



# **THE APPLICABILITY OF SYSTEMS THINKING IN UNIVERSITIES OF TECHNOLOGY (UoTs) IN KWAZULU-NATAL**

Submitted in fulfilment of the requirements for the degree

Doctor of Philosophy in Management Sciences: Business Administration in the  
Faculty of Management Sciences at the

Durban University of Technology

**PATRICK MBONGWA MHLONGO**

Student Number: 19450347

April 2021

Supervisor: Dr R.W.D. Zondo



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29 April 2021  
....Date.....

## **DECLARATION**

I, Patrick Mbongwa Mhlongo, hereby declare that this project is the result of my own investigation. Where ideas of other people might have been used, they have been duly acknowledged. This dissertation is submitted in fulfilment of the requirements for the degree Doctor of Philosophy in Management Sciences: Business Administration. This work has not previously been accepted in substance or submitted in candidature for any degree.

Signed

Date            April 2021

## **LIST OF ACRONYMS**

DUT	Durban University of Technology
HEI	Higher Education Institution
KZN	KwaZulu-Natal
MUT	Mangosuthu University of Technology
UoT	University of Technology

## **DEDICATION**

I dedicate this project to my late mother and my late brothers for being a source of inspiration. This project is also dedicated to my lovely wife, uMaNkala, and my two lovely children, uLindelwa and Akhelethu.

## **ACKNOWLEDGEMENT**

I wish to express my sincere appreciation to the following people who made an immense contribution to the successful completion of this research project:

Dr Zondo, my Research Supervisor for his support, guidance and motivation. May God bless him and his family. It was a privilege to embark on this research journey with Dr Zondo.

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My entire family for their support and motivation.

God, the Almighty, for revealing my potential and giving me strength to make a meaningful contribution to knowledge creation.

## **ABSTRACT**

Organisations in both the private and public sectors have to interact with their surrounding and volatile environments in order to survive. Hence it is critical for organisations to remain competitive under such conditions. There is a need to respond effectively to the needs of stakeholders. Universities of Technology (UoTs) are not immune to global and local challenges. For UoTs, their stakeholders include students, government, accreditation bodies and industry. The focus of the study was on exploring Systems Thinking in the context of UoTs. Systems Thinking empowers members of the organisation with the ability to think holistically in terms of how organisations operate. Given the challenges and the environment in which UoTs operate, it was critical to conduct the study to explore an alternative management approach. The study explores the Systems Thinking approach as an alternative management approach to traditional management practices. The research problem identified in this study is silo practices or functional silos in UoTs. The Systems Thinking philosophy has been identified as an effective management approach to deal with unpredictable and complex challenges in both the public and private sectors. It serves as a catalyst in terms of conditioning organisational members to appreciate the interrelations and interdependence of various departments or units within an organisation.

The study adopted a mixed methods approach, investigating the applicability of Systems Thinking in UoTs as the aim of the study. Data was collected through a combination of interviews and a survey. Systems Thinking was the phenomenon being explored, thus the study was phenomenological. A Convergent approach was used as both qualitative and quantitative data were collected simultaneously. In other words, the study was cross-sectional. Moreover, data collected was used to develop grounded theory. It was through the inductive philosophy that the study contributed to the development of a theory.

Self-administered questionnaires and unstructured face-to-face interviews were used to collect data from the participants. Qualitative and quantitative data were necessary to achieve the objectives of the study and also to answer the formulated research questions.

Permanent employees of the Durban University of Technology (DUT) and Mangosuthu University of Technology (MUT) participated in the study. The population comprised staff from both the administration and academic sectors. Stratified sampling and simple random sampling were used to select manageable sample from the population. The Statistical Package for the Social Sciences (SPSS) was used to analyse quantitative data, whilst Nvivo was the computer software used to analyse qualitative data. A response rate of 73% was achieved.

The findings indicated that there was a lack of an institutionalised and internalised overarching Systems Thinking in the UoTs. Participants also felt that there was a strong culture of functional silos in the UoTs. The study showed that the focus of employees was more on departmental or faculty goals, instead of broader institutional goals. Participants were optimistic about opportunities for the application of Systems Thinking in the UoTs. Resistance to change was one of the factors identified as a challenge in terms of the implementation of a Systems Thinking philosophy in the UoTs.

The study makes a theoretical contribution and provides necessary insights to improve processes and practices in UoTs. The significance of the study is that it identifies a phenomenon that has received no attention from previous researchers. The study deals with the gap in the existing literature as the focus has been more on Systems Thinking in the context of the corporate sector. The significance of the study is that it provides insights that should be considered during decision-making and strategy formulation processes in UoTs. Systems Thinking empowers decision-makers with the ability to consider all relevant variables of the situation.



# TABLE OF CONTENTS

DECLARATION .....	iii
LIST OF ACRONYMS .....	iv
DEDICATION .....	v
ACKNOWLEDGEMENT .....	vi
ABSTRACT .....	vii
TABLE OF CONTENTS .....	ix
LIST OF TABLES .....	xvi
LIST OF FIGURES .....	xvii
CHAPTER ONE: INTRODUCTION AND BACKGROUND .....	1
1.1 Introduction .....	1
1.2 Background to the problem .....	2
1.3 Clarification of key terms .....	4
1.4 Motivation for the study .....	6
1.5 Research problem .....	7
1.6 Research aim .....	8
1.7 Research objectives .....	8
1.8 Research questions .....	9
1.9 Rationale for the study .....	10
1.10 Scope of the study .....	10
1.11 Delimitations of the study .....	11
1.12 Research design and methodology .....	11
1.12.1 Target population .....	12
1.12.2 Sampling method .....	12
1.12.3 Data collection .....	12

1.12.4	Research instruments.....	13
1.12.5	Data analysis.....	13
1.12.6	Ethical consideration .....	13
1.13	Division of chapters.....	13
1.14	Chapter summary .....	15
CHAPTER TWO: LITERATURE REVIEW.....		17
2.1	Introduction .....	17
2.2	What is Systems Thinking?.....	18
2.3	Historical development of Systems Thinking.....	20
2.4	Reductionism as the opposite of Systems Thinking.....	22
2.5	Systems Thinking as an effective alternative to Reductionism.....	24
2.6	Benefits of implementing Systems Thinking in an organisation.....	26
2.7	Systems Thinking and functional boundaries from an organisational perspective .....	28
2.8	Systems Thinking in the higher education environment .....	32
2.9	Knowledge management in a UoT context.....	35
2.9.1	Communities of Practice (CoPs) and Systems Thinking.....	38
2.10	Learning Organisation philosophy in an organisation .....	40
2.10.1	Systems Thinking as a critical element of a Learning Organisation concept	44
2.11	Systems Thinking concept as a strategic option for organisations.....	45
2.11.1	Competitive Advantage in a higher education context.....	48
2.11.2	Stimulating a sense of shared purpose through the application of Systems Thinking in an organisation.....	50
2.12	Embracing Systems Thinking to stimulate Organisational Citizenship Behaviour.....	54
2.13	Perceptions of organisational members of Systems Thinking.....	56

2.14	Chapter summary .....	58
CHAPTER THREE: LITERATURE REVIEW (IDENTIFIED SYSTEMS THINKING MODELS FOR UoTs).....		60
3.1	Introduction .....	60
3.2	Model 1: Douglas and Kerfoot's model (Douglas and Kerfoot 2008).....	60
3.3	Model 2: Systems Thinking Leadership model (Davies, Dent and Wharff 2015) 63	
3.4	Model 3: Four stage model (Stroh 2015).....	65
3.5	Model 4: Systems model for Organisational Change (Werner 2016) .....	66
3.6	Overview of the models .....	70
3.7	Proposed Systems Thinking model.....	72
3.7.1	Significance of the model.....	74
3.8	General Systems Theory (GST).....	75
3.9	Chapter summary.....	77
CHAPTER FOUR: RESEARCH METHODOLOGY .....		78
4.1	Introduction .....	78
4.2	Research site .....	79
4.3	4.3 Research methodology and design appropriateness .....	80
4.3.1	Research design.....	81
4.3.2	Convergent Design .....	81
4.3.3	Inductive philosophy .....	83
4.3.4	Cross-sectional approach .....	83
4.3.5	Grounded Theory.....	84
4.4	Research Methodology .....	85
4.4.1	Target population.....	85
4.4.2	Sampling technique .....	85
4.4.3	Data collection method .....	87

4.4.4	Gatekeeper permission.....	88
4.4.5	Instrumentality .....	88
4.5	Quantitative paradigm .....	90
4.5.1	Drafting of the questionnaire.....	90
4.5.2	Characteristics of a good questionnaire.....	92
4.5.3	Advantages of a questionnaire .....	92
4.5.4	Pre-testing the research instrument.....	93
4.5.5	Administration of the questionnaire.....	93
4.5.6	Response rate .....	94
4.6	Qualitative paradigm .....	94
4.6.1	Unstructured face-to-face interviews .....	95
4.6.2	Advantages of interviews .....	96
4.7	Ethical considerations .....	97
4.8	Data analysis.....	98
4.8.1	Quantitative design: data analysis .....	98
4.8.2	Qualitative analysis: data analysis .....	99
4.9	Steps taken to avoid bias .....	99
4.9.1	Subjectivity .....	100
4.10	Summary of the chapter.....	100
CHAPTER FIVE: PRESENTATION OF THE FINDINGS .....		101
5.1	Introduction .....	101
5.1.1	Profile of participants .....	101
5.2	Research Results: quantitative paradigm.....	103
5.2.1	Descriptive analysis .....	104
5.3	Overall frequency distribution scores for all the constructs .....	113
5.3.1	A Sense of shared purpose in UoTs .....	114

5.3.2	Knowledge-sharing culture in the UoTs .....	116
5.3.3	Overall scores on the perceptions for the application of Systems Thinking in UoTs	118
5.3.4	Opportunities for the application of Systems Thinking in the UoTs.....	119
5.3.5	Descriptive statistics for the constructs between the institutions.....	121
5.3.6	Descriptive statistics for the constructs between sectors within the Institutions.....	123
5.3.7	Descriptive statistics for constructs relating to academic qualifications	124
5.3.8	Descriptive statistics for the constructs relating to the years of experience in the institution .....	126
5.3.9	Descriptive statistics for the constructs relating to gender .....	128
5.3.10	Descriptive statistics for constructs relating to age.....	129
5.4	Spearman's rho correlations output .....	130
5.5	Inferential statistics.....	132
5.5.1	Normality test for opportunities for the application of Systems Thinking in UoTs	132
5.5.2	Mann-Whitney U-test output between the two institutions .....	134
5.5.3	Kruskal-Wallis test output for qualifications of the participants .....	135
5.5.4	Kruskal-Wallis test for experience of the participants in the UoT .....	136
5.5.5	Mann-Whitney U-test for the gender of the participants.....	137
5.6	Reliability Scores.....	138
5.7	Qualitative findings.....	139
5.7.1	Presentation and discussion of the findings.....	139
5.7.2	Discussion of themes and sub-themes .....	152
5.8	Contribution of the study .....	163
5.9	Chapter summary.....	163
CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS .....		164

6.1	Introduction .....	164
6.2	Overview of the theoretical orientation .....	165
6.3	Empirical overview of the study .....	167
6.3.1	Research process and stages followed to conduct the study .....	168
6.4	Achievement of the research objectives .....	169
6.4.1	Exploring Systems Thinking as an alternative to functional silos (reductionism) .....	169
6.4.2	To examine if Systems Thinking would be a strategic option to deal with complex challenges in UoTs .....	170
6.4.3	To determine if Systems Thinking would help to stimulate a sense of shared purpose in the UoTs .....	170
6.4.4	To ascertain employees' and management's perceptions on the application of Systems Thinking in the UoTs.....	170
6.4.5	To contribute to systems theory by capturing UoTs' context .....	171
6.4.6	To establish the challenges and opportunities for the application of Systems Thinking in the UoTs.....	171
6.5	Implications of the results for policy formulation in the UoTs.....	172
6.6	Limitations and scope of the study .....	174
6.7	Significance of the findings.....	174
6.8	Recommendations for future research .....	175
6.9	Chapter summary .....	176
	LIST OF REFERENCES .....	178
	APPENDICES .....	190
	Appendix A .....	190
	Appendix B .....	196
	Appendix C .....	197
	Appendix D .....	198

Appendix E .....	200
Appendix F.....	204
Appendix G .....	206

## LIST OF TABLES

Table 1 Distribution of socio-demographic variables .....	102
Table 2: Overall scores for a sense of shared purpose .....	115
Table 3: Knowledge sharing culture .....	117
Table 4: Opportunities for the application of Systems Thinking in the UoTs .....	120
Table 5: Descriptive statistics for all the constructs between the institutions.....	122
Table 6: Descriptive statistics for all the constructs between sectors .....	123
Table 7: Descriptive statistics for all the constructs relating to qualifications.....	124
Table 8: Descriptive statistics for all the constructs relating to years of experience in the institutions .....	126
Table 9: Descriptive statistics for all the constructs for gender.....	128
Table 10: Descriptive statistics for all the constructs for age of the participants.....	129
Table 11 Spearman's rho Correlations output.....	131
Table 12: Tests of Normality output for opportunities for the application of Systems thinking in the UoTs.....	133
Table 13: Mann-Whitney U-test output.....	134
Table 14: Kruskal Wallis Test output for qualification .....	135
Table 15: Kruskal-Wallis Test output for experience .....	136
Table 16: Mann-Whitney U-test output for gender.....	137
Table 17: Reliability scores .....	138
Table 18: Designations of participants .....	141
Table 19: Years of service at the institution (n=15) .....	142
Table 20: Themes and sub-themes.....	153



## LIST OF FIGURES

Figure 1: There is a sense of shared purpose in this institution (n=220) .....	105
Figure 2 Commitment to achieving the strategic objectives of the institution is visible at n=220 .....	106
Figure 3: The drive for excellence in this institution is visible (n=220) .....	107
Figure 4: Knowledge-sharing culture (n=220) .....	108
Figure 5: Perceptions on the application of Systems Thinking (n=220) .....	110
Figure 6 Opportunities for the application of Systems Thinking in UoTs (n=220)...	111
Figure 7: Challenges for the application of Systems Thinking in the UoTs (n=220)	112
Figure 8: Distribution of overall scores for the perceptions on the application of Systems .....	119
Figure 9: Sector indications (n=15) .....	140

# **CHAPTER ONE: INTRODUCTION AND BACKGROUND**

## **1.1 Introduction**

This chapter provides the background to the study; a clarification of relevant concepts; an awareness of the problem; the aim and objectives of the study; and the division of chapters. It is an introductory chapter that also contextualizes the research project. Organisations in all sectors, including UoTs are operating in an environment characterised by a number of complex challenges. Such challenges include globalisation, new technology, ever-changing stakeholder demands, legislation and other societal issues. According to van Niekerk (2016:29), Higher Education (HE) in South Africa is an embattled sector. Given this background, this study explores the applicability of Systems Thinking as an alternative approach to deal with complex and chronic challenges in UoTs. Functional silos in the UoTs create a challenge as departments and faculties compete, instead of working together towards a common goal. Srikanathan and Dalrymple (2007:174) maintain that borders between administrative and academic departments are prevalent in UoTs.

Systems Thinking is viewed as an effective approach to dealing with complex challenges. Consequently, there is need for a culture where UoT employees appreciate interconnectedness and interrelationships within and beyond the institution. The study investigates a Systems Thinking philosophy in the context of UoTs, particularly in KwaZulu-Natal. According to Mthembu (2011:195), UoTs in South Africa were established in 2004. There are six UoTs nationally, namely the Central University of Technology (CUT), Cape Peninsula University of Technology (CPUT), Durban University of Technology (DUT), Mangosuthu University of Technology (MUT), Vaal University of Technology (VUT) and Tshwane University of Technology (TUT). Of the six UoTs, only two are in the province of KwaZulu-Natal (KZN), i.e MUT and DUT. UoTs differ from traditional universities in that their operations and practices are research informed.

## **1.2 Background to the problem**

Universities in South Africa are under pressure to respond effectively to demands of society. However, there are major challenges in the environment in which universities operate. Adhikari (2010: 95) describes the business environment for universities as volatile and dynamic. Moreover, silo practices or functional silos are prevalent in UoTs. There is a need for new management approaches which are informed by an understanding of the interconnectedness and interrelationships amongst various faculties and departments in the university. According to van Niekerk (2016:29), this should help university stakeholders to work towards the common good of the society. She further states that processes and practices in the higher education sector are informed by mechanistic and reductionist thinking. Srikanthan and Dalrymple (2007:174) posit that borders between academic and administration sectors are firmly entrenched in Higher Education Institutions (HEIs). Furthermore, they argue that there is a need for a shared awareness of common goals within a university.

Systems Thinking is regarded as a way of thinking that recognises the interrelationships and interactions of a system's components to achieve a common goal. In an organisational context, Systems Thinking is about understanding the interrelationships and interactions of various departments or units to achieve common and broader organisational goals. Organisational members in UoTs lack this understanding. Jackson (2011:13) supports the argument that organisations are complex in nature and therefore understanding the relationships and interactions of various organisational parts is critical.

The ineffectiveness of reductionism to deal with complex challenges resulted in the emergence of Systems Thinking. Reductionism means to break down a system into different elements instead of considering the system as a whole. Tracing the historical development of Systems Thinking, Flood (2010:269) states that this concept emerged in the twentieth century as an alternative to reductionism. The Systems Thinking concept has been identified as a strategic option to deal with complex organisational challenges. It has been adopted mostly in corporate sector organisations. UoTs operate in dynamic environments where they have to deal with a number of complex

challenges. Johl, von Solms and Flowerday (2014:129) confirm that indeed, the higher education environment is highly complex. A competitive global environment and competing for prestige university rankings are critical factors for the UoTs. Hence a need for UoTs to adopt effective management practices instead of relying on traditional academic practices. Remaining competitive has become necessary for UoTs as they are also competing not only among themselves, but with other types of tertiary institutions.

The study focuses on a systems thinking concept in the context of UoTs in KwaZulu-Natal. The intention is to investigate the applicability of a Systems Thinking philosophy in dealing with complex challenges, as well as to achieve strategic objectives in UoTs. There are only two UoTs in KZN namely the DUT and MUT.

The UoTs and other HEIs operate in a rapidly changing environment. Muchie and Baskaran (2010:174) stress that HEIs are faced with a number of apparently insurmountable challenges. The adoption of effective approaches like Systems Thinking is the only option to dealing with such complex challenges. Changes taking place globally and nationally are impacting negatively on the higher education sector. In the words of Du Pre (2009:31), responding effectively to such challenges is critical. UoTs are expected to meet the needs of society. Recognising the core focus area of the UoTs, which is research, Du Pre (2009:33) further explains that research done at UoTs should assist in solving societal problems. In an organisational environment where there is a lack of understanding of systems thinking, they fail to recognise the bigger picture (Naicker and Mestry 2015:7). Eventually, this leads to silo practices in the organisation.

The UoTs are regarded as new-generation organisations. According to (Mthembu 2011:189) these are organisations that defy the traditional way of doing business in higher education. It is the responsibility of UoTs to educate students intellectually, ensuring that graduates have the necessary practical skills to be effective in the workplace. The business of UoTs is driven by research, innovation, teaching, learning and engagement (Mthembu 2011:189). Providing an overview of higher education in

South Africa, Lategan (2008:61) explains that there are three types of universities, namely general or classical universities, UoTs and comprehensive universities. Interestingly, all university types have research, teaching, learning and service as their core functions (Lategan 2008:61). Given this context, it is therefore necessary to explore an alternative management approach in UoTs, one that empowers organisational members with holistic thinking. The next section provides clarification of key terms relevant to this study.

### **1.3 Clarification of key terms**

Salient relevant key terms or concept should be clarified in research (Kobus and Van der Westhuizen 2009:19). According to Cooper and Schindler (2014:601), this section of the research project is important where the researcher defines key terms in a similar format as a glossary of terms in some textbooks. Defining relevant terms is critical in order to provide meaning in the context of the specific research project (Fox and Bayat 2010:140).

#### **Competitive advantage:**

It is the ability of an organisation to outperform other organisations because it produces goods and offers services more effectively and efficiently (Jones and George 2014: 638). According to Bruton and White (2011:377), competitive advantage refers to organisational capabilities or qualities that enable the organisation to operate effectively and efficiently to outsmart competitors.

#### **Complex environment:**

It is an environment that has many environmental factors (Williams 2014:555).

#### **Knowledge management:**

This is a systematic promotion of creating, sharing and applying knowledge, as well as capturing lessons learnt and best practices into organisational memory to foster continuous organisational learning (Dalkir 2011:469). According to Bruton and White

(2011:378), knowledge management is the ability of an organisation to acquire, store and share knowledge using human and technical systems.

**Learning organisation:**

It is an organisation where individuals and groups think and behave creatively to maximize the potential for organisational learning to take place continuously (Jones and George 2014:645).

**Mechanistic structure:**

It is an organisational structure in which authority is centralized, tasks and rules are clearly specified (Jones and George 2014:58). In a mechanistic structure, command and control shape operations and daily routines in an organisation. Jones and George (2014:58) further describe a mechanistic structure as a structure where employees are closely supervised.

**Organic structure:**

It is a structure where employees are encouraged to be flexible, cooperate and adapt to the unexpected. Authority is decentralized (Jones and George 2014:58).

**Organisational commitment:**

This refers to the degree to which an employee identifies with the organisation and is willing to perform beyond the job description (Noe et al. 2011:558).

**Reductionism:**

It is the tendency or principle of analysing complex things into simple elements or parts (Tulloch 1993:1284). In other words, this is a principle of breaking a system into isolated parts. Miquel (2014:242) defines reductionism as a philosophical concept of scientific investigation based on studying parts of a system.

**Shared vision:**

It is a common mental model adopted and embraced by all members of the organisation to frame challenges and opportunities (Jones and George 2014:213).

**System:**

It is a set of interrelated and interconnected elements or components that interact to accomplish a common goal (Stair and Reynolds 2012:650).

**Systems Thinking:**

It is a process of understanding how a group of interdependent, interrelated and interacting components influence one another to achieve a common goal within a whole (Kelly 2012: 1). In Senge's perspective, as stated by Dalton (2010:170), systems thinking practically means being able to see how actions in one part of the organisation influence the other parts of the same organisation. However, Behl and Ferreira (2014:104) define Systems Thinking as the ability to think about a system as a whole, instead of considering parts individually.

**University of Technology (UoT):**

It has been defined by Du Pre (2009:xi) as an institution of higher learning that is career focused, producing quality graduates who will excel in the workplace.

**1.4 Motivation for the study**

Responding effectively to complex challenges and remaining relevant has become critical for UoTs. The study explores and investigates the Systems Thinking concept as an alternative to current management practices in UoTs. Complex challenges confronting UoTs require new thinking. Hence the study recognises that current management practices are informed by reductionism thinking, which has been criticised for being ineffective in dealing with complex challenges. There is thus a need to consider an approach that improves processes and practices from a holistic perspective. Jackson (2011:12) observes that organisations are operating in a rapidly changing environment yet are generally very slow to adapt. Furthermore, Jackson (2011:12) puts it succinctly that there is a problem where management practices in

organisations are still informed by reductionism. This means that interrelationships between organisational elements are ignored.

## **1.5 Research problem**

The problem is silo practices, whereby university departments operate in silos. Hence Keeling, Underhill and Wall (2007:22) agree that various departments in higher education institutions focus on their (departmental) goals and ignore broader institutional goals. There is a lack of an internalised and institutionalised over-arching philosophy that should inspire organisational members to understand and appreciate the interconnectedness of various departments and faculties in UoTs. Faculties and various departments should be interacting to achieve broader institutional goals. This argument is also espoused by Togo and Lotz-Sisistka (2013: 674), that the educational system was still grounded and informed by reductionism worldviews. Faculties, departments and sections within departments operate in silos and there is a tendency to use a reductionist approach which is problematic for complex and dynamic environments like a university. Davis, Dent and Wharff (2015:349) concur that institutions of higher education have been criticized for operating in what they refer to as “departmental silos”. The DUT 2015-2019 Strategic Plan (DUT 2015:3) states that there is a critical need to replace outmoded means of operating and adopt efficient and effective approaches. In the same strategic plan, DUT acknowledges the need to respond effectively to both global and local complex challenges. In view of reductionism, Jackson (2011:4) expresses his disapproval of this approach as it fails to deal with complex challenges in complex systems.

Jackson (2011:12) further argues that management thinking is predominantly shaped by reductionism. However, systems thinking creates a culture where organisational members recognise the fact that everything or process in different departments contribute to a common organisational goal (Certo and Certo 2009:69). A common goal of the organisation could be in the form of a final product or service. The focus of the study is not to challenge structural arrangements of UoTs, but rather the silo practices. Hence, Cilliers and Greyvenstein (2012:3) confirm that silo practices create an “us and them” problem. They further state that silos are not physical, but the mindset of the



organisational members. Silo practices also discourage boundary-crossing and cross-unit collaboration in an organisation (Cilliers and Greyvenstein 2012:3).

The problem of working in silos therefore leads to a situation where members of the organisations ignore the interdependency, interactions and interrelationships of various units within the organisation. In this instance, the organisation is not viewed from a holistic perspective. Considering the need for higher education institutions to be competitive, Kim and Ju (2009:282) agree that the sharing of knowledge and expertise is critical in academic institutions. Systems Thinking could be used as a catalyst to promote the understanding that organisations are systems by nature.

The observation made by Mthembu (2012:186) is that as UoTs strive to improve their research output, other core areas (for example teaching and learning) are not receiving the necessary attention. This points to the fact that UoTs lack a systems culture where the university should be viewed holistically. In the Systems Thinking context, the focus is not on individual parts of the organisation, but on the organisation as a whole, including stakeholders and environmental factors. It is on this understanding that Flood (2010:271) correctly states that System Thinking considers the organisation as a complex system with interrelated parts. This means different departments and faculties in the context of UoTs and other academic institutions.

## **1.6 Research aim**

To investigate the applicability of a Systems Thinking concept in UoTs in KwaZulu-Natal.

## **1.7 Research objectives**

- To explore the Systems Thinking concept as an alternative approach to silo practices in UoTs
- To establish whether Systems Thinking would be a strategic option to deal with the complex challenges in UoTs
- To determine if Systems Thinking would help to stimulate a sense of a shared purpose in UoTs

- To ascertain employees' and management's perceptions about the Systems Thinking concept in UoTs
- To contribute to Systems Thinking theory by capturing UoTs' context

These are the objectives of the study that also informed the choice of a research design and methodology for this project. In line with the research objectives, there are research questions that need to be answered. The research questions are presented in the following section.

## **1.8 Research questions**

Formulating critical research questions is an important aspect of a scientific research project. Hence, research questions should be formulated to inspire the researcher to find answers to the research questions. Research questions are in fact a starting point for a good research study (Graziono and Raulin 2013:59).

Listed below are the research questions for the study:

- Will it be practically possible to apply a Systems Thinking concept in UoTs?
- Is the application of a Systems Thinking concept the best option for UoTs?
- Will a Systems Thinking concept help to stimulate a sense of shared purpose in UoTs?
- What are organisational members' perceptions of a Systems Thinking concept?
- How applicable is the Systems Thinking philosophy to UoTs?
- What are the challenges and opportunities for adopting Systems Thinking in UoTs?

The next section deals with the rationale for the importance of conducting this study.

## **1.9 Rationale for the study**

The rationale for the study is to explore the Systems Thinking concept in the context of UoTs as alternative management approach. The study contributes to systems thinking theory, with particular attention to the UoT context. It is hoped that the study will provide Systems Thinking practitioners and decision-makers with powerful insights to deal with the complex challenges in UoTs. The study explores Systems Thinking to facilitate holistic thinking in order to improve processes and processes in the UoTs. The understanding is that UoTs and other HEIs are operating in an environment that is turbulent, dynamic and unpredictable. It is also important to mention that this study is not challenging the structural designs of UoTs but explores the applicability of a Systems Thinking concept in UoTs.

The study considers UoTs as organisations made up of systems and sub-systems that interact internally and externally with the environmental factors. Therefore, the study explores Systems Thinking as an effective concept for organisations to deal with complex challenges. It stimulates holistic thinking that considers all the relevant variables of the situation during decision-making. Jackson (2011:25) concurs that Systems Thinking empowers organisations to deal effectively with complex challenges. According to Furseth and Everett (2013:4), research should be conducted to deal with a phenomenon that has not received the attention of the previous researchers. Hence this study deals with the gaps in the systems thinking literature, where not much attention has been given to systems thinking in the context of higher education institutions. Furseth and Everett (2013:4) further accentuate that is vital for researchers to identify gaps in the current research or literature.

## **1.10 Scope of the study**

Qualitative and Quantitative data was collected at DUT and MUT. This is based on practical reasons and a lack of resources. The DUT is a multi-campus institution with five campuses in Durban and two campuses in Pietermaritzburg. At MUT, data was collected from the main campus and a satellite campus. This study is focusing on

Systems Thinking as a concept, but not on different systems thinking methodologies which include the Soft Systems Methodology (SSM), Viable Systems Model (VSM), Systems Dynamics (SD), Strategic Options Development and Analysis (SODA), as well as Critical Systems Heuristics (CSH). It is important to reiterate that this study is inspired and informed by Peter Senge's theoretical framework and he does not capture different methodologies. Senge (2006:12) presents Systems Thinking as the learning organisation's element that stimulates a sense of appreciating inter-connectedness and inter-relationships within a whole. Flood (2002:26) points out that Systems Thinking is effective in generating a sense of a shared vision in organisations. Essentially, this is something that is critical for UoTs. Only research variables relevant to the applicability of Systems Thinking in UoTs were considered in this study.

### **1.11 Delimitations of the study**

The study explores Systems Thinking as a phenomenon. The intention was to focus on the application of Systems Thinking in UoTs in KZN. Therefore, MUT and DUT participated in the study. There are other higher education institutions in KZN. However, the study focused only on UoTs. The decision to focus on UoTs in KZN only was based on practical reasons. The study did not cover different System Thinking methodologies. However, the focus was on exploring Systems Thinking as a holistic phenomenon in the context of its applicability in UoTs.

### **1.12 Research design and methodology**

The study adopted a mixed methods approach. Qualitative and quantitative data was collected from the employees of DUT and MUT. Selecting a specific research design is a matter of personal choice which should be informed, amongst other things, by the nature of the study and the researcher's expertise (Fox and Bayat 2010: 66). Authors further state that the researcher must be familiar with the elements of their chosen research design. The study investigates the applicability of the systems thinking concept in the context of UoTs. Self-administered questionnaires were used to collect quantitative data, whilst unstructured face-to-face interviews were used to collect qualitative data. The study adopted an approach where both qualitative and quantitative data were collected simultaneously. In other words, the researcher used a

cross-sectional approach. Kumar (2014: 368) describes the cross-sectional design as an approach that is commonly used in social sciences research. According to Trochim, Donnelly and Arora (2016:393) a cross-sectional study is one that is conducted at a single point in time. The cross-sectional study is the opposite of a longitudinal study. The study is phenomenological in nature as it investigates Systems Thinking as a phenomenon. The context of the study informed the decision to consider the phenomenological approach. Relevant elements relating to the methodology adopted in the study are discussed briefly in the following sections. However, they are discussed in greater detail in the methodology chapter. Those elements include the population, research approach, sampling, research instrument and analysis of data.

#### **1.12.1 Target population**

The target population for the study was permanent employees of both DUT and MUT. This included academics, management and administration staff members. Fox and Bayet (2010:51) define a target population as the full set of cases from which samples are selected.

#### **1.12.2 Sampling method**

Stratified sampling was used to select a sample from the target population. After the target population was broken into strata, the researcher used simple random sampling to identify participants. Probability sampling was adopted. According to Fox and Bayet (2010:55), this sampling technique provides valid estimates and deductions about the population.

#### **1.12.3 Data collection**

Data collection is defined by Wagner, Kawulich and Garner (2012: 69) as a process of gathering information to assist the researcher in answering research questions. This information also assists the researcher to achieve the objectives of the study.

#### **1.12.4 Research instruments**

Qualitative and quantitative data was collected for the purposes of this study. Research instruments used were self-administered questionnaires and unstructured face-to-face interviews. Quantitative data was collected by means of a self-administered questionnaire, whilst face-to-face interviews were used to collect qualitative data.

#### **1.12.5 Data analysis**

The Statistical Package for the Social Sciences (SPSS) was used to analyze quantitative data and NVivo was used to analyze qualitative data. Analysis of data is the process of examining collected research data to get logical meaning (Wagner, Kawulich and Garner 2012: 269). In addition, analyzing data helps to make logical sense of the data.

#### **1.12.6 Ethical consideration**

The researcher complied with the DUT's institutional requirement for ethical guidelines. Ethical clearance and permission was granted by the Ethics Committee before the study was conducted. Part of the ethical requirements was to attach the letter of information and a consent form to the questionnaire. The letter of information outlined the purposes of the study and assured participants that their identities were not going to be revealed. Participants were asked to sign the consent form to indicate their willingness to participate in the study voluntarily. Hence, Wagner, Kawulich and Garner (2012:68) describe informed consent as a principle ensuring participants' right to agree or not agree to participate in the study.

### **1.13 Division of chapters**

A logical breakdown and proper planning of chapters is critical so that each section or sub-division provides a meaningful link between the research topic, methodology, findings and conclusions (Anderson and Poole 2009:96). In other words, chapters and sub-divisions should be succinctly and logically related. Presenting chapters logically is critical and there is a chapter summary at the end of each in this project.

## Chapter One: **Introduction and Overview**

The first chapter outlines the background, aims, objectives, problem statement and the scope of the study. Critical research questions generated to address the objectives of the study are also highlighted in Chapter One. The aim of this chapter was also to contextualise Systems Thinking in UoTs and to provide a background to the study. Captured in this chapter are the limitations and delimitations of the study. It was critical to clarify key terms and concepts relevant to the study, hence key terms are clarified in this chapter. The researcher used the introductory chapter to introduce the study, with the intention of generating reader' interest in the whole study (Anderson and Poole 2009:96).

## Chapter Two: **Literature Review**

This chapter presents theoretical base of the study from various sources of information. The focus was on exploring System Thinking as a phenomenon in the context of UoTs. Concepts relevant to SystemsThinking are discussed in this chapter. According to Jenson and Laurie (2016:353), the literature review helps the researcher to demonstrate the proper context of the study and a full understanding of the relevant literature.

## Chapter Three: **Systems Thinking Models**

Identified Systems Thinking models are presented and discussed in this chapter.

## Chapter Four: **Research Design and Methodology**

The research methodology, including the target population, data collection and data analysis is covered in this chapter. The purpose of this chapter is to provide a detailed explanation of the research design adopted to conduct this study. The mixed method approach was adopted to collect qualitative and quantitative data relating to the application of Systems Thinking in UoTs. This chapter further describes how data was collected and analysed.

## Chapter Five: **Presentation and Discussion of the Findings**

Chapter Five presents the findings of the study from data collected by means of a self-administered questionnaire and face-to-face interviews. This chapter also discusses the findings based on the interpretation of the results, which are presented in Chapter 5. Good discussions of the findings require the research to make reference to the literature (Anderson and Poole 2009:27). Discussing the findings should help the research to contextualise the study and also to contribute to existing knowledge.

## Chapter Six: **Conclusion and Recommendations**

The interpretation of the findings assisted the researcher to draw conclusions and make recommendations. This chapter provides finality to the study. Hence, this is a final chapter that captures the conclusion and recommendations of the study. According to Anderson and Poole (2009:97) the conclusion serves to tie together the whole thesis.

### **1.14 Chapter summary**

This chapter introduced the research project and contextualized the applicability of Systems Thinking in UoTs. According to Zikmund *et al* (2013: 618), the introductory chapter should explain why it was necessary for the study to be conducted. The research problem, objectives of the study, critical questions, as well as the rationale for the study are highlighted and presented in this chapter. Chapter One also outlined the breakdown of the chapters of the study. Key concepts relevant to the study were defined to acquaint the reader with their meaning. The study contributes to Systems Thinking literature by capturing the UoT context. Systems Thinking has been described by Langstrand (2016:197) as a well- established management approach in the field of management studies. This chapter has placed Systems Thinking in the context of managing UoTs, although the study is not challenging structural designs of UoTs as organisations. However, this chapter highlighted why it was necessary for UoTs to adopt effective management approaches. Notshulwana (2011:143) asserts that indeed, universities are under constant pressure to meet the needs of their stakeholders. Given this background, it was necessary to conduct this study in order



to explore a Systems Thinking philosophy as an alternative management approach to managing UoTs. This chapter has contextualized the study and provided an executive summary of the study. The chapter also serves to attract the attention of the reader and to stimulate readers' interest in the rest of the project. The next chapter deals with the theoretical framework underpinning this study.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Introduction**

The previous chapter was an introduction to the study, which outlined the background and the context of the study. It highlighted the aim, objectives, problem statement and research questions of this research project. This chapter deals with the literature consulted to explore Systems Thinking as a concept, particularly in the context of UoTs. Hence the purpose of the study is to investigate the applicability of the Systems Thinking concept in UoTs in KZN. This chapter is called the literature review chapter and the literature consulted provided global and local perspectives of the phenomenon being investigated. It is divided into sections which are relevant to the study. According to Hart (2018:3), the literature review is a process of analyzing, critically evaluating and synthesizing existing knowledge relevant to a research problem. The study identifies the gap in Systems Thinking literature where more emphasis is placed on the private sector context and there is little in terms of higher education institutions. Further to that, the study explores Systems Thinking as an alternative management approach for UoTs. The aim and objectives of the study have played an important role in shaping the process of reviewing the relevant literature for this study.

The study acknowledges the fact that UoTs operate in a continuously changing higher education environment. Lenka and Shawla (2015:265) emphasise that educational institutions are transforming themselves, striving for recognition and meeting higher academic standards. Internal and external factors have a direct impact on universities (Brits 2011:1290). It is therefore critical that each individual, each department and each function should help institutions to achieve their goals. Systems Thinking has since been identified as a strategic choice to respond to unpredictable and complex challenges. As emphasised by Langstrand (2016:197), SystemsThinking is a well-established management tool in the field of management.

Demonstrating the connection between the research objectives, research aim and the literature review is critical, hence this chapter illustrates that connection. This chapter therefore provides the context within which the study is conducted. The researcher was mindful of the fact that a literature review should involve a critical analysis, proper

engagement and evaluation of literature. Furseth and Everett 2013:77) state that critiquing the literature is critical to supporting the researcher's argument.

