept in creating new products, services or processes in seizing the relevant identified opportunities. Lastly, South African organisations could be more efficient in changing routines, assets and processes as sensed and seized, to adapt to environmental changes. By teaching and nurturing complexity leadership behaviours, all three higher order dynamic capabilities – sensing, seizing and transforming – could be improved, ultimately improving the organisation's dynamic capabilities and sustain competitive advantage.

7.4. Limitations and future research

In addition to the methodology limitations noted in chapter four of this study, the following limitations related to this study and the topic thereof were noted. Only complexity leadership and dynamic capabilities as defined by Clarke (2013) and Teece (2007) respectively were considered in this study. It is acknowledged that complexity leadership and dynamic capabilities are not the only constructs to support organisations in sustaining competitive advantage. Anning-Dorson (2018) argues that innovation leadership to significantly influence the creation of competitive advantage of organisations are required.

Jones, Harrison & Felps (2018) moreover suggest that stakeholder theory provide sustainable competitive advantage amidst dynamic markets. Future research on an organisation's ability to sustain competitive advantage and the various associations with organisation capabilities and leadership is warranted. It will be interesting to explore other leadership styles and their associations with an organisation's dynamic capabilities. This will assist in establishing and solidifying a framework for organisations to sustain competitive advantage during changing environments.

Future research should re-examine the proffered relationships using a longitudinal study with objective measures. Also, increasing the number of participants to more than 300 and broadening the scope to numerous other countries will assist in generalising the results (substantiate or disprove). In addition, generally acceptable scales for complexity leadership and dynamic capabilities do not exist. Additional research on how to measure complexity

leadership behaviours and dynamic capabilities within an organisation will assist both business in better understanding how to sustain competitive advantage and academics in measuring the two constructs to conduct research.

Leadership is pivotal to this study and consequently, businesses will need to be able to train the relevant leadership behaviours to their employees. Future research on how to train these key behaviours to employees will greatly aid business in adapting to change and further support literature. Future research should also examine the possible relationships between complexity leadership's subconstructs – patterning of attention, developing networks and contextual intelligence – and an organisation's dynamic capabilities, as well as its higher order capabilities, to better understand the various inter-relationships.

7.5. Conclusion

The rise of the fourth industrial revolution is forcing change onto all industries (Schwab, 2016). Dynamic capabilities are pivotal for an organisation to sustain competitive advantage amidst changing environments (Fainshmidt & Frazier, 2017; Hermano & Cruz, 2016; Laaksonen & Peltoniemi, 2018). Leadership plays a fundamental role to support an organisation's dynamic capabilities (Arndt, Pierce & Teece, 2017; Felin & Powell, 2016; Hermano & Cruz, 2016; Teece, Peteraf & Leih, 2016; Uhl-bien & Arena, 2018; Verreynne, Hine, Coote & Parker, 2016). Felin and Powell (2016) argue traditional leadership styles to be inadequate in supporting an organisation's dynamic capabilities. Uhl-bien and Arena (2018) suggest complexity leadership to possibly support an organisation's dynamic capabilities adequately.

The aim of this study was to explore the relationship between complexity leadership and an organisation's dynamic capabilities. This study found a significant, positive, linear relationship between complexity leadership and an organisation's dynamic capabilities as suggested by Uhl-bien and Arena (2018). Complexity leadership could aid in strengthening an organisation's dynamic capabilities, and by doing so, sustain competitive advantage.

The results of this study have practical and theoretical application in that it contributes to building on organisation theory, strategy and entrepreneurship literature and practical application. The findings provide insights toward future research opportunities to consolidate understanding of sustainable competitive advantage in light of complexity leadership and dynamic capabilities constructs, their relationships and supporting framework.

8. REFERENCES

- Alsos, G.A., Borch, O.J., Ljungren, E., & Madsen, E.L. (2008). *Dynamic capabilities - Conceptualization and operationalization*. Paper presented at Academy of Management 2008 annual meeting, August 8–13, Anaheim CA, USA.
- Anning-Dorson, T. (2018). Innovation and competitive advantage creation: The role of organisational leadership in service firms from emerging markets. *International Marketing Review*. (ABS Journal Ranking 3)
- Arndt, F., & Pierce, L. (2017). The behavioural and evolutionary roots of dynamic capabilities. *Industrial and Corporate Change*, 27(2), 413-424. (ABS Journal Ranking 3)
- Augier, M., & Teece, D. J. (2009). Dynamic capabilities and the role of managers in business strategy and economic performance. *Organization science*, 20(2), 410-421. (ABS Journal Ranking 4*)
- Bah, E. M., Crotti, R., Hanouz, M. D., Hoffman, B., Marchat, J. M., & Verdier-Chouchane, A. (2017). The Africa competitiveness report 2017. *World economic forum*.
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of management*, 17(1), 99-120. (ABS Journal Ranking 4*)
- Barney, J. B., Ketchen Jr, D. J., & Wright, M. (2011). The future of resource-based theory: revitalization or decline?. *Journal of management*, 37(5), 1299-1315. (ABS Journal Ranking 4*)
- Besanko, D., Dranove, D., Shanley, M., & Schaefer, S. (2012). *Economics of Strategy* (6th ed.). John Wiley & Sons Inc.
- Birkinshaw, J., Zimmermann, A., & Raisch, S. (2016). How do firms adapt to discontinuous change? Bridging the dynamic capabilities and ambidexterity perspectives. *California Management Review*, 58(4), 36-58. (ABS Journal Ranking 3)
- Blaikie, N. (2003). *Analyzing quantitative data: From description to explanation*. SAGE.
- Burns, R.B., & Burns, R.A. (2008). *Business research methods and statistics using SPSS*. London: SAGE Publications.