A literature review is a critical aspect of the thesis. Bui (2014: 120) points out that the literature review is more than just a summary, but the researcher has to critically evaluate and analyze literature for the purposes of creating a link between the research study (research elements) and the relevant literature. Scholarly journals, textbooks and research reports relevant to the research topic are some of the information sources that were used to place this study into its proper context. The approach as recommended by Furseth and Everett (2013:76) to start from general to specific in terms of the literature search and review was adopted by the researcher. This chapter is divided into relevant sections in line with the research variables and each section has relevance to the objectives of the study.

The purpose of this section was to introduce the chapter and place the study into its proper context in relation to the relevant literature. The next section unpacks and defines Systems Thinking.

## **2.2 What is Systems Thinking?**

Systems Thinking serves as an overarching management philosophy that stresses the connection between various elements into a coherent whole. This is a tool (Systems Thinking) that is used to understand both problems and opportunities (O'Brien and Marakas 2011:56). Systems Thinking is a trans-disciplinary model which is effective and applicable to different organisational contexts (Jackson 2011:13).

The study does not seek to challenge physical and structural elements of UoTs, but the focus is on the applicability of Systems Thinking. Diamond and Allcorn (2009) cited in Cilliers and Greyvenstein (2012:3) agree that silos are not physically present in organisations. However, they exist in the minds of organisational members. The point made by Forsten-Astikainen et al (2017:474) is that it is critical to promote connections that foster inter-organisational collaboration. This is what Systems Thinking is all about, to challenge silo mentality in organisations.

Like the concept of leadership that has various definitions, Systems Thinking has also been defined in many ways (Arnold and Wade 2015:670). Although there are divergent views on what ST is, there is a strong sense of agreement that it is an effective alternative to the reductionist model which fails to depict a situation or problem fully. Considering the objectives of this study, it is important to define and unpack Systems Thinking. In the words of Dr Forrester, as quoted by Arnold and Wade (2015:674), explaining that there is no clear definition of Systems Thinking. Nevertheless, Kafalas (2011:345) refers to Systems Thinking as a concept with three characteristics, namely a holistic view of the world; emphasis on interdisciplinary nature; and lastly a concept that emphasises interrelationships. In view of the fact that there are divergent views on what Systems Thinking is, Kafalas' views (2011:345) on its characteristics provide a clear explanation. In addition, Kafalas (2011:345) refers to Systems Thinking as a concept with different interpretations, as it is applicable to various disciplines.

Well-respected gurus, including Peter Senge, also agree that a definition of systems thinking should at least include interconnectedness, seeing wholes instead of parts (Arnold and Wade 2015:674). In the process of reviewing literature, a comprehensive definition has been identified. Behl and Ferreira (2014:105) define Systems Thinking as the ability to recognize, understand and synthesize the interactions as well as the interdependence in a set of components designed for a specific purpose. To draw from Robbins, Decenzo and Coulter (2011:449), they define System Thinking as a management approach that views an organisation as a system with a set of interrelated and interdependent parts arranged in a manner that produces a unified whole. Sterman in Palaima and Skarzauskiene (2010:332) defines Systems Thinking as a way of understanding reality, with a focus is on the relationships amongst the system's elements instead of focusing on individual parts.

In addition, Foster (2010:534) offers a simple definition which says that Systems Thinking or the systems view is a management viewpoint that focuses on the understanding of interactions between various components that interact to produce a product or service. In the context of an organisation, these interacting components are people, policies, machines and processes.

According to Peters (2014:1), Systems Thinking can be described as an enterprise aimed at seeing and understanding how elements or components are connected to each other within a whole entity. In addition, he indicates that the word 'system' originated from the Greek word "sunistanai", which means "to cause to stand together". This is important as Systems Thinking operates on the systems principle. It is therefore necessary to define a system. O'Leary and O'Leary (2014:422) define a system as a collection of activities and elements designed to accomplish a goal. On the other hand, a system has been defined by Certo and Certo (2009:66) as a number of interdependent parts or elements interacting within a whole for a purpose.

Based on these definitions, it makes sense to view organisations as systems. It is in this context that O'Brien and Makaras (2009:639) define a system as a group of people using machines and methods to accomplish a set of specific functions. It is for this reason that Sondhi (2006: 26) warns organisational members to always be mindful of the fact that organisational dynamics and the business environment are continuously becoming complex. He further suggests a holistic perspective as it allows organisations to develop effective solutions to complex challenges. Essentially, SystemsThinking capacitates decisions-makers with the ability to consider all the variables and their interconnectedness in the situation (Sondhi 2006:27).

This section defined and unpacked Systems Thinking. Interactions, inter-connectedness and interdependency are some of the characteristics of Systems Thinking. These characteristics of Systems Thinking have relevance in terms of how different elements of an organisation should function. The next sections outline the historical development of Systems Thinking.

## **2.3 Historical development of Systems Thinking**

This section covers the historical development of the systems thinking concept. It is for this reason that Hart (2018:33) stresses that understanding the history of the subject being investing is important. This provides a perspective on how the subject has developed. Systems Thinking was originally used in cybernetics and biology. According to Mingers (2006:11), Systems Thinking originated in the 1930s and the biologist von Bertalanffy was also influential in the development of the theory. This is a

management concept that originates from the study of biology (Schiuma, Carlucci and Sole 2012:8046). Capturing the historical development of the systems thinking concept is critical as this study explores this concept in the context of UoTs in KZN.

This study is significant as it explores a concept that was traditionally applicable to the field of biology, then adopted in the corporate sector and is currently applicable in all the sectors of the economy. Its effectiveness has stimulated an appetite for consideration by other sectors of the economy. Nguyen *et al* (2011:15) confirm that Systems Thinking is becoming popular. As a result, it has been adopted in many diverse fields. Systems Thinking empowers managers with the necessary capabilities to respond effectively to complex challenges (Schiuma, Carlucci and Sole 2012:8046).

The limitations of a Reductionism approach were the main reason for the emergence or development of a Systems Thinking concept. The problem with Reductionism was that it relied on breaking down the phenomenon (situation) into smaller parts or elements in order to understand cause and effect. This is contrary to Systems Thinking which relies on viewing the situation holistically (Flood 2010:269). The Systems thinking concept emerged in the twentieth century as an effective alternative to reductionism. Interrelatedness and interaction are key fundamentals of a Systems Thinking concept. Jackson (2011:11) reveals that System Thinking emerged in the 1940s and 1950s as the reductionist approach was failing to cope with complex challenges.

Providing historical development of the Systems Thinking concept, Nahavandi et al (2015:485) reveal that this concept became popular for organisations in the 1960s and 1970s. According to Skarzauskiene (2010:50), authors who were instrumental in the development of Systems Thinking theory include Bertalanffy, Beer, Forrester, Ackoff, Peter Senge and Gharajedaghi. Systems Thinking is also viewed as a convergent approach to understand and interpret complexity (Conti 2010:354). The rapidly changing business environment urgently requires a change in the management paradigm. Key factors of complexity require new management approaches. The challenge is that the Mechanistic model is deeply entrenched in organisations, although the conditions keep changing at a rapid pace. It is for these reasons Conti (2010:365) stresses that there is a mismatch between management approaches and

the challenges faced by modern organisations. Providing a historical development of Systems Thinking is critical for decision-makers, especially in the sectors where traditional approaches are still being used. This highlights when, why and how Systems Thinking as a phenomenon was developed.

Authors give different accounts on the historical development of Systems Thinking. Despite this point, one gets a sense of when systems thinking originated. The next section discusses Reductionism. It has been mentioned that Systems Thinking is an alternative to Reductionism. Therefore, it becomes necessary to unpack Reductionism. The following section discusses Reductionism.

## **2.4 Reductionism as the opposite of Systems Thinking**

Reductionism is the opposite of Systems Thinking. In this section, Reductionism is discussed at length. The aim is to unpack and understand reductionism, which is important for this study. The best thing about Systems Thinking is the fact that it focuses on parts and their relationships, as well as their interaction within the whole (Jackson 2011:4). Reductionism on the other hand focuses on individual parts and not the whole. This means that reductionism ignores the interactions, relationships and interdependency of parts within the whole. As a result, this approach promotes the fragmentation of organisational systems. According to Conti (2010:354), a lack of systems perspective promotes specialisation and fragmentation. The argument is that with this approach, the overall picture is lost, which means interdependence and the relationship of the components within the whole is ignored. Naicker and Mestry (2015:7) argue that the bigger picture perspective is lost where there is a lack of a systems culture. Challenging the mechanistic model, which is informed by reductionism, Nahavandi et al (2015:489) accentuate that there is a need for modern organisations to consider approaches that inspire flexibility, adaptiveness, as well as responsiveness. Those who studied the historical development of systems thinking as a concept, for example Flood (2010:269), explain eloquently that Systems Thinking has been identified as an alternative to reductionism.

The problem with Reductionism is breaking down system elements and studying them individually (Flood 2010:269). Challenging silo mentality, Selway (2011:540) is able to

articulate a number of factors to prove the shortcomings of the silo mentality which also result from Reductionism. In essence, Reductionism creates a limited perspective where people only think about what is happening in their departmental boundaries and ignore what is happening in other parts of the organisation. Given the forces for change in the business environment, Selway (2011:540) further emphasizes the importance of teamwork, where each individual staff member relies on others to achieve organisational or collective goals. Reductionism promotes a culture of competition, where people claim superiority over others, which does not help the organisation to achieve its strategic goals.

It is noted by Struwing and Cilliers (2012: 2) that 21<sup>st</sup> century organisations have become intertwined and interdependent. Collaboration across the organisation is critical and necessary for organisations in all sectors. A fascinating observation by Cilliers and Greyvenstein (2012:2) is that organisational silos are a prevalent phenomenon that has however not been thoroughly researched.

Organisational silos are an organisational practice where various organisational units or departments operate in a disconnected manner (Cilliers and Greyvenstein (2012:2). The view is that the traditional and mechanistic structure of organisations promotes a silo mentality. The reality is that in an organisation where there is a silo mentality, organisational members focus on their units or departments and not the organisation as a (whole) at large. Contrary to a silo culture, Systems Thinking stimulates the quest for a broader perspective. In other words, Systems Thinking empowers organisational members with an understanding of interactions between organisational parts, as well as the interactions between organisations and their environment. In their research findings, Togo and Lotz-Sisitka (2013:674) reveal that educational systems are predominantly grounded on a Reductionist approach. Adaptive capacity is critical to respond effectively to complex challenges. However, the reductionist approach does not promote flexibility as it is grounded on a mechanistic model. The Mechanistic model breaks the organisation into functional specialisations. For example, there would be marketing, human resources, production and operations departments. If that is the case, then people do not appreciate the interconnectedness of various units in an organisation.



The problem with silo mentality, as per Ciliers and Greyvenstein (2012:3), is that it creates an 'us and them' culture in an organisation. A conducive environment is necessary for various departments in an organisation to work together. Hence Gaffon and Cloete (2010:3) warn that functional silos should be eliminated in order to achieve organisational efficiency. Functional silos are also prevalent in universities. Ellis (2011:117) raises an interesting issue that many institutions of higher learning have a culture of defending academic turf. In other words, this implies that people defend their territories and barriers are always in place to discourage collaboration across the institution (Ellis 2011:17). Generally, there are strong views against Reductionism, which is dominant in some organisations. It is on the basis of complex challenges that alternative approaches are considered as the reductionist approach fails to deal with such challenges, which have impacted the operations of organisations in both the public and corporate sectors.

The preceding discussed Reductionism, which is being challenged for not being effective in dealing with complex challenges.

The next section presents Systems Thinking as an alternative to Reductionism.

## **2.5 Systems Thinking as an effective alternative to Reductionism**

There is a link between this section of the chapter and the research objective that explores Systems Thinking as an effective alternative to silo practices in UoTs. A System Thinking concept is effective in integrating different parts of an organisation and enhancing the performance of each part to achieve broader organisational goals (Douglas and Kerfoot 2008:53). It is well stated in the DUT strategic plan 2015-2019 (2015:4) that a university should appreciate and work closely with the community in which it is situated. Systems thinking is therefore important to inspire this kind of thinking in a university, the kind of thinking where stakeholders are considered at all times, especially when strategy is being formulated.

Commenting on the quality of service offered by HEIs, Min and Khoon (2013:994) argue that quality higher education is critical. The business of HEIs is to offer quality education and produce top class graduates. Although SystemsThinking puts more

emphasis on wholes, organisations still have hierarchical structures with bureaucracy, characterized by compartmentalized arrangements. However, in essence, Systems Thinking deals with the mindset instead of structural designs. Diamond and Allcorn (2010:208) describe an organisation not as an abstract collection of functions, but as an expression of the very real human and psychological qualities of its members. The higher education sector is becoming competitive and therefore effective strategies are necessary for higher education institutions to remain relevant.

Min and Khoon (2013:994) also maintain that universities are adopting approaches that have proven to be effective in the business sector. Globalisation and environmental factors have impacted significantly on the business of HEIs. The general observation is that universities are still relying on traditional approaches where departments operate in silos. The Systems Thinking concept has since been identified as a source of competitiveness. Stowell and Welch (2012: xv) put it succinctly that, indeed, the Systems Thinking concept has proven to be effective for both private and public organisations. Highlighting the importance of higher education institutions partnering with external stakeholders, Davis (2009:691) accentuates that this creates opportunities for knowledge exchange. Third-stream income generation is also critical for higher education institutions and hence partnerships with external stakeholders are important to generate such income. It be through the adoption of Systems Thinking that such partnerships could form and be sustained.

The student-centeredness philosophy at DUT highlights the university's commitment to providing students with a learning environment that is conducive to developing students intellectually, socially and emotionally (DUT 2015:5). This has an element of systems thinking as it considers the holistical development of students to become productive citizens. According to Hebel (2007:501), the benefits of Systems Thinking include the use of a holistic approach that considers all critical aspects of the business. The partnership between DUT and other stakeholders recognizes the importance of cross-sector collaboration to address some of the challenges faced by communities. It is expected that UoTs should also play a role in addressing societal problems. In its 2015-2019 strategic plan (DUT 2015:8), the university highlights its commitment to foster and embrace Systems Thinking through the adoption of a Learning Organisation philosophy.

Highlighted in its current (DUT) strategic plan is the commitment to foster and embrace Systems Thinking, taking into consideration the latest development in the higher education environment.

This section presented Systems Thinking as an alternative to Reductionism. The next section discusses the benefits of systems thinking.

## **2.6 Benefits of implementing Systems Thinking in an organisation**

Although literature reveals that Systems Thinking is becoming popular as it is adopted by organisations in some sectors of the economy, there are disadvantages to Systems Thinking. Highlighting some of the disadvantages, Hebel (2007:501) points out that systems thinking provides an open-ended framework which does produce defined actions. Another shortcoming of this concept is that it is generally viewed as something that is problem-centered. Despite these disadvantages, positive aspects of systems thinking far outweigh the disadvantages. Hebel (2007:501) further emphasises that Systems Thinking provides a model for conceptualizing the situation.

The key strength of the Systems Thinking concept is its ability to provide a holistic approach inspired by a clear understanding of all relevant aspects in a given situation. The appropriateness of systems thinking is not only at an organisational level, but also at a global community level (Zulauf 2007:498). In South Africa, government departments are partnering and collaborating to address complex challenges, for example HIV and Aids. The male circumcision project is a kind of intervention where traditional leaders, the Department of Health and universities are working together. Even at a community level, there are many challenges that require Systems Thinking. Consequently, indications are that Systems Thinking could be used at the organisational level, community, country and global community levels. Systems Thinking has also been described by Zulauf (2007:498) as a skill to see how the system (organisation) operates and also to plan better for future direction. This is something that is paramount for UoTs as it is also critical for organisational members to understand the full picture during strategy and policy formulation (Maon, Lindgreen and Swaen 2008:423).

According to Smith (2010:1), System Thinking stimulates the appetite and the appreciation of diverse views in any given situation. The use of diverse views is also known as the 'wisdom of the crowd' or 'collective wisdom'. Taking into consideration the importance of organisational efficiency, Gaffoor and Cloete (2010: 3) make an important point that functional silos need to be eliminated in order to ensure that organisational units and departments work together. In other words, it is critical to have organisational processes that are informed by Systems Thinking. However traditional ways of thinking are still prevalent in many organisations. The commitment of organisational members at all levels is an important ingredient to achieve organisational success (Gaffoor and Cloete 2010: 3) and Systems Thinking stimulates that commitment where members of the organisation strive to achieve organisational success.

For Systems Thinking, the focus is on the ability of organisational systems and sub-systems working interdependently to co-exist (Brits 2011:1288). This definitely produces desirable outcomes for the organisation. In addition, Brits (2011:1288) is of the view that management in an organisation has a significant role to play in terms of promoting Systems Thinking.

It has been articulated by Littledyke, Manolas and Littledyke (2013:368) that Systems Thinking facilitates the coordination of different elements within an organisation and also further promotes the integration of institutional processes for sustainability purposes. The failure of traditional approaches has forced organisations to look for alternatives. Complex challenges require flexible strategies that are informed by a clear understanding of the situation as a whole. UoTs are unfortunately still operating with and using outdated approaches. The command and control approach focuses on functional boundaries. It is on these bases that Systems Thinking is viewed as a cornerstone that serves as a catalyst to transform the way of thinking in a Learning Organisation (Govender 2009:369). Surely this applies to other types of organisations as well.

This section highlighted the benefits of applying Systems Thinking in an organisation. One of the key benefits is facilitating the formulation of a flexible organisational strategy

to respond to complex and dynamic challenges. Therefore, the next section deals with functional boundaries in organisations. Functional boundaries are where organisational functions are designed according to areas of specialization. Systems Thinking serves as a catalyst to encourage cross-functional collaboration in an organisation, across boundaries.

## **2.7 Systems Thinking and functional boundaries from an organisational perspective**

The focus of the Systems Thinking concept is not on the structural designs and physical aspects of the organisations, but the mindset and attitude of organisational members to view organisations as systems. Relationships, interdependence and challenging functional boundaries are some of the characteristics of Systems Thinking. With Systems Thinking, members of the organisation are inspired to collaborate beyond their functional boundaries. According to Smith (2010:6), Systems Thinking capacitates individuals to transform the way of viewing the world around them. This then informs how they can deal with a complex situation, particularly in an organisational context. In other words, they look beyond functions boundaries.

Greenberg and Baron (2003) cited in Cilliers and Greyvenstein (2012:2) contend that the hierarchical structure of an organisation is a model that came in to being in the 1950s. This is where an organisation has layers or levels of positions from the top to bottom arrangement. According to Cilliers and Greyvenstein (2012:3), the top level has more power and influence. It is also important to stress that silos exist in the minds of organisational members and not in the physical structure of the organisation.

There are strong and convergent views indicating that the Systems Thinking concept capacitates organisations to adapt to opportunities and challenges in a rapidly changing business environment (Maon, Lindgreen and Swaen 2008:415). Besides focusing on the core business, Maon, Lindgreen and Swaen (2008:413) explain that organisations are under constant pressure to also address other societal issues. Likewise, HEIs are under constant pressure to go beyond their core business and assist to solve societal problems. This could be in the form of a community outreach programme. It is for this reason that they describe organisations as open systems,

hence organisations face internal and external challenges. Systems Thinking promotes institutionalized attitudes to view an organisation as a system.

Therefore, Systems Thinking is relevant for modern organisations as they face multifaceted challenges (Senge 2006:268). Thinking beyond functional boundaries and collaboration in the organisation are critical. Hence Dalton (2010:170) emphasises that Systems Thinking creates awareness and a sense of understanding that actions in one part of an organisation will have consequences in other parts of the same organisation. This is crucial for UoTs as departments and faculties still operate in silos. It is in this context that Littledyke, Manolas and Littledyke (2013:367) raise the important point that Systems Thinking coordinates multi-aspects of the organisation's processes and operations. In essence, Systems Thinking facilitates the integration of various institutional practices into an internalized and streamlined approach informed by systems principles. Systems Thinking provides a holistic perspective, which is necessary to solve complex problems. Hence, Sondhi (2006:26) reiterates that a holistic perspective is important during strategic thinking and decision making.

This study focuses on Systems Thinking in the context of UoTs, which operate in an environment that is dynamic. Hence new approaches and new way of thinking should be considered. DUT is confronted by challenges which affect all universities locally and globally (DUT 2015:3). It has been accentuated by Skarzauskiene (2010:49) that private and public organisations operate in an environment characterized by high competitive pressure. Critical indicators point to the fact that higher education institutions are facing complex challenges (Davis, Dent and Wharff 2015:334). Mechanistic and traditional approaches fail to deal with complex challenges in the rapidly changing higher education environment. Hence the study intends to determine the applicability of a Systems Thinking approach in the context of the UoTs in KwaZulu-Natal.

Given all the other factors that characterize the higher education environment, Bitzer (2010:16) explains that universities are under constant scrutiny from external stakeholders. Being subjected to such scrutiny therefore means it is necessary for universities and UoTs to respond effectively to the needs of the stakeholders. Clare and Sivil (2014:60) raise the issue of transformation in higher education, particularly in

South Africa. It is with this understanding that McKenna (2014:6) highlights the importance and transformational role to be played by institutions of higher learning, particularly in South Africa. Clare and Sivil (2014:60) further mention the issue of South African higher education having to meet international norms. Adopting different approaches is critical given the circumstances. A Systems Thinking concept is necessary to understand the nature of how organisations operate as systems. Langley et al (2009:77) elaborate that services and products are a result of complex systems with various elements including people, procedures and equipment that interact to achieve organisational goals. Interaction, interdependence and interrelationships are the key factors that informs the Systems Thinking concept.

The concept of Systems Thinking is relevant to the organisational context as Langley (2009:77) clarifies that organisations are made of departments or units, organisational members, equipment and procedures. In a SystemsThinking context, organisations are treated as systems. Likewise, universities are a system with systems and sub-systems. Universities are made up of faculties, academic and administration departments. In the words of Brits (2011:1288), integration of various functions is necessary, therefore, Systems Thinking is applicable to universities. Worth noting also is the fact that Brits (2011:1288) further emphasises that universities' success depends on sub-systems appreciating their interactions and also valuing their interdependence. This is the core principle of Systems Thinking.

Peter Senge's theoretical framework influences this study. Arnold and Wade (2015:674) describe Peter Senge as a well-respected guru in the field of Systems Thinking. Hence, Arnold and Wade (2015:674) eiterate that Peter Senge played a critical role in the historical development of the concept of the Learning Organisation. They further point out that systems thinking is indeed one of the elements of the Learning Organisation concept. The general understanding is that SystemsThinking stimulates the kind of thinking where an organisation is viewed as a system.

Fascinating to note is that Peter Senge was successful in incorporating Systems Thinking into management science, organisational change and learning theory (Caldwell 2012:151). The study explores Systems Thinking as a concept, but not different systems methodologies. According to Reynolds and Holwell (2011:129)

systems methodologies include the Viable Systems Model (VSM), Soft Systems Methodology (SSM) and Critical Systems Heuristics (CSH). These are a few examples of Systems Thinking methodologies.

Systems Thinking has caught the attention of other sectors of the economy. Behl and Ferreira (2014: 105) provide a list of sectors that have adopted Systems Thinking including education, healthcare and project management amongst others. To support this point, Nguyen *et al* (2011:15) argue that the Systems Thinking concept has become popular to manage complex problems in different sectors. The concept is receiving attention from organisations simply because traditional management approaches focus on one aspect of the organisation and relationships between various parts of the organisation are ignored. Badenhorst *et al* (2004:136) is of the view that those who developed System Thinking envisioned the organisation as made up of interrelated and interacting parts to achieve a common purpose. This highlights the importance of understanding the interaction between organisations and their environment, as well as the interactions of various units within an enterprise.

In a Systems Thinking context, one part influences the other parts of the organisation. Using a university setup as an example, what happens in the student admissions department in a way impacts on other university operations. Given the complexity and rapid changes confronting organisations in all sectors, Systems Thinking informs strategy formulation that encompasses an appreciation and understanding of all aspects of a complex situation (Nguyen *et al* 2011:15). Focusing on individual parts and ignoring their interactions and relationships with other parts will not provide organisations with effective solutions. This argument is supported by Mingers and White (2009:1148) who emphasise that in Systems Thinking, the emphasis is on understanding relationships and interactions of parts instead of individual parts of the system. The understanding is that a silo mentality is prevalent in the UoTs. Hence Systems Thinking is used to instill a culture of cross-functional collaboration.

This section has particular relevance to the research objectives as it deals with functional boundaries that are informed by traditional ways of thinking in organisations. Systems Thinking serves as a catalyst to encourage cross-functional collaboration in



an organisation. The next section deals with Systems Thinking in the context of the higher education environment.

## **2.8 Systems Thinking in the higher education environment**

In essence, Conti (2010:366) emphasizes the need for transforming organisations from mechanistic models to management models that allow flexibility to deal effectively with complex and ever-changing societal needs. This includes HEIs. To stress his point, Conti (2010:366) makes a very profound statement that “without changing our patterns of thought, it is impossible to solve problems that we have created with our current patterns of thought”. The literature, particularly Conti (2010:366), argues that a Systems Thinking concept stimulates the thinking and a culture where organisations are viewed as systems. As such, an organisation should be viewed as a system. There is therefore a need to transform mechanistic thinking and embrace Systems Thinking, given the rapidly changing environment in which organisations operate.

Systems Thinking recognises the interconnectedness and interdependence of all the elements of a system (Naicker and Mestry 2015:2). To further illustrate the problem of Reductionism which focus on individual parts, Naicker and Mestry (2015:2) provide an example of a Change Management model that was used in schools. This model failed to produce the desired outcomes because the focus was on individual schools. This proves that challenges faced by organisations in different sectors require new approaches.

Protest actions at South African universities at the beginning of the academic year, (2016) highlighted complexity in the higher education landscape. The main issue was the #feesmustfall campaign (where students protested and demanding that universities should not increase tuition fees in South Africa). Subsequently, students demanded free higher education and decolonized education. This is another example of a complex challenge that requires a Systems Thinking approach.

The issue of fees at the universities cannot be solved effectively using traditional and reductionist approaches. In sourcing outsourced workers especially cleaners and security guards, is another complex matter requiring a Systems Thinking approach in

higher education. In fact, a Systems Thinking approach at the level of government and also the university level will be the best option. Johl, von Solms and Flowerday (2014:129) are therefore correct to state that the higher education environment is generally highly complex. In the context of the fees must fall students' campaign, any intervention will have serious consequences for the UoTs. Here, the researcher is highlighting some of the complex challenges faced by UoTs and other higher education institutions. Accommodation for students is another complex issue in HEIs and this cannot be solved using a Reductionist approach.

Improving quality in higher education requires multi-dimensional approaches. It is in this context that Mouyabi (2010:1179) argues that relevant stakeholders should always be considered when decisions are made at HEIs. In fact, the core functions of a UoT is learning, teaching and research. Embracing Systems Thinking concepts therefore makes it necessary for the UoTs to consider students, staff, facilities, the environment and all other relevant stakeholders in decision-making processes. Nguyen et al (2011: 14) describe the environment in which organisations operate as becoming complex, rapidly changing and with a need to consider diversity. These are the factors that should always be considered for strategy formulation and policy-making processes. In addition, Nguyen et al (2011:15) recommend Systems Thinking as it offers a holistic view to capture and understand all the dimensions of a complex situation. This becomes critical to inform the process of strategy formulation and decision-making.

Describing the value of Systems Thinking, Arnold and Wade (2015:670) maintain that researchers are of the view that SystemsThinking is critical to dealing with complex challenges. It is also interesting to note that there is even a need for the members of the public to understand Systems Thinking (Arnold and Wade 2015:670). HEIs should play a role in producing graduates with Systems Thinking skills. In a rapidly changing higher education environment, becoming responsive and remaining relevant is a strategic imperative and vital for universities (DUT 2015:4). Operationalising System Thinking is paramount in UoTs, as Keeling, Underhile and Wall (2007:24) point out that departments in the universities compete instead of collaborating. The culture of departments competing in a university is a direct opposite of the System Thinking principle. Universities are systems that interact with the external environment. Therefore, understanding the internal university environment and trends in the higher

education landscape is vital. According to Brits (2011:1290), external elements are unpredictable, and they have an impact on university operations. In pursuit of excellence, collaboration between universities and external stakeholders is important (Manring 2013:125). This points to the fact that SystemsThinking is relevant, and it is a strategic option for universities. It is encouraging to note that in Business Colleges at some universities, Systems Thinking is being taught as one of the modules. Hence, Seiler (20011:60) mentions that System Thinking modules prepare university students to become effective in a competitive business environment.

It has been well articulated by Kock and Roux (2012:107) that sharing best practices and enhancing organisational effectiveness leads to organisational adaptability. The Systems Thinking concept in actual fact fosters collaboration and the sharing of best practices in an organisation. Brits (2011:1295) is of the view that silo practices in UoTs could be dealt with effectively through the application of System Thinking. Viewing the university holistically and understanding the interactions and interrelationships of various departments is critical for the university. In the words of Bui (2010:234), Systems Thinking concept could be used to bridge the gap between the academic and administrative staff in the university, although it could also be used as an overarching philosophy that helps university stakeholders to understand the dynamics in higher education system.

Program evaluation is another area in the university context where SystemsThinking could be used. Upon receiving programme review reports, relevant stakeholders could work together on a quality improvement plan. It is for this reason that Dyehouse et al (2009:187) recommend Systems Thinking to deal with complex challenges within a multifaceted context like a university. Those who understand Systems Thinking argue that linear approaches are not effective for program evaluations at the university. The complexity of the education system requires System Thinking, hence Dyehouse et al (2009:187) highlight that traditional models have failed to deal with complex challenges. The use of systems thinking allows program review members to understand the interaction as well as interrelationships of multiple elements that make up complex programs. This is the case in the universities where many factors should be considered when programs are being evaluated and modified.

In the modern world, organisations are viewed as systems that influence the environment, whilst they (organisations) are also being influenced by the environment (Skarzauskiene 2010:50). Empirical evidence from the study conducted by Davis, Dent and Wharff (2015:351) proves that the Systems Thinking concept has a positive impact in enhancing organisational performance. Bui and Baruch (2010:234) espoused the view that Systems Thinking is not prevalent in higher education. However, it has been adopted and implemented successfully in some countries.

This study is therefore necessary to explore that niche area: the applicability of Systems Thinking in the UoTs. While Bui and Baruch (2010:236) are of the opinion that Systems Thinking is predominantly prevalent in the corporate sector, it could be instrumental in HEIs as they compete at national and global levels. In relation to the transformation of a curriculum, Bazalek et al (2010:1024) suggest something they call inter-institutional, inter-disciplinary and collaborative approaches. These suggestions are in line with the Systems Thinking concept. Although this section highlighted a few challenges faced by higher education institutions, particularly in South Africa, there are in fact many challenges, which are mostly complex and unpredictable.

This section places Systems Thinking in the context of UoTs, while the next section discusses the influence of Systems Thinking in stimulating knowledge-sharing at UoTs. The next section discusses knowledge management, a concept that is relevant to Systems Thinking. Systems Thinking stimulates a culture of knowledge sharing in an organisation. The purpose is to demonstrate that systems thinking does inspire the sharing of knowledge in an organisation and thus there is relevance between this section and the research objectives

## **2.9 Knowledge management in a UoT context**

Systems Thinking plays a critical role in promoting a culture of knowledge-sharing in an organisation. As mentioned previously in this study, Reductionism discourages cross-functional collaboration and as a result knowledge-sharing becomes difficult. One of the research constructs for this study is knowledge-sharing. Many organisations have units or departments that are only responsible for the research and development of new products or services. Therefore, it is important to cover Knowledge

Management in the context of a Systems Thinking philosophy. Knowledge Management (KM) is critical for universities to become competitive in an increasingly competitive higher education environment. Hence knowledge management is generally described as a strategic lever for continuous improvement of the organisation's performance. The understanding is that with systems thinking, organisational members should be willing to share knowledge to improve organisational effectiveness. The aim is not to discuss Knowledge Management as a separate concept. However, in the spirit of Systems Thinking, knowledge should be shared at all levels across the institution. Systems Thinking creates a conducive environment for knowledge-sharing. Hence knowledge-sharing improves organisational effectiveness. It has been argued by Mosala- Bryant and Hoskins (2017:1) that knowledge contributes to the success of any organisation. Knowledge Management has been described by Gaffoor and Cloete (2010:3) as a management philosophy that has the ability to impact all the aspects of an organisation. Furthermore, Knowledge Management serves as catalyst for achieving organisational effectiveness. It is therefore important to discuss Knowledge Management in this section.

Institutional knowledge is a critical component and a source of competitive advantage for UoTs. The link between Knowledge Management and Systems Thinking is that the latter stimulates a culture of knowledge-sharing, where people think beyond departmental boundaries to achieve broad organisational goals. In light of this, Gaffoor and Cloete (2010:3) demonstrate a link between Knowledge Management and SystemThinking as they stress that for knowledge management to be effective, functional silos need to be eliminated. There is also a strong link between Knowledge Management and a Learning Organisation, of which Systems Thinking is a part. As noted by Takawira, Coetzee and Schreuder (2014:2), Knowledge Management involves the identification of knowledge, knowledge acquisition, development, retention and knowledge transfer. In discussing the Knowledge Management concept further, they stress that it allows for better decision- making, which leads to quality academic programmes and improved academic services.

Shiuma and Carlucci (2012:8049) present an argument that the Systems Thinking concept is a catalyst for the effective management of knowledge in an organisation. For organisations to survive and remain competitive, the adoption of a Knowledge

Management concept is critical. In addition, Chong, Yuen and Gan (2014:203) have identified Knowledge Management as a strategic option for organisations. They further stress the importance of a conducive environment to stimulate knowledge-sharing across the organisation. Therefore, organisational infrastructure and resources should be made available to enable knowledge-sharing. Organisations could make use of technology to manage knowledge effectively. Chong, Yuen and Gan (2014:207) put it succinctly that higher education institutions experience similar challenges as in the business sector in terms of barriers to knowledge-sharing.

According to research conducted by Chong, Yuen and Gan (2014:207), bureaucracy in HEIs is seen as one of the barriers to Knowledge Management. Furthermore, in terms of factors that hamper knowledge-sharing, Chong, Yuen and Gan (2014:211) highlight a lack of recognition and rewards as barriers to knowledge sharing in an organisation. In the context of Systems Thinking and knowledge-sharing Nahavandi et al (2015:485) provide an insightful argument that individual members in organisations have useful insights that should be shared. The willingness and commitment to share knowledge will lead to improvements in organisational performance. Hence Davis (2009:683) confirms that through knowledge-sharing practices, organisations are able to enhance their performance.

Gaffoor and Cloete (2010:3) agree with this view as they describe knowledge management as a critical philosophy to improve organisational performance. Despite the positive impact of the Knowledge Management philosophy, this should be supported by the creation of conducive and supportive organisational cultures. However, there is empirical evidence that a Knowledge Management philosophy has also been adopted in certain government departments and municipalities (Gaffoor and Cloete 2010:5). There is a strong view that effective Knowledge Management stimulates new thinking for organisational effectiveness and innovation. Dalton (2011:166) postulates that Honda and Canon are some of the organisations that have adopted a Knowledge Management philosophy as generating and utilizing information is becoming increasingly critical for organisations to gain competitive advantage (Gaffon and Cloete 2010:1). Knowledge Management is important, given the challenges and the rapidly changing environment in which organisations operate.

This section recognizes that in an organisation where Systems Thinking is adopted there is a possibility of having a conducive environment for knowledge-sharing. The next section discusses the influence of Systems Thinking in promoting Communities of Practice (CoPs) in an organisation.

### **2.9.1 Communities of Practice (CoPs) and Systems Thinking**

Communities of Practice are part of Knowledge Management concept. They are a critical element of the Knowledge Management philosophy. Systems Thinking is indeed a catalyst for knowledge-sharing in an enterprise. In line with the spirit of Systems Thinking, CoPs help to bridge organisational boundaries to facilitate and increase the development of collective knowledge across the organisation (Conner and Clawson 2004:41). The CoP concept has been identified by Laquinto, Ison and Faggian (2011:4) as an effective model to promote knowledge-sharing in an organisation. Jashapara (2011:340) defines CoPs as groups of people who have a common vision, common concerns and who interact informally on an ongoing basis. The very fact that they share a common vision generates enthusiasm to intentionally work together for the benefit of their organisation. This study explores Systems Thinking which stimulates the appreciation for information-sharing across the organisation. Collaboration, information sharing as well as the sharing of expertise are critical to gain competitive advantage and they are the key elements of CoPs. There is no doubt that Systems Thinking is in fact a catalyst for collaboration across organisations, which also includes collaboration of units or departments within an organisation.

Observations by Laquinto, Ison and Faggian (2011;4) are that the CoPs model has been adopted by private sector organisations and academia. The benefits of CoPs include skills development, sharing of best practices and talent retention. In discussing CoPs, Laquinto, Ison and Faggian (2011:4) iterate that this model is also applicable to a diverse context. Likewise, Systems Thinking has been described as a concept that is relevant to a diverse context. The CoPs concept puts strong emphasis on collaboration and knowledge-sharing (Laquinto, Ison and Faggian 2011:5). There is a strong relationship between a Systems Thinking concept and CoPs as both concepts challenge the compartmentalization of expertise and silo practices. Systems Thinking

is seen as a contributing factor in the functioning of the CoPs. In the context of CoPs, people look beyond job descriptions and functional areas. They commit themselves to broader organisational goals instead of focusing on their functional boundaries.

The CoPs are inspired by Systems Thinking and how they operate is informed by understanding the value of interaction and interdependence to achieve organisational goals. Languinto, Isom and Faggian (2011:6) point out that CoPs are even relevant in the world and country context. Given global challenges, CoPs have been considered in some instances to deal with poverty, diseases and climate change. To enhance productivity and to gain competitive advantage, ST serves as a catalyst and a strong factor that binds organisational departments or units together (Mohamed, Stankosky and Murray 2004:127).

The CoPs are an informal and friendly network of organisational members with a shared vision to add value and improve organisational processes as well practices. These are people who are willing to share their knowledge and best practices (Gelin and Milushova 2011:7). The understanding is that organisational departments are interrelated, hence this should be a driving force behind the formation of CoPs. In the CoPs, members learn from one another. The other benefits of the model is collaboration that prevents the wastage and duplication of resources, as well as the unnecessary re-invention of the wheel, drawing from Bitzer (2010:27) where he puts it that the CoPs concept is appropriate in the university. By internalising the concept of CoPs, it becomes possible for staff to participate in organisational activities beyond their normal patterns of their work.