- Byrne, B. M. (2016). *Structural equation modelling with AMOS: Basic concepts, applications, and programming*. Routledge.
- Clarke, N. (2013). Model of complexity leadership development. *Human Resource Development International*, 16(2), 135–150. (ABS Journal Ranking 3)
- Creswell, J.W. (2012). *Educational research: Planning, conducting and evaluating quantitative and qualitative research* (4th ed.). Boston: Pearson Education.
- Dane, F. C. (2018). *Evaluating research: Methodology for people who need to read research* (2nd ed.). SAGE.
- Deutskens, E., De Ruyter, K., Wetzels, M., & Oosterveld, P. (2004). Response rate and response quality of internet-based surveys: An experimental study. *Marketing letters*, 15(1), 21-36. (ABS Journal Ranking 3)
- DeVellis, R. F. (2016). *Scale development: Theory and applications* (Vol. 26). SAGE publications.
- Dixon, S., Meyer, K., & Day, M. (2014). Building dynamic capabilities of adaptation and innovation: A study of micro-foundations in a transition economy. *Long Range Planning*, 47(4), 186-205. (ABS Journal Ranking 4)
- Dinh, J., Lord, R., Gardner, W., Meuser, J., Liden, R.C., & Hu, J. (2014). Leadership theory and research in the new millennium: Current trends and changing perspectives. *Leadership Quarterly*, 25(1), 36–62. doi: 10.1016/j.leaqua.2013.11.005. (ABS Journal Ranking 4)
- Drack, M. (2015). Ludwig von Bertalanffy's organismic view on the theory of evolution. *Journal of Experimental Zoology Part B: Molecular and Developmental Evolution*, 324(2), 77-90.
- Fainshmidt, S., & Frazier, M. L. (2017). What facilitates dynamic capabilities? The role of organizational climate for trust. *Long Range Planning*, 50(5), 550-566. (ABS Journal Ranking 3)
- Felin, T., & Powell, T. C. (2016). Designing organizations for dynamic capabilities. *California Management Review*, 58(4), 78-96. (ABS Journal Ranking 3)
- Field, A. (2013). *Discovering statistics using IBM SPSS statistics*. SAGE.
- Goldstein, J. (1999). Emergence as a construct: History and issues. *Emergence*, 1(1), 49-72.

- Gorsuch, R. L. (1983). *Factor analysis* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
- Gravetter, F. J., & Wallnau, L. B. (2006). *Statistics for the behavioral sciences*. Cengage Learning.
- Guadagnoli, E., & Velicer, W. F. (1988). Relation of sample size to the stability of component patterns. *Psychological bulletin*, 103(2), 265.
- Hair, J.F., Black, W.C., Babin, B.J., & Anderson, R.E. (2010). *Multivariate data analysis* (7th ed). Pearson.
- Helfat, C. E., & Martin, J. A. (2015). Dynamic managerial capabilities: Review and assessment of managerial impact on strategic change. *Journal of Management*, 41(5), 1281-1312. (ABS Journal Ranking 4*)
- Helfat, C. E., & Peteraf, M. A. (2015). Managerial cognitive capabilities and the microfoundations of dynamic capabilities. *Strategic Management Journal*, 36(6), 831-850. (ABS Journal Ranking 4*)
- Helfat, C. E., & Winter, S. G. (2011). Untangling dynamic and operational capabilities: Strategy for the (N) ever-changing world. *Strategic management journal*, 32(11), 1243-1250. (ABS Journal Ranking 4*)
- Hermano, V., & Martín-Cruz, N. (2016). The role of top management involvement in firms performing projects: A dynamic capabilities approach. *Journal of Business Research*, 69(9), 3447-3458. (ABS Journal Ranking 3)
- Jones, T. M., Harrison, J. S., & Felps, W. (2018). How applying instrumental stakeholder theory can provide sustainable competitive advantage. *Academy of Management Review*, (ja). (ABS Journal Ranking 4*)
- Junfeng, Z., & Wei-ping, W. (2017). Leveraging internal resources and external business networks for new product success: A dynamic capabilities perspective. *Industrial Marketing Management*, 61(1) 170–181. (ABS Journal Ranking 3)
- Katz, D., & Kahn, R. L. (1978). *The social psychology of organizations*. New York: John Wiley & Sons

- Karimi, J., & Walter, Z. (2015). The role of dynamic capabilities in responding to digital disruption: A factor-based study of the newspaper industry. *Journal of Management Information Systems*, 32(1), 39-81. (ABS Journal Ranking 4)
- Khanna, T. (2014). Contextual intelligence. Retrieved from <https://hbr.org/2014/09/contextual-intelligence>. (ABS Journal Ranking 3)
- Kline, P. (1994). *An easy guide to factor analysis*. New York: Routledge.
- Kumar, R. (2011). *Research Methodolgy: A step-by-step guide for beginners* (3rd ed.). Britan: SAGE.
- Kutz, M. (2008). Toward a conceptual model of contextual intelligence: a transferable leadership construct. *Leadership Review*, 8(2), 18-31.
- Laaksonen, O., & Peltoniemi, M. (2018). The essence of dynamic capabilities and their measurement. *International Journal of Management Reviews*, 20(2), 184-205. (ABS Journal Ranking 3)
- Makkonen, H., Pohjola, M., Olkkonen, R., & Koponen, A. (2014). Dynamic capabilities and firm performance in a financial crisis. *Journal of Business Research*, 67(1), 2707-2719. (ABS Journal Ranking 3)
- Matysiak, L., Rugman, A. M., & Bausch, A. (2018). Dynamic Capabilities of Multinational Enterprises: The Dominant Logics Behind Sensing, Seizing, and Transforming Matter!. *Management International Review*, 58(2), 225-250. (ABS Journal Ranking 3)
- O'Reilly III, C. A., & Tushman, M. L. (2011). Organizational ambidexterity in action: How managers explore and exploit. *California management review*, 53(4), 5-22. (ABS Journal Ranking 3)
- Osborn, R. N., & Hunt, J. G. J. (2007). Leadership and the choice of order: Complexity and hierarchical perspectives near the edge of chaos. *The Leadership Quarterly*, 18(4), 319-340. (ABS Journal Ranking 4)
- Osborn, R.N., Hunt, J.G., & Jauch, L.R. (2002). Toward a contextual theory of leadership. *The Leadership Quarterly*, 13(1), 797–837. (ABS Journal Ranking 4)
- Osborn, R. N., & Marion, R. (2009). Contextual leadership, transformational leadership and the performance of international innovation seeking alliances. *The Leadership Quarterly*, 20(2), 191-206. (ABS Journal Ranking 4)