Universities face multifarious challenges and remaining competitive is important. This section of the study highlights the link between Systems Thinking and Knowledge Management. The Systems Thinking concept does have an impact in terms of the effective sharing of information across the organisation. It is on these bases that Omerzel, Biloslavo and Trnavcevic (2011:113) argue that successful organisations are the ones that have a strong knowledge-sharing culture. The effective management of knowledge is necessary, given the challenges faced by organisations in all sectors of the economy. Knowledge Management is in actual fact a management concept. It is a concept that facilitates the creation, transfer and sharing of knowledge across the



organisation (Govender 2009:371). Also, worth mentioning is a conducive environment and appropriate organisational culture which are vital to ensuring the successful management of knowledge in an organisation. Lewis (2016:209) makes an interesting observation that working together in a positive way helps members of the organisation to form stronger social bonds. Systems Thinking serves as an overarching philosophy that promotes a sense of community in an organisation.

This section discussed Knowledge Management and CoPs. The next section presents the Learning Organisation philosophy in the context of UoTs. Systems Thinking is part of a Learning Organisation philosophy.

## **2.10 Learning Organisation philosophy in an organisation**

It is important to capture a theoretical perspective of a Learning Organisation (LO) philosophy, since Systems Thinking is one of its five critical elements. In a Learning Organisation context, Systems Thinking is commonly known as the fifth discipline. Systems thinking and a culture of learning in an organisation are closely related (Hebel 2007:501). In a highly competitive and rapidly changing environment, a knowledgeable workforce is critical for organisations to survive (Khoza 2012:27). The Learning Organisation philosophy is viewed as a solid foundation that stimulates a culture of continuous learning and sharing of knowledge across the organisation. Dalton (2011:168) states that the Learning Organisation has been defined in many different ways.

According to Certo and Certo (2009:68), a Learning Organisation is an organisation that excels in developing, acquiring and transferring knowledge across departments, which leads to a modification of employee behavior to manifest new insights. On the other hand, Jashapara (2011:342) defines a Learning Organisation as an organisation that sustains its competitive advantage through learning faster than competitors.

Robbins et al (2009:538) defines a Learning Organisation as an organisation that continuously develops its capacity to adapt and change. It is critical to include Peter Senge's definition of a Learning Organisation. Hence, he is regarded as one the authors who popularized the Learning Organisation philosophy. Therefore, Senge

(2006:3) defines a Learning Organisation as an organisation where people continuously expand their capacity to produce the results they desire, where new thinking is nurtured, collective aspiration is openly set free and where people continually learn together. According to Dalkir (2011:470), a Learning Organisation is one that possesses practices, systems and a culture that inspires its members to share knowledge and experiences to achieve quality performance. Through the application of a Learning Organisation, the organisation is able to achieve effectiveness and success.

Unpacking the Learning Organisation philosophy, Certo and Certo (2009:69) explain that it is built on five features: systems thinking, shared vision, mental models, team learning and personal mastery. These are important as they confirm that Systems Thinking is an essential element of a Learning Organisation. It also plays a critical role in integrating all the other elements of a Learning Organisation. In an organisational context, Systems Thinking inspires members of the organisation to understand how each of them contribute to the bigger scheme of things to achieve organisational goals (Certo and Certo 2009:69).

A *shared vision* is essential as it generates sincere commitment to achieving a common organisational goal. *Mental Models* are the element of a Learning Organisation philosophy that motivates organisational members to challenge the status quo and search for new and effective ways to perform their tasks. *Team learning* is therefore all about teamwork and collective spirit. Lastly, *Personal Mastery* helps members of the organisation to have a clear understanding of their responsibilities and as a result organisational goals are achieved. Senge (2006:4) raises a critical point that becoming a Learning Organisation is important for organisations as the business environment in which they operate has become dynamic, interconnected and more complex. Given this background, Senge (2006:4) warns that organisations that will truly excel in the future will be those that discover how to tap people's capacity and to encourage continuous learning at all levels in an organisation. The list of top companies that have adopted a Learning Organisation philosophy include Xerox, IBM and Kodak (Senge 2006:4). Further to the list of Learning Organisations, Liker and Franz (2011: xxvii) refer to Toyota as an example of organisations that have been transformed into

learning organisations. Innovation, continuous improvement and adaptability are critical elements of organisational culture at Toyota.

Greenberg (2011: 604) provides a list of other top organisations that have adopted the learning organisation philosophy and that includes General Electric, Xerox, Ford, Motorola and Wal Mart. The important aspect of the learning organisation is the spirit and the commitment to share ideas freely. From their perspective Certo and Certo (2009:69) successful organisation that have adopted learning organisation philosophy include Honda, General Electric and Corning. In addition Greenberg (2011:604) states that in a learning organisation new ways of thinking are encouraged. The learning organisation philosophy generates a sense of community where, organisational members commit themselves to achieve organisational effectiveness and competitiveness. The ability to adapt and respond effectively to complex challenges is critical and the learning organisation philosophy as stated by Greenberg (2011:604) enables the organisation to gain competitiveness.

Drawing from the views of Dalton (2011:169) learning organisation philosophy stimulates collaboration across the organisation. Collaboration is critical as Davenport (2005:175) notes that in most organisations there is a lack of collaboration across units or departments. Therefore, it is important to explore a systems thinking. To reinforce a sense of learning community in an organisation, there should be a strong sense and reliance on insights from all relevant stakeholders. It is therefore important to consider the views of stakeholders during the process of decision making. Articulating the characteristics of a learning organisation, Dalton (2011:168) includes factors such as systematized learning, striving for competitive advantage, shared learning and learning for empowerment which has to happen at all levels and across the organisation. These characteristics are important to understand the learning organisation. Hence there are many different definitions of a learning organisation.

Employee motivation helps employees to learn at an individual level or as a collective. Their full understanding of the business environment is the driving force that inspires learning organisation. It is for these reasons, Bak (2012:163) explains that in a learning organisation member contribute and inspire continuous learning. Understanding of internal and external environment is critical as this shape the behavior and attitudes of

employees to help the organisation achieves its goals. The learning organisation philosophy challenges Frederick Taylor's scientific management where only experts are expected to think while ordinal members are regarded only as doers (Liker and Franz 2011:21). In a university context, great ideas are generally expected only from people in the upper echelons, for example deans, HoDs and professors. Flexibility and responding promptly to environmental challenges is critical and that should inform processes and practices in a Learning Organisation. There is a sense that it will be difficult to unlearn ideas learnt from the Scientific Management approach. Liker and Franz (2011:20) view flexibility as a vital organisational ability in global competition.

Challenging the Mechanistic view of the organisation, Liker and Franz (2011:95) disapprove of it as this is a model where the emphasis is on rules and procedures. Surely any deviation from rules and procedures is a punishable offence. The problem with this mentality is that organisational members are not encouraged to experiment and learn from the mistakes. The mechanistic view allows for rules and procedures to be formulated by privileged and elite bureaucrats, while inputs from ordinal employees is ignored. The emphasis is on command and control. It has to be emphasized that the Mechanistic view is definitely against the spirit of a Learning Organisation philosophy. According to Liker and Franz (2011:84) the Mechanistic view in an organisation provides a limited perspective of the situation as interactions and interrelationships between parts is ignored. This is what Systems Thinking was developed to deal with.

There are multifarious definitions of a Learning Organisation in the literature. Hence Limwichtir and Broady-Preston (2015:481) reiterates that there are divergent views on defining a Learning Organisation. However, there is agreement in the fact that every definition emphasizes Continuous Learning for improving organisational performance. This is critical for UoTs. Most learning organisation definitions highlight collective learning and experimentation with new approaches. Greenberg (2011:604) defines a Learning Organisation as an organisation that is successful at acquiring, cultivating and applying organisational knowledge to adapt to environmental changes. This is why knowledge-sharing is discussed in great detail in one of the sections of this chapter. However, Manning and Curtis (2012:350) describe a Learning Organisation as an organisation that continuously searches and implements effective ways to improve its

operations and practices. It has been mentioned that DUT has adopted the Learning Organisation philosophy.

This background information is vital to demonstrate a link between the Learning Organisation philosophy, Knowledge Management and Systems Thinking concept. Systems Thinking challenges organisational members to think beyond individual level, beyond teams, beyond their departments and even beyond the organisational boundaries (Bak 2012:169). Worth mentioning is that Certo and Certo (2009:68) highlight the benefits of the LO philosophy as follows:

- organisational members are encouraged to experiment with new ideas;
- learning from past experiences is part of organisational culture; and
- organisational members learn from one another.

This section has highlighted the impact and influence of a Learning Organisation philosophy in challenging the Mechanistic view in an organisational context.

The next section deals with the connection between Systems Thinking and a Learning Organisation philosophy.

### **2.10.1 Systems Thinking as a critical element of a Learning Organisation concept**

As mentioned in the previous section, Systems Thinking is part of a Learning Organisation concept, Caldwell (2013:155) support this argument as he believes that Systems Thinking and the Learning Organisation are synonymous. Higher education institutions are not profit-making organisations. However, there are factors that force these institutions to differentiate themselves from their competitors (Dunnion and O'Donovan 2014:24). Besides dealing with competition from other HEIs, UoTs have to meet the needs of the stakeholders in order to demonstrate that Systems Thinking is part of a Learning Organisation. Caldwell (2012:145) describes Systems Thinking as the heart of the Learning Organisation. An interesting observation is that ST is viewed as a cornerstone of the LO (Caldwell 2013:146). Systems Thinking is further described as a framework to appreciate interrelationships and seeing patterns of change instead of static snapshots. Most importantly, it serves as a conceptual cornerstone that integrates the other four disciplines of a Learning Organisation into a coherent whole.

Institutions of higher learning are made of interrelated elements that should function as a system. Discussing the link between a Learning Organisation and Systems Thinking, Bui and Baruch (2010:208) put it succinctly that Systems Thinking is the foundation on which the LO should be built. In a fast-changing business environment, the Learning Organisation has been adopted by organisations to deal with change. Given the influence of Systems Thinking, Bui and Baruch (2010:218) point out that there are organisations that provide SystemsThinking training to enhance organisational performance. Brits (2011:1288) recommends Systems Thinking for institutions of higher learning in South Africa. This on the basis that Systems Thinking should be used to integrate various functions in the institutions. Hence Bui and Baruch (2010:218) emphasise that formulating an organisational strategy will be a difficult task without Systems Thinking.

The purpose of this section is to demonstrate the link between Systems Thinking and the Learning Organisation philosophy. Despite the fact that this study explores Systems Thinking, it is important to note that Systems Thinking is part of a Learning Organisation philosophy. The next section discusses the use of Systems Thinking in formulating effective organisational strategy.

## **2.11 Systems Thinking concept as a strategic option for organisations**

Modern organisations continue to encounter multifaceted challenges where they are expected to deal with internal and external challenges (Maon, Lindgreen and Swaen 2008:413). Beyond focusing on internal organisational processes and practices, organisations have a role to play in terms of addressing complex societal challenges. Liker and Franz (2011:84) argue and challenge Mechanistic thinking. In their view, an organisation is an open system that constantly interacts with its environment. It is therefore necessary for the organisations to have flexible processes and policies to allow adaptation. Likewise, UoTs face unpredictable challenges. UoTs play a vital role in this regard by producing knowledgeable graduates and also through community outreach programmes. Another important area where UoTs play an important role is in research to find solutions to societal problems.

The Systems Thinking concept has proven to be effective for both private and public organisations. Hence Senge (2006:67) views System Thinking as critical for an organisation to deal with complexity. Systems Thinking also serves as a catalyst to transform traditional thinking from seeing elements individually to seeing wholes (Senge 2006:69). Seiler (2011:55) clearly states that business organisations have adopted Systems Thinking as a strategic option to maintain competitiveness in a turbulent environment. In essence, the environment in which UoTs operate is also characterized by a number of challenges.

Kinicki and Williams (2013:62) point out that in the Systems Thinking perspective, an organisation is regarded as a system with interconnected and interacting parts to achieve a common goal. It provides a holistic perspective of an organisation and, as a result, it informs strategy formulation and decision-making processes (Stowell and Welch 2012: xv). According to Seiler (2011:55), Systems Thinking has been adopted by organisations in various sectors of the economy. To mention examples of sectors where systems thinking has been adopted, Skarzauskien (2010:51) includes medicine, engineering, art, political science, as well as psychology. In the tourism sector as well a Systems Thinking approach has been identified and adopted (Peric and Djurkin 2014:484). In his analysis of the Systems Thinking concept, Dalton (2010:170) emphasises that it conditions organisational members to understand that actions in one part of the organisation will have an impact in other parts of the organisation. This understanding is important for UoTs where functional silos are still prevalent.

The important aspect of a Systems Thinking concept is the fact that it allows members of the organisation to consider all the various elements of the situation instead of just one element (Skarzauskien 2010:51), especially during strategy formulation and decision-making. According to Peric and Djurkin (2014:484), Systems Thinking provides a holistic view and as result, it becomes possible to engage all relevant stakeholders in the planning and decision processes in an organisation. In other words, Systems Thinking creates a link amongst different parts to a single and understandable whole. It is critical for universities to remain competitive. Hence Min and Khoon (2013:994) state that higher education has been affected by globalisation and other environmental factors. They further put it succinctly that HEIs are now adopting concepts that were once relevant only in the private sector. The intention of the study

is also to explore an alternative approach to help UoTs to achieve their strategic objectives and responding effectively to complex challenges. DUT embraces a Learning Organisation philosophy of which Systems Thinking is a critical part.

Research findings by Mingers (2010:1135) show that Systems thinking is also effective in analysing and getting a full understanding of complex organisational situations. In addition, they look at Systems Thinking in the context of organisations. It is clear that a Systems Thinking concept is critical for making informed decisions. Mingers and White (2009:1148) analyze Systems Thinking both theoretically and practically. This is a useful approach to inspire a change of mindset of organisational members. UoTs are complex in nature and operate in a complex higher education environment. The holistic view through SystemsThinking makes the decision-making process simpler. Answering the question of why Systems Thinking is relevant to UoTs, Green and Hardman (2013:1536) argue that there is a constant state of competition in the higher education sector. Therefore, Systems Thinking is relevant to HEIs, including the UoTs.

Expressing his views on the relevance of Systems Thinking in a university context, Brits (2011:1288) states that it is critical for different sections or departments in the university to function as interrelated and interdependent elements. In other words, this implies that Systems Thinking is relevant and applicable to universities. Traditional and singular approaches have not been effective in dealing with complex and transformational challenges in the higher education sector. In the case of South African higher education, UoTs are still expected to meet their transformational obligations.

In terms of demographics, curricula, structural designs and effective interactions with stakeholders, these are some of the key areas where UoTs still have to double their efforts in terms of transformation. According to Green and Hardman (2013:1535) higher education institutions play a significant role both in terms of economic development and also in addressing complex societal challenges. Green and Hardman (2013:15) further present a relevant conceptual framework which also captures different systems methodologies. However, it has to be noted that this study focuses on Systems Thinking as a concept and not on different systems methodologies because the study is inspired by Peter Senge's theoretical framework which does not capture systems methodologies. In Caldwell's point of view (2012:146), Peter Senge



is very influential in incorporating Systems Thinking into workplace practices. Peter Senge calls systems thinking the Fifth Discipline (O'Brien and Makaras 2011:516).

Presented in this section was a discussion of Systems Thinking in terms of strategy formulation to gain competitiveness. The purpose of the next section is to discuss the influence of Systems Thinking in terms of stimulating performance that helps organisations to gain a competitive advantage.

### **2.11.1 Competitive Advantage in a higher education context**

Competitive advantage is a term that is commonly used in the private sector, but it is applicable to the public sector (De Haan 2015:45). Higher education has become market-driven hence it is critical for higher education institutions to be competitive. Adapting to the internal and external environments is vital for UoTs and other modern organisations. De Haan (2015:45) also raises an important point that HEIs and private organisations operate in an environment where survival and the need to prosper has become critical. According to Schoemaker and Day (2018:701), the critical and practical question is always about what should be done when environmental changes are impacting on the operations of an organisation?

Sharing the same argument, Scott (2013:292) warns that new approaches are necessary as universities world-wide have to deal with various change forces which come at a rapid and unpredictable pace. It is well articulated in the DUT 2015-2019 strategic plan (DUT 2015:3) that there is a need to re-evaluate business processes at DUT to respond to both global and local complex challenges. This indicates that UoTs realize a need to be competitive.

According to Du Pre (2009:31), HEIs have to respond to a rapidly changing environment. Change in both national and global contexts has a profound influence on the higher education landscape. On the point of higher education institutions having to deal with a dynamic environment, Omerzel, Biloslavo and Trnavcevic (2011:112) mention that surviving in such conditions is as important for higher education institutions as it is critical for any other organisations. Describing the environment within which universities operate, Scott (2013:293) observes that universities capable of

implementing quality improvement plans successfully and consistently will remain competitive in a turbulent HE landscape.

Tian and Martin (2014:932) note that business models predominantly used in the corporate sector have caught the attention of public institutions, including universities. In her view, McKenna (2014:10) describes higher education as “Big business”. Research trends also show growing interest from researchers in higher education research. This study points in that direction as it looks at higher education but focusing on the application of Systems Thinking concepts at UoTs. Researching higher education is important as higher education institutions are constantly searching for effective approaches to provide quality education and improve students’ experiences (McKenna 2014:10). This study is conducted in that context.

This study hopes to shape strategy and policy formulation in UoTs by providing insights for continuously improving processes and practices. It has been reiterated by Brits (2011:1288) that Systems Thinking is applicable to universities. A Systems Thinking approach fosters the integration of various university parts to improve institution’s core business (Brits 2011:1288). Lone et al (2015:3) concur that HEIs have adopted market-oriented models to gain competitiveness in the turbulent environment. This indicates that there are business models that have been adopted by higher education institutions to deal with global competition and challenges. It has also been recognized by McKenna (2014:6) that universities are under constant pressure from stakeholders, which means that universities have to improve their efficiency. As McCaffery (2010:61) emphasizes, it is important to note the fact that there are universities that have taken a lead to transform their traditional characters into being more entrepreneurial, hence a need to explore alternative management approaches.

The reality is that universities are under constant pressure to be innovative (McCaffery 2010:61). Globalisation opens spaces for universities to compete with other top institutions of higher learning in the world. Expressing his views on higher education challenges, Scott (2013:275) concedes that such challenges are a combination of factors. These factors are social, demographic, technological, environmental and political. It is therefore critical for universities to be able adapt and respond to such challenges. Failure to adapt and deal effectively with these challenges will be

catastrophic for universities and UoTs. Scott (2013:278) is not only highlighting the challenges, but he also proposes a need for effective approaches to deal with these challenges.

Responsiveness, pro-activeness and flexibility are some of the qualities required to remain competitive. Out-learning and out-smarting competitors is important (Liker and Franz 2011:xxvii). Higher education institutions also have a role to play in addressing socio-economic challenges. Ekem 2019 (cited in Remenyi, Grant and Singh 2019:45) concurs with the notion that indeed the role of universities is not only to develop individuals intellectually, but they are also expected to be of service to society. This section highlights important issues of competitiveness in terms of higher education institutions. There are compelling cases as to why institutions of higher learning have to adopt effective approaches. Therefore, it becomes obvious why organisations in both public and private sectors consider Systems Thinking. Arnold and Wade (2015:670) confirm that Systems Thinking is indeed a strategic choice to deal with complex challenges. The problem with Reductionism is its failure to provide a full picture of dynamic and complex situations.

The next section looks into Systems Thinking in terms of stimulating a sense of shared purpose in an organisation.

### **2.11.2 Stimulating a sense of shared purpose through the application of Systems Thinking in an organisation**

Organisational members are critical assets to gain competitive advantage (Oosthuizen and Kara 2008:45). The holistic understanding of organisations and their environment has been described by Islam, Khan and Bukhari (2016:13) as important so that members of the organisation perform their formal day-to-day jobs beyond job descriptions. Commenting on the importance of having a sense of shared purpose Brown, Bessant and Lamming (2013:241) raise an important point. In their view, it is critical to engage people at all levels of the organisation during strategy development processes. It is in this context that Loredan (2013:47) stresses that human resources play an important role to achieve excellence in a university. Achieving excellence becomes possible once members of the organisation have a sense of shared purpose.

Modern organisations are operating in a business environment that has been described as characterized by rapid change, globalisation and unprecedented complexity (Weeks 2014:82). This argument is supported by Skarzauskiene (2010:50) that it has become very difficult for organisations to focus and plan. Hence Liker, (2011:84) accentuates that it is necessary for organisations to become adaptive and flexible as they operate in a rapidly changing environment. UoTs are not immune to these challenges. It has been noted by Min and Khoon (2013:994) that globalisation and other environmental factors have impacted significantly on the business of higher education. Therefore, it is necessary to adopt an overarching philosophy that conditions members of the organisation to have a strong sense of shared purpose. This leads to organisational effectiveness.

In South Africa, organisations in all sectors are expected to assist with the transformation agenda. According to Corcoles, Penalver and Ponce (2011:357) universities in Europe are under pressure to improve their effectiveness. This is an indication that HEIs in other parts of the world are expected to provide quality services. A strong sense of shared purpose is necessary to pursue excellence in an organisation. UoTs are also required to comply with transformational requirements. According to Clare and Sivil (2014:60), this has impacted every aspect of university operations. Besides addressing transformational issues, higher education institutions have to operate according to international norms and standards. Continuous improvement of processes is indeed important for UoTs to provide quality services.

Part of transforming the higher education landscape is to increase students in-take. As a result, universities have to address the issue of students being under-prepared for the university environment (Clare and Sivil 2014:61). A sense of a shared purpose from organisational members is necessary to improve the student experience at the university.

Looking at the higher education environment, Garrison and Vaughan (2008:143) concur that the higher education environment is characterized by uncertainty. Given the complex challenges faced by organisations in both private and sectors, the ability to develop new ideas and new knowledge has become vital for organisations. Based on rapid change and complexity in the business environment, McCaffery (2010:12)

asserts that globalization has far-reaching implications for higher education institutions. Traditional approaches are no longer relevant in helping HEIs to respond effectively to complex challenges. Addressing the need for organisations to become flexible and to be able to adapt, Govender (2009:366) reiterates that organisations should be able to adapt to the new challenges. In this regard, the workforce plays an important role.

In the modern world, understanding complex situations is important and Systems Thinking approach has been identified by Skarzauskiene (2010:50) as a relevant option available to the organisation. Systems Thinking plays a vital role in stimulating a sense of shared purpose. According to Stowell and Welch (2012:xv), Systems Thinking is critical to design organisational processes that are effective in dealing with complex challenges. UoTs and higher education institutions are regarded as organisations made up of multiple aspects which include structures, processes and operations (Littledyke, Manolas and Littledyke 2013:368). The research findings by Littledyke, Manolos and Littledyke (2013: 368) confirm that Systems Thinking plays an effective role in coordinating various aspects of the university to achieve organisational goals. They further confirm that a Systems Thinking concept also creates a space that empowers university employees at all levels to be proactive and produce desired outcomes. A sense of shared purpose is an important ingredient to produce desired outcomes.

This study is not challenging the structural design of the UoTs, but the accepted practices where various departments still operate in silos. A strong sense of an institutionalised shared purpose is vital for universities. In the DUT 2015-2019 strategic plan (DUT 2015:2) the DUT stresses the need to build a shared understanding of the university and its context. Brits (2011:1292) concurs that higher education institutions still adopt silo practices which contradict the principle of Systems Thinking. To gain and maintain competitiveness requires an effective organisational strategy. It is easier to implement the strategy where members of the organisation have a sense of shared purpose. The nature of challenges in the UoTs and higher education in general require new approaches. Organisational strategy therefore should allow flexibility and adaptability. A Systems Thinking concept helps organisations to achieve organisational effectiveness, thus DUT (2015:3) acknowledged the need to replace ineffective modes of operating.

In view of local and global challenges, DUT (2015:8) promotes Systems Thinking through the adoption of a Learning Organisation philosophy. Although a Learning Organisation philosophy is captured in the strategic document of DUT, this philosophy has not been implemented successfully as it has not been practically institutionalized and internalized across the institution. Hamilton and Tee (2013:748) state that higher education institutions use a combination of instructional modes to enhance learning. Although their focus is on instructional modes in higher education, they also indicate that HEIs are considering flexible learning, which allows student learning to take place even outside of the classroom environment. This indicates a need for innovation in UoTs. These are innovations to enhance teaching and learning in the higher education environment. The Systems Thinking concept could be critical to influence flexibility and adaptability as higher education institutions continuously improve their operations.

Systems Thinking has been identified as a tool that enables organisations to scan the environment. Successful organisations are able to articulate strategic goals and they are also able to stimulate a strong sense of direction (Brown, Bessant and Lamming 2013:241). This is essential to motivate members of the organisation to commit themselves to help the organisation achieve strategic goals. As stated by Croxton and Chow (2015:83), indicators are that Systems Thinking assists higher education institutions to align resources with rapidly changing demands and also to provide quality education.

UoTs and higher education institutions are also interested in understanding and evaluating their impact in addressing social challenges (Posner and Stuart 2013:264). Through the implementation of Systems Thinking, the university is able to re-design its processes and coordinate programs to achieve organisational goals. Posner and Stuart (2013: 265) point out that universities are in fact a kind of business focusing on teaching, learning and research. However, beyond their core business, universities play a role in dealing with some kinds of challenges in communities. Remaining competitive is therefore critical, also considering the important role played by universities.

Discussing Systems Thinking in the context of a university, Posner and Stuart (2013:267) put it succinctly that universities are in fact made up of elements that

interact in complex ways. They further describe a university as an organisation with various departments, for example administration and academic sectors. Enhancing the effectiveness of the university program is important in order to remain competitive. Despite competitiveness being critical for universities, the real challenge is the lack of resources to implement necessary changes. Budget cuts are a major challenge for higher education institutions.

The study highlights a culture of working in silos or compartments as creating barriers to knowledge-sharing. Posner and Stuart (2013:274) concur that teaching, learning and research happen in silos at universities. In other words, disciplinary boundaries still exist. In relation to the complexity of higher education, Dyehouse et al (2009:189) note that traditional ways of thinking are no longer appropriate to interpret complexity in the higher education landscape. This in actual fact demonstrates a need to adopt effective approaches.

A sense of shared purpose is critical to achieving organisational success. This section discussed the influence of Systems Thinking in stimulating a sense of shared purpose in an organisation. The next section describes Systems Thinking as a catalyst to stimulate citizenship behavior in an organisation.

## **2.12 Embracing Systems Thinking to stimulate Organisational Citizenship Behaviour**

Citizenship behavior is defined by Colquitt, Lepine and Wesson (2015: 551) as voluntary employee behavior that contributes positively to the achievement of organisational goals. Systems Thinking provides a solid foundation for citizenship behavior in an organisation as it is important to achieve organisational effectiveness. Cross-functionality in an organisation is important and should be inspired by an overarching philosophy that binds an organisation's units together. In an organisation where various units work together, this leads to improved productivity (Mohamed, Stankosky and Murray 2004:127). Systems Thinking inspires cross-functionality in an organisation. The value of System Thinking is that it empowers organisational members with the capacity to find innovative solutions which are practical to solve complex challenges. Well-articulated by many scholars, including Peric and Djurkin

(2014:484), is the argument that Systems Thinking is an effective tool to improve organisational performance. To further support their point, they highlight some organisations that have adopted a Systems Thinking concept, including McIltoch, Milfener and many others, particularly in the tourism sector.

It is important for members of an organisation to go beyond their call of duty or beyond their specified job roles to achieve organisational goals (Onyishi 2010:304). The author further argues that traditional approaches, for example command and control, have become obsolete. Skarzauskien (2010:59) provides empirical evidence to confirm that Systems Thinking inspires performance, which leads to organisational effectiveness. Therefore, citizen behavior has to be promoted in UoTs. Organisational Citizenship Behaviour (OCB) encourages members of the organisation to display their commitment by performing their tasks beyond their job descriptions. Systems Thinking is also about focusing on an organisation as whole. It is also about a culture where people look beyond their specific roles to ensure that organisational objectives are achieved. Survival and gaining competitiveness is vital when it comes to the application of Systems Thinking in an organisation.

Organisational Citizenship Behavior (OCB) is important for the successful implementation of strategies and policies in an organisation. System Thinking is in fact against what Conti (2010:354) calls a fragmented view. In Conti's view, a fragmented view is also a problem in a general management sense. A fragmentation model produces silo mentality (Conti 2010:354). In the Systems Thinking perspective, the interdependency of various elements in a system is critical. In the context of citizenship behavior, members of organisations are motivated, committed and willing to go the extra mile for the benefit of the entire organisation.

This section discussed the influence of Systems Thinking in stimulating citizenship behavior in an organisation. The next section discusses the perceptions of organisational members towards Systems Thinking.



## **2.13 Perceptions of organisational members of Systems Thinking**

One of the objectives of this study is to ascertain employees' perceptions about Systems Thinking. The perceptions of university employees are critical to meeting the objectives of this study. Therefore, this section captures the perceptions of organisational members on Systems Thinking. The research findings of a study conducted by Littledyke, Manolas and Littledyke (2013:375) reveal that participants were of the view that Systems Thinking was critical and there was a need to improve the coordination of processes and practices in universities. There is a strong indication that participants in that study felt that a Systems Thinking model was necessary to achieve efficiency in university operations (Littledyke, Manolas and Littledyke 2013:380). Based on the empirical findings, there was a general consensus indicating a need for collaboration and to challenge the culture of working in silos at the university.

Interesting research findings of the study conducted by Loosemore and Cheung (2015:1333) reveal that participants felt that the adoption of Systems Thinking will require changing traditional and deeply embedded ways of thinking. Challenges to the successful adoption and implementation of Systems Thinking include amongst other factors, resistance to change and how people view complexity (Loosemore and Cheung 2015:1333). A conducive environment is also necessary where members of the organisation are comfortable to share information. The general understanding is that reductionist approaches are still and predominantly used in organisations.

In terms of knowledge-sharing in an organisation, Teh and Sun (2012:76) provide empirical evidence indicating that job satisfaction and job involvement has a major influence on knowledge-sharing. This further suggests that there is a strong link between employees' job attitudes and their willingness to share knowledge. There is also a strong perception suggesting that leadership has a role to play in creating a knowledge sharing culture in an organisation. Presenting their empirical evidence, Loosemore and Cheung (2015:1329) revealed a general perception that it was difficult to change the habitual and traditional thinking which inform organisational processes. Their study further indicated that changing traditional ways of thinking was also the biggest challenge.

According to Dyenhouse (2009:195) Systems Thinking empowers organisations with a holistic understanding, as well as to appreciate patterns and relationships in a system. In other words, a holistic view provides more insights into influential factors between systems and the environment. Based on the study by Dyehouse *et al* (2009:195), the perception is that Systems Thinking is effective to evaluate educational programs in higher education institutions. When it comes to the sharing of knowledge at the university, there is a strong sense that a silo mentality was still prevalent. The general perceptions were that university employees were of the opinion that there are still barriers which need to be removed to share knowledge effectively, (Rego et al 2008:33).

Systems Thinking is also considered as an excellent concept to respond effectively to environmental and organisational challenges. This is based on the fact that SystemsThinking is a framework that allows flexibility. Universities are faced with rapid changes and demands from stakeholders (Croxtan and Chow 2015:95). From the research findings presented by Littledyke, Manolas and Littledyke (2013:378), there was a sense and a need to deal with silo mentality and also to promote a shared-purpose where university staff learn from each other. In an organisation where there is a strong culture of learning, there is evidence based on the research findings by Coetzer (2007:431) that organisational members regard one another as useful sources of learning. Given the rapidly changing business environment in which organisations operate, continuous learning is important. The perception, according to Coetzer (2007:422), is that learning takes place if members of the organisation are encouraged to do more than their day-to-day duties. The sense is also that members of the organisation appreciate the opportunity to provide ideas to solve organisational problems.

Hong and Yehuda (2010:230) reiterate a point that has been made by other authors in the literature. The point is that systems thinking could be used to create an organisational culture where all sectors within the university appreciate interrelationships and interdependence. Authors also agree with the issues raised as a problem statement of this study, which is the lack of a strong Systems Thinking culture in higher education.

On ST being adopted as a strategic choice in other sectors, Seiler (2011:55) puts it succinctly that organisations that have adopted Systems Thinking dominate in their respective sectors. From the literature, one gets a sense that members of the organisation are generally optimistic about Systems Thinking. One of the objectives of this study is to ascertain organisational members' perceptions on the application of Systems Thinking in the UoTs.

This section demonstrates a link between the theory and the research objective that deal with the perceptions of organisational members in terms of the application of Systems Thinking in UoTs. The next section presents concluding remarks on this chapter and also summarizes the theoretical insights captured in this chapter.

## **2.14 Chapter summary**

This chapter captured theoretical perspectives of Systems Thinking. It also demonstrated a logical link between literature and research variables. The chapter also highlighted the link between Systems Thinking and other concepts, for example Learning Organisation and Knowledge Management. According to Hart (2018:47), a literature review is an important section of a thesis as it demonstrates the researcher's ability to think critically and be able to evaluate ideas and methodologies used by previous researchers. The successful development of organisational strategies and policies should be informed by a full understanding of complex challenges faced by organisations (Maon, Lindgreen and Swaen 2008:423). In other words, organisations operate in a business environment characterized by unpredictability, complexity and multifaceted challenges. In this context, Systems Thinking is considered as a strategic option for organisations to respond effectively to such challenges. This chapter also highlights challenges faced by higher education institutions, as well as the benefits of adopting Systems Thinking. Systems Thinking has been discussed in the context of its applicability in UoTs.

Brits (2011:1292) confirms that silo practices are generally still prevalent in higher education institutions. System Thinking is the philosophy that appreciates and considers the value of all the elements within the system. One of the advantages of SystemsThinking is that it empowers organisations with the capacity to operate in a

complex and turbulent environment (Smith 2011: 7). Systems Thinking is relevant to HEIs as they also operate in an environment described by Garrison and Vaughan (2008:143) as unpredictable and turbulent. Generally, the literature describes a Systems Thinking concept as a strategic choice for organisations to operate successfully in a turbulent business environment. This argument is also supported by Smith (2011:6), that Systems Thinking is becoming popular as it is adopted in other fields, including management science. Given the rapidly changing higher education landscape, DUT in its strategic plan (DUT 2015:3) also confirms that all universities both locally and globally are confronted with complex challenges. Relevant information sources were consulted in the literature review process for this study. The next chapter discusses Systems Thinking models.

## **CHAPTER THREE: LITERATURE REVIEW (IDENTIFIED SYSTEMS THINKING MODELS FOR UoTs)**

### **3.1 Introduction**

The previous chapter discussed the theoretical framework underpinning this study. The adopted theoretical framework provided logical relationships amongst the variables relevant to the study. The purpose of Chapter Three is to present and discuss Systems Thinking models, as well as Systems theories. It is necessary to look at Systems Thinking models and identify appropriate models to implement the concept in UoTs. A proposed model (developed by the researcher in this study) to implement systems thinking is also included in this chapter. Graziano and Raulin (2013:394) describe models as simplified representations of the complex reality of the real world. On the other hand, Laudon and Laudon (2010:634) describe a model as an abstract representation that illustrates the components of a phenomenon.

In the words of Bueno (2012:89), a model is the tool used by organisations to deal with uncertainty and continuously improving organisational performance. It is in this context that Smulowitz (2015:70) emphasises the point that organisations should be able to respond to an ever-changing business and competitive environment. The study identifies four Systems Thinking models to guide decision-making processes in organisations and particularly in UoTs. Considering complexity and connectedness in the business environment, models are necessary to explore various options before decisions are made. According to Pidd (2003:24), models are tools for thinking and models are useful to manage risks and uncertainty. Identified models are also relevant to UoTs. The models are presented and discussed below.

### **3.2 Model 1: Douglas and Kerfoot's model (Douglas and Kerfoot 2008)**

The model presented by Douglas and Kerfoot (2008:53) takes into consideration critical aspects for the implementation of Systems Thinking in an organisation. Although this model was developed for healthcare organisations, it is relevant and applicable to UoTs and organisations in other sectors. The model provides steps on

how to implement Systems Thinking in an organisation. Douglas and Kerfoot (2008:53) developed a model with seven elements, namely understanding interconnectedness; investing in Systems Thinking; establishing interdisciplinary teams; benchmarking; designing an effective mechanism; implementing Systems Thinking; and lastly monitoring and evaluation. The UoT is regarded as a system. Hence it is critical to stress that a system is not just a collection of parts, but a functional entity where its elements cannot exist independently (Mizikaci 2006:43). The model was considered because it was relevant to the study and it could be instrumental in guiding the process of implementing Systems Thinking in an organisation. The following section discusses the elements of this model:

- **Promoting an understanding of interconnectedness**

It is critical to ensure that stakeholders in their diversity, are able to understand the big picture. At this stage of the model, effective communication strategies are used to communicate how divisions/departments should work together to achieve a common goal. When Systems Thinking is implemented, it could be used to mobilise and inspire members of the organisation to optimize the whole instead of focusing on the individual parts in terms of functional areas (Stroh 2015:2). In the words of Griffin (2017:49), achieving organisational success is possible when divisions in an organisation work together instead of working in silos.

- **Investing in Systems Thinking**

Stroh (2015:2) states that this includes the process of identifying high leverage interventions, taking into consideration the effective use of limited resources. At this level, the emphasis is on the provision of the necessary support and aligning resources accordingly. Understanding interdependency amongst organisational units and also the environment (business environment) are some of the factors to be considered when decisions are being made. Systems Thinking is relevant to address the challenges faced by higher education institutions. Mizikaci (2006: 37) explains that HEIs are adopting management approaches that were traditionally used in the private sector. Like any other project, necessary

resources are critical for the implementation of Systems Thinking in an organisation.

- **Establishing interdisciplinary teams**

Recognizing a system's elements and their interaction, as well as interrelationships, underpins one's actions where Systems Thinking is implemented (Dunnion and O'Donovan 2012:26). Hence, developing organisational members' ability to work with one another is viewed by Stroh (2015:86) as a cornerstone to implement Systems Thinking. He further describes Systems Thinking as a team sport where stakeholders with diverse perspectives share their views openly and develop a complete picture of the reality they have to deal with collectively. Interdisciplinary teams are formed to assist with the implementation of Systems Thinking in an organisation.