- Pallant, J. (2011). *SPSS survival manual: a step by step guide to data analysis using SPSS* (4th ed). Australia: Allen & Unwin.
- Pascale, R. T. (1999). Surfing the edge of chaos. *Sloan management review*, 40(3), 83. (ABS Journal Ranking 3)
- Porter, M. E. (1980). Industry structure and competitive strategy: Keys to profitability. *Financial Analysts Journal*, 36(4), 30-41. (ABS Journal Ranking 3)
- Renko, M., El Tarabishy, A., Carsrud, A. L., & Brännback, M. (2015). Understanding and measuring entrepreneurial leadership style. *Journal of Small Business Management*, 53(1), 54-74. (ABS Journal Ranking 3)
- Saunders, M., & Lewis, P. (2012). *Doing research in business and management*. Harlow, England: Pearson.
- Sheng, M. L. (2017). A dynamic capabilities-based framework of organizational sensemaking through combinative capabilities towards exploratory and exploitative product innovation in turbulent environments. *Industrial Marketing Management*, 65 (2017), 28-38. (ABS Journal Ranking 3)
- Schneider, M., & Somers, M. (2006). Organisations as Complex Adaptive Systems: Implication of Complexity Theory for leadership research. *The Leadership Quarterly*, 17(1), 351–365. (ABS Journal Ranking 4)
- Schwab, K. (2016). The fourth industrial revolution: what it means, how to respond. Retrieved from <https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/>
- Shapiro, C. (1989). The theory of business strategy. *The Rand journal of economics*, 20(1), 125-137. (ABS Journal Ranking 4)
- Spicer, J. (2005). *Making sense of multivariate data analysis: An intuitive approach*. SAGE.
- Tashakkori, A., Teddlie, C., & Teddlie, C. B. (1998). *Mixed methodology: Combining qualitative and quantitative approaches* (Vol. 46). SAGE.
- Teece, D. J. (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic management journal*, 28(13), 1319-1350. (ABS Journal Ranking 4*)

- Teece, D. J. (2014). A dynamic capabilities-based entrepreneurial theory of the multinational enterprise. *Journal of International Business Studies*, 45(1), 8–37. doi: 10.1057/jibs.2013.54. (ABS Journal Ranking 4*)
- Teece, D. J. (2018). Business models and dynamic capabilities. *Long Range Planning*, 51(1), 40-49. (ABS Journal Ranking 3)
- Teece, D., Peteraf, M., & Leih, S. (2016). Dynamic capabilities and organizational agility: Risk, uncertainty, and strategy in the innovation economy. *California Management Review*, 58(4), 13-35. (ABS Journal Ranking 3)
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic management journal*, 18(7), 509-533. (ABS Journal Ranking 4*)
- Uhl-Bien, M., & Arena, M. (2017). Complexity Leadership: Enabling people and organisations for adaptability. *Organizational Dynamics*, 46(1), 9—20. (ABS Journal Ranking 2)
- Uhl-Bien, M., & Arena, M. (2018). Leadership for organizational adaptability: A theoretical synthesis and integrative framework. *The Leadership Quarterly*, 29 (2018) 89–104. (ABS Journal Ranking 4)
- Uhl-Bien, M., Marion, R., & McKelvey, B. (2007). Complexity Leadership Theory: Shifting leadership from the industrial age to the knowledge era. *Leadership Quarterly*, 18(4), 298–318. (ABS Journal Ranking 4)
- Verreyne, M. L., Hine, D., Coote, L., & Parker, R. (2016). Building a scale for dynamic learning capabilities: The role of resources, learning, competitive intent and routine patterning. *Journal of Business Research*, 69(10), 4287-4303. (ABS Journal Ranking 3)
- Vogel, R., & Güttel, W.H. (2013). The Dynamic Capability View in Strategic Management: A Bibliometric Review. *International Journal of Management Reviews*, 15(1), 426–446. (ABS Journal Ranking 3)
- Von Bertalanffy, L. (1972). The history and status of General Systems Theory. *The Academy of Management Journal*, 15(4), 407–426. (ABS Journal Ranking 4*)
- Wang, C. L., & Ahmed, P. K. (2007). Dynamic capabilities: A review and research agenda. *International journal of management reviews*, 9(1), 31-51. (ABS Journal Ranking 3)
- Wegner, T. (2016). *Applied business statistics: Methods and Excel-based applications*. Juta and Company Ltd.

Weiers, R. M. (2010). *Introduction to business statistics*. Cengage Learning.

Winter, S. G. (2003). Understanding dynamic capabilities. *Strategic management journal*, 24(10), 991-995. (ABS Journal Ranking 4*)

9. APPENDIX A – MEASUREMENT INSTRUMENT

Construct	Scale developed by	Scales
Dynamic capabilities		
Sensing	Junfeng and Wei-ping (2017)	In scanning, searching and exploring across technologies and markets for product innovation, we are capable of 1. Exploring opportunities and options. 2. Detecting new opportunities and product solution options. 3. Spotting new technology possibilities. 4. Identifying trends in customer needs.
Seizing	Junfeng and Wei-ping (2017)	Based on our firm's established organization structures, procedures, designs and incentives, we are able to 1. Seize most business opportunities when they emerge. 2. Catch many new opportunities available in the market. 3. Capture new R&D opportunities whenever they appear. 4. Grab new product development opportunities resulting from changes in technologies
Transforming	Makkonen, Pohjola, Olkkonen, and Koponen (2014)	1. We have developed routines to enable employees' active participation in generating ideas for new products or services. 2. We have developed routines to enable employees' active participation in generating ideas for new production processes or organizational procedures. 3. The firm has routines for systematizing employees' experiences.
Complexity leadership		
Patterning of attention	Osborn and Marion (2009)	1. Facilitates dialog and discussion to help employees share knowledge in developing a shared understanding of issues 2. Initiates discussions on what is important, not what to do and how to do it 3. Connects employees with a broad variety of potential information sources such as those people with relevant information 4. Injects ideas and information into the system for it to process to create energy for change 5. Tells stories to illustrate important learning points 6. Encourages employees to raise difficult and challenging questions that others may perceive as a threat to the status-quo
Developing networks	Osborn and Marion (2009)	1. Creates linkages between entities inside the organisation and with outside stakeholders 2. Has political skill of sizing up group politics for the benefit of the department or business unit 3. Displays political savvy in understanding the interests of the other players in organisational networks 4. Builds networks across internal organisational boundaries/ silos or functions

		<ul style="list-style-type: none"> 5. Embraces diversity by having diverse people and views as part of the network 6. Gathers feedback information from external stakeholders such as suppliers and customers to improve the organisation
Contextual intelligence	Kutz (2008)	<ul style="list-style-type: none"> 1. Gathers intelligence from what is happening in the context like which threats and opportunities are developing 2. Demonstrates being in tune with the organisational and external environment or context 3. Frames our change projects in ways that appeal or speaks to the interest of particular stakeholders 4. Adapts his/her communication to different ethnic cultures in the organisation 5. Investigates relevant contextual variables that are or might influence the organisation 6. Has a forward-looking mentality - sense of direction for where the organisation is going in the future 7. Provide opportunities for diverse employees to interact in a non-discriminatory manner

10. APPENDIX B – GOOGLE FORMS SURVEY

MBA Research Questionnaire

*Required



Dear Respondent

I am conducting research on the relationship between complexity leadership and an organisation's dynamic capabilities. To that end, you are asked to complete the following survey questions regarding your perceptions of your organisation's complexity leadership and dynamic capabilities. This will help us better understand the relationship between complexity leadership and an organisation's dynamic capabilities, and should not take more than 20 minutes of your time.

Your participation is voluntary, and you can withdraw at any time without penalty. Your participation is anonymous and only aggregated data will be reported. By completing the survey, you indicate that you voluntarily participate in this research. If you have any concerns, please contact my supervisor or me. Our details are provided below.

Researcher name: Dewan Lombard
Email: 26211620@mygibs.co.za
Phone: 0825660211

Research supervisor: Annelie Gildenhuis
Email: Annelie.Gildenhuis@standardbank.co.za
Phone: 0832511326

1. BIOGRAPHICAL QUESTIONS

Please answer the following questions related to your background and organisation you are currently employed at.

1.1 Personal Demographics

1. What is your gender? *

Mark only one oval.

- Female
 Male

2. How many years have you worked for the organisation? *

Mark only one oval.

- 0 - 2 years
- 3 - 5 years
- 6 - 10 years
- 11 - 15 years
- 16 + years

3. On which level within the organisation are you employed? *

Mark only one oval.

- Entry Level
- Experienced Level
- Middle Manager
- Senior Manager
- Executive
- Other: _____

1.2 Organisation Demographics

4. What is the size of your organisation? *

Mark only one oval.

- 1 - 50 employees
- 51 - 100 employees
- 101 - 200 employees
- 201 - 500 employees

- 501 - 1 000 employees
- 1 001 + employees

5. How many years have your organisation been conducting business? *

Mark only one oval.

- 0 - 2 years
- 3 - 5 years
- 6 - 10 years
- 11 - 20 years
- 21 - 50 years
- 51 + years

6. What is your organisation's primary business activity? (Select only one) *

Mark only one oval.

- Agricultural, Forestry and Fishing
- Mining
- Construction
- Manufacturing
- Transportation, Communication, Electric, Gas and Sanitary Service
- Retail
- Finance, Insurance and Real Estate
- Services
- Public Administration
- Energy
- Education
- Food
- Healthcare
- Telecommunication
- Information
- Other: _____

7. Latest reported organisation revenue? *

Mark only one oval.

- 0 - R 1 000 000
- R 1 000 001 - R 5 000 000

- R 5 000 001 - R 10 000 000
- R 10 000 001 - R 50 000 000
- R 50 000 001 - R 100 000 000
- R 100 000 001 +

2. LEADERSHIP

The following questions pertain to leadership and the style of leadership within your organisation, as you perceive it. Score the behavior listed according to the following scale:

- 1 - Never
- 2 - Rarely
- 3 - Sometimes
- 4 - Often
- 5 - Always

8. **Facilitates dialog and discussion to help employees share knowledge in developing a shared understanding of issues ***

Mark only one oval.

1	2	3	4	5
<input type="radio"/>				

9. **Initiates discussions on what is important, not what to do and how to do it ***

Mark only one oval.

1	2	3	4	5
<input type="radio"/>				

10. **Connects employees with a broad variety of potential information sources such as those people with relevant information ***

Mark only one oval.