- **Benchmarking**

According to Achim et al (2009: 853), benchmarking is a self-improvement strategy used by organisations to compare themselves with other organisations in terms of best practices. The purpose of benchmarking is to learn how to improve and as a result outsmart competitors. Griffin (2017:664) emphasise that benchmarking is one of the tools and techniques used to improve quality in terms of organisational operations. In the context of Systems Thinking benchmarking can happen within or beyond the organisation. If it happens within departments, they will be benchmarking against each other. In the UoT context, faculties, academic and administrative departments will be encouraged to share best practices.

- **Designing of effective organisational mechanisms**

In an organisation where people understand Systems Thinking, it is possible to design effective organisational mechanisms to deal with chronic and complex challenges. It is on this understanding that Flood (2010:269) argues that interrelatedness is the key element of Systems Thinking. He further highlights that organisations should be viewed as systems made up of interrelated parts. According to Stroh (2015:7) Systems Thinking is a useful tool that contributes

to stimulating cross-sector co-ordination. He calls this sector coordination “collective impact”. It is therefore critical to establish a clear and compelling shared vision, common goals and common understanding which help to develop effective organisational strategy (Stroh 2015:52).

- **Implement, monitor and evaluate Systems Thinking processes**

It is important to formulate evaluation and monitoring methods that are relevant to Systems Thinking principles. Stroh (2015: 4) puts it succinctly that systems thinking is appropriate to deal effectively with complex and chronic challenges. Given the turbulent and ever-changing business environment in which organisations operate, it is becoming critical to evaluate organisational processes continuously (Smulowitz 2014:70). Hence Systems Thinking has been described by Stroh (2015: 10) as a catalyst to transform an organisation’s operations in terms of processes and procedures. It is also critical to put in place necessary mechanisms to monitor and evaluate the implementation of Systems Thinking in an organisation.

The model is underpinned by a holistic perspective and a need to deal effectively with complex challenges. A holistic perspective helps the organisation to adapt easily to a rapidly changing business environment. The model provides critical guidelines in terms of implementing Systems Thinking in an organisation. These elements include the creation of a teamwork culture, engaging relevant stakeholders and providing necessary resources to implement Systems Thinking.

### **3.3 Model 2: Systems Thinking Leadership model (Davies, Dent and Wharff 2015)**

This model was developed for managing change in an organisation through adaptive and participatory practices informed by Systems Thinking. The model advocates three phases for implementing Systems Thinking in an organisation, which are discussed below.



➤ **Discovery phase**

Davis, Dent and Wharff (2015:348) describe the discovery phase being informed by a full understanding of the issues and their boundaries in an organisation. This phase takes into account the needs and views of stakeholders. In this phase, organisational members are clear in terms of why their organisation exists and what the core functions of their organisation are. The language of metaphors is used to stimulate Systems Thinking, for example referring to an organisation as an organism or brain. Sensitizing members of the organisation about Systems Thinking is vital in this phase.

➤ **Framing phase**

This phase uses the rich picture technique to help organisational members to understand relationships and elements in the situation, particularly in the organisational context. The needs of stakeholders are captured and considered for decisions-making purposes. The rich picture technique uses pictures to evoke insights into a given situation. The use of rich pictures during the Framing phase makes it possible to analyze the situation holistically and design the necessary intervention. It is possible to design necessary interventions through the application of Systems Thinking because it provides decision-makers with a holistic perspective of the situation.

➤ **Action phase**

From the three phases of this model, this is a phase where the Systems Thinking philosophy is implemented in an organisation. The implementation phase includes effective communication, involving all stakeholders, providing the necessary support and aligning resources accordingly. Systems Thinking capacitates members of the organisation with the ability to think in a holistic way (Behl and Ferreira 2014:109). Hence Smulowitz (2015:72) explains that getting departments to work together has been identified as a challenge in higher education institutions.

This model highlights important phases in the implementation of a Systems Thinking philosophy in an organisation. Systems Thinking serves as a catalyst in connecting relevant stakeholders to design effective interventions to deal with organisational challenges. Given the environment and the nature of UoTs, there is a need to consider ideas from all relevant stakeholders when strategic decisions are being made.

### **3.4 Model 3: Four stage model (Stroh 2015)**

This model is known as the Peter Senge model (Stroh 2015:73). In essence, the model proposes a culture in an organisation where members have a clear understanding of their organisation's vision; an understanding of where they are in terms of organisational goals; and lastly the understanding of what their organisation wants to achieve. It is commonly known as the four-stage model as there are four stages in this model, which include building a strong foundation for change in an organisation; building and enhancing systematic capacity; encouraging commitment; and promoting continuous learning. The emphasis is on promoting commitment from members of the organisation to go the extra mile to help their organisation achieve its strategic objectives.

#### **Stage 1**

This is a stage where all relevant stakeholders are identified, and strategies are developed to engage such stakeholders. The strategy to engage stakeholders' needs to outline how they (stakeholders) will be engaged at an individual and collective levels. Creating a shared vision is also one of the critical elements that happens at this stage. Also at this stage of this model, people's ability to think systematically is developed. Preparing and conditioning members of the organisation to understand their organisation and its environment holistically occurs at this stage of the model. This point has been raised by Mizikaci (2006: 43) where he argues that parts of the organisation are interrelated and therefore cannot be understood in isolation. It is also an argument presented by Green and Adekanmbi (2014: 948), that there is strong competition in higher education for attracting and retaining students. Given this context, Systems Thinking is necessary to encourage holistic thinking in UoTs.

#### **Stage 2**

It is critical to understand the level at which each member of the organisation is in terms of their understanding of organisational processes and practices. It is in this context that Pelton (2016:82) explains that communication is critical not only in terms giving instructions, but also in communicating the values of the organisation. Hence a need to create a conducive environment that stimulates conversations around new and alternative approaches to improve organisational processes and practices. Different

viewpoints are necessary to promote the understanding of interconnectedness within an organisation (Behl and Ferreira 2014:108).

### **Stage 3**

It is at this stage that members of the organisation commit themselves towards what they want to achieve (common goal). The analysis of benefits and costs of failing to respond effectively to environmental challenges and the needs of the stakeholders are critical for this stage. According to Stroh (2015:1), Systems Thinking mobilizes diverse stakeholders to improve the system as a whole, instead of their individual self-interest (functional areas). Providing their insights, Dunnion and O'Donovan (2014:23) make a point that gaining a competitive advantage over rivals is key for higher education institutions, both in terms of student experience and operational processes.

### **Stage 4**

This is a final stage for this model. It involves the identification and appreciation of leverage points. The emphasis is also on the establishment of processes that drive continuous learning in an organisation. A critical element of this stage is the evaluation of processes which incorporate input from all relevant stakeholders. Mizikaci (2006:37) adds that information gathered during the evaluation processes becomes important for all relevant stakeholders in an organisation.

This model provides a simplified approach to implement Systems Thinking in an organisation. It emphasises organisational members thinking systematically, engaging relevant stakeholders and stimulating continuous learning to achieve organisational effectiveness.

## **3.5 Model 4: Systems model for Organisational Change (Werner 2016)**

This model is informed by the notion that organisations are open systems interacting continuously with their environment. Werner (2016:428) states that organisations are regarded as systems because they are made up of sub-systems that are continuously interacting. Changes in one part of the system will affect the other parts of the system. Hence the understanding is that these system elements influence each other. This

model takes into consideration all factors that influence the organisation in terms of input, transformation, (intervention) or processing of input and lastly, the output. Ferrell, Hirt and Ferrel (2011:240) emphasize the point that organisations exist to produce products, ideas and offer services to customers or stakeholders. This model has three critical elements namely: input, transformation (processing of input) and output. According to Boardman and Sauser (2013:57), the three elements are vital in the Systems Thinking context. The three elements are discussed below.

- **Inputs**

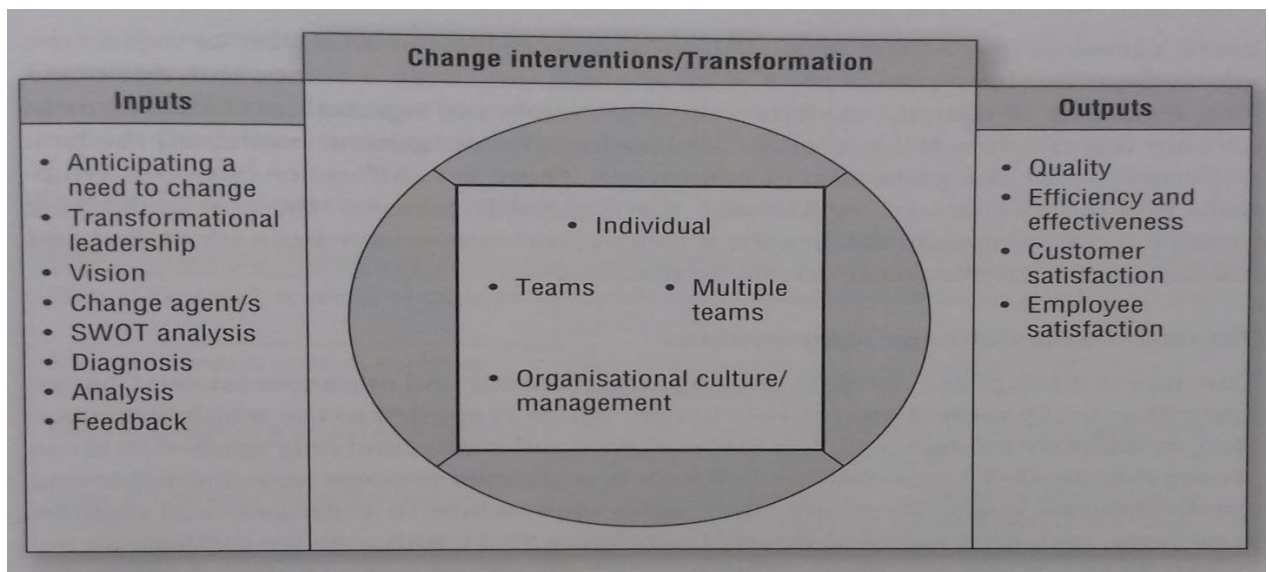
Inputs are the resources that are converted into outputs. Examples of outputs include labour, money, materials and energy (Ferrell, Hirt and Ferrell 2011:241). According to Mizickaci (2006: 43), systems or organisations receive input from their environment. To have a common vision plays a critical role in inspiring members of the organisation to thrive and as a result, organisational effectiveness is achieved. Organisations are institutions where employees generally work for the common good and to meet the needs of the stakeholders. The common vision should be well articulated in a manner that is understood by all members of the organisation. In the context of input, a sense of belonging is a critical element to drive and inspire organisational members to ensure that the organisation achieves its strategic objectives. Environmental factors that impact on the operations of the organisation both positively and negatively should always be considered. Explaining his systems model, Werner (2016: 428) highlights the important role that leaders and managers should play to articulate a compelling vision for the organisations. Organisational members should be involved in the process of developing a vision for the organisation. Werner (2016:429) further states that an organisation's vision developed collaboratively will always be supported by the members of the organisation. Hence the vision should influence the positive behavior of organisational members. Systems Thinking is therefore critical, even at the stage of developing a vision for the organisation. This model focuses on the fact that all critical factors relating to the input stage have to be considered during a process of developing a vision for the organisation. This model is relevant to UoTs as it allows them to consider various factors when dealing with the input stage and when developing institutional vision.

- **Transformation, Intervention or processing of inputs**

The transformation of input differs from organisation to organisation. For service organisations, the output is intangible. An organisational culture that stimulates teamwork and collaboration is necessary in the process of transforming inputs. Innovation and adaptive behavior become critical, considering the rapidly changing business environment. Understanding systems is important as organisations are made up of interrelated elements. Transformation or the processing of inputs happens in a coordinated manner to achieve pre-determined organisational goals. Werner (2016:430) points out that understanding all aspects of how organisations operate is important. He further states that organisations also have structural, technical and behavioural challenges to deal with. In the context of Systems Thinking, these issues are interrelated. Hence Werner (2016:430) puts it succinctly that changes in one area of the organisation will affect other parts of the organisation. Systems Thinking is relevant in the context of transforming input. In the pursuit of excellence, the transformation stage requires an empowered workforce to improve productivity and the services rendered by organisations.

- **Outputs**

These are final products, services or ideas that result from the conversion of inputs (Ferrell, Hirt and Ferrell 2011:241). It is important to determine if the intervention is producing the desired outputs. Therefore, outputs need to be measured at regular intervals. In the university context, surveys, programme reviews and departmental self-reviews are done for the same purposes of measuring outputs. Werner (2016:430) reiterates the point that employee commitment is critical to achieving organisational success. Hence, he further explains that systems should be in place to determine employee satisfaction in an organisation. This is done to ensure that outputs in the form of services or products meet the needs of customers and stakeholders.



### Organisational change Model by Werner 2016

Systems Thinking inspires organisational members to perform their functions beyond acceptable norms. The higher education landscape globally is characterised by complex challenges and traditional approaches have failed in both private and public organisations. This study is important to bring Systems Thinking to the attention of UoTs. Meeting the needs of the customers is important in the context of outputs. It has been articulated by Werner (2016:36) that organisations are dealing with well-informed and demanding customers, thus using Systems Thinking to continuously improve organisational processes is critical. In the context of higher education, UoTs have to meet the needs of students and other relevant stakeholders. Contemporary students have complex demands that require new approaches. These demands include quality education, transformation, free education and free accommodation. Systems Thinking, in the words of Stroh (2015:208) empowers members of the organisation with an understanding that everything is connected in organisations and their environments. According to Mizikaci (2006:43) systems have outputs to achieve their goals. Feedback is then received from the environment relating to the output.

Given the complex challenges that UoTs face, adopting Systems Thinking is critical as it fosters a culture where processes and practices are oriented towards the overall goals of the organisation as a whole. Adopting Systems Thinking optimizes interrelationships amongst various elements of the organisation, instead of just

focusing on certain parts only (Stroh 2015:209). These are important points, not only relevant in corporate sector organisations but to institutions of higher learning as well.

According to Stroh (2015:206), Systems Thinking is a philosophy that considers the emotional, physical and spiritual dimensions of organisational members. Outlining the benefits of applying Systems Thinking, he further indicates that Systems Thinking transforms parts of a complex problem into a shared understanding of the larger problem. This therefore facilitates the incorporation of different aspects of an organisational strategy into a clear direction or roadmap. Through the application of Systems Thinking, stakeholders from different backgrounds have the opportunity to expand their understanding of the full picture in terms of a given situation. The interesting part about Systems Thinking is the fact that it stimulates a shared understanding of a bigger picture (Stroh 2015:209).

Twenty-first century universities are operating in turbulent environment. The challenge as outlined by Smulowitz (2015: 72) is that departments within universities compete with each other instead of working together towards a common goal. This therefore suggests a need for a Systems Thinking approach to replace traditional approaches in UoTs.

### **3.6 Overview of the models**

The Systems Thinking models discussed above are as relevant to UoTs as they are in other sectors of the economy. Models are useful tools in the implementation of Systems Thinking in an organisation. These models present a necessary paradigm shift in terms of viewing organisations as dynamic systems that have to deal with dynamic challenges. Peltonen (2016:208) indicates even the boundary between the internal and external context of the organisation is changing and indicates a paradigm shift in terms of how organisations should be viewed. Systems Thinking models discussed in this chapter have some similarities. Highlighted below are some of the key elements (characteristics) of these models.

- viewing the organisation as a system;
- adapting to a turbulent and dynamic environment;

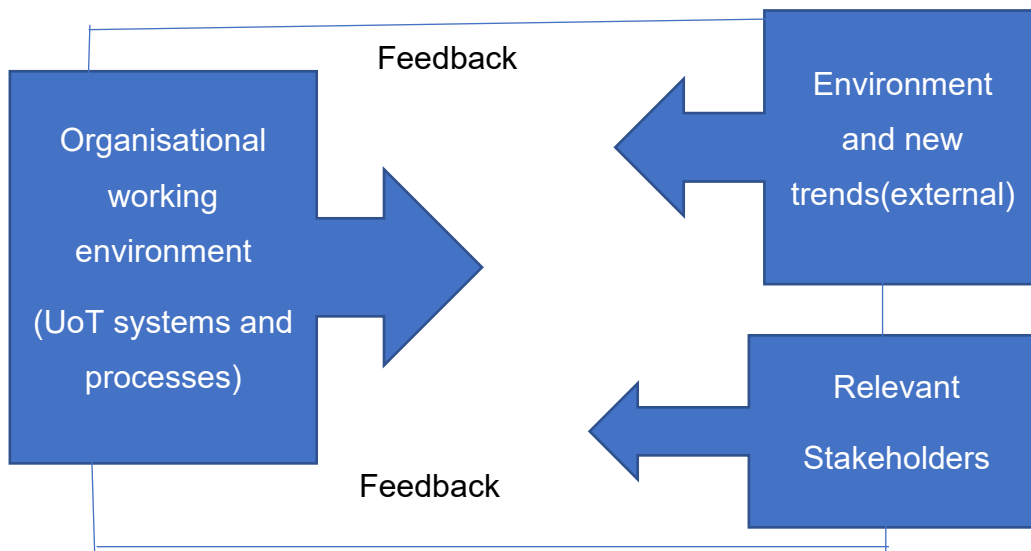
- developing new alternatives;
- commitment to continuous learning;
- building collaborative capacity;
- challenging silo mentality;
- building a sense of shared purpose;
- building the capacity for learning;
- competitiveness and organisational flexibility; and
- stakeholder involvement or engagement.

Given various socio-economic challenges, higher education institutions are under constant pressure to offer academic programmes that improve the employability of their graduates (Teichler 2013:321). Hence Systems Thinking is being investigated as an effective approach for responding to such challenges. This study is investigating the applicability of Systems Thinking in UoTs. Thus, exploring Systems Thinking in the context of UoTs informs the aim of this study. In their view, Davis, Dent and Wharff (2015:335) posit that Systems Thinking empowers those in leadership positions with the ability to adapt and respond to the growing complexities which every organisation faces.

The next model has been developed by the researcher to facilitate the implementation of a Systems Thinking in UoTs.



### 3.7 Proposed Systems Thinking model



**FIG 3.2: Proposed Systems Thinking model for UoTs (researcher's own)**

This model is informed by both the theory and responses from the participants of the study. Systems Thinking helps organisations to achieve their strategic objectives in the most effective and efficient way (Evans 2017:33). The aspects of this proposed Systems Thinking model are discussed below.

- **Create a conducive working environment and develop a sense of shared purpose**

One of the fundamental considerations to implement Systems Thinking successfully is to create a conducive environment. This becomes the solid foundation for the implementation of Systems Thinking across the organisation. Part of creating a conducive environment includes providing the necessary resources, support structures and getting buy-in from all organisational members across the institution. It may also be necessary to provide training workshops on Systems Thinking to sensitize members of the organisation and empower them with Systems Thinking abilities. According to Vemuri and Bellinger (2017:3), significant change in the way people think and act is critical for the successful implementation and adoption of any new initiative in an organisation. It is also critical to stimulate a sense of shared purpose. Fostering trust

and active inclusive participation is key to developing a sense of shared purpose in an organisation.

- **Implementing Systems Thinking to improve processes and practices**

Once a conducive environment has been created, then a Systems Thinking philosophy can be implemented. Processes and practices should be informed by Systems Thinking and should consider a holistic understanding of the institution, as well as the environment in which the institution operates. The implementation process has to emphasise the importance of interrelationships, interconnectedness and interactions of various parts of the institution. Once Systems Thinking has been implemented, it influences the behavior and the understanding that different parts of the organisation interacts to achieve the common goals of the organisation as a whole. Cross- functional collaboration across the institution is important and should therefore be promoted. Systems Thinking promotes the sharing of knowledge and best practices in an organisation. In addition, it is possible to achieve organisational effectiveness where people are encouraged and allowed to share knowledge beyond functional boundaries. According to Bryson, Crosby and Stone (2015:649), collaboration serves as a catalyst for developing trust and commitment to achieve collective goals. This is critical for any organisation to remain relevant as the environment in which organisations operate has been described as turbulent and unpredictable. Scanning the environment provides necessary insights to inform strategy development and decisionmaking processes in an enterprise. In the process of scanning the environment, an organisation should also be able to identify opportunities (niche areas) to introduce services. In a university context, this might be the opportunity introduce new courses. Wheatley (1999:85) eloquently points out that when an organisation knows its strengths, it can intelligently respond to changes from the environment as a result.

- **Appreciation of multiple perspectives and encouragement of feedback from relevant stakeholders**

Internal and external stakeholders should be allowed to provide insights during the process of formulating strategies and policies in the institution. Given the dynamic environment in which UoTs operate, the ability to adapt is important. Diverse perspectives should shape strategy and policies. It should be easier for the institution

to adapt and respond to changes, especially in the higher education landscape. Commenting on the relationship between DUT and alumni, Mthembu (2018:3) adds that it is critical for DUT to have effective engagements with alumni in order to improve their on marketing and fundraising initiatives. Furthermore, he stresses that for the successful implementation of a new philosophy, all relevant stakeholders have to act in concert to achieve a common goal. Receiving and responding to feedback is a critical aspect of Systems Thinking as it allows the organisation to develop effective and efficient processes. Feedback could be in the form of complaints, complement or suggestion for improvement. It is important to encourage relevant stakeholders to play their active role in improving the effectiveness of the organisation.

### **3.7.1 Significance of the model**

Given the competitiveness and turbulent environment in which UoTs operate, the proposed model provides a practical approach for the implementation of a Systems Thinking in UoTs. It is informed by the findings of the study which are presented and discussed later in this project as well as the insights from systems thinking literature. The proposed model takes into consideration the necessary aspects for the successful implementation of Systems Thinking in an organisation. In this model, there is a strong emphasis on the creation of a conducive environment for the adoption of Systems Thinking and continuous scanning of the environment. Furthermore, scanning of the environment provides necessary information to outsmart competitors. Asterrios and Kefalas (2011:350) accentuate that a system operates within an environment. Hence it important scan the environment in which organisations operate. This model emphasises stakeholder engagement, the development of a sense of shared purpose and cross-functional collaboration. The model also allows for feedback relating to successes and failures to be received. Hence, feedback is important for continuous learning and improvement of organisational processes as well practices. The creation of a conducive environment provides a solid foundation for the successful implementation of Systems Thinking in UoTs. The next section discusses general Systems Theory.

### **3.8 General Systems Theory (GST)**

Systems Thinking originates from General Systems Theory. Therefore, it is appropriate to consider GST in this study. The study focuses on the applicability of Systems Thinking at UoTs. It has been revealed by Drack and Schwarz (2010:601) that General Systems Theory was introduced in 1949 by Ludwig von Bertalanffy. It is fascinating to note, as stated by Drack and Schwarz (2010:603), that GST was introduced as a formal approach applicable to various scientific disciplines. In addition, they further describe general systems theory as a tool to deal with Reductionist approaches. General Systems Theory has been adopted by management thinkers and managers for the purposes of studying organisations. In the context of Systems Thinking, organisations are viewed as systems.

A profound viewpoint from Skyttner (2014: 3) is that each science is informed by a certain or a particular point of view. This suggests that each science pursues its studies from a certain viewpoint. Hence, Systems Thinking theory is shaped or informed by a viewpoint that stresses the interrelationship between the man and his environment as part of an interacting system. General Systems Theory deals holistically with the whole or matter from multiple perspectives. In other words, it provides multiple perspectives when dealing with complex situations. Skytter (2014:4) further describes Systems Theory as a tool that provides an understanding of a situation from a systems-ness perspective.

The term 'systems-ness' is taken from Malecic (2017:631). GST has the advantage in a sense that it empowers organisations to address problems beyond conventional reductionist boundaries (Skytter 1996: 16). The argument presented by Kitto (2014:544) is that GST can be applied to all types of systems. This includes the organisational context. The challenge is that people in organisations generally concentrate on what happens in their units. Hence Systems Thinking is necessary to understand the bigger picture. There is need for organisational members to look beyond their organisation's boundaries (Bak 2012:169). Systems Thinking empowers members of the organisation to appreciate that elements of any organisation (system) are interlinked.

Discussing Systems Thinking in a political context, the formation of the United Nations Organisation (UN) was informed by the understanding of a Systems Thinking philosophy. According to Zenko *et al.* (2013: 637), the UN is described as a most holistic organisation at world level that has adopted Systems Thinking. They further point out that innovation is key for organisations to become competitive. Hence, through complex interactions between individuals, organisations and environmental factors, innovation is always possible.

GST stimulates the use of a holistic approach and this approach is receiving the attention of politicians, business leaders and professionals across the world (Zenko *et al.* 2013:638). As a result, there are universities that offer courses on Holistic Thinking. Dealing with specialisation in an organisational context is also a challenge (Zenko *et al.* 2013: 638). In their argument, specialisation may restrict the capacity to solve complex problems through interdisciplinary approaches. In other words, people focus on their areas of specialisation and will not be concerned about issues beyond their scope of work. This is what Systems Theory is challenging when it stimulates and advocates collaboration. GST is essential as traditional change management approaches have failed to provide solutions. With Systems Thinking, organisations are no longer viewed from a mechanistic perspective but from a holistic perspective informed by Systems Thinking (Mc Elyea 2003: 57).

The need to adapt has essentially forced organisations to discard mechanistic approaches. It is for this reason that organisations are viewed as open systems. Mc Elyea (2003:59) presents the argument that GST is influential in terms of how organisations are managed and studied. GST is applicable to multiple disciplines. Hence management consultants offer systems theory courses to business leaders. GST empowers business leaders with the capacity to understand organisational design. Mc Elyea (2003:60) describes GST as a scientific exploration of wholes and wholeness.

### **3.9 Chapter summary**

This chapter discussed Systems Thinking models and General Systems Theory. Hence it makes a meaningful contribution to Systems Thinking theory, both in general and in the context of higher education institutions. However, the focus of this study is on UoTs. The proposed Systems Thinking model is informed by a number of fundamental factors, but mainly Systems Thinking theory, responses from participants and Systems Thinking models developed by other researchers. Mizikaci (2006:37) explains that decision makers in the higher education sector are adopting approaches which were traditionally regarded as relevant to the private sector only. Hence the models discussed are relevant to UoTs. Given the complexity of the challenges faced by organisations both in the private and public sectors, it is necessary for organisations to stimulate learning, innovation and collaboration (Snyder, Wenger and Briggs 2004:1).

This study acknowledges the complex and dynamic challenges in higher education sector. There is therefore a need for UoTs to find an effective approach to deal with such complex and unpredictable challenges. Teichler (2013:327) points out that higher education research should be relevant and helpful to improve institutional processes. Research should also help to find solutions to societal problems. This argument is supported by Mizikaci (2006:37) as he stresses the for higher education systems to respond to the needs of stakeholders. In addition, Smulowitz (2015:71) accentuates that indeed, higher education institutions are under constant pressure to meet the demands of stakeholders, and in this context, stakeholders include accreditation bodies as well as government. There is also a strong emphasis on accountability from HEIs.

Based on the Systems Thinking models identified in this study, Systems Thinking is regarded as a catalyst for stimulating holistic thinking, collaboration, continuous learning and stakeholder involvement in order to achieve organisational effectiveness. The models and Systems Thinking theory discussed in this chapter will be useful for the implementation of Systems Thinking in UoTs. The next chapter covers the research methodology adopted to conduct this study.

## **CHAPTER FOUR: RESEARCH METHODOLOGY**

### **4.1 Introduction**

The previous chapter presented and discussed Systems Thinking in general. This chapter outlines and expounds the research methodology and research design employed to conduct this study. Research methodology and research design aspects covered in this chapter include the research site, research instruments, target population, sampling techniques, data collection and data analysis. The chapter begins with defining research methodology and research design, followed by detailed a discussion on the methodology and design elements of the study. The reasons that informed the choice of a particular methodology and design are provided in the relevant sections of this chapter.

Research methodology covers the procedures followed to conduct research (Babbie 2017:492). On the other hand, Kumar (2014:381) describes research design as a procedural plan adopted by the researcher to conduct research. This plan outlines how data will be collected and analyzed; who will be the participants; and how the findings will be communicated. A clear understanding of the different research designs and methodologies, including their strengths and weaknesses, is critical in choosing an appropriate research design (Jensen and Laurie 2016:28). To achieve the objectives of the study, it was important to choose an appropriate research methodology and research design.

Spickard (2017: 8) puts it succinctly that research is conducted to answer questions. The research questions for this study also influenced the decision to choose a particular design and methodology. Theory on research was instrumental in influencing the decision to adopt a particular research methodology and research design. According to Pokorny and Warren (2016: 1), the higher education sector globally is experiencing unpredictable challenges.

Smulowitz (2014:71) emphasises that institutions of higher learning are under constant pressure to meet the needs of their stakeholders. This study was necessary to explore alternative management approaches to deal with challenges in UoTs. Given the

unpredictable environment in which UoTs operate, Maila (2012:1159) iterates that the higher education environment has become complex and turbulent. He further explains that these complex challenges in the higher education sector are difficult to understand and manage. Such challenges in UoTs provide the basis for the study being conducted.

This chapter deals with questions relating to the following practical aspects:

- where data was collected;
- how it was collected;
- who participated in the study; and
- how data was analysed for this study.

This chapter demonstrates the logical link between the research methodology, research design used and other critical aspects of this study. Those aspects include the aim of the study, research questions and objectives. One of the requirements was to comply with the institutional ethical principles and guidelines. This meant that the researcher had to apply for gatekeeper permission and ethical clearance. The process followed to obtain gatekeeper permission and ethical clearance is discussed in the relevant sections of this chapter. Some participants described the topic being investigated as interesting. The topic was relevant to the field of higher education. The next section of this chapter deals with the research sites on which the study was conducted.

## **4.2 Research site**

Research is conducted to find out something about things that are being investigated (Spickard 2017: 8). The choice of a research site was informed by a number of factors which included the type of data required, the aim and objectives of the study. The research site is a geographical area where the researcher conducts his or her research (Spickard 2017:96). It is also known as the data collection site. The other factors that should inform the choice of the research site include easy accessibility to participants who are in the position to provide information relating to the phenomenon being studied.



The study was conducted at the two UoTs in KZN. Amongst the HEIs in KZN, DUT and MUT were the only UoTs in the province. The institutional offerings of the UoTs are mainly research, teaching and learning. DUT was formed as a result of a merger between the former ML Sultan Technikon and Technikon Natal in April 2002. The DUT has seven campuses two of which are in Pietermaritzburg and other five are in Durban. Steve Biko, M L Sultan, City, Ritson and Brickfield campuses are in Durban, whilst Indumiso and Riverside campuses are in Pietermaritzburg. In terms of faculties, DUT has six, namely Accounting and Informatics; Arts and Design; Management Sciences; Applied Sciences; Health Sciences; and Engineering and the Build Environment. On the other hand, MUT has three faculties, namely the Faculty of Engineering, Management Sciences and Natural Sciences. The mission of MUT is to provide advanced, technology-based programmes and services that are career and business-oriented in the broad fields of engineering, natural and management sciences for the upliftment of talented but mainly disadvantaged individuals. In doing this, the university shows its commitment to social redress.

Part of MUT's mission is to contribute to creating an equitable and prosperous Southern Africa in which individuals have the opportunity to achieve their full potential; whilst DUT's mission is to excel through a teaching and learning environment that values and supports the University community. DUT's mission statement further mentions, promoting excellence in learning and teaching; technology transfer and applied research; external engagement that promotes innovation; and entrepreneurship through collaboration and partnerships. In terms of staff categories, employees at both institutions are broadly categorised as management, administration and academic staff. The general set up in UoTs is similar to the traditional universities in terms of the workforce categories.

#### **4.3 4.3 Research methodology and design appropriateness**

The nature of the phenomenon that was being investigated influenced the decision to adopt a particular research design and methodology. The chosen research design and methodology are discussed in detail in the next section of this chapter.

#### **4.3.1 Research design**

Research design has been described as a research plan adopted by the researcher to conduct research (Kumar, 2014:381). He further states this plan outlines how data will be collected; how participants will be selected; how data will be analyzed; and how the research will be communicated. On the other hand, Creamer (2018:59) provides her insights and describes research design as a well-constructed plan that outlines the purpose of the study and processes to be followed in conducting the research project. Research design plays an important role in helping the researcher to use an appropriate methodology.

The study was phenomenological in the sense that it investigated Systems Thinking as a phenomenon. Davies (2007:240) maintains that phenomenology helps to explore and explain people's worldview based on their experiences and interpretation of the particular phenomenon. Hence Leedy and Ormrod (2013:145) describe phenomenological research as a study that attempts to understand people's perceptions, perspectives and their understanding of a particular situation. An interesting observation made by Creswell and Poth (2018:352) is that phenomenology is an approach to investigate lived experience and to elicit descriptive data. With this approach, the researcher was able to make generalizations from such perspectives of the participants. In this study the researcher collected data from participants relating to the applicability of Systems Thinking in UoTs in KZN. The next section discusses the mixed methods design that was used to conduct this study.

#### **4.3.2 Convergent Design**

The study adopted a Convergent Design approach. Leedy and Ormrod (2015: 331) describe Convergent Design as an approach where the researcher collects both qualitative and quantitative data in parallel. This therefore means that both qualitative and quantitative data are collected at the same time. Creswell and Creswell (2018:15) describe the Convergent Design as a form of mixed methods approach where the researcher converges quantitative and qualitative data. One of the benefits of using Convergent Design is that data is collected in a one-phase approach (Creswell and Clark 2018:68). From the different types of mixed methods, the researched adopted a

concurrent triangulation strategy. This is an approach where the researcher collects both quantitative and qualitative data concurrently and compares both sets of data to determine if there is convergence, differences or a combination (Creswell 2009: 213). The next sub-section deals with how mixed methods were used in this study.

#### **4.3.2.1 Mixed methods**

A mixed methods approach was used to collect data from the participants. Jenson and Laurie (2016:28) describe mixed methods as an approach where more than one research method is used to conduct a single research project. They further indicate that this approach generally involves using a combination of quantitative and qualitative methods. On the other hand, Trochim, Donnelly and Arora (2016:397) define a mixed methods approach as an approach where the researcher uses a combination of a qualitative and quantitative methods. According to Bryman and Bell (2015:643), mixed methods research has become popular and it is used generally in the social sciences and business research. The qualitative and quantitative approaches are compatible.

Kumar (2014:16) recommends a mixed methods approach as the best approach. Where mixed methods is used, the approaches complement each other. This means that the research draws from the strength of each approach, whilst also mitigating the weaknesses of each approach. The practical aspects of how quantitative and qualitative paradigms were used in this study is espoused and discussed in the next section under data collection. According to Trochim, Donnelly and Arora (2016:70) mixed methods research provides for a better understanding of the research problem than when one approach is used. It is with such understanding that Sekaran and Bougie (2016:106) emphasise that a mixed methods approach helps researchers to answer research questions that cannot be answered when only a qualitative or quantitative approach is used. In fact, mixed methods research combines qualitative and quantitative approaches to collect and analyze data in a single study or series of studies. One of the benefits for using a mixed methods approach is data enrichment. This means supplementing required data with another set of data. It was this primary reason that informed the decision to use a mixed methods approach in this study.

The choice of the research methodology was informed by the research design. According to Cooper and Schindler (2014:125), research methodology serves as a blue print outlining how data will be collected, measured and analyzed. The next section discusses the inductive aspect of the research design.

#### **4.3.3 Inductive philosophy**

The study adopted an Inductive philosophy. Babbie (2013:82) describes the inductive model as one where theory is developed based on empirical research data. Trochim, Donnelly and Arora (2016: 396) concur that an inductive approach begins with specific observations and measures that end up as general conclusions or theory. Hence the collected research data assisted with the development of Systems Thinking theory in the UoT context. One of the objectives for this study was to contribute to Systems Theory by capturing UoTs' context. In other words, the study provided new insight on existing knowledge relating to Systems Thinking. The process started by collecting data from the participants and then the data was analysed and arranged according to themes. Broad patterns were identified from the themes, which is how the theory was developed. Leedy and Ormrod (2015: 387) point out that with the inductive approach, observations are made about a particular phenomenon which helps the researcher to make broader generalizations about the phenomenon. The next section deals with the cross-sectional design.

#### **4.3.4 Cross-sectional approach**

The researcher adopted a cross-sectional approach to conduct the study. According to Kumar (2014: 368), the cross-sectional approach is the most commonly used design the in Social Sciences. In a cross-sectional approach, data is collected once, which means that only one round of data collection is done. Data is not collected using multiple occasions like in the longitudinal approach. However, it may be over a period of days, weeks or months to answer research questions (Sekaran and Bougie 2016:390). The Cross-sectional design, in the words of Kumar (2014: 368), is useful to get a bigger picture relating to the phenomenon being investigated. He further mentions that the cross-sectional design is used to measure a phenomenon at a specific moment. In other words, as Jensen and Laurie (2016:167) succinctly put it,

with a cross-sectional survey, collected data reflects a single point in time. This research was measured the views of DUT and MUT employees on the applicability of Systems Thinking to UoTs. Replicability and representativeness was taken into consideration as the sample sufficiently represented the target population.

#### **4.3.5 Grounded Theory**

Grounded Theory is defined by Sekaran and Bougie (2016:392) as the systematic development of an inductively derived theory from data using a set of procedures. In the process of research, Grounded Theory is developed through the collection and analysis of data. The term 'Grounded Theory' means that theory emerges from data that has been collected and analysed, but not data from the existing literature. According to Ivey (2017:288), Grounded Theory uses data to develop theory. To achieve the objectives of the study, the researcher used data obtained through interviews and questionnaires to develop the theory. Grounded Theory is regarded by Leedy and Ormrod (2015:274) as useful in cases where existing theories about a phenomenon are inadequate or non-existent.

##### **4.3.5.1 Substantive theory**

Substantive Theory was the approach used to develop the Systems Thinking theory. Remenyi (2014:180) describes Substantive Theory as a theory which is applicable to the institution or the individuals who participated in the study. He further states that Substantive Theory is regarded as the first step in producing a Grounded Theory. Once Substantive Theory has been developed, then it may be further refined or developed into a formal theory which could have a greater scope and generalizability. Ideas from empirical data were used to get a deeper understanding and explanation of the Systems Thinking phenomenon that was being investigated. The analysis of data was instrumental in identifying patterns that were used to develop Substantive Theory. It has also been articulated by Sekaran and Bougie (2016:106) that in research, theory is developed by identifying patterns based on the analysis of data. The next section deals with the research methodology.

## **4.4 Research Methodology**

Research Methodology is a general approach that is adopted to conduct research. According to Babbie (2017: 492), methodology deals with the procedures followed to conduct scientific investigation. The methodology outlines the research approach adopted to conduct research (Leedy and Ormrod 2015:389). On the other hand Cameron and Price (2009:xxiii) put it succinctly that research methodology describes and justifies the use of a particular research approach to conduct research. The following section outlines methodological aspects relating to how this study was conducted.