1	2	3	4	5
<input type="radio"/>				

11. **Injects ideas and information into the system for it to process to create energy for change ***

Mark only one oval.

1	2	3	4	5
<input type="radio"/>				

12. Tells stories to illustrate important learning points *

Mark only one oval.

1	2	3	4	5
<input type="radio"/>				

13. Encourages employees to raise difficult and challenging questions that others may perceive as a threat to the status-quo *

Mark only one oval.

1	2	3	4	5
<input type="radio"/>				

14. Creates linkages between entities inside the organisation and with outside stakeholders *

Mark only one oval.

1	2	3	4	5
<input type="radio"/>				

15. Has political skill of sizing up group politics for the benefit of the department or business unit *

Mark only one oval.

1	2	3	4	5
<input type="radio"/>				

16. Displays political savvy in understanding the interests of the other players in organisational networks *

Mark only one oval.

1	2	3	4	5
<input type="radio"/>				

17. Builds networks across internal organisational boundaries/ silos or functions *

Mark only one oval.

1 2 3 4 5

18. **Embraces diversity by having diverse people and views as part of the network ***

Mark only one oval.

1 2 3 4 5

19. **Gathers feedback information from external stakeholders such as suppliers and customers to improve the organisation ***

Mark only one oval.

1 2 3 4 5

20. **Gathers intelligence from what is happening in the context like which threats and opportunities are developing ***

Mark only one oval.

1 2 3 4 5

21. **Demonstrates being in tune with the organisational and external environment or context ***

Mark only one oval.

1 2 3 4 5

22. **Frames our change projects in ways that appeal or speaks to the interest of particular stakeholders ***

Mark only one oval.

1 2 3 4 5

23. **Adapts his/her communication to different ethnic cultures in the organisation ***

Mark only one oval.

1 2 3 4 5

24. Investigates relevant contextual variables that are or might influence the organisation *

Mark only one oval.

1 2 3 4 5

25. Has a forward-looking mentality - sense of direction for where the organisation is going in the future *

Mark only one oval.

1 2 3 4 5

26. Provide opportunities for diverse employees to interact in a non-discriminatory manner *

Mark only one oval.

1 2 3 4 5

3. ORGANISATION CAPABILITIES

The following questions refer to your organisation's capabilities, as you perceive it.

Score the capabilities listed according to the following scale:

1 - Not at all

2 - Not really

3 - Undecided

4 - Somewhat

5 - Very much

3.1 In scanning, searching and exploring across technologies and markets for product innovation, we are capable of:

27. Exploring opportunities and options *

Mark only one oval.

1 2 3 4 5

28. **Detecting new opportunities and product solution options ***

Mark only one oval.

1	2	3	4	5
<input type="radio"/>				

29. **Spotting new technology possibilities ***

Mark only one oval.

1	2	3	4	5
<input type="radio"/>				

30. **Identifying trends in customer needs ***

Mark only one oval.

1	2	3	4	5
<input type="radio"/>				

3.2 Based on our firm's established organization structures, procedures, designs and incentives, we are able to

31. **Seize most business opportunities when they emerge ***

Mark only one oval.

1	2	3	4	5
<input type="radio"/>				

32. **Catch many new opportunities available in the market ***

Mark only one oval.

1	2	3	4	5
<input type="radio"/>				

33. **Capture new R&D opportunities whenever they appear ***

Mark only one oval.

1	2	3	4	5
<input type="radio"/>				

34. **Grab new product development opportunities resulting from changes in technologies ***

Mark only one oval.

1	2	3	4	5
<input type="radio"/>				

3.3

35. We have developed routines to enable employees' active participation in generating ideas for new products or services *

Mark only one oval.

1	2	3	4	5
<input type="radio"/>				

36. We have developed routines to enable employees' active participation in generating ideas for new production processes or organizational procedures *

Mark only one oval.

1	2	3	4	5
<input type="radio"/>				

37. The firm has routines for systematizing employees' experiences *

Mark only one oval.

1	2	3	4	5
<input type="radio"/>				

11. APPENDIX C – DATA ANALYSIS

Table 23: Descriptive statistic results

Variable N = 115	Minimum	Maximum	Mean	5% Trimmed Mean	Std. Deviation	Skewness	Kurtosis
Complexity leadership	1	5	3.51	3.53	0.84	-0,23	-0,29
Patterning of attention	1	5	3.50	3.53	0.94	-0.34	-0.44
Developing networks	1	5	3.43	3.45	0.89	-0.28	-0.16
Contextual intelligence	1	5	3.60	3.64	0.86	-0.46	-0.03
Dynamic capabilities	1	5	3.81	3.87	0.90	-0.92	0,41
Sensing	1	5	4.05	4.14	0.93	-1.32	-1.47
Seizing	1	5	3.69	3.75	1.06	-0.73	-0,40
Transforming	1	5	3,70	3.74	1.04	-0,59	-0,48

Table 24: Correlation matrix for complexity leadership variables

	CL_POA_01	CL_POA_02	CL_POA_03	CL_POA_04	CL_POA_05
CL_01	1,000				
CL_02	0,757	1,000			
CL_03	0,657	0,689	1,000		
CL_04	0,743	0,658	0,717	1,000	
CL_05	0,622	0,571	0,564	0,607	1,000
CL_06	0,674	0,495	0,585	0,602	0,583
CL_07	0,529	0,466	0,613	0,652	0,522
CL_08	0,608	0,498	0,600	0,594	0,573
CL_09	0,589	0,464	0,495	0,537	0,480
CL_10	0,618	0,391	0,528	0,575	0,399
CL_11	0,624	0,527	0,531	0,610	0,468
CL_12	0,441	0,422	0,421	0,489	0,268
CL_13	0,553	0,432	0,498	0,498	0,308
CL_14	0,549	0,426	0,517	0,531	0,396
CL_15	0,595	0,469	0,569	0,692	0,513
CL_16	0,479	0,397	0,573	0,537	0,405
CL_17	0,562	0,418	0,525	0,584	0,491
CL_18	0,531	0,362	0,474	0,528	0,418
CL_19	0,506	0,447	0,570	0,554	0,413
	CL_POA_06	CL_DN_01	CL_DN_02	CL_DN_03	CL_DN_04
CL_06	1,000				
CL_07	0,615	1,000			
CL_08	0,652	0,653	1,000		
CL_09	0,625	0,525	0,691	1,000	
CL_10	0,666	0,587	0,591	0,553	1,000

CL_11	0,522	0,540	0,489	0,540	0,483
CL_12	0,496	0,438	0,560	0,447	0,367
CL_13	0,492	0,470	0,585	0,595	0,478
CL_14	0,624	0,523	0,656	0,638	0,583
CL_15	0,651	0,618	0,658	0,602	0,632
CL_16	0,464	0,514	0,530	0,460	0,402
CL_17	0,639	0,571	0,557	0,525	0,469
CL_18	0,549	0,541	0,538	0,559	0,558
CL_19	0,505	0,536	0,502	0,484	0,474
	CL_DN_05	CL_DN_06	CL_CI_01	CL_CI_02	CL_CI_03
CL_11	1,000				
CL_12	0,462	1,000			
CL_13	0,474	0,672	1,000		
CL_14	0,544	0,552	0,759	1,000	
CL_15	0,511	0,567	0,624	0,688	1,000
CL_16	0,578	0,504	0,428	0,488	0,596
CL_17	0,564	0,548	0,493	0,635	0,633
CL_18	0,471	0,394	0,563	0,700	0,549
CL_19	0,496	0,426	0,460	0,543	0,505
	CL_CI_04	CL_CI_05	CL_CI_06	CL_CI_07	
CL_16	1,000				
CL_17	0,686	1,000			
CL_18	0,480	0,641	1,000		
CL_19	0,486	0,574	0,552	1,000	

Table 25: Communalities for two factor extraction

	Initial	Extraction
CL_01	1,000	0,761
CL_02	1,000	0,700
CL_03	1,000	0,704
CL_04	1,000	0,753
CL_05	1,000	0,654
CL_06	1,000	0,647
CL_07	1,000	0,591
CL_08	1,000	0,659
CL_09	1,000	0,591
CL_10	1,000	0,531
CL_11	1,000	0,539
CL_12	1,000	0,552
CL_13	1,000	0,688
CL_14	1,000	0,781
CL_15	1,000	0,691
CL_16	1,000	0,492

CL_17	1,000	0,629
CL_18	1,000	0,597
CL_19	1,000	0,490

Table 26: Total explained variance

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10,780	56,736	56,736	10,780	56,736	56,736
2	1,273	6,702	63,437	1,273	6,702	63,437
3	0,879	4,624	68,062			
4	0,832	4,377	72,439			
5	0,649	3,414	75,853			
6	0,583	3,070	78,924			
7	0,548	2,883	81,807			
8	0,489	2,571	84,378			
9	0,449	2,363	86,740			
10	0,412	2,167	88,908			
11	0,365	1,920	90,828			
12	0,317	1,667	92,495			
13	0,294	1,545	94,040			
14	0,249	1,310	95,350			
15	0,231	1,217	96,567			
16	0,215	1,132	97,700			
17	0,188	0,989	98,688			
18	0,148	0,780	99,468			
19	0,101	0,532	100,000			