### **4.4.1 Target population**

The target population of this study comprised permanent employees from both DUT and MUT. Discussing a target population in research, Cooper and Schindler (2014:667) define a target population as people, events or records that have been identified to provide the required information or data for the research project. The target population comprised administration staff, academics, middle and top management at MUT and DUT. Hence the study explored a Systems Thinking concept in UoTs. Information relating to staff complements was obtained from the Human Resources departments of both institutions. DUT has 1450 employees across campuses. The staff complement at MUT is 527. The research targeted permanent employees of the two universities. The next section deals with sampling methods used in the study.

### **4.4.2 Sampling technique**

Sampling is a process followed to select units, individuals or organisations to represent the population in the study. This could also be text, for example diaries; internet discussions boards; blogs or graphic images. A sample is selected from the population and the results can be generalized to the population from which the sample was chosen (Trochim, Donnelly and Arora 2016:80). In total, the target population was 1977 employees. This included both DUT and MUT employees. Sekaran and Bougie (2013:268) state that if the population size is 2000, then the sample size should be 322. Permanent employees of both DUT and MUT were appropriate to provide relevant data for this study. At MUT, there were 212 academics and 315 administrative staff.

Sekaran and Bougie's (2013:268) table was consulted and used to determine a sample size that reflected sufficient representation of the population.

#### **4.4.2.1 Probability sampling design**

Probability sampling uses the theory of probability where the sample is selected in such a way that each element in the population has an equal chance of being selected and be part of a sample (Kumar 2014:378). The sampling approach used in this study was probability sampling. Outlining the benefits of using the probability sampling, Cooper and Schindler (2014: 343) explain that it offers the opportunity to generalize the research findings. Through probability sampling, the sample is selected in accordance with the probability theory. It uses a random selection approach (Babbie 2017:494).

#### **4.4.2.2 Stratified sampling**

A sample is a subset of the target population (Jensen and Laurie 2016:88). Stratified sampling was used in this study. Sekaran and Bougie (2013:242) assert that sampling is critical as it is practically impossible for the researcher to collect data from every element in the target population. According to Cooper and Schindler (2014: 35), stratified sampling is chosen because it provides significant statistical efficiency. Stratified sampling is regarded as the most efficient amongst all probability designs (Sekaran and Bougie 2013:254).

Stratified sampling assisted the researcher to break the population into strata (according to sectors and levels of responsibilities); for example, academic, support staff, middle and top management. Identified sectors in the population were representative of the university workforce. Once participants had been divided into strata, simple random sampling was then used to select participants from whom data was collected in both institutions. According to Sekaran and Bougie (2013:398), simple random sampling is a probability sampling design in which every single element in the population has an equal chance of being selected as a subject. Simple random sampling ensures that the sample is statistically representative (Jensen and Laurie 2016:93). When simple random sampling is used, the researcher has access to the whole population and randomly selects the number of participants to make up the

sample. Jenson and Laurie (2016:101) accentuate that fair representation of the target population is critical, thus the sample should match the characteristics of the population as closely as possible. They further state that random sampling is often used in conjunction with other sampling techniques. In this study, it was used in conjunction with stratified sampling. According to Jensen and Laurie (2016:93), simple random sampling is the simplest technique of probability sampling.

#### **4.4.2.3 Non-probability sampling**

Non-probability sampling is a sample selection process in which the elements in the target population do not have a pre-determined chance of being selected as sample subjects (Sekaran and Bougie 2016:394). Since the study adopted a mixed methods design, a non-probability sampling technique was used to collect qualitative data. Purposive sampling, which is part of non-probability sampling, was adopted for this study. According to Kumar (2014:374), purposive or judgemental sampling is where the researcher uses his or her judgement to select individuals who can provide the best information to achieve the objectives of the study.

#### **4.4.3 Data collection method**

According to Remenyi (2013:109), data is commonly regarded as primary or secondary. Research allows data to be collected and used to answer the research question. The choice of a data collection method, which is outlined in this section, was critical to achieve the objectives of the study. The data collection method refers to the adopted methods to collect data from the participants (Quinlan *et al* 2015:395). On the other hand, Spickard (2017:385) defines data collection as a technique used to collect specific types of data. There are many different data collection methods. However self-administered questionnaires and unstructured face-to-face interviews were the methods used in the study. The decision to use unstructured face-to-face interviews and self-administered questionnaires was informed by a number of factors, which include:

- Aim of the study;
- Type of data required; and
- Population from which data was collected.



Quinlan et al (2015:152) emphasise that it is critical for the researcher to choose an appropriate data collection method for the research project. Kumar (2014:173) mentions that it is important for the researcher to have a clear understanding of the target population, including their educational levels, age structure and their socio-economic status.

#### **4.4.4 Gatekeeper permission**

The researcher followed the necessary procedure to obtain gatekeeper permission to conduct the study at the two institutions. The application for permission was processed by the institutional research offices, and the permission was granted. This process was necessary to gain access to participants who were going to provide insights into the topic under investigation. Gatekeepers are defined by Creswell and Creswell (2018:248) as individuals who provide permission for the researcher to access the research site.

#### **4.4.5 Instrumentality**

The appropriate research instruments for the study were questionnaires and interviews. Hence a mixed methods approach was used. A questionnaire was used to collect quantitative data and unstructured interviews for qualitative data. Both instruments are discussed in detail in the next sections. Research instruments were designed with the objectives of the study in mind. Both instruments were designed in a way that they solicited answers to specific research questions. In fact, the adopted research instruments were appropriate to collect quantitative and qualitative data. The research instruments were designed by the researcher and existing literature provided guidance in the development of the instruments. The next sub-sections discuss validity and reliability.

##### **4.4.5.1 Validity**

Ensuring validity is a key aspect of the research project. This helps to ensure that the research being conducted measures or investigates exactly what it claims to be measuring. Validity refers to the degree to which the research instrument measures what it was designed to measure (Bless, Hugson-Smith and Sithole 2013:395). Factors that could have created confusion about the meaning of the results were eliminated.

To determine the validity of the research instrument, pre-testing of the research instrument was done before data was collected from participants. The researcher formulated one set of similar questions for all the participants. Participants were also given clear instructions on how to answer the questions.

All questions were asked using simple English language and the researcher ensured that all questions were relevant to achieve the objectives of this study. The content validity measure assisted the researcher to establish the validity of the research instruments. Kumar (2014: 367) describes content validity as a measure to establish if questions or items in the research instrument cover all the aspects of what the research is intending to investigate. The research instrument used in this study contained questions and items that solicited data relating to the applicability of Systems Thinking in UoTs. Participants were also given sufficient time to answer the questionnaires. For validation purposes, a statistician's advice was sought before data was collected. This helped the researcher to make the necessary adjustments required. Question and subjective bias were avoided.

#### **4.4.5.2 Reliability**

To ensure the reliability of the research instrument, the researcher used Cronbach's alpha. Cronbach's Alpha is a specific method of estimating the internal consistency reliability of a measure. Bryman and Bell (2015:169) postulate that Cronbach's alpha is used to test internal reliability. It calculates the average of all possible split-half reliability coefficients. Ambiguity in the wording of questions was avoided to ensure the reliability of the research. Bless, Higson-Smith and Sithole (2013:222) describe reliability as the degree to which the research instrument produces accurate and the same results when used repeatedly.

Kumar (2014: 220) concurs that the reliability of an instrument refers to its ability to produce consistent measurement each time it is used repeatedly under similar conditions. Reliability statistics are presented as part of the findings in Chapter Five of this study. For the qualitative aspects of this study, neutrality in the context of the phenomenon being investigated was also maintained. Although Kumar (2014: 220) suggests that there is no set of procedures to determine indicators for validity and

reliability in qualitative research, however he states that reliability in qualitative research is measured by dependability or confirmability.

#### **(i) Dependability**

Dependability in qualitative research is similar to reliability in quantitative research. According to Kumar (2014:369), it is when the instrument produces the same results after observing the same phenomenon repeatedly. Various statistical analyses were performed to attest to the accuracy of data.

#### **(ii) Confirmability**

Confirmability refers to the degree to which the results obtained by means of a qualitative study could be confirmed by other researchers (Kumar 2014:366). This is similar to reliability in quantitative research. The findings of the study were based on the interpretation of data and not on their researcher's personal influence. The next section deals with the quantitative paradigm of the study.

### **4.5 Quantitative paradigm**

For the purposes of this study, the researcher collected quantitative data as well. Quantitative data represents the phenomena by assigning numbers in a meaningful and logical manner (Zikmund et al 2013:655). According to Jensen and Laurie (2016:28), quantitative aspects of research deal with the collection and analysis of data in a numerical form. They further mention that in quantitative research, knowledge is developed by using inferential statistics. This is when relationships between variables and statistical patterns from data are identified. One of the benefits of using a quantitative approach is that it helps to identify patterns that apply at the level of the entire population. Discussed in the next sub-sections is the instrument and strategy used to collect quantitative data.

#### **4.5.1 Drafting of the questionnaire**

The process of drafting the questionnaire was informed by a number of factors that had to be considered. Some of the factors included the objectives of the study, type of data

that was required and data analysis method that was going to be used. Babbie (2016:248) describes a questionnaire as an instrument designed specifically to elicit relevant information from participants. Solicited information is then analyzed to give meaning in relation to the objectives of the study. The format and the wording of questions asked in the questionnaire are important (Babbie 2016: 254).

The questionnaire was divided into eight sections. Section A covered the background information of the participants; Section B elicited the biographical information of the participants; Section C covered a sense of shared purpose; Section D solicited information about a knowledge-sharing culture; Section E solicited information about perceptions of participants on the application of Systems Thinking in UoTs; Section F covered items on the opportunities for the application of a Systems Thinking philosophy in UoTs; and Section G covered items relating to possible challenges for the application of a Systems Thinking philosophy in UoTs.

A statistician was consulted during the design stage of the questionnaire and his input was critical as his services were going to be used in the data analysis process. The questionnaire was designed in a Likert scale format. For example, 1=Strongly disagree, 2= Disagree, 3=Neutral, 4=Agree and 5=Strongly agree. When a Likert scale is used, participants indicate their attitudes by choosing whether they agree or disagree with the statements in the questionnaire. In other words, participants rate the degree to which they agree or disagree with the statements. Salkind (2018: 260) explains that the Likert scale is a method used in attitude scales where participants agree or disagree with a set of statements using a five-point scale in a questionnaire.

Questions in the questionnaire were presented in a logical order, as recommended by Trochim, Donnelly and Arora (2016:192). The order of questions were from general to specific. Authors further mention that the researcher should begin with the questions that will pique interest and motivate participants to answer all the questions in the questionnaire. The questionnaire was designed in such a manner that it would be easy for participants to complete. Listed below were some of other factors that the researcher considered during the process of designing the questionnaire:

- Content and types of questions;
- Presentation of each question;
- The order of questions; and
- The length of the questionnaire.

The researcher avoided ambiguity in all the questions as answers to all the questions were also critical.

#### **4.5.2 Characteristics of a good questionnaire**

Knowledge of the topic being investigated is critical for the researcher to develop a good research instrument (Jensen and Laurie 2016:149). The researcher consulted relevant literature to gain more insights on Systems Thinking, helped with terminology used to formulate questions. Cottrell (2014:156) highlights the following factors as characteristics of a good questionnaire.

- Only relevant questions are included;
- The questionnaire looks easy to complete;
- The questionnaire looks non-threatening ( in terms of number and length of questions); and
- The layout is professionally done (it must be simple and straightforward).

#### **4.5.3 Advantages of a questionnaire**

According to Fox and Bayat (2010:88), the questionnaire has the following advantages.

- Questionnaires offer greater anonymity;
- It is relatively easier to administer;
- Participants can complete the questionnaire at their own convenience;
- Questionnaire can be completed in a short space of time;
- It can be administered to a wide number of people at the same time;
- They are easy to analyze;
- Most people are familiar with questionnaires; and
- Middle-man bias and influence is eliminated.

#### **4.5.4 Pre-testing the research instrument**

Pre-testing the research instrument has been defined by Zikmund (2010:231) as a trial run where only a few participants are involved, the purpose of which is to identify and rectify fundamental problems in the research instrument. Kumar (2014: 378) describes pre-testing as a practice where the researcher is testing the instrument to ascertain likely problems before it is used in the actual study. It was for this reason that pre-testing of the instrument was done.

To pre-test the research instrument, fifteen questionnaires were distributed. The completed questionnaires were collected from the participants after a few days. Of the fifteen questionnaires that were distributed, fourteen were collected. Only one questionnaire was not completed. Based on the pilot study results, participants felt that the questionnaire was easy to complete and the questions and instructions were simple to understand. The researcher was satisfied with the results of the pilot study as there were no amendments required for the questionnaire. Participants who took part in the pilot study did not participate in the main study as per recommendation from the Ethical Research Committee at DUT. Piloting of the instrument was done from the 2<sup>nd</sup> to 10<sup>th</sup> February 2017.

#### **4.5.5 Administration of the questionnaire**

Questionnaires were personally administered by the researcher for this study. The total number of questionnaires distributed was 322. Out of the 322 questionnaires that were distributed, 235 were returned and as a result 73% response rate was achieved. From the total of 235, about 14 questionnaires were regarded as spoilt because some sections were not completed. The self-administered questionnaire was adopted because it does not require much skills to administer. Another important factor is that it is less expensive (Sekaran and Bougie 2016:143). In some sections, there were individual staff members who volunteered to coordinate the distribution of questionnaires and the aim was to encourage more staff members in their sections to participate in the study. The researcher left the questionnaires with the participants and answered questionnaires were personally collected by the researcher after a few days. The approach to self-administer questionnaires is, according to Quinlan (2015:155) a

drop and collect method where the researcher drops a questionnaire and returns at a later stage to collect completed questionnaire. This approach gave participants enough time to answer the questionnaire. Participants answered questionnaires at their convenience, and they were not put under pressure. The letter of information and the consent form were attached to the questionnaire. Some participants commended the researcher for designing a questionnaire that was easy to answer. Distribution of the questionnaires started on the 15<sup>th</sup> of May 2017 until 6<sup>th</sup> of October 2017.

#### **4.5.6 Response rate**

The response rate for the study was 73%. A good response rate is critical; hence the researcher should do everything possible to stimulate interest from participants. The response rate is a key to ensure that the research project is representative. Flick (2015:271) describes a response rate as a share of questionnaires that are completed and returned in the study. According to Quinlan et al (2015: 179), high response rates contributes to the validity of the research. It was encouraging as in some departments participants motivated their colleagues to participate in the study. In some instances, participants requested that the research findings be shared with them at the end of the study. The layout of the questionnaire was set out clearly and instructions and questions were easy to understand. As a result, the response rate achieved was encouraging. The strategy to motivate people to participate in the study is critical. Although there was no follow-up made for this study in terms of sending emails or making phone calls to encourage participants to answer the questionnaire, the topic that was being investigated appealed to the participants. Their participation forms the foundation of a successful research study (Jensen and Laurie 2016:114). Therefore, building a research relationship with the participants is important. Participants provided the required data for the study. Discussed in the next section is the qualitative paradigm of the study.

#### **4.6 Qualitative paradigm**

Qualitative aspects of research deal with data that is not numerical. Hence this type of data is described as data not in a numerical form but which is in a textual, visual or oral form (Zikmund et al 2013: 655). According to Jensen and Laurie (2016:11), a qualitative

approach begins with the collection of data which is then analyzed to develop theory. The instrument used to collect qualitative data for this study was unstructured face-to-face interviews.

#### **4.6.1 Unstructured face-to-face interviews**

This section deals with unstructured face-to-face interviews, whilst self-administered questionnaires were discussed in the previous sections of this chapter. According to Jensen and Laurie (2016:11), a qualitative approach starts with data collection and then progresses to theory development. One of the benefits of using a qualitative approach is that it helps to establish a new understanding of previously ignored or under-researched topics. It helps to provide good explanations of the ideas, perspectives and experiences of the participants. Unstructured interviews were used to collect qualitative data. A total of 15 participants were interviewed. Trochim, Donnelly and Arora (2016:405) describe unstructured interviews as an interviewing method that uses no predetermined interview protocol. However, the interview questions emerge as the interview progresses. Research interviews involve asking participants questions relating to the research topic (Kumar 2014:374). This could be face-to-face or telephonic. According Jensen and Laurie (2016: 133), the research interview is a data collection method where the researcher has a conversation with a person or individuals and during which questions relating to the research topic are asked. Fox and Bayat (2010:72) define an interview as an instrument to gather information about people's thoughts, feelings and experiences.

As outlined by Quinlan et al (2015:154) the interview approach has a number of advantages including the fact that the researcher has the opportunity to establish a rapport with the participants. According to Sekaran and Bougie (2016:120), where face-to-face interviews are used, the researcher has the opportunity to ensure that questions are well understood by participants. Another advantage for using this data collection method is that the researcher is in a position to motivate respondents and also establish a rapport with the participants (Sekaran and Bougie 2016:123).

Arrangements and appointments were made well in advance with the participants. An email was sent to participants asking for an appointment with them. A letter of



information, consent form and list of questions were attached to a letter that was emailed to participants requesting the appointment with them. Interviews took place in the participants' work stations (offices). This was important for participants to be comfortable and feel at ease during the interview. Considering other factors, interviews took about 20 minutes at a maximum. Interviews were audio-recorded for purposes of transcription and data analysis. A digital voice recorder was used to record interviews and a smartphone was also used as a back-up. Participants were informed that the interviews would be audio recorded and they were comfortable with that. During the interview sessions, the interviewer was warmly received.

At the beginning of the interview, it is important to briefly highlight the context of the study. During the interview, the researcher started by introducing himself and thanked the participants for agreeing to take part in the study. The researcher adopted an approach in which he started with ice-breaker questions. For the style of questioning used, the researcher started with questions relating to background information and gradually moved to more open-ended questions. The main questions required participants to elaborate their responses in more detail. At the end of interview session, the researcher expressed his gratitude to participants for their time and valuable input. Trochim, Donnelly and Arora (2016: 199) recommend that at the end of an interview, the researcher should thank the participants. Those who participated in the research interviews were mostly at the management level. They included deputy deans, managers, coordinators, directors and professors.

#### **4.6.2 Advantages of interviews**

According to Fox and Bayat (2010:101), using interviews has the following advantages:

- The interviewer has the opportunity to ask follow- up questions;
- Questions and instructions can be clarified during an interview;
- There is always a good chance not to skip any question; and
- Non responses are far less likely to occur in personal interviews.

## 4.7 Ethical considerations

Ethical principles are relevant to research in general. This has to do with protecting the interests of those who participate in a study (Flick 2014:48). Institutional procedure for DUT was followed to obtain ethical clearance. This included the application for permission to collect data from the participants. The researcher complied with DUT's ethical guidelines when the study was being conducted. A letter of consent was attached to a questionnaire, explaining the purpose of the study and also assuring participants that their responses would be kept confidential. In the consent letter, participants were made aware that their participation in the study was voluntary. Kumar (2014:285) stresses that it is important that participants are informed of the purposes of the study and they need to be informed that their responses will be used for research purposes only. Hence it is critical for the researcher to make participants fully aware of the nature and purpose of the research before they participate in the study (Oliver 2014:158).

DUT has a research office that is also responsible for assessing if the researcher has complied with institutional research guidelines before ethical clearance and a gatekeeper's letter can be granted. Flick (2015: 38) attests that generally, an ethics committee is in charge of assessing whether researchers are complying with ethical requirements before research can be conducted.

To ensure confidentiality and to protect participants' identities, their names were not required. Part of ethical requirements was the gatekeeper's letter giving the researcher permission to conduct the study. Application for permission was made to the relevant authorities and the researcher was given such permission to conduct the study at the two UoTs (DUT and MUT). For ethical purposes, participants signed a consent form as an indication of voluntarily participating in the study.

The consent form outlined the following:

- Purpose of the study
- How data will be collected, handled and stored
- Assuring participants that their identities will not be revealed
- Stressing that participation in the study was voluntary

- Making participants aware that had a right to withdraw from the study at any point without consequences
- For ethical reasons, it was critical to inform participants that there would be no financial incentives or of any form of reward for participating in the study.

Participants were not subjected to any experiments. No sensitive information was solicited from the participants. Basically, participants were given sufficient information to make decisions on whether to participate or not participate in the study. The study was conducted in order to contribute new insights to existing knowledge. Participants understood the overall aim of the study and they were enthusiastic to take part in the study.

## **4.8 Data analysis**

This section outlines briefly how data was analysed, however a detailed analyses of data is covered in the next chapter. Data analysis is a process that involves determining consistent patterns revealed from the research data. According to Zikmund et al (2013:68), this may involve statistical analysis from simple frequency distribution to a more complex multivariate analysis.

According to Wagner, Kawulich and Garner (2013:269,) data analysis is the process of examining data to get a logical meaning. They further explain that data should provide meaning and answers to the research questions. Quantitative analysis deals with the numerical representation and manipulation of the observations to describe the phenomena that those observations reflect (Babbie 2017:423). Qualitative analysis is the non-numerical examination and interpretations of the observations (Babbie 2017:420).

### **4.8.1 Quantitative design: data analysis**

Once data had been collected, the Statistical Package for the Social Sciences Software (SPSS) version 25.0 was used to analyze quantitative statistics. This is a computer software package that is used to perform statistical analysis. SPSS is effective in statistical analysis for descriptive and inferential statistics (Sekaran and Bougie 2013:

332). The decision to use SPSS was informed by its ability to calculate simple and sophisticated analysis.

#### **4.8.2 Qualitative analysis: data analysis**

Thematic analysis was performed for qualitative statistics. Thematic analysis has been defined by Wegner, Kawulich and Garner (2012:231) as a general approach to analyze qualitative data. It involves the identification of themes or patterns in the data. Analysis of data is considered as a critical step in any research project (Flick 2015:77).

The researcher used NVivo, which is a computer software to analyze qualitative data. Nvivo is used for the both analysis and management of data. It also provides tools to illustrate and present the findings. The study worked with both numerical and narrative data. Computerized software packages are useful to manage and analyze data. It has also been stressed by Quinlan et al (2015:32) that analyses of data are very simple when a computerized software package is used. For qualitative data, Thematic Analysis was adopted to provide meaning to the qualitative data that was collected through interviews.

#### **4.9 Steps taken to avoid bias**

Necessary steps were taken to avoid bias of any form from influencing the study. To avoid bias of any form is critical in research as this improves the reliability and validity of the study (Jensen and Laurie 2016:157). According to Quinlan et al (2015:394), bias is anything that compromises the research or data. Harvey and Land (2017: 64) describe bias in research as a deliberate manipulation of a research process. For example, data collection or data analysis to suit a researcher's desired outcomes. In this study, leading questions were avoided. On the issue of avoiding bias, Jensen and Laurie (2016:157) accentuate the point that leading questions should be avoided. The wording used in the research instrument was carefully chosen to avoid bias. In discussing issues of bias in research, Quinlan et al (2015:248) put it succinctly that bias could be a particular perspective in the research project that highlights some aspects and on the other hand ignoring other important aspects of the research.

#### **4.9.1 Subjectivity**

According to Harvey and Land (2017:379), subjectivity is a measurement or observation that helps to ascertain the extent to which the results are influenced by researcher's interpretation. Unpacking subjectivity, Kumar (2014: 385) stresses that this relates to allowing a researcher's personal views to influence the interpretation of the research findings. As a result, a researcher's beliefs and experiences have influence in the research. In this study, the researcher's beliefs and preconceived ideas did not influence the study. The researcher approached the study from a neutral standpoint. In other words, objectivity was maintained at each and every stage of the research project.

#### **4.10 Summary of the chapter**

This chapter presented and discussed the research design and methodology adopted to conduct this study. The choice of a research design and methodology was informed by a number of factors, mainly the aim and objectives of the study. Critical elements of research methodology covered in this chapter include aim, objectives, research questions, population, sampling, data collection, research instruments and data analysis. Outlined in this chapter was also the scope of the study. A mixed methods approach was adopted to conduct this study. Qualitative and quantitative data were collected simultaneously. This means that the researcher used a cross-sectional approach. It was through the inductive approach that the researcher was able identify broad patterns from themes and as a result, theory was developed. This was important as one of the objectives of the study was to contribute new insights to Systems Thinking theory. The study was phenomenological as it was investigating Systems Thinking as a phenomenon. The adopted research methodology helped the researcher to achieve the objectives of the study and the research questions were also answered. The next chapter presents the findings of the study.

## **CHAPTER FIVE: PRESENTATION OF THE FINDINGS**

### **5.1 Introduction**

The previous chapter discussed the research methodology and research design that were adopted to conduct this study. A Mixed methods approach was used to collect data relating to the applicability of Systems Thinking in UoTs. A Convergent parallel design was adopted to collect quantitative and qualitative data. Research instruments used to collect data were structured questionnaires that were self-administered by the researcher and unstructured face-to-face interviews. The target population for this study was the permanent employees of DUT and MUT.

This chapter presents the findings based on the data collected from participants in order to achieve the objectives of the study. Graphs and tables are used to present the findings in a meaningful manner. This chapter deals with both qualitative and quantitative results. Bazeley (2018:655) describes the integration of different sets of data as essential, since this approach provides an enriched view and a deeper understanding of the phenomenon being investigated. Bloomberg and Volpe (2019:251) point out that the findings must address the research problem and provide answers to the research questions. Presented in the first part of this chapter is the quantitative results and the latter part covers the qualitative findings. Quantitative data was analysed with SPSS version 25 whilst Nvivo version 12 was used to analyse qualitative data. The next section deals with the profile of the participants.

#### **5.1.1 Profile of participants**

This section covers the distribution of socio-demographic variables including years of experience, gender, qualification, age and the sector in terms of administration and academic. According to Pajo (2018:302), the demographics section deals with the basic characteristics of the target population. Table 1 below demonstrates the socio-demographic variables of the participants.

**Table 1 Distribution of socio-demographic variables**

VARIABLES		FREQUENCY	PERCENT
Institution	DUT	172	78
	MUT	48	22
	Total	220	100.0
Sector	Academic	103	47
	Admin	116	53
	Total	219	100.0
Qualification	Matric	18	8.2
	Diploma	30	13.6
	B.Tech	86	39.1
	Masters	65	29.5
	Doctorate	21	9.5
	Total	220	100.0
No of years working in the institution	1-5 years	82	37.3
	6-10 years	57	25.9
	11-15 years	26	11.8
	16-20 years	22	10.0
	21-25 years	21	9.5
	>25 years	12	5.5
	Total	220	100.0
Gender	Female	128	58.2
	Male	92	41.8
	Total	220	100.0

Age in years	15-25 years	10	4.5
	25-35 years	78	35.5
	35-45 years	61	27.7
	45-55 years	49	22.3
	>55 years	22	10.0
	Total	220	100.0

A total of 220 participants completed the self-administered questionnaire to provide quantitative data for this study. It was found that more than three quarters of the participants at (78%) were from DUT and 22% were from MUT. In terms of educational qualifications, the majority of participants (at 39.1%) had a Bachelor of Technology degree (B.Tech). Only 9.5% of participants had a Doctoral qualification. The results also revealed that 13.6% of the participants had a diploma. Based on the research results, 8.2% of participants had matric only.

The results revealed that 47% of participants were from the academic sector whilst 53% were from the administration sector. Regarding the years of experience, the majority of participants at (63%) had ten years or less. On the other hand, 15% of the participants had more than twenty years of experience in their respective institutions. More than half at (58%) of the participants were females. The socio-demographic variables reflect diversity in terms of the characteristics of the participants in this study. The next section deals with the research results based on quantitative data.

## 5.2 Research Results: quantitative paradigm

Quantitative analysis is described by Babbie (2017:494) as the numerical representation and interpretation of quantitative data to explain the phenomenon being investigated. Different statistical tests were performed using SPSS to analyse quantitative data. Statistical analysis performed in this study included descriptive and inferential statistics. According to Jensen and Laurie (2016:333) quantitative analysis



helps to create descriptions and summaries of emerging patterns using sets of data and statistics. Leedy and Ormrod (2013:270) stress that the analysis of quantitative data helps the researcher to make sense of the world (phenomenon) through numbers. They further mention that the numbers are then summarised and interpreted using statistics. The next section deals with the descriptive analysis. The presentation and the discussion of the descriptive results is followed by the sections that cover inferential statistics.

### **5.2.1 Descriptive analysis**

Descriptive analysis is one of the statistical analyses performed in this study. Creswell and Creswell (2018:247) describe descriptive analysis as the process of analysing data for variables in the study. Sekaran and Bougie (2016:391) define descriptive statistics as statistics that provides descriptive information about a set of data. In addition, descriptive statistics is used to describe basic features of data in the study (Trochim, Donnelly and Arora).

Descriptive statistics describe the results through means, standard deviations and the range of scores. According to Leedy and Ormrod (2015:386), descriptive statistics is the type of statistics that summarise the nature of a particular set of numerical data. Sub-sections covered in this section include a descriptive analysis relating to all the research constructs for this study. In research, a construct is defined by Robinson and Leonard (2019:211) as something to be measured that cannot be directly observed. Listed below are the research constructs of this study.

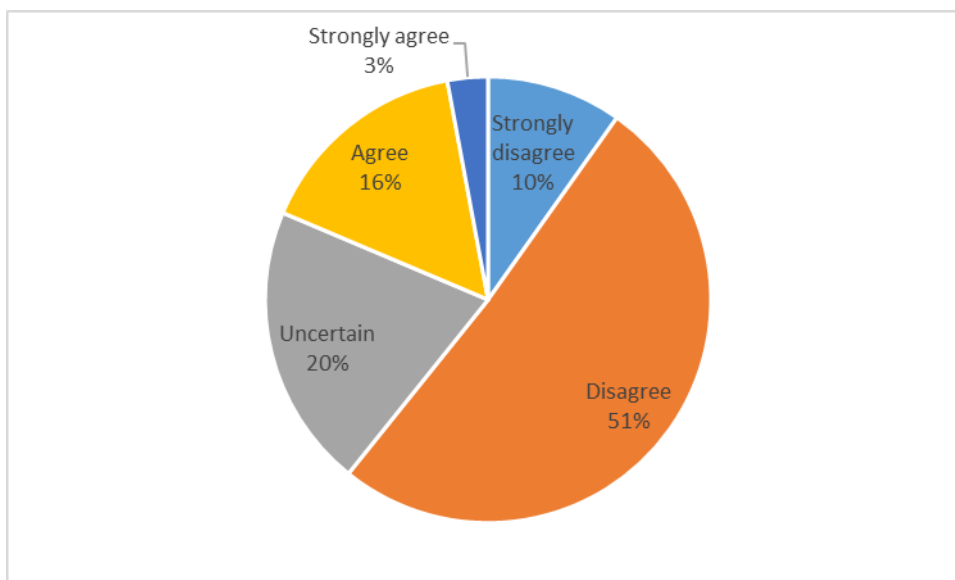
- (a) A sense of shared purpose in the institution
- (b) Commitment to achieving the strategic objectives of the institution
- (c) The drive for excellence in the institution
- (d) Knowledge-sharing culture in the institution
- (e) Perceptions of the application of Systems Thinking in the UoTs
- (f) Opportunities and challenges for the application of Systems Thinking in UoTs.

These research constructs are relevant in the context of Systems Thinking, which is a concept or philosophy being investigated in this study.

#### 5.2.1.1 A sense of shared purpose in the institution

This section solicited responses relating to a sense of shared purpose in the UoTs. The aim was to get a sense of the extent to which a sense of shared purpose played a role in improving organisational processes and practices in the UoTs.

Results as presented in Figure 1 below illustrate how participants responded to statements relating to a sense of shared purpose in the institution.

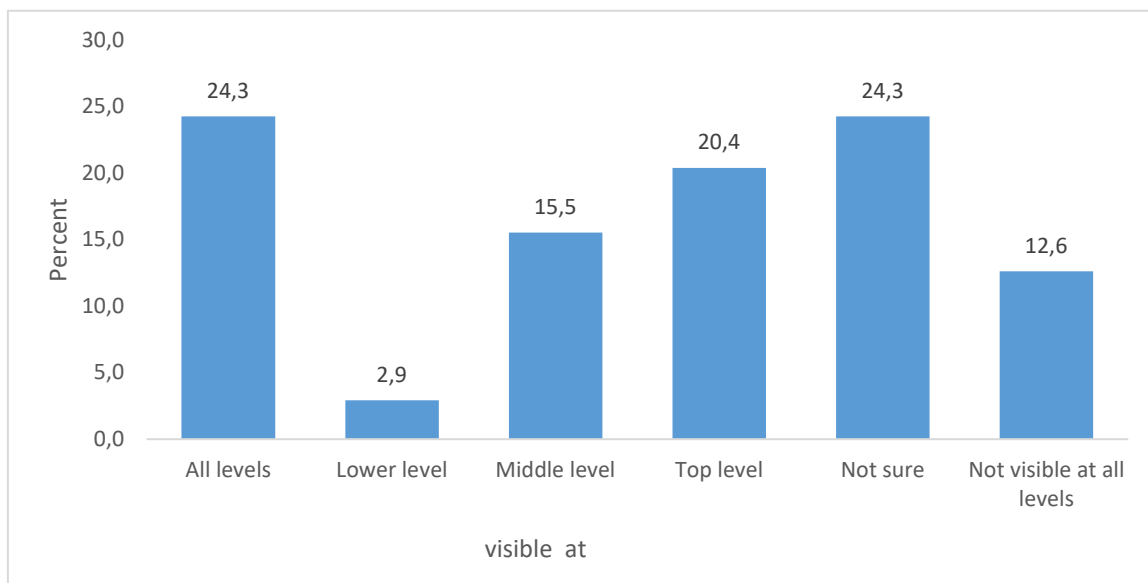


**Figure 1: There is a sense of shared purpose in this institution (n=220)**

The majority of participants at 51% indicated that there was no sense of a shared purpose in the institution. However, 20% of the participants indicated that they were not sure whether or not there was a sense of shared purpose. On the other hand, only 16% of the participants indicated that there was a sense of shared purpose in their institution. A sense of shared purpose is critical in any organisation. This applies to both private and public organisations. Systems Thinking serves as a catalyst to promote a sense of shared purpose in an organisation. According to Yukl (2010:374), when a group of organisational members has a collective identity, those members understand a need for cooperation, and they will agree on the objectives, values and most importantly organisational strategy.

### 5.2.1.2 Commitment to achieve strategic objectives of the institution

Presented in Figure 2 below are the responses relating to the commitment to achieve the strategic objectives in the UoTs. Yukl (2010:309) defines a strategic objective as tangible outcome to be achieved with a specific deadline attached to it. The aim of this construct was to establish if the commitment to achieving the strategic objectives was demonstrated at all levels across the institution.



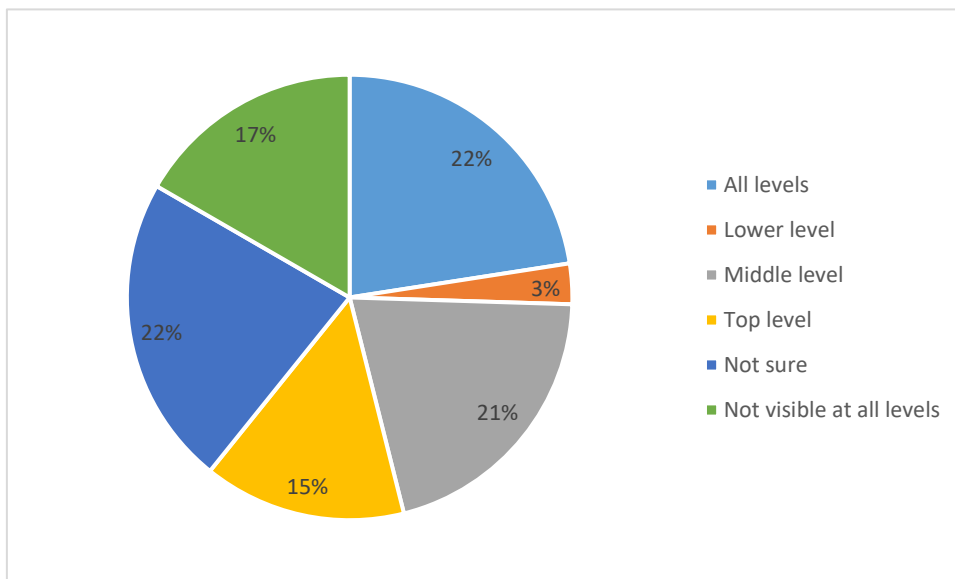
**Figure 2 Commitment to achieving the strategic objectives of the institution is visible at n=220**

The results showed that only a quarter of the participants at 24.3% indicated that the commitment to achieve strategic objectives of the institution was visible at all levels. Whereas 13% of the participants indicated that commitment to achieve strategic objective was not visible at all levels. Participants at 24.3% indicated that they were not sure. The results also indicated that 20% of the participants felt that commitment to achieve strategic objectives of the institution was visible at the top management level. However, 16% of the participants were of the view that commitment to achieve strategic objectives of the institutions was visible at the middle management level. Only 3% of the participants indicated that the commitment to achieve strategic objectives of the institution was visible at the lower levels.

The number of those who felt that the commitment to achieving the strategic objectives was visible at all levels was equal to the number of those who were not sure about the visibility of the commitment to achieving the strategic objectives of the institution. It is important that commitment to achieving strategic objectives is promoted and demonstrated at all levels of the organisation. Systems Thinking is effective in stimulating commitment from organisational members to work as a collective in pursuit of achieving the strategic objectives of the organisation.

### 5.2.1.3 The drive for excellence in the institution

Figure 3 illustrates responses relating to the visibility of a drive for excellence in the UoTs. Stowell and Mead (2016:54) assert that it is critical to internalise the organisation's vision and mission, as well as to understand how each unit or department can contribute to moving the whole enterprise forward. Systems Thinking serves to stimulate a drive for excellence in the organisation. Hence this construct solicited responses on a drive for excellence to gain competitiveness in the UoTs.



**Figure 3: The drive for excellence in this institution is visible (n=220)**

The statements on the drive for excellence being visible at all levels in the institution were supported by 22% of the participants. The results indicated that 3% of the participants perceived that the drive for excellence was visible at the lower level. It was found that 15% of the participants felt that the drive for excellence was visible at the

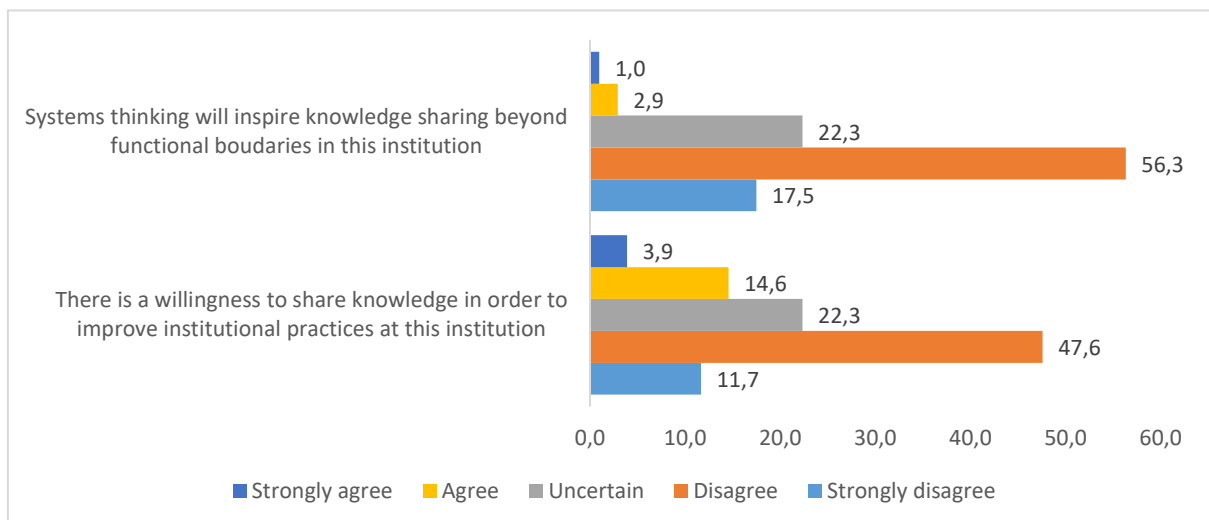
top level. On the other hand, 21% of the participants were of the view that the drive for excellence was in the middle-management level. It was also found that 17% of the participants indicated that the drive for excellence was not visible at all the levels, whereas 22% of the participants indicated that they were not sure.

The number of participants who indicated that the drive for excellence was visible at all levels was equal to the number of those who were not sure. The results highlight a need for institutionalised Systems Thinking that would stimulate the drive for excellent at all the organisational levels in the UoTs. Yukl (2010:386) contends that organisations rely on their team members to continuously improve efficiency and quality in terms of services and products. Hence there was a need for adopting Systems Thinking to inspire a culture of excellence in the UoTs.

#### 5.2.1.4 Knowledge-sharing culture in the institution

Systems Thinking serves as a catalyst for knowledge-sharing in an organisation, hence this construct solicited data related to knowledge-sharing practices in the UoTs.

Figure 4 below illustrates participants' responses relating to the knowledge-sharing culture in the UoTs.



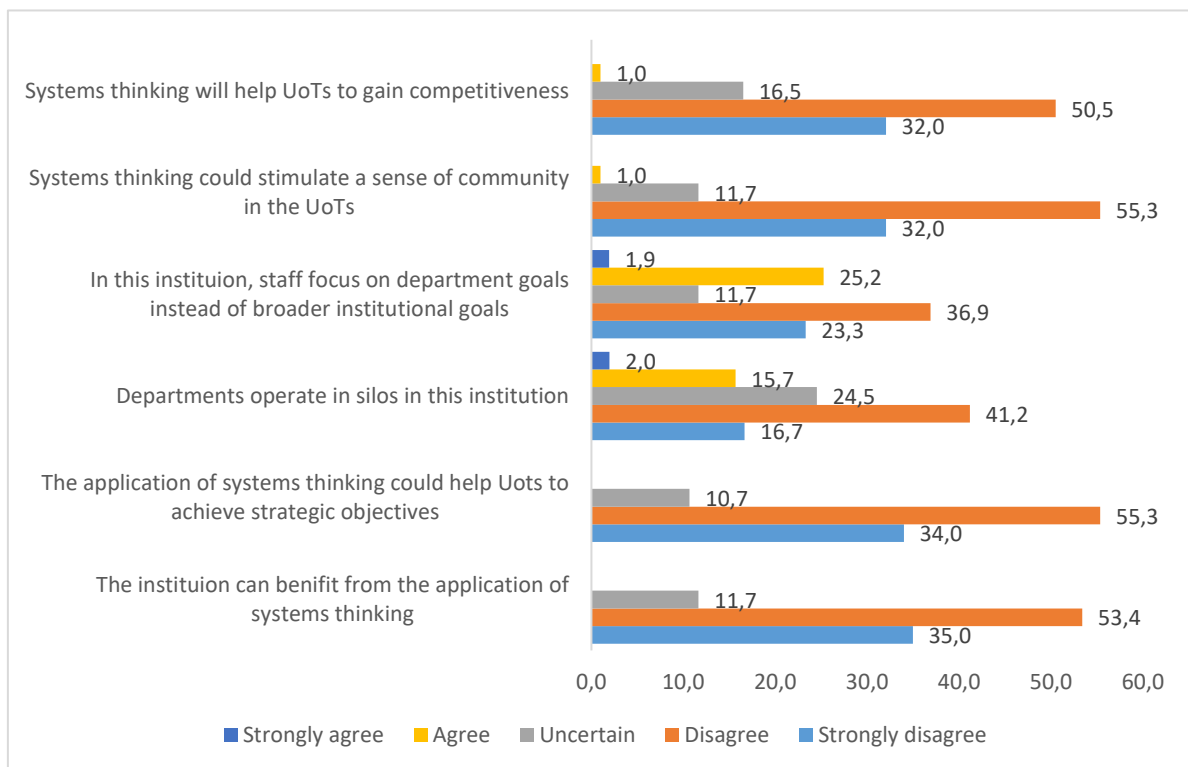
**Figure 4: Knowledge-sharing culture (n=220)**

Regarding the knowledge-sharing culture in the UoTs, participants at 48% reported that there is no willingness to share knowledge in order to improve institutional practices at this institution. This therefore suggests that in their view, there was no willingness to share knowledge in order to improve institutional practices at the institution. However, 56.3% of the participants indicated that Systems Thinking will not inspire knowledge-sharing beyond functional boundaries in this institution. The majority of participants therefore indicated that Systems Thinking will not inspire knowledge sharing beyond functional boundaries in the institution. In other words, the majority of participants felt that the institution might not benefit from the application of Systems Thinking in a context of knowledge-sharing. About 22% of the participants were uncertain about both statements. Discussing the benefits of knowledge-sharing in an organisation, Yukl (2010:323) points out that with knowledge-sharing, employees can interact with each other to get advice and support about a common problem.

#### **5.2.1.5 Perceptions of the application of a Systems Thinking in UoTs**

This construct deals with ascertaining the perceptions of UoTs' employees of the application of Systems Thinking in their sector (UoTs).

Figure 5 below presents data on the perceptions of the participants on the application of Systems Thinking in UoTs.



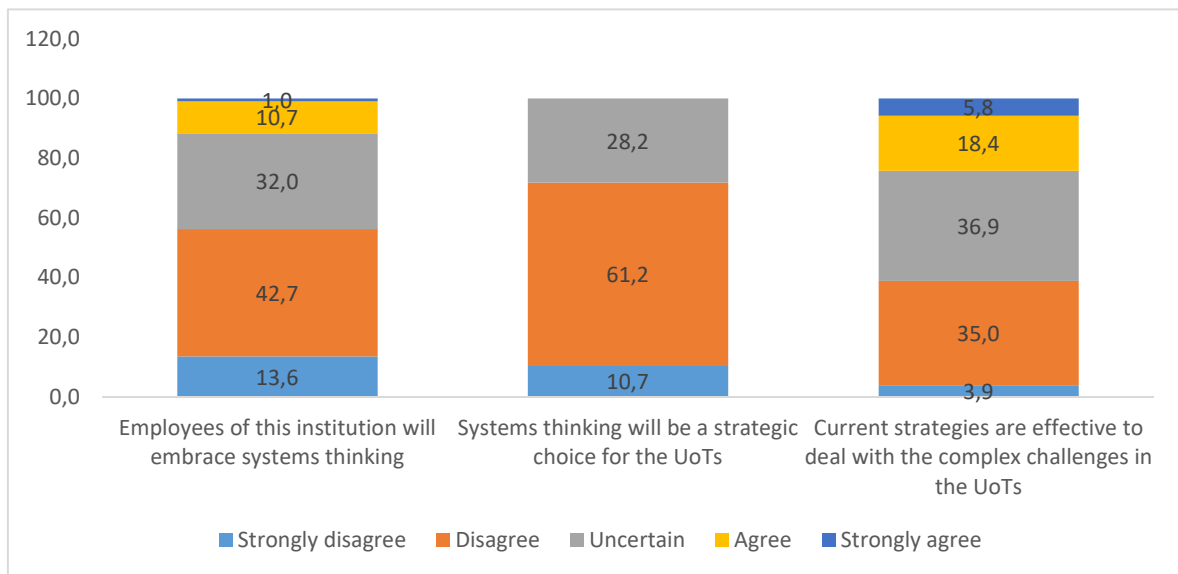
**Figure 5: Perceptions on the application of Systems Thinking (n=220)**

Most of the participants disagreed with all the statements regarding their perception on the application of Systems Thinking. For example, 50.5% of the participants disagreed that Systems Thinking will help UoTs to gain competitiveness; 32% disagreed that Systems Thinking could stimulate a sense of community in UoTs; and 55.3% disagreed that the application of Systems Thinking could help UoTs to achieve strategic objectives. The results also revealed that 53.4% disagreed that the institution could benefit from the application of Systems Thinking. Participants at 36.9% disagreed with the statement that the focus from staff was more on departmental goals instead of broader institutional goals. It was established that 41.2% of the participants were of the view that departments in the institution were not operating in silos. Stowell and Mead (2016:56) posit that where Systems Thinking is institutionalised, people will understand that every unit has a vital role to play and they will also understand that their contribution will affect the performance of the whole enterprise both in the short and long term

### 5.2.1.6 Opportunities for the application of Systems Thinking in UoTs

Regarding opportunities for the application of Systems Thinking in UoTs, results showed that majority of the participants reported negatively to most of the statements.

Figure 6 below illustrates how participants responded to the statements relating to the opportunities for application of a Systems Thinking in the UoTs.



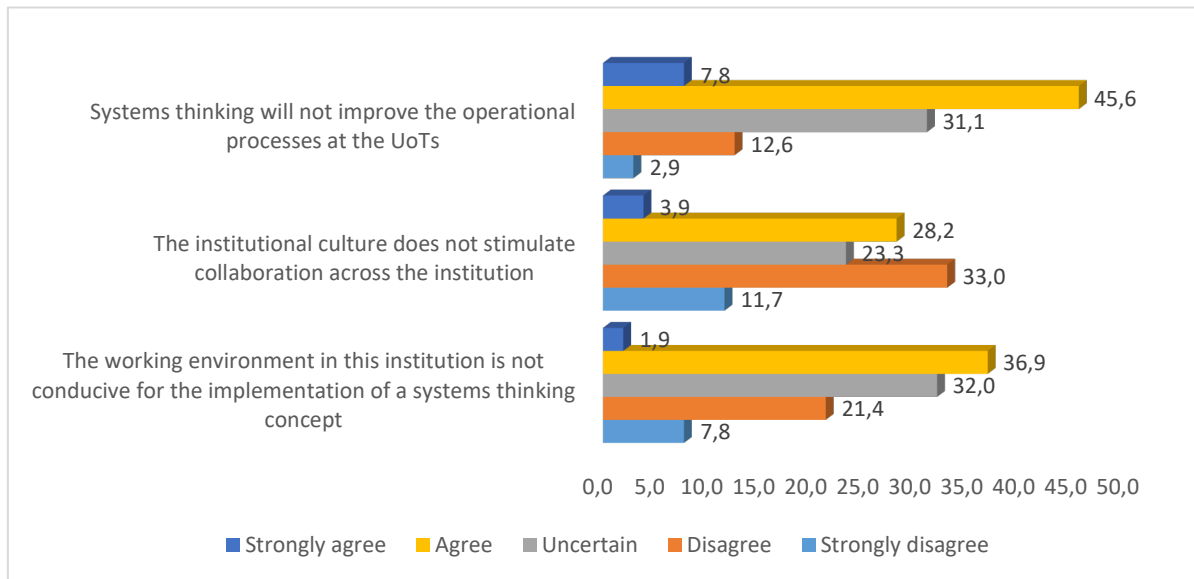
**Figure 6 Opportunities for the application of Systems Thinking in UoTs (n=220)**

It was found that 61.2% of the participants disagreed that Systems Thinking will be a strategic choice for the UoTs, and 56.3% mentioned that employees of this institution will not embrace Systems Thinking. It was found that 35.0% of the participants disagreed that current strategies were effective in dealing with the complex challenges. Participants who were unsure with statement were at 36.9%. There were participants at 18.4% who were of the view that current strategies were effective to deal with complex challenges in the institution. The results therefore indicated that the majority of participants disagreed with statements relating to the opportunities for the application of a Systems Thinking philosophy in the UoTs. Members of the organisation are likely to embrace change if there is a clear understanding as to why that is important and how it will benefit their organisation.



### 5.2.1.7 Challenges for the application of Systems Thinking in UoTs

Presented in Figure7 below are the overall results relating to the statements on the challenges for the application of a Systems Thinking philosophy in UoTs. This research construct deals with establishing and understanding factors that could be viewed as challenges for the application of Systems Thinking in the UoTs.



**Figure 7: Challenges for the application of Systems Thinking in the UoTs (n=220)**

More than half of the participants at 54% reported that Systems Thinking will not improve the operational processes at the UoTs, whilst more than a third of the participants at 37% agreed that the working environment in the institution was not conducive for the implementation of a Systems Thinking concept. About 33% of the participants disagreed with the statement that the institutional culture does not stimulate collaboration across the institution. In their opinion, the institutional culture does stimulate collaboration across the institution.

The next section covers the overall frequency distribution scores. According to Gravetter and Wallnau (2009:37), placing scores in a frequency distribution is a common procedure to present and organise a set of data. Salkind (2012: 503) put it succinctly that a frequency distribution highlights all the scores for a variable in a

particular set of data. Furthermore, frequency distribution explains how many times a score occurs in a set of data.

### **5.3 Overall frequency distribution scores for all the constructs**

Frequency distribution is a summary of the frequency of individual values or ranges of values for a variable or construct (Trochim, Donnelly and Arora 2016:395). According to Gravetter and Forzano (2018:515), frequency distribution is an organised display of scores that shows how many scores are located in each category on the scale of measurement. The purpose is to simplify and organise a set of scores and group them into a meaningful display that shows the entire set. In other words, the advantage of a frequency distribution is that it provides a complete view of the entire set of scores in research.

The interpretation criteria are based on the total scores for each construct. This means that if a distribution is skewed to the left, it is regarded as negatively skewed; but if it is skewed to the right, it is considered to be positively skewed (Larson and Farber 2000:61). The point is accentuated by Salkind (2010:506) that a frequency distribution is considered positive if scores form a tail to the right of the mean and it is considered to be negative if it forms a tail to the left of the mean. It is further stated by McMillan and Schumacher (2010:161) that the frequency distribution is positively skewed if most of the scores are at the low end of the distribution, with a few high scores. However, it is negatively skewed if most scores are located at the high end. To present a frequency distribution, each raw data value is categorised into categories and according to Bluman (2015:42), these categories are known as 'classes'.

According to Salkind (2008:388), the upper and lower boundaries of a set of scores in a frequency distribution are used to determine class intervals. The general principle applied by the researcher was based on whether participants responded positively or negatively to the statements for the research constructs. It is stated by McMillan and Schumacher (2010:154) that researchers summarize distribution scores by the percentage of responses for each score. Therefore, where the majority of participants responded negatively on a construct that will be interpreted as being negative about

that construct. Likewise, if the majority responded positively, that will be interpreted as they were positive about the construct. The overall frequency distribution scores are based on the participants' responses relating to the following constructs:

- A sense of shared purpose;
- Knowledge-sharing culture;
- Perceptions on the application of Systems Thinking in the UoTs; and
- Opportunities for the application of Systems Thinking in the UoTs.

### **5.3.1 A Sense of shared purpose in UoTs**

Table 2 provides information based on the responses of the participants relating to a sense of shared purpose in the UoTs. There were three statements relating to a sense of a shared purpose variable, namely:

- There is a sense of a shared purpose in this institution
- The commitment to achieve strategic objectives of the institution is visible at.... (participants given options to choose from)
- The drive for excellence in this institution is visible at.... (participants given options to choose from)

**Table 2: Overall scores for a sense of shared purpose**

<b>Overall scores</b>	<b>Frequency</b>	<b>Percent</b>	<b>Cumulative Percent</b>
3.00	9	4.1	4.1
4.00	22	10.0	14.1
5.00	4	1.8	15.9
6.00	11	5.0	20.9
7.00	11	5.0	25.9
8.00	33	15.0	40.9
9.00	15	6.8	47.7
10.00	17	7.7	55.5
11.00	17	7.7	63.2
12.00	13	5.9	69.1
13.00	35	15.9	85.0
14.00	13	5.9	90.9
15.00	9	4.1	95.0
16.00	9	4.1	99.1
17.00	2	0.9	100.0
Total	<b>220</b>	<b>100.0</b>	

Total frequency scores from Table 2 are divided into categories. In statistical research terms, categories are commonly known as classes. The first four classes (**3.00, 4.00, 5.00 and 6.00**) cover total scores of six or less. Covered in the rest of the classes (**7.00**

– **17.00**) are the total scores from seven and above. A majority of the participants at 79.2% scored seven or more from the three statements. These are the participants who responded negatively to questions relating to a sense of shared purpose in the UoTs, which indicated that they were negative about a sense of shared purpose in their institutions. Participants who scored six or less on the sense of shared purpose construct were at 21%. In other words, only 21% of participants were positive about a sense of shared purpose in the UoTs as they responded positively to the statements relating to this construct. Manely et al (2014:1) refer to a shared purpose as an important part of developing an effective workplace culture. They further describe a shared purpose as a powerful strategy to unify diverse stakeholders in an enterprise. Systems Thinking is therefore critical to inspire a sense of shared purpose in UoTs.

### **5.3.2 Knowledge-sharing culture in the UoTs**

Table 3 presents research data relating to knowledge-sharing culture in the UoTs. The first three classes (**2.00, 3.00 and 4.00**) cover a total score of four or less. The rest of the classes (**5.00-10.00**) cover scores of five or more. There were two statements relating to a knowledge-sharing culture variable. Those two statements were:

- There is a willingness to share knowledge to improve institutional practices at this institution; and
- Systems Thinking will inspire knowledge sharing beyond functional boundaries in this institution.

**Table 3: Knowledge sharing culture**

Overall scores	Frequency	Percent	Cumulative Percent
2.00	11	5.0	5.0
3.00	30	13.6	18.6
4.00	83	37.7	56.4
5.00	30	13.6	70.0
6.00	43	19.5	89.5
7.00	19	8.6	98.2
8.00	2	1.0	99.1
10.00	2	0.9	100.0
<b>Total</b>	<b>220</b>	<b>100.0</b>	

It was found that 56.4% of the participants scored four or less from two Likert scale type statements, which meant that they were positive about a knowledge-sharing culture in the institutions as they responded positively to all the statements relating to this construct. The results revealed that 43.7% of the participants scored five or more. This therefore means that they were negative about a knowledge-sharing culture. These are participants who responded negatively to this construct. To support the positive view expressed by the majority of participants on knowledge-sharing, Castaneda and Duran (2018:158) explain that conducive conditions are vital to encourage workers to share knowledge in their organisations.

In the words of Kock and Le Roux (2012:158), the sharing of knowledge and best practices enhances organisations' performance. The results of this study confirm that participants understood the importance of knowledge-sharing in the UoTs. Wheatley

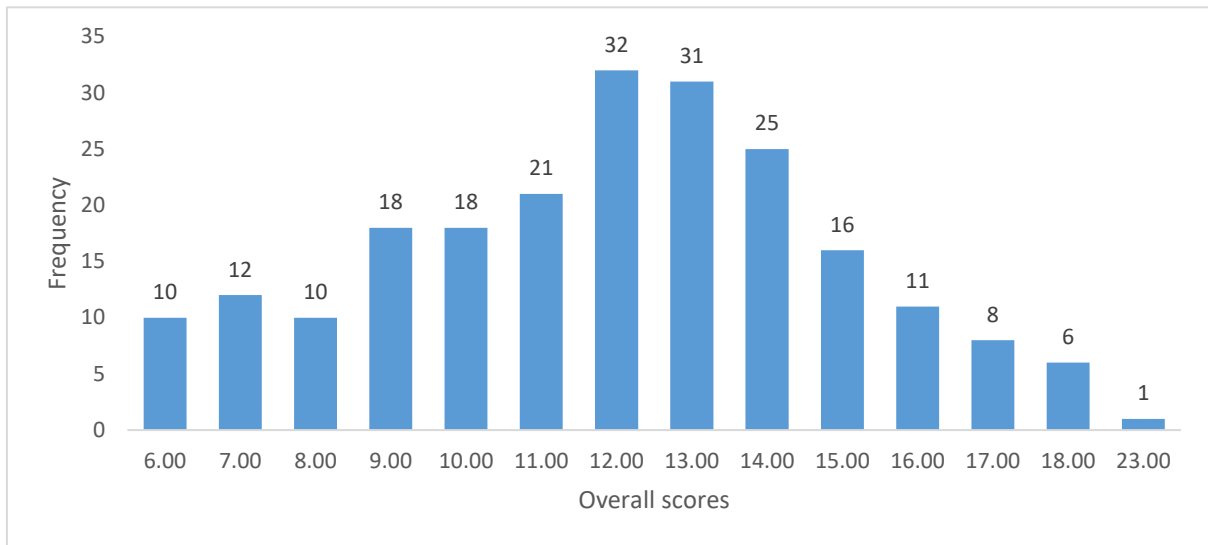
(1999:110) eloquently explains that one of the most important competencies for an organisation is the ability to create the conditions to freely generate and share knowledge. The understanding is that Systems Thinking plays a vital role to institutionalise and internalise knowledge-sharing in an organisation.

### **5.3.3 Overall scores on the perceptions for the application of Systems Thinking in UoTs**

Presented in Figure 8 are the responses relating to the perceptions of participants on the application of Systems Thinking in the UoTs.

According to the perceptions of the participants on the application of Systems Thinking, the average scores were **12.09**, which indicated that the majority of the participants had positive perceptions in this constructs (Figure 8). This is on the basis that the distribution is skewed to the right. There were six statements relating to the perceptions on the application of Systems Thinking in the UoTs. Those statements were:

- The institution can benefit from the application of Systems Thinking;
- The application of Systems Thinking could help to achieve strategic objectives;
- Departments operate in silos in this institution;
- In this institution, staff focus on departmental goals instead of broader institutional goals;
- Systems Thinking could stimulate a sense of community in the UoTs; and
- Systems Thinking will help UoTs to gain competitiveness.



**Figure 8: Distribution of overall scores for the perceptions on the application of Systems Thinking (n=220)**

The results showed that participants had positive perceptions on the application of Systems Thinking in the UoTs as they responded positively to all the statements for this variable. Haines, Aller-Stead and McKinlay (2005:16) argue that thinking and management approaches that worked in the 20<sup>th</sup> century and during the Industrial Revolution are no longer relevant. In addition, they explain that organisations have realised that making changes in one part without considering the rest of the system (organisation) creates undesirable consequences elsewhere in the system. The responses from the participants are informed by this understanding that traditional approaches were no longer relevant in an environment described as unpredictable and turbulent. It is accentuated by Wheatley (1999:15) that organisations were transforming from being mechanistic to being fluid, organic and boundary-less structures. The responses from the majority of the participants indicated that it would be easier for them to embrace a Systems Thinking philosophy.

#### **5.3.4 Opportunities for the application of Systems Thinking in the UoTs**

Presented in Table 4 are the overall scores on the opportunities for the application of a Systems Thinking construct in the UoTs. The first four classes (**3.00, 4.00, 5.00 and 6.00**) cover scores from six or less and the rest of the classes (**7.00-13.00**) cover the total scores from seven or more.



**Table 4: Opportunities for the application of Systems Thinking in the UoTs**

Overall scores	Frequency	Percent	Cumulative Percent
3.00	3	1.4	1.4
4.00	3	1.4	2.8
5.00	16	7.3	10.0
6.00	46	20.9	30.9
7.00	50	22.7	53.7
8.00	34	15.5	69.1
9.00	39	17.7	86.9
10.00	19	8.6	95.5
11.00	8	3.6	99.1
12.00	1	0.5	99.6
13.00	1	.5	100.0
<b>Total</b>	<b>220</b>	<b>100.0</b>	

Regarding opportunities for the application of Systems Thinking in the UoTs, it was found that only a third (31%) of the participants scored six or less from the three statements, indicating that they had a negative perception about the opportunities of the application of Systems Thinking in the UoTs. They responded negatively to the statements relating to this construct. However, the results showed that 69% of the participants scored seven or more on the opportunities for the application of Systems Thinking. These are the participants who responded positively to this construct.

The three statements were:

- Employees of this institution will embrace Systems Thinking;
- Systems Thinking will be a strategic choice for the UoTs; and
- Current strategies are effective to deal with complex challenges in this institution.

Based on the analysis of data, a majority of participants were positive about the opportunities for the application of Systems Thinking in the UoTs. Kapsali in Loosemore and Cheung (2015:1328) refers to Systems Thinking as a holistic approach which views an organisation as a system with interrelated sub-systems of people, processes and technologies that work together to achieve a common goal. Systems Thinking helps organisational members to understand how different parts of a system interact (Loosemore and Cheung 2015:1328). It is further argued by Wheatley (1999:144) that one of the fundamental requirements was to create organisations that always appreciate a dense network of interdependent relationships.

Quantitative results, particularly the section that deals with the overall frequency distribution scores, resonate with the qualitative findings on all the research constructs. These similarities between the two sets of results is further demonstrated and discussed in the section discussing the findings.

#### **5.3.5 Descriptive statistics for the constructs between the institutions**

Table 5 below provides descriptive statistics for all the constructs between the institutions.

The interpretation criteria used to analyse descriptive statistics was based on mean rank scores of the constructs. According to Trochim, Donnelly and Arora (2016:293) the mean is the method used to describe central tendency.

**Table 5: Descriptive statistics for all the constructs between the institutions**

<b>Ranks</b>				
	<b>Institution</b>	<b>N</b>	<b>Mean Rank</b>	<b>Sum of Ranks</b>
Sense of shared purpose	DUT	172	50.64	2734.50
	MUT	48	51.41	2416.50
	Total	220		
Knowledge sharing culture	DUT	172	58.04	3250.00
	MUT	48	44.81	2106.00
	Total	220		
Perceptions on the application of systems thinking	DUT	171	49.21	2756.00
	MUT	48	55.32	2600.00
	Total	219		
Opportunities for the application of a systems thinking in the UoTs	DUT	172	54.37	3044.50
	MUT	48	49.18	2311.50
	<b>Total</b>	<b>220</b>		

The descriptive statistics showed that participants from DUT had the higher mean rank score for a knowledge-sharing culture (at 58.04%), and opportunities for the application of Systems Thinking in UoTs (at 54.37%). In addition, there were high mean rank scores for MUT on a sense of shared purpose (at 51.41%) and perceptions on the application of Systems Thinking at 55.32%.

### 5.3.6 Descriptive statistics for the constructs between sectors within the Institutions.

Table 6 provides descriptive statistics for the constructs between the sectors in the institution.

**Table 6: Descriptive statistics for all the constructs between sectors**

<b>Ranks</b>				
	<b>Sector</b>	<b>N</b>	<b>Mean Rank</b>	<b>Sum of Ranks</b>
Sense of shared purpose	Academic	103	55.77	1952.00
	Admin	116	48.47	3199.00
	Total	219		
Knowledge sharing culture	Academic	103	46.54	1675.50
	Admin	116	54.93	3680.50
	Total	219		
Perceptions on the application of systems thinking	Academic	103	49.53	1783.00
	Admin	116	53.33	3573.00
	Total	219		
Opportunities for the application of a systems thinking in the UoTs	Academic	103	52.72	1898.00
	Admin	116	51.61	3458.00
	<b>Total</b>	<b>219</b>		

The descriptive statistics showed that participants who were non-academic had the higher mean rank score for a knowledge-sharing culture at 55% and perceptions on the application of Systems Thinking at 53.33%. On the other hand, participants from the academic sector had a high mean rank for two constructs, namely a sense of

shared purpose at 56% and opportunities for the application of Systems Thinking in UoTs at 53%.

### 5.3.7 Descriptive statistics for constructs relating to academic qualifications

Presented in Table 7 are the descriptive statistics based on the qualifications of the participants.

**Table 7: Descriptive statistics for all the constructs relating to qualifications**

Ranks			
	Qualification	N	Mean Rank
Sense of shared purpose	Matric	18	45.14
	Diploma	30	49.63
	B.Tech	86	51.86
	Masters	65	51.72
	Doctorate	21	55.94
	Total	220	
Knowledge sharing culture	Matric	18	47.59
	Diploma	30	51.45
	B.Tech	86	56.65
	Masters	65	51.57
	Doctorate	21	38.50
	Total	220	
Perceptions on the application of systems thinking	Matric	18	70.59
	Diploma	30	60.42
	B.Tech	86	42.45

	Masters	65	51.00
	Doctorate	21	57.56
	Total	220	
Opportunities for the application of a systems thinking in the UoTs	Matric	18	52.64
	Diploma	30	47.95
	B.Tech	86	50.22
	Masters	65	62.20
	Doctorate	21	41.83
	Total	220	

Descriptive statistics showed that participants who had a doctoral qualification had a higher mean rank score at 55.94% for the sense of a shared purpose construct. However, participants with a doctoral qualification had the lowest mean rank score for a knowledge-sharing culture at 38.50% and opportunities for the application of a Systems Thinking in UoTs at 41.83%. Descriptive statistics indicated that participants with a Bachelor of Technology degree had a high mean rank score at 56.65% for a knowledge-sharing culture. There was a high mean rank score for participants with a matric certificate at 70.59% for the perceptions on the application of Systems Thinking in the UoTs. Participants with a master's qualification had a high mean rank score at 62.20% on the opportunities for the application of Systems Thinking in the UoTs.

### 5.3.8 Descriptive statistics for the constructs relating to the years of experience in the institution

Presented in Table 8 are the descriptive statistics for all the constructions in relation to the years of experience in the current institution.

**Table 8: Descriptive statistics for all the constructs relating to years of experience in the institutions**

Ranks			
	No of years working in the institution	N	Mean Rank
Sense of shared purpose	1-5 years	82	57.84
	6-10 years	57	48.50
	11-15 years	26	39.81
	16-20 years	22	44.79
	11-25 years	21	50.50
	>25 years	12	47.80
	Total	220	
Knowledge sharing culture	1-5 years	82	43.75
	6-10 years	57	56.29
	11-15 years	26	57.58
	16-20 years	22	60.75
	11-25 years	21	62.75
	>25 years	12	55.00
	Total	220	
Perceptions on the application of systems thinking	1-5 years	82	52.31
	6-10 years	57	57.09
	11-15 years	26	57.08

	16-20 years	22	53.88
	11-25 years	21	15.83
	>25 years	12	47.10
	Total	220	
Opportunities for the application of a systems thinking in the UoTs	1-5 years	82	47.89
	6-10 years	57	52.79
	11-15 years	26	57.65
	16-20 years	22	57.81
	11-25 years	21	69.25
	>25 years	12	37.20
	Total	220	

The descriptive statistics indicated that participants who had the least experience had the highest mean rank score at 57% for a sense of shared purpose and had the lowest mean rank at 43.75% for a knowledge-sharing culture. It was also found that participants having the most experience had the lowest mean rank score at 37.20% for opportunities for the application of Systems Thinking in the UoTs. Participants with 11 to 25 years of services in their respective institutions had a higher mean rank score at 62.75% for the knowledge-sharing culture and opportunities for the application of Systems Thinking in the UoTs (at 69.25%).

The results indicated that participants with 6 to 10 years of service in their respective UoTs had a high mean rank score at 57.09% for the perceptions on the application of Systems Thinking in UoTs.



### 5.3.9 Descriptive statistics for the constructs relating to gender

Descriptive statistics for all the constructs based on the gender of participants are presented in Table 9 below.

**Table 9: Descriptive statistics for all the constructs for gender**

Ranks				
	Gender	N	Mean Rank	Sum of Ranks
Sense of shared purpose	Female	128	50.36	2669.00
	Male	92	51.71	2482.00
	Total	220		
Knowledge sharing culture	Female	128	51.95	2805.50
	Male	92	52.05	2550.50
	Total	220		
Perceptions on the application of systems thinking	Female	128	53.79	2904.50
	Male	92	50.03	2451.50
	Total	220		
Opportunities for the application of a systems thinking in the UoTs	Female	128	53.12	2868.50
	Male	92	50.77	2487.50
	Total	220		

Results showed that female participants had the higher mean rank score at 53.79% for perceptions on the application of Systems Thinking in the UoTs. Female participants also had a high mean rank score at 53.12% for the opportunities for application of Systems Thinking in the UoTs. Male participants had the highest mean rank score for a sense of shared purpose at 51.71% and a knowledge-sharing culture at 52.05%. However, the mean rank score differences were not statistically significant.

### 5.3.10 Descriptive statistics for constructs relating to age

Table 10 illustrates descriptive statistics in relation to the age of the participants.

**Table 10: Descriptive statistics for all the constructs for age of the participants**

Ranks			
	Age in years	N	Mean Rank
Sense of shared purpose	15-25 years	10	85.38
	25-35 years	78	53.05
	35-45 years	61	44.10
	45-55 years	49	43.81
	>55 years	22	58.00
	Total	220	
Knowledge sharing culture	15-25 years	10	23.38
	25-35 years	78	52.55
	35-45 years	61	47.27
	45-55 years	49	61.66
	>55 years	22	54.06
	Total	220	
Perceptions on the application of systems thinking	15-25 years	10	46.38
	25-35 years	78	57.28
	35-45 years	61	44.02
	45-55 years	49	42.58
	>55 years	22	68.11
	Total	220	

Opportunities for the application of a systems thinking in the UoTs	15-25 years	10	40.00
	25-35 years	78	48.63
	35-45 years	61	52.88
	45-55 years	49	60.55
	>55 years	22	54.56
	<b>Total</b>	<b>220</b>	

It was found that young participants had the highest mean rank score at 85.38% for a sense of shared purpose. They had the lowest mean rank score at 23.38% for a knowledge-sharing culture and opportunities for the application of Systems Thinking in the UoTs at 40.00%. The age group above 55 years had a high mean rank score at 68.11% for perceptions on the application of Systems Thinking in the UoTs. The result also revealed that participants in the age group (45-55) had the highest mean rank score at 60.55% for the opportunities for the application of Systems Thinking in the UoTs. Participants in the age category (45-55) had a high mean rank score at 61.66% on a knowledge-sharing culture in UoTs. The next section presents the correlation output.

#### 5.4 Spearman's rho correlations output

A **P**-value of **0.05** is the conventional significance level adopted by many researchers (Wright and London 2009:201). Furthermore, on the significance level of the p values, Knapp (2014:99) confirms that in the social sciences a **p**-value of **0.05** is indeed a statistical significance threshold. The statistically significant relationship between variables is indicated by \*or \*\*. The interpretation criteria used were based on the p-values for the variables. The correlation test was performed to measure the relationship between the variables. According to Spickard (2017: 375), correlation is used to measure the degree to which one set of values is related to another set of values from the same population. Jensen and Laurie (2016: 320) point out that correlation can be either negative or positive.

**Table 11 Spearman's rho Correlations output**

			Sense of a shared purpose	Knowledge sharing culture	Perceptions on the application of systems thinking	Opportunities for the application of a systems thinking in the UoTs
Spearman's rho	Sense of shared purpose	Correlation Coefficient	1.000	-.214*	-.190	-.140
		Sig. (2-tailed)	.	.032	.057	.163
	Knowledge sharing culture	Correlation Coefficient	-.214*	1.000	.019	.383**
		Sig. (2-tailed)	.032	.	.852	.000
	Perceptions on the application of systems thinking	Correlation Coefficient	-.190	.019	1.000	.013
		Sig. (2-tailed)	.057	.852	.	.900
	Opportunities for the application of a systems thinking in the UoTs	Correlation Coefficient	-.140	.383**	.013	1.000
		Sig. (2-tailed)	.163	.000	.900	

\*. Correlation is significant at the 0.05 level (2-tailed).

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

The correlation test showed that there was a statistically significant relationship or correlation between the sense of shared purpose and a knowledge-sharing culture constructs at **0.214**. It was also found that there was a significant moderate positive correlation between a knowledge-sharing culture and opportunities for the application of Systems Theory constructs at **0.383**. No other relationships were found amongst other constructs. All the constructs with no statistically significant relationship are listed as follows:

- Knowledge-sharing culture and perceptions on the application of a Systems Thinking is **0.852**
- The perceptions on the application of Systems Thinking and a sense of shared purpose is **0.057**.
- The opportunities for the application of Systems Thinking and a sense of shared purpose is **0.163**.
- Perceptions on the application of Systems Thinking and opportunities for the application of Systems Thinking is **0.900**.

Descriptive statistics were used to provide quantitative descriptions of data in a graphic and manageable manner. Trochim, Donnelly and Arora (2016:291) suggest that descriptive statistics form the basis of quantitative data analysis. The next section discusses inferential statistics.

## **5.5 Inferential statistics**

Inferential statistics is described by Sekaran and Bougie (2016:392) as statistics that are used to establish relationships amongst various variables, from which conclusions are drawn. Furthermore, they emphasise that this type of statistics are also used to make inferences about the population from the sample. Leedy and Ormrod (2015:387) concur that inferential statistics helps with drawing inferences about a large population from the sample. Types of normality tests performed were Kolmogorov-Smirnov and Kruskal-Wallis.

### **5.5.1 Normality test for opportunities for the application of Systems Thinking in UoTs**

In order to do further analysis, a normality test was conducted on the overall scores. A normality test is used determine whether a sample comes from a normally distributed population (Drezner, Turel and Zerom 2010:693). The Kolmogorov-Smirnov test was used for the normality test in this study. The Kolmogorov-Smirnov test is described by Drezner, Turel and Zerom (2010:694) as a test for normality in research.

The normality test output is presented in Table 12 below.