Figure 21: Scree plot with two components

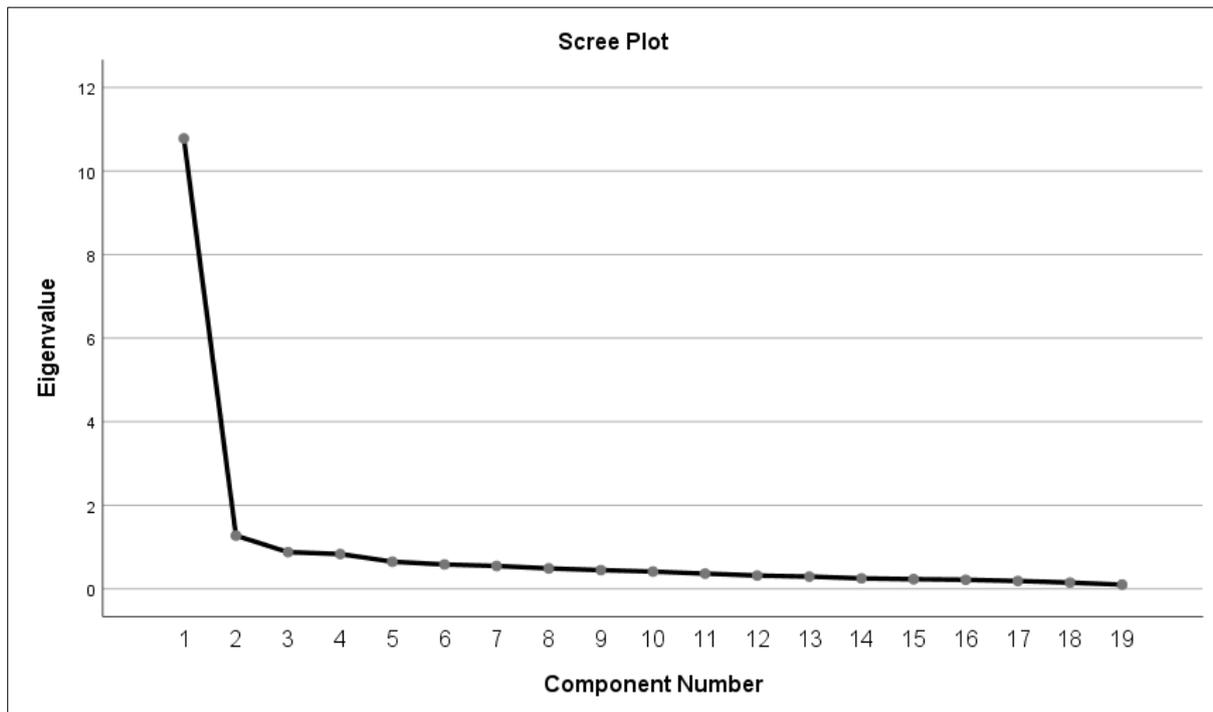


Table 27: PCA with Varimax Kaiser Normalisation rotation results

Complexity leadership item	Component 1	Component 2
CL_14	0,847	
CL_13	0,807	
CL_12	0,718	
CL_18	0,712	0,301
CL_15	0,699	0,450
CL_17	0,680	0,409
CL_09	0,647	0,416
CL_08	0,642	0,497
CL_06	0,574	0,564
CL_10	0,567	0,458
CL_16	0,565	0,416
CL_19	0,536	0,451
CL_02		0,815
CL_05		0,786
CL_01	0,397	0,777
CL_04	0,420	0,759
CL_03	0,367	0,754
CL_07	0,519	0,567
CL_11	0,476	0,559

Table 28: Communalities for three factor extraction

	Initial	Extraction
CL_01	1,000	0,765
CL_02	1,000	0,718
CL_03	1,000	0,717
CL_04	1,000	0,757
CL_05	1,000	0,669
CL_06	1,000	0,709
CL_07	1,000	0,596
CL_08	1,000	0,687
CL_09	1,000	0,650
CL_10	1,000	0,702
CL_11	1,000	0,593
CL_12	1,000	0,673
CL_13	1,000	0,689
CL_14	1,000	0,795
CL_15	1,000	0,693
CL_16	1,000	0,707
CL_17	1,000	0,685
CL_18	1,000	0,620
CL_19	1,000	0,506

Table 29: Forced three factor PCA with Varimax Kaiser Normalisation rotation results:

Complexity leadership item	Component 1	Component 2	Component 3
CL_10	0,743	0,378	
CL_14	0,729		0,487
CL_09	0,683	0,337	
CL_18	0,658		0,372
CL_06	0,649	0,491	
CL_08	0,637	0,422	0,321
CL_13	0,603		0,559
CL_15	0,591	0,376	0,450
CL_02		0,797	
CL_05	0,305	0,756	
CL_01	0,422	0,729	
CL_03		0,718	0,355
CL_04	0,346	0,716	0,355
CL_11		0,519	0,508
CL_07	0,493	0,508	0,309
CL_12	0,317		0,745
CL_16		0,380	0,735
CL_17	0,389	0,350	0,641

CL_19	0,360	0,401	0,465
-------	-------	-------	-------

Figure 22: Histogram - Dynamic capabilities distributed data with normal curve (mean = 3.81, std. deviation = 0.90, N = 115)

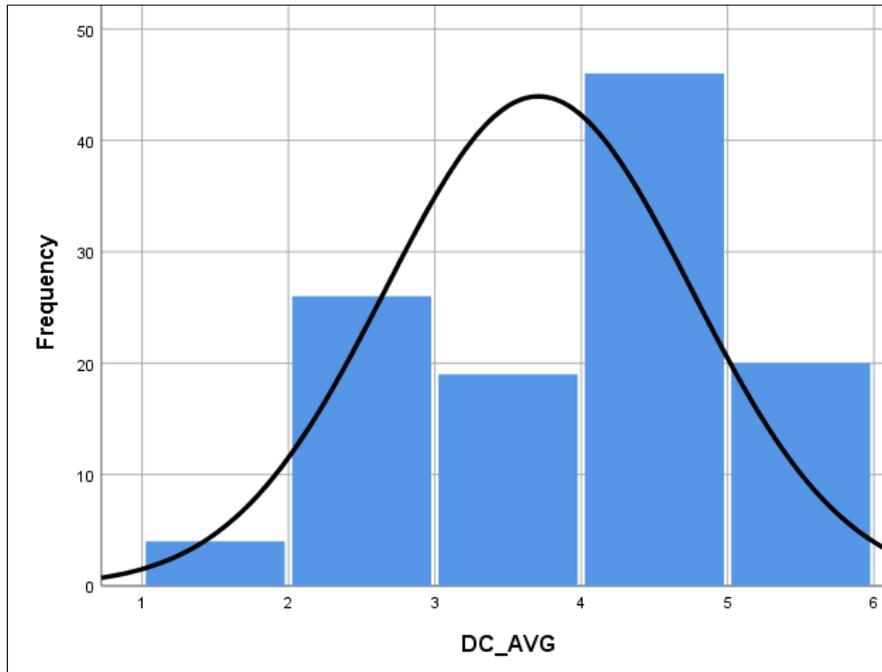


Figure 23: Histogram - Complexity leadership distributed data with normal curve (mean = 3.51, std. deviation = 0.84, N = 115)

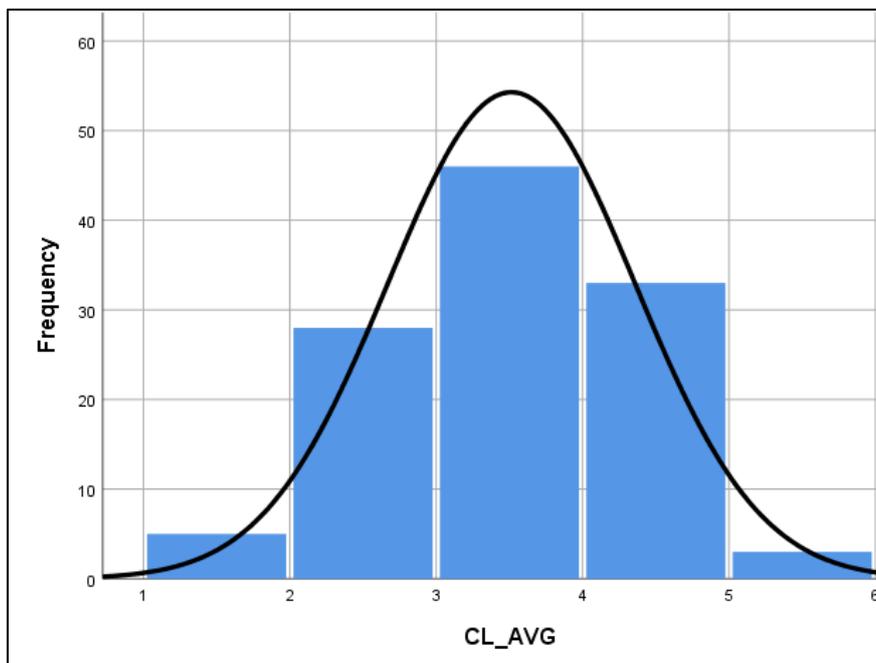


Figure 24: Histogram - Transforming distributed data with normal curve (mean = 3.70, std. deviation = 1.04, N = 115)

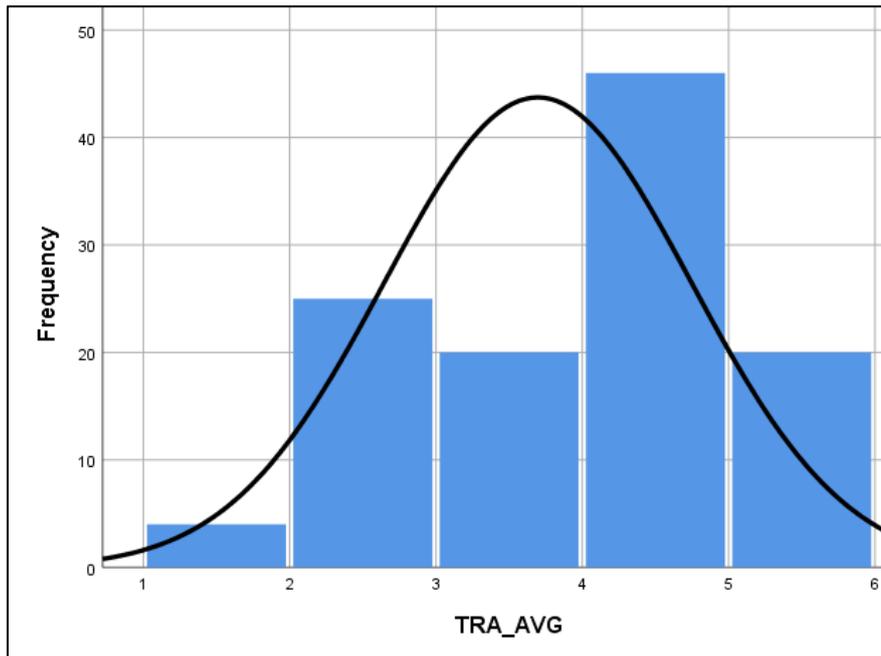


Figure 25: Histogram - Seizing distributed data with normal curve (mean = 3.69, std. deviation = 1.06, N = 115)

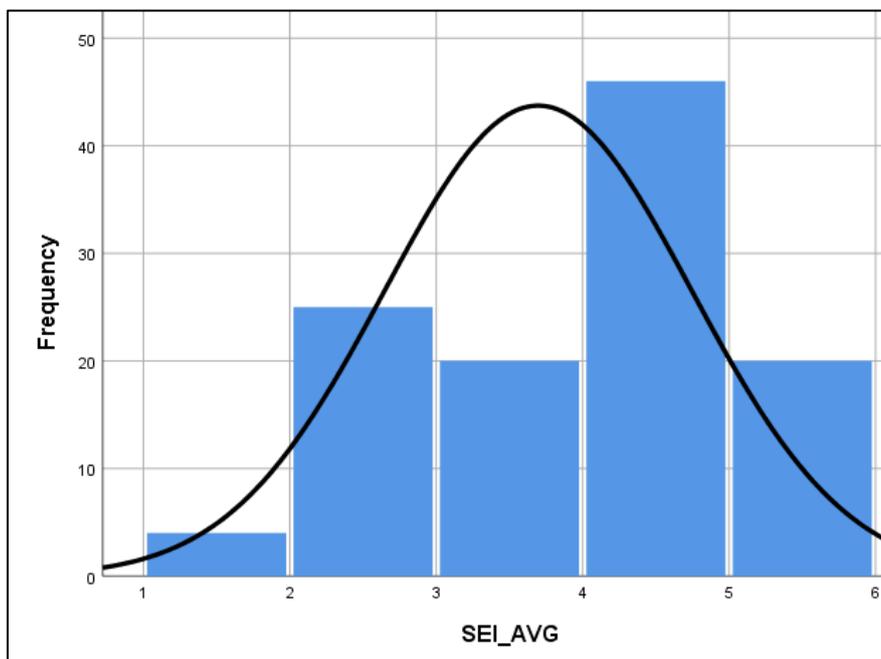


Figure 26: Sensing distributed data with normal curve (mean = 4.05, std. deviation = 0.93, N = 115)