**Table 12: Tests of Normality output for opportunities for the application of Systems thinking in the UoTs**

	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Sense of shared purpose	.199	219	.000	.934	219	.000
Knowledge sharing culture	.231	219	.000	.924	219	.000
Perceptions on the application of systems thinking	.094	218	.030	.942	218	.000
Opportunities for the application of a systems thinking in the UoTs	.194	219	.000	.934	219	.000

a. Lilliefors Significance Correction

Based on the normality test, all variables had a **p** significant value less than **0.05**. This suggests that there was a statistically significant relationship between the constructs. The **p** values for each construct are listed below:

- Sense of shared purpose at **0.000**
- Knowledge-sharing culture at **0.000**
- Perceptions on the application of Systems Thinking in the UoTs at **0.030**
- Opportunities for the application of Systems Thinking in the Uots at **0.000**

It was found that all the overall scores for all the constructs were not normally distributed. Hence non-parametric tests were performed for further analysis. Non-parametric tests as described by (Leedy and Ormrod 2015:388) are statistical procedures not based on any assumptions about the nature of the population from which one or more samples have been drawn.

### 5.5.2 Mann-Whitney U-test output between the two institutions

A Mann-Whitney U-test between the institutions was also performed and the results are presented in Table 13 below. Salkind (2010:747) describes the Mann-Whitney U test as a non-parametric test that is undertaken to compare two independent samples. The Mann-Whitney test is a popular test for comparing two independent samples (Salkind 2010:747). Discussing the advantages of using Mann-Whitney, Fay and Malinovsky (2017:3991) add that it can be used for small and large samples

**Table 13: Mann-Whitney U-test output**

Test Statistics <sup>a</sup>				
	Sense of shared purpose	Knowledge sharing culture	Perceptions on the application of systems thinking	Opportunities for the application of a systems thinking in the UoTs
Mann-Whitney U	1249.500	978.000	1160.000	1183.500
Wilcoxon W	2734.500	2106.000	2756.000	2311.500
Z	-.137	-2.317	-1.038	-.895
Asymp. Sig. (2-tailed)	.891	.020	.299	.371

a. Grouping Variable: Institution

The Mann-Whitney Test showed that all the constructs had a **p-value** greater than **0.05** except the knowledge-sharing culture construct which had a **p-value of 0.020**. This indicated that there was no statistically significant relationship amongst the following constructs:

- Sense of shared purpose at **0.891**
- Perceptions on the application of Systems Thinking at **0.299**
- Opportunities for the application of Systems Thinking in the UoTs, with a **p-value of 0.371**

### 5.5.3 Kruskal-Wallis test output for qualifications of the participants

A Kruskal-Wallis test was performed, and the results are presented in Table 15 below. According to Schindler (2019:545), Kruskal-Wallis is a generalised version of the Mann-Whitney test that is used to rank all scores in the entire pool of observations, from smallest to largest.

**Table 14: Kruskal Wallis Test output for qualification**

<b>Test Statistics<sup>a,b</sup></b>				
	Sense of shared purpose	Knowledge sharing culture	Perceptions on the application of systems thinking	Opportunities for the application of a systems thinking in the UoTs
Kruskal-Wallis H	.811	3.302	10.400	4.390
Df	4	4	4	4
Asymp. Sig.	.937	.509	.034	.356

a. Kruskal Wallis Test

b. Grouping Variable: Qualification

The Kruskal-Wallis test found that there was a statistically significant rank difference for perceptions on the application of Systems Thinking amongst the participants in relation to their qualifications. This construct had a **p-value of 0.032** which was less than **0.05**. The **p-value** for the following constructs was greater than **0.05**:

- A sense of a shared purpose at **0.937**
- Knowledge-sharing culture at **0.509**
- Opportunities for the application of Systems Thinking in the **UoTs** at **0.356**



#### 5.5.4 Kruskal-Wallis test for experience of the participants in the UoT

The Kruskal-Wallis test output relating to the years of experience of the participants in their respective institutions is presented in Table 16 below.

**Table 15: Kruskal-Wallis Test output for experience**

Test Statistics <sup>a,b</sup>				
	Sense of shared purpose	Knowledge sharing culture	Perceptions on the application of systems thinking	Opportunities for the application of a systems thinking in the UoTs
Kruskal-Wallis H	5.052	6.184	10.284	5.002
df	5	5	5	5
Asymp. Sig.	.410	.289	.068	.416
a. Kruskal Wallis Test				
b. Grouping Variable: No of years working in the institution				

There was no statistically significant difference between the constructs relating to the years of experience of the participants. All the constructs had a **p-value** greater than **0.05**.

- A sense of shared purpose at **0.410**
- Knowledge-sharing culture at **0.289**
- Perceptions on the application of Systems Thinking at **0.068**
- Opportunities for the application of Systems Thinking in the UoTs at **0.416**

### 5.5.5 Mann-Whitney U-test for the gender of the participants

Presented in Table 16 below are the Mann-Whitney U-test results to the gender of the participants.

**Table 16: Mann-Whitney U-test output for gender**

Test Statistics <sup>a</sup>				
	Sense of shared purpose	Knowledge sharing culture	Perceptions on the application of systems thinking	Opportunities for the application of a systems thinking in the UoTs
Mann-Whitney U	1238.000	1320.500	1226.500	1262.500
Wilcoxon W	2669.000	2805.500	2451.500	2487.500
Z	-.239	-.017	-.641	-.407
Asymp. Sig. (2-tailed)	.811	.986	.522	.684

a. Grouping Variable: Gender

From the Mann-Whitney U-test, the gender of the participants was not statistically significance since all the constructs had a **p-value** greater than **0.05**. Therefore, there was no statistical significance between the constructs. Listed below are the constructs and their **p-values**:

- A sense of shared purpose at **0.811**
- Knowledge-sharing culture at **0.986**
- Perceptions on the application of Systems Thinking at **0.522**
- Opportunities for the application of Systems Thinking at **0.684**

The next section deals with the reliability test output.

## 5.6 Reliability Scores

A Cronbach's alpha test was performed to test the reliability of the research instrument (the questionnaire) that was self-administered. Table 17 below presents the reliability test output.

**Table 17: Reliability scores**

Constructs	No of Items	Cronbach's Alpha
Sense of shared purpose	3	0.79
Knowledge sharing culture	2	0.82
Perceptions on the application of systems thinking	6	0.84
Opportunities for the application of a systems thinking in the UoTs	3	0.76
<b>Overall</b>	<b>14</b>	<b>0.85</b>

The reliability analysis scores were greater than **0.70**. According to McMillan and Schumacher (2006:186), the Cronbach's alpha test is the appropriate type of reliability for survey research and other questionnaires where there is a range of possible answers for each item. Tavakol and Dennick (2011:53) add that Cronbach's Alpha is the most widely used objective measure of reliability. They further indicate that acceptable Cronbach's Alpha scores range from **0.70** to **0.95**. The reliability scores for all the constructs were within the acceptable range of **0.70** to **0.95**. Hence the results were reliable.

This section covered the analysis and the interpretation of the quantitative paradigm for the study. Broad categories of quantitative analysis in this section included descriptive and inferential statistics. The following section covers the analysis and the interpretation of the qualitative paradigm of this study. Sub-sections also covered in the next section will include a discussion of the findings, contribution of the study and chapter summary.

## **5.7 Qualitative findings**

This section presents the research findings based on the qualitative data. Qualitative analysis is described by Babbie (2017:494) as the non-numerical representation and interpretation of qualitative data to discover the underlying meanings and patterns of relationships in the study being investigated. The previous section dealt with the results based on the quantitative data. A total of fifteen participants were interviewed for the qualitative data. Questions asked during the research interviews were in line with the objectives of the study. The data analysis approach adopted was in sequential phases, which included the organisation of data, categorising data, identification of patterns / themes and coding of data. According to Bloomberg and Volpe (2019:43), in qualitative research, the researcher is the primary instrument for data collection and analysis. This section deals with the findings based on the qualitative data that was collected by means of research interviews. An unstructured interview approach was used.

### **5.7.1 Presentation and discussion of the findings**

The discussion of the findings is described by Pajo (2018: 317) as a process that weaves together the theoretical background and the interpretation of the results. This section discusses the qualitative findings. However, quantitative findings will be integrated in certain parts of this section since the study adopted a convergent mixed methods approach. The integration of the two sets of data demonstrates similarities and differences of the quantitative and qualitative paradigms in terms of the findings. Quantitative results that have been integrated with the qualitative findings are drawn mainly from the overall frequency distribution scores, which is informed by the fact that overall frequency distribution scores provide overall scores for all the constructs.

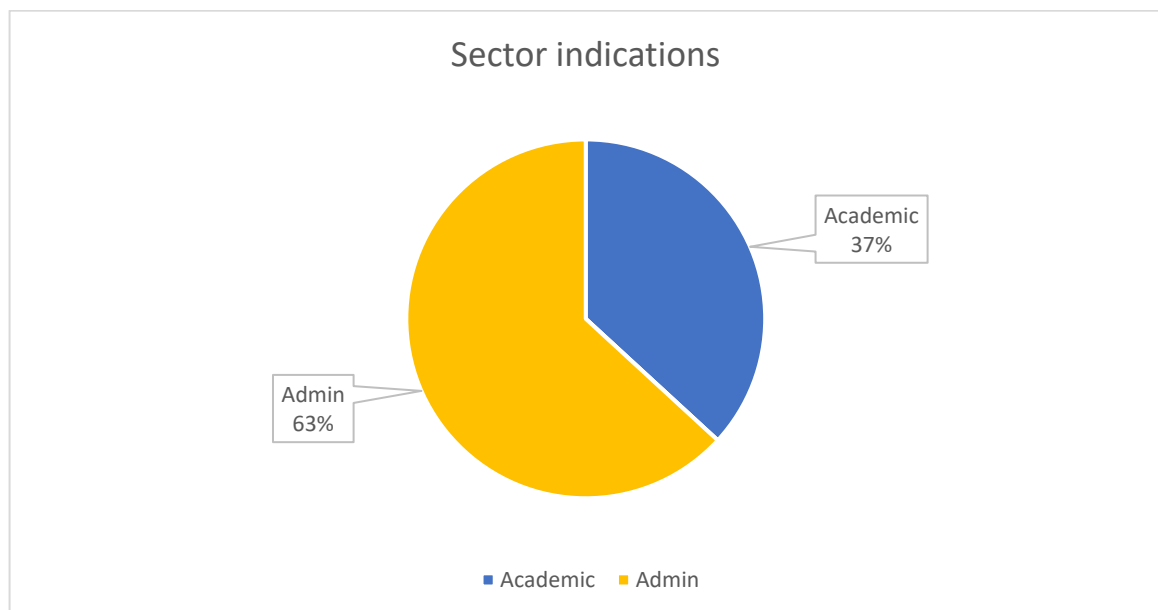
The last part of this section deals with the themes and sub-themes that emerged from the analysis of the qualitative data. According to Creswell and Creswell (2018: 103), data analysis in the convergent design has three phases. The first phase deals with analysing quantitative data using statistics. In the second phase, qualitative data is analysed by coding and identifying themes from the patterns in terms of responses. The last phase integrates both quantitative and qualitative findings. The authors further elaborate that in a convergent design the discussion of the findings includes comparing quantitative and qualitative findings. The same approach was used in this study.

#### **5.7.1.1 Sector indications**

The respondents were asked to indicate their sector in terms of administration or academic departments. Out of the 15 participants, six were from the academic sector and nine were from the administration sector.

Figure 9 below presents the responses relating to the sectors from which the participants were drawn.

**Figure 9: Sector indications (n=15)**



#### **5.7.1.2 Designations of participants**

Participants were mostly in the positions of authority and operating at the strategic levels in their institutions. This was important as they understood the processes and

practices in their institutions. Participants were asked to state their occupation at their respective institutions. Presented in Table 18 below is the breakdown of the participants in terms of their occupations:

**Table 18: Designations of participants**

<b>Participant</b>	<b>Occupation</b>
Participant 1	Quality Specialist
Participant 2	Associate Professor (Arts and Design)
Participant 3	Associate Professor (IT Department)
Participant 4	Director Co-operative Education
Participant 5	Assistant Registrar
Participant 6	Director: Academic Development Unit
Participant 7	Manager: Financial Aid Unit
Participant 8	Student Development Officer
Participant 9	Writing Centre Co-ordinator
Participant 10	HoD: HR (Academic Department)
Participant 11	HoD: Photography (Academic Department)
Participant 12	Deputy Dean: Faculty of Accounting and Informatics
Participant 13	Deputy Dean: Faculty of Management Sciences
Participant 14	Health and Safety Officer
Participant 15	Director: Special Projects

The characteristics of the participants reflected diversity in terms of the functional roles in the UoTs' context.

### 5.7.1.3 Years of service at the institution

The participants were asked to indicate their years of service at their respective institutions. Their responses are presented in Table 19 below.

**Table 19: Years of service at the institution (n=15)**

<b>Years</b>	<b>No of Respondents</b>	<b>%</b>
5	3	14%
10	1	7%
17	2	14%
22	4	29%
23	1	7%
30	1	7%
33	1	7%
37	1	7%
40	1	7%

Responses relating to the years of experience revealed that all the participants had five or more years of experience in the UoT environment. This proved that with the experience that participants had, they understood processes and practices in the UoT environment.

### 5.7.1.4 Silo mentality in the institution

Participants were asked for their opinion on whether departments or faculties were still operating in silos in their institutions. All the participants (100%) felt that departments or faculties were still operating in silos. Working in functional silos therefore was not promoting the sharing of ideas across the organisation. Bento, Tagliabue and Lorenzo

(2020:2) are also of the view that silo mentality indeed does not promote information sharing and cross-functional collaboration in an organisation. The findings of the study therefore suggested that there was a need to deal with functional silos in the UoTs. Davis, Dent and Wharf (2015:349) support the findings of this study that there were still departmental silos in institutions of higher learning.

Below are some of the common responses from the participants:

*“Very much so, the silo mentality is very strong at DUT and why do I say so? There are so many initiatives targeted at students which can be integrated or can probably be combined to come up with one strong and well co-ordinated initiative”.*

*“I think departments are operating in silos. I believe they operate in silos because people don’t want to lose their identity associated with their departments and faculties. So what happens is that silo mentality is entrenched”.*

*“I think departments and faculties operate in silos for identity purposes and that is so entrenched at the institution”*

Based on the responses from the participants, there was a clear indication that departments and faculties were still operating in silos in the UoTs. From the quantitative results, a majority of the participants at 79.2% indicated that there was a lack of a sense of shared purpose in their respective institutions. The lack of a sense of shared purpose had an influence on the silo mentality in the UoTs. There was a correlation between the quantitative and qualitative findings in relation to the prevalence of silo a mentality in the UoTs.

#### **5.7.1.5 Focusing on departmental or faculty goals instead of broader institutional goals**

Participants were asked for their views on whether employees at their respective institutions were focusing on departmental or faculty goals instead of broader



institutional goals. The findings indicated that there was no sense of community at the institutional level as organisational members were focusing more on faculties and departmental goals instead of the broader goals of the institution. There was no institutionalised philosophy that drives people to look beyond their areas of operation. Responses to this construct correlate with responses in the quantitative paradigm where the majority of participants felt that there was no sense of shared purpose in the institution.

This was also done to establish if participants were willing to assist in whatever way possible in the projects co-ordinated at the institutional level. Fourteen participants (93.33%) agreed that the focus was more on departmental and faculty goals instead of broader institutional goals. One participant (6.67%) was uncertain and did not provide a clear response.

Nisula and Pekkola (2018:101) point out that it was important to change the attitudes of organisational members to deal with the silo mindset in the organisation. Hence Systems Thinking stimulates a sense of shared of purpose in an organisation. Where Systems Thinking is implemented, the focus is on broader institutional goals instead of departmental goals.

Presented below are some of the common responses from the participants:

*“I like to believe so because if you look at the understanding that we got, academic departments still think that they are superior than admin departments, forgetting that we need each other. Without the admin, the academic business would not be. So there is still a gap that needs to be closed between the two. Thus I am saying departments and faculties still believe in their own autonomy besides having the whole concept affecting everyone.”*

*“For sure, because there seems to be a disconnect in terms of what is happening at the institutional, faculty and department levels.”*

*“There seems to be a disconnect in terms of what people think is important in their respective departments and those at management level. There are silos in the institution.”*

*“Not entirely, because we do have existing committees at the institution where various departments are represented. For example, University Planning Resources Forum (UPRF). Perhaps at an operational level, you can say people still operate in silos.”*

*“I would like to believe so, because there are departments that want to avoid interaction with other departments. Those department want to do things in their own ways”.*

The issue raised by the participants (79.2%) in the quantitative paradigm that there was no sense of a shared purpose correlates with the qualitative results where the majority of participants stated that the focus was on departmental and faculty goals instead of broader institutional goals.

#### **5.7.1.6 Systems Thinking as the best option to address complex challenges in the UoTs**

Participants were asked if Systems Thinking would be the best option to address complex challenges in the UoTs. Participants agreed that Systems Thinking was the best option to deal with the complex challenges that UoTs face on a continuous basis. The environment in which UoTs operate was unpredictable and therefore Systems Thinking was critical for UoTs to remain competitive. According to Mthembu (2012:189), the role of the UoT was not only to develop graduates intellectually, but also to empower graduates with the necessary practical skills required in the workplace. This highlighted a need for a balance between the theoretical and practical aspects in terms of what UoTs offer.

Beyond the challenges relating to teaching, learning and research, UoTs have to respond to legislation requirements, transformation requirements and meet the needs of stakeholders. Universities face complex and dynamic problems and therefore it was

important to replace traditional management approaches with a Systems Thinking philosophy (Kim and Rehg 2018:308). Ginsberg in Kim and Rehg (2018: 310) argue that HEIs were still using traditional ways to do strategic planning.

Listed below are some of the common responses from the participants:

*“Systems Thinking is used for problem-solving because Systems Thinking advocates and takes into account different views. It takes into account various perspectives.”*

*“I think it can help but there are numerous complex challenges, so to adopt one method to accomplish problems can be a solution.”*

*“It will help us to achieve organisational effectiveness, break down functional boundaries and promote collaboration”.*

*“It could help us to work towards an overall common vision of the institution.”*

In the quantitative findings, 56.3% of participants were optimistic about a knowledge-sharing culture in the UoTs. Given this understanding, it should then be easier to deal with complex challenges in the UoTs, in the sense that organisational members will be willing to share their knowledge and expertise across the organisation. There is a correlation between the quantitative results and qualitative findings in terms of implementing Systems Thinking to deal with the complex challenges in UoTs. Responses in both the quantitative and qualitative paradigm were positive in terms of knowledge-sharing culture in the UoTs.

#### **5.7.1.7 Implementation of Systems Thinking as a catalyst to achieve the strategic objectives of the institution**

The study participants were asked if the implementation of Systems Thinking would help their respective institutions to achieve strategic objectives. Thirteen (87%) respondents responded with ‘Yes’, while two (13%) responded with uncertainty by giving no straight response. UoTs, like any organisations in other sectors of the economy, are under constant pressure to remain competitive and meet the needs of

stakeholders. The findings of the study revealed that the implementation of Systems Thinking would help the UoTs to achieve their strategic objectives. Tian and Martin (2014: 932) attest that public institutions including universities were considering to adopt business models that were predominantly used in the corporate sector. According to Schoemaker and Day (2018: 702), the best strategic options are important for organisations to deal with unpredictable external change.

Responses from the participants are presented below :

*“It was necessary to adopt Systems Thinking rather than operating in silos.”*

*“Yes, our current Vice Chancellor did mention Systems Thinking approach thus, but it will require a common understanding and a common application of Systems Thinking.”*

*“Systems Thinking can work since it engages the surrounding environment. Therefore it does not just consider one’s department, but looks outside, not even just within the institution, but involves all stakeholders and the community at large.”*

Responses from the quantitative analysis indicated that the majority of participants scored 12.09, which was an indication that they had positive perceptions on the implementation of Systems Thinking. The results from the quantitative results correlate with the qualitative findings in relation to this construct.

#### **5.7.1.8 Challenges and opportunities for adopting Systems Thinking in UoTs**

Participants were asked about what the challenges and opportunities for the application or adoption of Systems Thinking in the UoTs would be. Both challenges and opportunities highlighted by the participants are presented in the following section.

#### **5.7.1.8.1 Challenges for the application of Systems Thinking in the UoTs**

Participants highlighted a number of challenges, which are summarised and presented below:

*“Change is the biggest challenge because people tend to resist change and they want to remain in their comfort zones.”*

*“The common understanding and the common application of a Systems Thinking approach by all faculties with different operational disciplines.”*

*“People will think they will lose their identity. When the system falls, everything falls.”*

*“To get buy-in from all employees of the institution was going to be a challenge.”*

These responses were critical to achieve one of the objectives of this study. Participants mainly in the qualitative analysis raised a number of challenges for the implementation of a Systems Thinking philosophy in the UoTs. The next sections deals with the opportunities for the application of Systems Thinking in the UoTs.

#### **5.7.1.8.2 Opportunities for the application of Systems Thinking in the UoTs**

Organisational effectiveness is paramount, given the turbulent environment in which organisations operate. Remaining competitive is also vital for UoTs. According to Steynberg *et al* (2020:158) higher education in general is becoming complex as a result of local and international factors. The findings of the study indicated that the implementation of Systems Thinking will indeed provide the UoTs with the ability to achieve organisational effectiveness. Presented below are participants' responses in relation to the opportunities for the application of Systems Thinking in the UoTs:

*“The institution will function better. There would be a greatest sense of shared purpose and we would be able to drive the strategic plan of the institution a lot better.”*

*“There will be a lot more of collaboration between departments, faculties and students and develop collaboration on projects and research etc, rather than the current silo mentality”.*

*“There will be synergy and sharing of resources”.*

From the quantitative findings, the majority of the participants at 69% scored seven or more, indicating that they were positive about the opportunities for the application of Systems Thinking in the UoTs. The positive perceptions from the participants in both the quantitative and qualitative analysis is an indication that it would be easier to implement Systems Thinking in the UoTs.

#### **5.7.1.9 Embracing Systems Thinking in UoTs**

Participants were asked if they would embrace the implementation of a Systems Thinking concept in their respective institutions and the majority of the participants (at 80%) responded positively. Commitment and buy-in from members of the organisation were important for the successful implementation of programmes in an organisation. In this case, participants indicated they would embrace the implementation of Systems Thinking. In other words, participants would support the implementation of Systems Thinking the UoTs. Presented below are some of the common responses from the participants.

*“I would support the implementation of Systems Thinking at the institution.”*

*“It is central to our institution’s strategic plan to deal with silos mentality in the institution and I would embrace it.”*

*“I would embrace Systems Thinking, I am already embracing Systems Thinking through E-learning project in the institution.”*

*“I would embrace it because it provides the opportunity for the left hand to understand what the right hand is doing.”*

*“Because of my experience, I understand that the environment in which we operate is dynamic and I would embrace Systems Thinking whole-heartedly.”*

*“Yes, I would embrace it because it is one of the things I am working towards-working in silos is counter-productive.”*

Generally, the perceptions of the participants from both the quantitative and qualitative findings were positive. In this construct, it was found that participants would embrace the implementation of Systems Thinking in the UoTs. Conte and Davison (2020:2) describe Systems Thinking as an approach that is used to make sense of complexity. Systems Thinking is also viewed by Lamont (2020:287) as a new way to understand relationships of elements in a complex system.

#### **5.7.1.10 Perceptions on a Systems Thinking concept in the UoT context**

Participants were asked about their perceptions on Systems Thinking in the context of UoTs. Responses received from the participants were positive. Given the environment in which UoTs operate, participants highlighted areas in terms of processes and practices that could be improved using Systems Thinking. Listed below are some of the responses from the participants:

*“It opens opportunities and enlightens us as to one would need to clearly know what the left hand side is doing as against or opposed to the right hand side. Currently, you find one wants to protect their own empire, yet the empire is the institution.”*

*“I am already using part of the Systems Thinking because for me, one has to understand the environment where you are working and you need to have communication with all the stakeholders around and beyond.”*

*“It is my responsibility to ensure that there is a shared understanding of what is the role of a writing centre with respect to students and staff development. So, Systems Thinking is the way to go. Operating in silos is countable and wastes resources. There is too much duplication, yet we can streamline and use those resources that are wasted by duplication to do other things.”*

*“We focus on our tiny silos and forget to look at the bigger picture, especially the trends nationally and globally. Systems thinking is about viewing things holistically”.*

The quantitative findings resonate with the qualitative findings. It was found in the quantitative findings that the majority of participants had positive perceptions about a Systems Thinking philosophy in the context of UoTs. The quantitative results showed that participants scored 12.09. In statistical terms, this score indicates a positive response. The findings revealed that participants were positive about the Systems Thinking. According to Stowell and Mead (2016:57), Systems Thinking is a source of inspiration and it serves as a driving force that pushes people beyond job descriptions. The next section presents themes and sub-themes that emerged from the analysis of the qualitative statistics.

The overall interpretation of both quantitative and qualitative results revealed similarities between the two sets of results. This was for all the research constructs. The next section discusses the themes and sub-themes that emerged from the analysis of the qualitative data.



### **5.7.2 Discussion of themes and sub-themes**

This section is the part of the research findings of this study that discusses the themes and sub-themes that emerged from the patterns identified during the process of data analysis. Bless, Higson-Smith and Sithole (2013:368) state that the discussion of the research findings is one of the most important aspects of research. It is the section where the researcher discusses the significance of the findings. A discussion of the findings also helps the researcher to make recommendations to improve policy formulation, as well as improving practices in the relevant context. Responses to most of the interview questions were similar but were presented differently. In presenting the findings, the researcher provides a summary of similar responses and where there are different viewpoints, they are also captured. In most instances, responses were similar. Presented in Table 20 are research themes and sub-themes that emerged in the process of qualitative data analysis.

**Table 20: Themes and sub-themes**

Theme	Sub-theme
<b>Theme 1</b> : Existence of silo mentality	Replacing traditional ways of thinking with Systems Thinking  Lack of overarching internalised and institutionalised Systems Thinking in the institution
<b>Theme 2</b> : Adoption of Systems Thinking to achieve broader UoT goals	Using multiple perspectives and appreciating interrelationships amongst departments in the UoT  Drive for excellence
<b>Theme 3:</b> Cross-functional collaboration to deal with complex challenges in the UoTs	Knowledge-sharing
<b>Theme 4:</b> Stakeholder engagement to achieve strategic objectives	Shared intentions from diverse stakeholders
<b>Theme 5</b> : Resistance to change	Lack of a shared sense of direction
<b>Theme 6</b> : Organisational effectiveness	Sharing aspirations, viewpoints and experiences to improve organisational performance  Commitment to achieve strategic objectives
<b>Theme 7:</b> employee buy-in to implement systems thinking in the UoTs	Appreciating what works and addressing what does not work
<b>Theme 8:</b> Using Systems Thinking to stimulate a sense of shared purpose	Shared responsibility and coordinated actions  Sense of shared purpose

### 5.7.2.1 Theme 1: Functional silos (silo mentality)

This section deals with the views of the participants on whether the UoTs' operations were informed by Reductionist approaches. Reductionism is when the parts of a systems operate from their individual perspectives and the whole is ignored. In an organisational context, this will mean that departments focus on their operations and ignore the broader mandate of their organisation. Based on their responses, participants recognised that there was a silo mentality culture in the UoTs. Participants were of the view that there was a culture of working in silos at the institutions. The question was intended to ascertain if departments and faculties were still operating in silos at the UoTs.

One participant indicated that *he could not generalise in his response, but he was sure that in his programme people were still operating in silos*. Explaining why departments and faculties were operating in silos, one of the participants was of the view that it was because departments and faculties did not want to lose their identities.

In line with the views expressed by the participants, Yukl (2010:358) states that where there is no Systems Thinking, organisational members' loyalty is on their functional units and they are concerned about protecting their functional turf.

According to Swap and Wayland (2013: 121), functional silos divide the university into different disciplines and as a result, there is no cross-functional collaboration. The findings of this study resonate with this point. The authors further argue that silos promote competition for recognition and funding, instead of collaboration. The overall findings confirm that there was a strong culture of working in silos in the UoTs, particularly at the departmental and faculty levels. Peter (2014:1) emphasises that Systems Thinking is an enterprise aimed at seeing how things are connected to each other in the whole entity.

In line with the responses from participants of this study, Skarzauskien (2010: 60) argues that Systems Thinking was critical to stimulating a culture of looking at the

organisation from multiple perspectives. Overall responses from the participants revealed that there was a lack of understanding in the institution that one part of the system might affect the other parts of the system. In simple terms this means that operations in one department might affect the operations of other departments in an organisation. In the quantitative results, a majority of the participants indicated that there was no sense of a shared purpose in the UoTs.

### **Sub-theme 1: Lack of institutionalised and internalised overarching systems thinking in the UoTs**

Responses from the participants suggested that UoTs lacked a institutionalised and internalised Systems Thinking philosophy. The understanding is that with Systems Thinking, it was possible to view the institution from a holistic perspective. It was critical to identify challenges and share best practices across the institution. Drack and Schwarz (2010:607) state that Systems Thinking is a useful philosophy to overcome reductionism or traditional ways of thinking in an organisation. The results indicated that there was a need to have an overarching institutionalised and internalised Systems Thinking philosophy in the UoTs. It is stated by Yukl (2010:485) that a collective identification with the organisation serves as a source of enhancing organisational commitment and loyalty. Hence, Gaffoor and Cloete (2010:3) confirm that functional silos were not helping the departments in an organisation to work together.

### **5.7.2.2 Theme 2: Adoption of Systems Thinking to achieve broader institutional goals**

Responses from the participants indicated that there were strategies in place at the institutional level. Therefore, departmental and faculty strategies had to be in line and should resonate with institutional strategies. However, most of the participants felt that those who were operating at the management level (including Deans and HoDs) were not doing enough to sensitise staff about Systems Thinking at an operational level.

The results indicate that strategies of the institutions were not clearly communicated to staff at the operational levels. Keeling, Underhile and Wall (2007:24) note that schools or faculties in higher education institutions were competing and promoting their own interests instead of the interests of the institution at large. As a result, there was a

strong culture where people focused on departmental or faculty goals instead of broader institutional goals. On the other hand, this also contributed to a lack of understanding of broader institutional goals. It has been stated succinctly by Stroh (2015:209) that Systems Thinking stimulates a shared understanding of complex issues. He further states that with a shared understanding of complex problems, it becomes easier to formulate a strategy that gives a clear direction for the organisation. It is important for an organisation to have an inspiring vision, which could lead to cooperation and trust amongst organisational members (Yukl 2010:485).

### **Sub-theme 2: Multiple perspectives and appreciating interrelationships in the institution**

Responses from the participants confirmed that there was a lack of understanding that various departments and faculties were interrelated and interdependent. The findings also indicated that the value of interrelationships amongst various functional units was ignored in the institution. However, it was necessary to appreciate and optimize interrelationships amongst different parts of the UoT. In stressing the importance of Systems Thinking, Stroh (2015:15) mentions that conventional thinking is not suitable to solve complex and chronic problems. Bui (2010:234) considers Systems Thinking as a tool to bridge the gap between the different sectors in UoTs. Multiple perspectives are critical to deal with complex challenges. Hence, Yukl (2010:311) points out that it is always important to consider other people's aspirations during decisions-making in an organisation.

#### **5.7.2.3 Theme 3: Application of a systems thinking to deal with complex challenges in the UoTs**

The responses from the participants were positive. One of the participants described Systems Thinking as a management approach that promotes multiple perspectives in dealing with complex challenges. To support their response, some comments included that:

*“Systems Thinking will help to break down functional boundaries”. “It will also help staff at every level of the institution to work towards a common goal”.* Overall, participants

agreed that the implementation of Systems Thinking would help UoTs to deal with complex challenges. Fifolt (2010 :59) raises a question as to *“why a student should register for financial aid in one location, register for classes in another location and also receive a financial disbursement in a third location within the institution.?”*

This is a classic example of processes informed by a Reductionist approach, as opposed to a Systems Thinking approach.

Multiple perspectives are critical, as confirmed by Stroh (2015:1), that Systems Thinking mobilizes diverse stakeholders to take actions that improve the effectiveness of the whole system. In line with the responses from the participants and consulted sources from the literature, Systems Thinking is effective in dealing with complex challenges. Stroh (2015:4) points out that Systems Thinking is more appropriate to solve complex and chronic social problems. The findings of the study revealed that Systems Thinking would help UoTs to deal effectively with complex challenges. According to Yukl (2010:483), optimism for the new strategy to succeed is critical for any organisation. Additionally, Jackson (2011:12) views Systems Thinking as an effective alternative to Reductionism.

### **Sub-theme 3: Knowledge-sharing**

Limitations in Reductionism resulted in the development of Systems Thinking (Flood 2010:270). The findings indicated that there was a need to create a conducive environment for knowledge-sharing across the institution. Given the importance of knowledge-sharing in an organisation, Lucas (2010:419) indicates that organisations continue to experience challenges in terms of successfully transferring information across the organisation. Sharing knowledge in organisations is paramount, given the fact that the environment in which organisations operate is becoming competitive and dynamic (Yukl 2010:320).

#### **5.7.2.4 Theme 4: Application of Systems Thinking to optimize stakeholder engagement to achieve strategic objectives in the UoTs**

Some participants covered this question when they were responding to the previous question, which was in relation to knowledge-sharing. Overall, participants agreed that the implementation of Systems Thinking would help UoTs to achieve strategic objectives. One participant commented that “*Systems Thinking is critical as it serves as a catalyst for the UoT employees not to understand their institutions only, but also the environment in which UoTs operate*”. UoTs are expected to produce well-rounded graduates who can assist to solve problems in their communities and the society at large. It is on this understanding that Systems Thinking becomes critical for UoTs.

According to Skarzauskie (2010:59), there were empirically-proven insights indicating that Systems Thinking enhances the performance and effectiveness of the organisation. He further reiterates that Systems Thinking was critical to deal with strategy formulation in an organisation. The critical role that stakeholders play is emphasised by Bitzer (2010:16). He goes further to stress that stakeholders play a vital in to continuously scrutinising processes and practices in the university. Hence, it is important to consider and engage stakeholders during processes of making strategic decisions. In line with the views of the participants, Seiler (2011:55) accentuates that business organisations have adopted Systems Thinking as a strategic option to remain competitive. Participants were of the view that systems thinking would be a strategic option for the UoTs.

#### **Sub-theme 4: Diverse stakeholders with shared intentions**

Shared intentions refer to a collective attitude inspired by a genuine desire for members of the organisation to work together (Bowden 2017:440). He further mentions that shared intentions are manifested or expressed in joint actions. Stroh (2015:134) put it succinctly that awareness and acceptance is vital for people to develop alternative solutions. According to Yukl (2010:311), support from all the relevant stakeholders is an important factor to achieve organisational change. From the findings of the study, it was clear that there was no institutionalised culture where people were collectively open to considering new ways of thinking and performing their tasks. Kokt and Le Roux

(2012:108) iterate that organisational effectiveness could be realised through effective partnerships and collaboration within the organisation. Systems thinking is therefore critical and Jackson (2011:13) describes Systems Thinking as an approach that is trans-disciplinary in nature. When people have a sense of ownership over a shared vision, they will not hesitate to share their insights (Stowell and Mead 2016:161).

#### **5.7.2.5 Theme 5: Challenges for the implementation of Systems Thinking**

Participants raised a number of challenges in terms of implementing Systems Thinking in the UoTs. Issues that were viewed as challenges included the following:

*“Resistance to change, fear to lose department or faculty identity. Considering the nature of the institution with multi perspectives, it would be difficult to adopt Systems Thinking. Getting buy-in from all staff was also identified as one of the main challenges.”*

According to Stroh (2015:208), everything is connected. He further states that Systems Thinking is a team sport which inspires stakeholders with diverse perspectives to work together. With the implementation of Systems Thinking, the challenges highlighted by the participants would easily be eliminated. In terms of the challenges for the implementation of Systems Thinking, Senge (1990:163) posits that it is always a challenge to change familiar ways of thinking and acting in an organisation. As a result, it becomes difficult to put new insights into practice. According to Yukl (2010:298), resistance to change is not about ignorance, but is natural reaction by people who want to defend their own interests. He further states that it generally takes years to implement significant change in organisations, particularly large ones.

Highlighting the importance of embracing change in organisations, Stowell and Mead (2016:140) argue that in a competitive world, organisations have no choice but to evolve if they want to remain relevant.



### **Sub-theme 5: Shared sense of direction**

The findings indicated that there was a lack of a shared sense of direction in institutions. Consequently, participants felt that resistance to change would be a challenge to implement Systems Thinking in the UoTs. According to Yukl (2010:304), objectives and strategies cannot be realised without cooperation amongst organisational members. A shared sense of direction is vital in any organisation as it serves as a source of unity where members of the organisation are committed and working hard to achieve the common goals of their organisation.

#### **5.7.2.6 Theme 6: Opportunities for the application of Systems Thinking in the UoTs**

Responses relating to opportunities for the application of Systems Thinking included the following comments:

*“It will promote cross-functional collaboration”. “There will also be flexibility in terms of operations and practices in the UoTs”.* One of the participants mentioned the point that *“Systems Thinking will help the institution to operate efficiently to achieve bigger goals.”*

Overall, participants were optimistic about the implementation of Systems Thinking philosophy in the UoTs.

Another comment was that *“Systems Thinking will promote a sense of shared purpose in the UoTs”.* *“Sharing of resources and saving costs”* was also one of the points expressed by one of the participants. Behl and Ferreira (2014:105) are of the view that Systems Thinking empowers people with the ability to appreciate the interdependences in a set of components designed for a specific purpose.

### **Sub-theme 6: Sharing collective aspirations, viewpoints and experiences to improve organisational performance**

With silo mentality, it was difficult for participants to share experiences and ideas to improve an institution's performance holistically. Sharing best practices within organisations leads to increased organisational performance (Kokt and le Roux 12:107). In addition Yukl (2010:361), stresses that where members of the organisation

consider strategic objectives of the organisation worth their best effort, that stimulates a sense of commitment.

#### **5.7.2.7 Theme 7: Embracing Systems Thinking**

This question was asked to ascertain if participants would embrace Systems Thinking in their institutions. The responses were positive and participants indicated that they would embrace the implementation of Systems Thinking in their UoTs. These findings suggest that it would be easier to implement Systems Thinking in the UoTs as participants view the application of Systems Thinking as something positive and worth considering. To ensure the survival of an organisation, Onyishi (2010:304) explains that it was important for employees to perform their duties beyond their job descriptions. However, Lewis (2016:3) notes that unpredictability and complexity makes it impossible to consider all the relevant variables of the situation. Therefore, Systems Thinking is worth considering by organisations that want to remain competitive. It is with this understanding that Senge (1990:311) points out that creating systematic solutions requires people to work together.

#### **Sub-theme7: Appreciating what is working and addressing what is not working as a collective**

Participants were optimistic that they would embrace the application of Systems Thinking in their UoTs as they viewed it as a strategic alternative worth considering. Systems Thinking serves as a catalyst to inspire members of the organisation to appreciate what is working and take responsibility to address what is not working as a collective (Stroh 2015:1). As a result, there is continuous learning and improvement of the organisation's operations.

According to Fuchs (2008:27), organisations that build and maintain a competitive advantage are capable of continually improving products and processes. The challenge in higher education is what Ellies (2011:117) calls 'defence of academic turf'. This means that people are defending their functional silos. Given the challenges in the UoT sector, Systems Thinking will be necessary to deal with complex challenges and remaining competitive. Kinicki and Williams (2013:62) describe Systems Thinking

as a critical concept to condition members of the organisation to understand organisations as a system with interconnected and interacting parts to achieve common goals.

#### **5.7.2.8 Theme 8: Perceptions on Systems Thinking in the UoTs**

Participants demonstrated their understanding of Systems Thinking and commented positively. In their view, there were pockets of excellence already in some sections of the institutions. A project like Siyaphumelela was mentioned, where various units were working together to improve the success rate of students, particularly at DUT. This was inspired by a Systems Thinking philosophy. One participant commented that *“there should be no resistance to the implementation of Systems Thinking as this would benefit the institution as a whole”*. It was also mentioned by one participant that *“Systems Thinking would help people in the UoTs to view things holistically”*. This view is supported by Behl and Fereirra (2010:109), that Systems Thinking empowers organisational members with the ability to think holistically, instead of focusing on individual parts (functional areas) of the organisation.

Another participant expressed a view that *“Systems Thinking was necessary to deal with silos in the institution and to encourage UoT employees also to understand trends in the UoT sector, both nationally and internationally”*. It was also positively stated by one of the participants that *“Systems Thinking was the way to go”*. The general perceptions from the participants was that Systems Thinking would help UoTs in their pursuit of excellence.

#### **Sub-theme 8: Shared responsibility and coordinated collective actions**

According to Bak (2012:169), Systems Thinking stretches organisational members' perspectives beyond their departmental and organisational boundaries. The results of the study indicated that Systems Thinking was worth considering in the UoTs. Without a Systems Thinking philosophy, it was difficult to stimulate a culture of shared responsibility and coordinated collective actions in the UoTs. Lewis (2016:155) notes that in an enterprise where people bring their individual knowledge together, collective

knowledge expands exponentially. Furthermore, Lewis (2016: 209) explains that when people work together in a positive way, this creates stronger social bonds in an organisation.

## **5.8 Contribution of the study**

The findings of the study make contributions to both Systems Thinking theory and organisational effectiveness in the context of UoTs. Pojo (2018: 2) stresses that new scientific knowledge is produced through scientific research. The study highlights a need for UoTs to consider replacing management approaches that are failing to deal with the complex challenges. Like any other organisations, UoTs operate in an environment that is characterised by unpredictable and complex challenges. The findings of the study indicated that Systems Thinking was a necessary philosophy to deal with functional silos and to enhance organisational effectiveness in the UoTs. Systems Thinking was explored and the focus was on both strategic and operational aspects in terms of its application in UoTs. Operational aspects included knowledge sharing, functional silos, a sense of shared purpose, as well as the challenges and opportunities for the application of Systems Thinking in the UoTs. Strategic aspects were about the implementation of Systems Thinking as a strategic option to deal with the complex challenges which UoTs continue to face. The next section is a summary of this chapter.

## **5.9 Chapter summary**

The purpose of the chapter was to present and discuss the findings of this study. A Mixed methods approach was adopted to conduct this study. Therefore, self-administered questionnaires and unstructured face-to-face interviews were the research instruments used to collect data from the participants. The data collected and analysed related to the applicability of Systems Thinking in UoTs. The findings of this study highlight the importance of a holistic mindset to improve processes and practices in the UoTs. It was found that functional silos were prevalent in UoTs. Participants were optimistic that Systems Thinking would be a strategic option for the UoTs. The next chapter deals with the conclusion and recommendations based on the interpretation of the findings. Bloomberg and Volpe (2019:319) posit that the conclusions of the study should flow from the findings of the study.

## **CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS**

### **6.1 Introduction**

The previous chapter presented the findings based on the analysis of data collected by means of a self-administered questionnaire and unstructured research interviews. Permanent employees of MUT and DUT participated in the study. This chapter is therefore the conclusion chapter of the study. It also provides recommendations for future research. Part of this chapter illustrates the significance and appropriateness of the findings. The study adopted a Phenomenological approach to investigate the applicability of Systems Thinking in UoTs. It also elucidates how this research project dealt with the main aim, objectives, research questions as well as the implications of the study findings, both in theory and practice. Cottrell (2014:192) explains that the conclusion chapter serves to sum up relevant sections of the research project and highlights the significance of the research findings. In the main, this chapter covers the theoretical overview; empirical overview of the findings; implications of the findings; achievement of the research objectives; and the significance of the findings.

The study is unique in the sense that it explored Systems Thinking from the UoT perspective. Previous research approached Systems Thinking mainly from the private sector perspective. Systems Thinking deals with internal processes, practices and the environment in which UoTs operate. In essence, Systems Thinking empowers organisations with the ability to holistically understand both the internal and external environments. It is mentioned by Van Niekerk (2016: 29) that narrow-mindedness in the form of a Reductionist approach is prevalent in the academe. All research constructs considered in the study were relevant to achieve the objectives of the study. Research questions also played a role in terms of the research constructs considered in the study.

The main aim of this study was to investigate the applicability of Systems Thinking in the UoTs in KZN.

Critical research questions were formulated to achieve the objectives of the study. According to Denscombe (2012:82), research questions help to indicate what factors

and relationships of a particular phenomenon will be investigated. Remenyi (2014:162) indicates that research is conducted to find answers to the research questions. He further stresses that academic research without research questions may be regarded as not being research at all.

Below is a list of research questions for the study:

- Will it be practically possible to apply a Systems Thinking concept in UoTs?
- Will the application of a Systems Thinking concept be the best option for UoTs?
- Will Systems Thinking help to stimulate a sense of shared purpose in the UoTs?
- What are organisational members' perceptions on the Systems Thinking concept?
- How applicable is a Systems Thinking philosophy in the UoTs?
- What will the challenges and opportunities be for adopting Systems Thinking in the UoTs?

The next section presents the theoretical orientation relating to the findings of this study.

## **6.2 Overview of the theoretical orientation**

This study was conducted to explore Systems Thinking in the context of UoTs. According to Hart (2018:65), research is conducted to explain, explore or critique a phenomenon. Remenyi (2014:186) confirms that the theoretical orientation provides explanations for the phenomenon that is being investigated. The theoretical perspective plays an important part in terms of explaining the research approach that was adopted to conduct the study (Hart 2018:65). This section demonstrates that

reviewing existing literature is not just about describing different methods and expressing opinions but that a theoretical perspective is also presented to demonstrate a logical link between theories, methodologies and the findings of the study. Oliver (2014:13) states that the aim of the study plays a role in influencing the choice of theoretical perspective and research methodology. The study adopted an inductive approach. According to Graziano and Raulin (2013:396), inductive theories are built on a strong empirical base. In addition, the study used a Phenomenological design, which is viewed by Davies (2007:240) as an approach to explain and explore the way people view the world in the context of their own experiences. The findings of this study concurred with the existing literature that Systems Thinking was an effective alternative to Reductionism or Functional silos. It is also argued in the existing literature that higher education institutions were adopting management approaches that were traditionally used in the private sector. According to Jones and George (2018:35), organisations should learn how to adapt if they want to remain competitive in a changing global environment. Hence, the study provides insights on Systems Thinking in the UoT context.

The findings of the study indicated that Systems Thinking was applicable to UoTs. Systems Thinking is a management approach that considers organisations as a systems (Robbins, Decenzo and Coulter (2011:449). Vemuri and Bellinger (2017:2) describe an organisation as a large family with a web of interactions. In other words, it is about understanding and appreciating the interactions, interdependence and interconnectedness of various units within an organisation. The findings revealed that this understanding is lacking in the UoTs. Participants felt that processes and practices were informed by a Reductionist approach in the UoTs. Hence the findings indicated that participants were of the view that the departments and faculties were operating in silos. Naicker and Mestry (2015:7) emphasise the point that when organisational members are unaware of Systems Thinking, they fail to appreciate the interconnectedness of various divisions within an organisation. Systems Thinking was developed as an alternative to a Reductionist approach. Given the challenges and ever-changing higher education environment, participants indicated that they would embrace the application of Systems Thinking in the UoTs. Hence, Vemuri and Bellinger (2017:3) put it succinctly that the successful implementation of an organisation-wide change requires a change of people's mindsets and the way they act. The findings

showed that organisational members in the UoTs do realize that current management approaches were not effective in dealing with chronic and complex challenges. According to Vemuri and Bellinger (2017:1), Systems Thinking is receiving attention from organisations in all the sectors. To show that Systems Thinking was applicable to all the sectors, Peters (2014:2) accentuates it could be used across and between different disciplines. There is a correlation between theory and the findings of this study. Participants felt that a silo mentality was prevalent in the UoTs. This point is supported by Posner and Stuart (2013:274) who confirm that teaching, learning and research was happening in silos in the UoTs.

The environment in which organisations operate is described by Palaima and Skarzauskiene (2010:333) as becoming more complex and there are a number of variables to be considered at one given point. The findings proved that Systems Thinking would be the best choice for the UoTs. Discussing the benefits of Systems Thinking, Palaima and Skarzauskiene (2010:333) mention that it provides a clearer way to understand an organisation, while at the same time considering the environment in which organisations operate. On the relevance of Systems Thinking in dealing with complex challenges, Palaima and Skarzauskiene (2010:331) stress that indeed operating in a growing dynamic environment requires managers and decision-makers who are systems thinkers.

In fact, even UoTs are systems with interconnected sub-systems. Hence, Khanyile (2018: 139) describes a university as a complex system that should adapt continually to meet the needs of stakeholders. Thus, the adoption of Systems Thinking would be a strategic choice for UoTs.

### **6.3 Empirical overview of the study**

The study explored Systems Thinking in the context of the UoTs. Given the environment in which UoTs operate, the study explores Systems Thinking as an alternative management approach to deal with the complex and unpredictable challenges that UoTs face. According to Oliver (2018:1), new paradigms are re-defining the higher education landscape. Hence it is critical to explore alternative management approaches in UoTs. The study emphasises the importance of



understanding that departments and faculties are interrelated and operate to achieve the common goals of the university as a whole. It is also critical to understand that a university is a system operating within a large system. Flood (2010:271) emphasises that in a Systems Thinking context, an organisation is viewed as a complex system made up of interrelated and interconnected parts.

### **6.3.1 Research process and stages followed to conduct the study**

The section below briefly highlights the research stages and processes followed to undertake this study. A research process covers the list of activities which had to be undertaken to achieve the desired outcomes of the research project. Necessary resources including research funds were acquired. Hence it was possible to conduct this research project.

#### **6.3.1.1 Planning**

A lack of Systems Thinking in the UoTs was identified as a problem. It was on this basis that the research project was conducted. Part of the problem was also a gap in Systems Thinking literature where the emphasis was more on the corporate sector and not much attention was given to the UoT context. The research plan was then formulated to achieve the desired outcomes. Institutional (DUT) research procedures were followed after the research proposal for this study was approved. Part of the requirements was ethical clearance and gatekeeper permission, both of which were granted.

#### **6.3.1.2 Data collection: secondary and primary data**

The study adopted a mixed methods approach. Quantitative and qualitative approaches were used to facilitate the collection of data. The self-administered questionnaire was used to collect quantitative data and unstructured interviews were used to collect qualitative data. Reviewing relevant literature provided the researcher with the necessary insights to understand the concept of Systems Thinking. As a result, the researcher was able to formulate critical research questions. Insights from the literature were used to justify certain elements of the methodology that was adopted.

#### **6.3.1.3 Analysis of data and interpretation of results**

The services of a statistician were acquired to assist with the analysis of data. The Statistical Package for the Social Sciences (SPSS) version 25.0 was used to analyse quantitative data. On the other hand, Nvivo version 12 was used to analyse qualitative data. Statistical tests performed for quantitative data included descriptive and inferential statistics. Graphs and tables were used to present the results in a meaningful and logical manner. The literature review was also used to interpret the findings.

#### **6.3.1.4 Writing the research report**

The report covered all the relevant elements of the research project. This included background, literature review, Systems Thinking model, methodology, the findings, as well as the conclusion and recommendations. The report is divided into five chapters presented logically from the introduction to a conclusion. The next section presents a discussion on the achievement of the research objectives.

### **6.4 Achievement of the research objectives**

This section covers the extent to which the research objectives of this study were achieved. The adopted research methodology was appropriate to achieve the study objectives. The discussion presented below incorporates key findings of the study.

#### **6.4.1 Exploring Systems Thinking as an alternative to functional silos (reductionism)**

Participants felt that departments and faculties were operating in silos. The study also revealed that participants were of the view that the focus or emphasis from UoT employees was more on departmental and faculties goals, instead of broader institutional goals. Participants also pointed out that it was difficult to understand broader institutional goals because of functional silos. The environment in which UoTs operate and the needs of the stakeholders require an approach that is informed by multiple perspectives. This objective of the study was achieved and the responses addressed the critical research question on whether it will be practically possible to apply Systems Thinking in UoTs. Participants acknowledged that functional silos were

a challenge and they were optimistic about Systems Thinking being an alternative to Reductionism. These responses were obtained through a qualitative paradigm.

#### **6.4.2 To examine if Systems Thinking would be a strategic option to deal with complex challenges in UoTs**

An organisational strategy that fails to look at the challenges holistically will not be effective to deal with the complex challenges. Participants indicated that they would not hesitate to embrace the implementation of Systems Thinking in the UoTs. These responses were solicited through a qualitative paradigm.

The findings of the study further indicated that there was a need for a strategy that considers multiple perspectives from all relevant stakeholders in the UoTs. This objective was achieved and participants also responded to the research question relating to Systems Thinking as a strategic choice to deal with complex challenges in the UoTs. Participants were of the view that Systems Thinking would be a strategic option.

#### **6.4.3 To determine if Systems Thinking would help to stimulate a sense of shared purpose in the UoTs**

Responding and dealing effectively with the needs of relevant stakeholders is important for the UoTs. Therefore, stimulating a sense of shared purpose is important. The findings revealed that participants at 79.2% felt that there was no sense of a shared purpose in the UoTs. The lack of an institutionalised and internalised overarching Systems Thinking philosophy could be a contributing factor. Participants demonstrated the understanding that Systems Thinking would help to stimulate a sense of shared purpose. Without a shared purpose, it would not be practically possible to achieve organisational effectiveness. Responses to a research question relating to Systems Thinking and a sense of shared purpose were provided. This objective of the study was achieved.

#### **6.4.4 To ascertain employees' and management's perceptions on the application of Systems Thinking in the UoTs**

Participants were optimistic about the application of Systems Thinking in the UoTs. The results indicated that participants (at 12.09%) had positive perceptions for the application Systems Thinking in the UoTs. Responses from the participants suggested that the application of Systems Thinking would be a strategic decision. Solicited responses relating to the research question about perceptions of organisational members were provided. Participants felt that Systems Thinking was necessary, given the environment in which UoTs operate. Essentially, the study objective to ascertain participants' perceptions of Systems Thinking was achieved.

#### **6.4.5 To contribute to systems theory by capturing UoTs' context**

An inductive approach was adopted to conduct this study. Through the analyses of data and identification of themes and patterns, the study was able to contribute to existing Systems Thinking literature. The purpose was to capture UoTs' context in Systems Theory. Data collected from the participants provided necessary insights for a UoT context in the Systems Thinking theory literature. A gap was identified that not much was covered in literature relating to systems thinking in the context of UoTs. As a result, the study contributes to existing Systems Thinking literature and provides necessary insights to cover that gap to a certain extent. Based on the responses given, the research question was covered, and objective achieved.

#### **6.4.6 To establish the challenges and opportunities for the application of Systems Thinking in the UoTs**

Participants highlighted some factors in relation to both challenges and opportunities for the application of Systems Thinking in the UoTs. It was established that participants (at 69%) were optimistic about the opportunities for the application of Systems Thinking in the UoTs. The findings confirmed that reductionism approaches have failed to deal with the complex challenges in UoTs as in other sectors of the economy. In essence the study objective relating to this construct was achieved. Further to that, participants responded to a research question relating to the challenges as well as opportunities for the application of Systems Thinking in the UoTs. Resistance to change was one of the factors identified as a challenge for the implementation of a systems thinking.

There was a statistically significant correlation between a sense of shared purpose and knowledge-sharing constructs at 0.214. The correlation test results revealed that there is a moderate positive relationship between a knowledge-sharing culture and the opportunities for the application of a Systems Thinking construct at 0.383. Based on the correlation test results, no relationship was found between other study variables except the ones mentioned above. The findings revealed a positive attitude towards the adoption of Systems Thinking in the UoTs. In terms of the findings, Systems Thinking was viewed as a philosophy that would help UoTs to remain relevant and competitive.

The study addressed all the research questions relating to all the constructs. All study objectives were also achieved. The next section presents the implications of the findings.

## **6.5 Implications of the results for policy formulation in the UoTs**

This section contextualizes and highlights the implications of the findings in the management field, particularly in UoTs. These results should inform strategy to improve processes and practices in UoTs. Bryman and Bell (2015:698) point out that the discussion of the findings should also reflect on the implications of the research findings.

Overall responses from the participants provided insights into the applicability of Systems Thinking in the UoTs. The study presents an alternative approach that helps to understand complex challenges. In Systems Thinking, all variables in the situation are taken into consideration, which is important for policy and strategy development. Key findings revealed that there is a need to promote an understanding that departments and faculties in the UoTs operate to achieve broader institutional goals. The research methodology and approach adopted was appropriate to expand knowledge on Systems Thinking, particularly in the context of UoTs. The last part of this section deals with the consequences for not considering these findings during policy or strategy formulation in the UoTs.

- **Dealing with complex challenges:** Based on the findings of this study, there is a need to adopt an overarching Systems Thinking philosophy to deal with dynamic and complex challenges. UoTs are under constant pressure to meet the needs of relevant stakeholders. Hence, it is important to adopt a Systems Thinking philosophy that provides a holistic understanding when dealing with complex problems in a dynamic higher education environment. The implementation of Systems Thinking will help to improve processes and practices in the UoTs.
- **Functional silos:** It emerges from the findings that departments and faculties should work together towards achieving broader institutional goals. Functional silos do not assist in the continuous improvement of practices and operations in the UoTs. Breaking down the silos helps to create space for cross-functional collaboration. It is critical to promoting an understanding of the interrelationships and interdependence of various sections in public higher education institutions. There is a need to understand that if something goes wrong in one section, it might affect the other sections of the organisation.
- **Stimulating a sense of shared purpose:** Where there is no sense of a shared purpose, people compete and defend their territories. Given the challenges that UoTs face, a shared sense of purpose is an important ingredient for sharing best practices and knowledge. The findings indicated that there was no sense of a shared purpose in the UoTs.
- **Stakeholder mobilization and engagement:** Understanding the needs of the relevant stakeholders is critical for the UoTs. Therefore, engaging stakeholders helps with policy formulation. In the UoT context, external and internal stakeholders have a vital role to play. Consideration for multi-perspectives in the decision-making process is important, as this study reveals that traditional approaches were not effective to deal with complex and dynamic challenges. Traditional approaches are informed by a Reductionism philosophy. It is advisable to have multi-perspectives when formulating a strategy for remaining competitive. The results indicated that current management approaches in the

UoTs did not take into consideration diverse perspectives. Hence, processes and practices were informed by a Reductionist approach.

Failure from decision-makers to give these findings the necessary attention would allow the continuation of a Reductionist approach in the UoTs. Strategic decisions will not be informed by a holistic understanding of the situation. As a result, not all relevant variables of the situation will be considered during the decision-making process. There will be no cross-functional collaboration. Organisational members will continue not to appreciate the interconnectedness of various units and faculties in the UoTs. A lack of understanding that changes in one part of the organisation affects the other part will remain prevalent. The findings have implications for the operations and practices in UoTs.

## **6.6 Limitations and scope of the study**

The study focused on UoTs. Hence the other types of public institutions in the higher education sector were excluded. Practical considerations and the number of UoTs in KZN were the main reasons to focus on UoTs. The study did not deal with structural designs of UoTs, but management approaches that lacked holistic perspectives and promoted functional silos. There are different systems methodologies. However, this study focused on Systems Thinking as a philosophy.

## **6.7 Significance of the findings**

The findings highlight the importance of taking into consideration the interactions, interdependence and interrelationships of variables when formulating a strategy for the organisation. Given the chronic and complex challenges faced by UoTs, the findings indicate a need for a change of mindset. The findings also show that organisational members need to understand that changes in one part may affect the other parts of the organisation.

Vemuri and Bellinger (2017:1) put it succinctly that in essence, Systems Thinking is about understanding the interactions and interconnectedness of a system's elements. This will be about the departments and faculties in the context of this study. The

findings provide decision-makers with necessary insights to promote cross-functional collaboration in the UoTs.

From the findings, possible challenges and opportunities are highlighted to guide policy or strategy formulation. Therefore, Systems Thinking could be used to improve processes and practices in UoTs. The findings draw the attention of university managers and policy developers to a Systems Thinking philosophy for dealing with complex challenges. In fact, the findings offer an alternative approach to Reductionism, which is regarded as an approach that has failed to deal effectively with complex and unpredictable challenges. Participants were optimistic that Systems Thinking could be used to stimulate a sense of shared purpose, drive for excellence, commitment to achieve strategic objectives and knowledge-sharing in UoTs.

The study identified a gap in the existing literature on Systems Thinking as the focus was more on private sector organisations and not much attention has been given to higher education institutions, which UoTs are among. The study therefore provides insights into Systems Thinking in the context of UoTs. Hence the study provides new perspective in terms of managing the UoTs. Hart (2018:49) posits that the aim of an academic research study is to add to what has been done previously and not to replicate it.

The findings resonate with the literature where Systems Thinking is regarded as a solution to dealing with complex challenges for both private and public institution. In addition, the findings indicated there was a lack of an institutionalised and internalised overarching philosophy in the UoTs. Systems Thinking was therefore viewed as an effective alternative to the traditional approaches used to manage UoTs. The next section presents recommendations for future research.

## **6.8 Recommendations for future research**

This section presents recommendations for future research. Bless and Higson-Smith (2004:141) state that it is important to make suggestions for further investigations on



some aspects that were not sufficiently covered by the study. The following are the recommendations for future research:

- To assess the implementation of a Systems Thinking approach to prepare university graduates for the world of work;
- To investigate the implementation of Systems Thinking to improve students' experience in UoTs;
- To ascertain the perceptions of academics on empowering university students with Systems Thinking skills;
- To explore the implementation of Systems Thinking to deal with gender- based violence in UoTs;
- To explore the adoption of Systems Thinking to enhance partnerships between tertiary institutions and selected high schools in KZN;
- To investigate the implementation of Systems Thinking for improving throughput rates in higher education institutions; and
- To investigate the applicability of Systems Thinking in creating a balance between decolonisation and internationalisation of the curriculum in South African universities.

The next section presents a summary of this chapter.

## **6.9 Chapter summary**

A lack of an institutionalised and internalised overarching philosophy in the UoTs was highlighted. Departments and Faculties are still operating in silos. The study investigated the applicability of Systems Thinking in the UoTs. This is a final chapter

highlighting the extent to which research objectives were achieved. On the other hand, it also presents recommendations for future research. The methodology adopted was appropriate to achieve the objectives of the study. Participants responded to all the research questions of the study. This chapter deals with the main salient points about this study as a whole. According to Badenhorst (2007:126); conclusions address the main points and provide a logical link indicating how the researcher dealt with those main points. This chapter contextualizes the meaning of the findings. Remenyi (2014:28) stresses that a conclusion should highlight the implications of the findings for practitioners in a particular discipline or community.

Operations and practices in UoTs are informed by a Reductionism approach, which is no longer effective to deal with complex challenges. These include the needs of internal and external stakeholders, as well as the turbulent environment in which UoTs operate. Based on the findings, Systems Thinking was applicable to the UoTs. The findings revealed that interconnectedness, interrelationships and interactions between departments and faculties were not being appreciated in the UoTs. Van Niekerk (2016:30) maintains that alternative ways of thinking in higher education institutions are critical.

Organisational members did not view a university as a system with sub-systems operating to achieve a common goal. This study makes a contribution to management, leadership and Systems Thinking literature. It adds the UoT context to the existing literature. The study provides insights to guide and inform decision-making and strategy formulation in UoTs. There was a correlation between theory and the findings of the study. According to Jackson (2003:13), Systems Thinking has been proven to be suitable for dealing with complex and chronic challenges. The findings revealed that the implementation of Systems Thinking will help UoTs to outsmart competitors. It will help UoTs to remain relevant and deal with the needs of stakeholders holistically and effectively.

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# APPENDICES

## Appendix A

### THE APPLICABILITY OF SYSTEMS THINKING AT THE UNIVERSITIES OF TECHNOLOGY (UoTs) IN KWAZULU-NATAL

Please complete the following questionnaire as frankly as possible, and where necessary indicate your option by means of a cross (X). Your input will be greatly appreciated and confidentiality ensured. Completed questionnaire will be collected personally by the researcher.

**Systems thinking** is defined by Robbin, Decenzo and Coulter (2011:449) as a management approach that views an organisation as a system with a set of interrelated and interdependent parts. These parts interact to achieve a common goal.

#### SECTION A: BACKGROUND INFORMATION

1. Please indicate your institution.

Institution	
DUT	
MUT	

2. Please indicate your sector.

Sector	
Academic	
Admin.	

3. Your highest qualification.

Qualification	
Matric	
Diploma	
B.Tech	
Masters	
Doctorate	
Other (specify)	

4. How long have you been working for this institution?

No. of years	
1-5	
6-10	
11-15	

16-20	
21-25	
26+	

5. What is your occupation at the institution?

Occupation	
------------	--

## **SECTION B: BIOGRAPHICAL INFORMATION**

6. Gender

Gender	
Female	
Male	

7. Age

Age	
15- 25	
25- 35	
35- 45	
45- 55	
55+	

## **SECTION C: SENSE OF A SHARED PURPOSE**

8. There is a sense of a shared purpose in this institution.

Shared purpose	
Strongly agree	
Agree	
Uncertain	
Disagree	
Strongly disagree	

9. The commitment to achieve strategic objectives of the institution is visible at

Shared purpose	
All levels	
Lower level	
Middle level	
Top level	
Not sure	
Not visible at all levels	



10. The drive for excellence in this institution is visible at

Shared purpose	
All levels	
Lower level	
Middle level	
Top level	
Not sure	
Not visible at all levels	

#### SECTION D: KNOWLEDGE SHARING CULTURE

11. There is a willingness to share knowledge in order to improve institutional practices  
at this institution.

Knowledge sharing	
Strongly agree	
Agree	
Uncertain	
Disagree	
Strongly disagree	

12. Systems thinking will inspire knowledge sharing beyond functional boundaries in this institution.

Knowledge sharing	
Strongly agree	
Agree	
Uncertain	
Disagree	
Strongly disagree	

**SECTION E: PERCEPTIONS ON THE APPLICATION OF SYSTEMS THINKING**

13. The institution can benefit from the application of systems thinking.

Systems thinking	
Strongly agree	
Agree	
Uncertain	
Disagree	
Strongly disagree	

14. The application of systems thinking could help UoTs to achieve strategic objectives.

Systems thinking	
Strongly agree	
Agree	
Uncertain	
Disagree	
Strongly Disagree	

15. Departments operate in silos in this institution.

Systems thinking	
Strongly agree	
Agree	
Uncertain	
Disagree	
Strongly disagree	

16. In this institution, staff focus on departmental goals instead of broader institutional goals.

Systems thinking	
Strongly agree	
Agree	
Uncertain	
Disagree	
Strongly disagree	

17. Systems thinking could stimulate a sense of community in the UoTs.

Systems thinking	
Strongly agree	

Agree	
Uncertain	
Disagree	
Strongly disagree	

18. Systems thinking will help UoTs to gain competitiveness.

<b>Systems thinking</b>	
Strongly agree	
Agree	
Uncertain	
Disagree	
Strongly disagree	

<b>SECTION F: OPPORTUNITIES FOR THE APPLICATION OF A SYSTEMS THINKING IN THE UoTs</b>
---

19. Employees of this institution will embrace systems thinking.

<b>Opportunities</b>	
Strongly agree	
Agree	
Uncertain	
Disagree	
Strongly disagree	

20. Systems thinking will be a strategic choice for the UoTs.

<b>Opportunities</b>	
Strongly agree	
Agree	
Uncertain	
Disagree	
Strongly disagree	

21. Current strategies are effective to deal with complex challenges in the UoTs.

<b>Opportunities</b>	
Strongly agree	

Agree	
Uncertain	
Disagree	
Strongly disagree	

<b>SECTION G: POSSIBLE CHALLENGES FOR THE APPLICATION OF A SYSTEMS THINKING IN THE UoTs</b>
---

22. The working environment in this institution is not conducive for the implementation of a systems thinking in the UoTs.

Challenges	
Strongly agree	
Agree	
Uncertain	
Disagree	
Strongly disagree	

23. The institutional culture does not stimulate collaboration across the institution.

Challenges	
Strongly agree	
Agree	
Uncertain	
Disagree	
Strongly disagree	

24. Systems thinking will not improve the operational processes at the UoTs.

Challenges	
Strongly agree	
Agree	
Uncertain	
Disagree	
Strongly disagree	

**Thank you for your participation in this study**

## Appendix B



Faculty of Management Sciences  
Department of Entrepreneurial Studies  
Durban University of Technology.  
17 October 2016

Dear Prof. Moyo

### PERMISSION TO CONDUCT RESEARCH FOR MY DOCTORAL QUALIFICATION

My name is Patrick Mbongwa Mhlongo, student at the Durban University of Technology in the Faculty of Management Sciences. Title of my research project: **The applicability of a systems thinking at the Universities of Technology (UoTs) in KwaZulu-Natal**

I would be grateful if you would kindly allow me to conduct my research in your institution. Please be assured that information obtained through interviews and questionnaire will be treated with utmost confidentiality.

Thank you for your assistance in this regard.

Yours sincerely

Patrick Mbongwa Mhlongo  
031-3735243  
[patrickm@dut.ac.za](mailto:patrickm@dut.ac.za)

.....

Supervisor: Dr. D. Zondo  
031 373 6831

.....

## Appendix C



*Directorate for Research and Postgraduate Support  
Durban University of Technology  
Tromso Annex, Steve Biko Campus  
P.O. Box 1334, Durban 4000  
Tel.: 031-3732578/7  
Fax: 031-3732848  
E-mail: [moyos@dut.ac.za](mailto:moyos@dut.ac.za)*

7<sup>th</sup> November 2016

Mr Patrick Mbongwa Mhlongo  
c/o Department of Entrepreneurial Studies  
Faculty of Management Sciences  
Durban University of Technology

Dear Mr Mhlongo

### **PERMISSION TO CONDUCT RESEARCH AT THE DUT**

Your email correspondence in respect of the above refers. I am pleased to inform you that the Institutional Research Committee (IRC) has granted full permission for you to conduct your research "The applicability of systems thinking at the Universities of Technology (UoTs) in KwaZulu- Natal" at the Durban University of Technology.

We would be grateful if a summary of your key research findings can be submitted to the IRC on completion of your studies.

Kindest regards.  
Yours sincerely

---

**PROF. S. MOYO**  
**DIRECTOR: RESEARCH AND POSTGRADUATE SUPPORT**

## Appendix D



### LETTER OF INFORMATION

**Title of the Research Study:** Applicability of systems thinking at the Universities of Technology (UoTs) in KwaZulu-Natal

**Principal Investigator/s/researcher:** (Patrick Mbongwa Mhlongo)

**Co-Investigator/s/supervisor/s:** (Dr. Zondo)

The study investigates the applicability of systems thinking in the UoTs. Systems thinking is regarded as a way of thinking that recognises interrelationships and interactions of a system's components to achieve a common goal. The study focuses on systems thinking in the context of the UoTs in KwaZulu-Natal. The intention of the study is to determine the influence of a systems thinking concept in dealing with complex challenges in the UoTs.

Self-administered questionnaire and semi-structured interviews will be used to collect data from the participants. A letter of consent will be given to participants outlining the purpose of the study and ensuring their confidentiality. Data collected will be used for research purposes only.

Participants will not be exposed to any risks since they will only be filling in the questionnaire and answering research interview questions. The study contributes to

knowledge production and the findings will be published in accredited publications.

Participants will be free to withdraw from the study at any stage without any consequences. There will be no monetary incentives and participation in study will be voluntary. Likewise there will be no charge for participating in the study.

Confidentiality will be maintained and responses from participants will be kept in a closed access. Identities of participants will not be revealed.

Participants will not be asked to participate in any experiments.

**Persons to Contact in the Event of Any Problems or Queries:**

For more information please contact the researcher on 031 3735243, my supervisor (031 3736831 or the Institutional Research Ethics Administrator on 031 373 2900. Complaints can be reported to the Director: Research and Postgraduate Support, Prof S Moyo on 031 373 2577 or [moyos@dut.ac.za](mailto:moyos@dut.ac.za)

**General:**

Potential participants must be assured that participation is voluntary and the approximate number of participants to be included should be disclosed. A copy of the information letter should be issued to participants. The information letter and consent form must be translated and provided in the primary spoken language of the research population e.g. isiZulu.



## Appendix E



### CONSENT

#### Statement of Agreement to Participate in the Research Study:

• I hereby confirm that I have been informed by the researcher, Mr Patrick

Mbongwa Mhlongo

about the nature, conduct, benefits and risks of this study - Research Ethics Clearance

Number: REC 103/16,

• I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.

• I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.

• In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.

• I may, at any stage, without prejudice, withdraw my consent and participation in the study.

• I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.

• I understand that significant new findings developed during the course of this research which may

relate to my participation will be made available to me.

\_\_\_\_\_  
**Full Name of Participant**

\_\_\_\_\_  
**Date**  
**Right**

\_\_\_\_\_  
**Time**

\_\_\_\_\_  
**Signature /**

**Thumbprint**

I, Patrick Mbongwa Mhlongo herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study

\_\_\_\_\_  
**Full Name of Researcher**

\_\_\_\_\_  
**Date**

\_\_\_\_\_  
**Signature**

\_\_\_\_\_  
**Full Name of Witness (If applicable)**

\_\_\_\_\_  
**Date**

\_\_\_\_\_  
**Signature**

\_\_\_\_\_  
**Full Name of Legal Guardian (If applicable)**

\_\_\_\_\_  
**Date**

\_\_\_\_\_  
**Signature**

**Please note the following:**

Research details must be provided in a clear, simple and culturally appropriate manner and prospective participants should be helped to arrive at an informed decision by use of appropriate language (grade 10 level

- use Flesch Reading Ease Scores on Microsoft Word), selecting of a non-threatening environment for interaction and the availability of peer counselling (Department of Health, 2004)

If the potential participant is unable to read/illiterate, then a right thumb print is required and an impartial witness, who is literate and knows the participant e.g. parent, sibling, friend, pastor, etc. should verify in writing, duly signed that informed verbal consent was obtained (Department of Health, 2004).

If anyone makes a mistake completing this document e.g. a wrong date or spelling mistake, a new document has to be completed. The incomplete original document has to be kept in the participant's file and not thrown away, and copies thereof must be issued to the participant.

**Ref  
ere  
nce  
s:**

Department of Health: 2004. *Ethics in Health Research: Principles, Structures and Processes*

<http://www.doh.gov.za/docs/factsheets/guidelines/ethnics/>

Department of Health. 2006. *South African Good Clinical Practice Guidelines*. 2nd Ed. Available at:

[http://www.nhrec.org.za/?page\\_id=14](http://www.nhrec.org.za/?page_id=14)



## Appendix F

### Interview questions to be answered by research participants

**Systems thinking** is defined by Robbin, Decenzo and Coulter (2011:449) as a management approach that views an organisation as a system with a set of interrelated and interdependent parts. These parts interact to achieve a common goal.

Please indicate your sector, admin or academic.

What is your occupation at this institution?

How long have you been working for this institution?

Would you say departments or faculties are operating in silos at this institution?

In your view, would you say employees at this institution focus on departmental or faculty goals instead of broader institutional goals?

Is systems thinking the best option to address complex challenges in the UoTs?

Will the implementation of systems thinking help this institution to achieve its strategic objectives?

What would be the challenges and opportunities for the adoption of a systems thinking in the UoTs?

Do you think systems thinking could stimulate a sense of a shared purpose at this institution?

Would you embrace systems thinking concept at your institution?

What is your general opinion about systems thinking concept in the context of how UoTs operate?

## Appendix G



14 October 2016

IREC Reference Number: **REC 103/16**

Mr P M Mhlongo  
3 Park Road  
Durban North  
4051

Dear Mr Mhlongo

**The applicability of systems thinking at the Universities of Technology (UoTs) in KwaZulu-Natal**

I am pleased to inform you that Provisional Approval has been granted to your proposal REC 103/16 subject to:

- Piloting of the data collection tools and
- Obtaining and submitting the necessary gatekeeper permission/s to the IREC.

Full approval is subject to meeting the above conditions.

The Proposal has been allocated the following Ethical Clearance number **IREC 111/16**. Please use this number in all communication with this office.

Approval has been granted for a period of two years, before the expiry of which you are required to apply for safety monitoring and annual recertification. Please use the Safety Monitoring and Annual Recertification Report form which can be found in the Standard Operating Procedures [SOP's] of the IREC. This form must be submitted to the IREC at least 3 months before the ethics approval for the study expires.

Any adverse events [serious or minor] which occur in connection with this study and/or which may alter its ethical consideration must be reported to the IREC according to the IREC SOP's.

Please note that any deviations from the approved proposal require the approval of the IREC as outlined in the IREC SOP's.

**Please note that you may continue with validity testing and piloting of the data collection tools. Research on the proposed project may not proceed until IREC reviews and approves the final documents. If there are no changes to the data collection tools, kindly notify the IREC in writing.**