A SYSTEMS PERSPECTIVE OF INFORMATION TECHNOLOGY (IT) GOVERNANCE: A CASE OF HIGHER EDUCATION INSTITUTIONS IN SOUTH AFRICA

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A Thesis submitted for the Degree of Doctor of Philosophy in Business Information Systems in the Department of Business Information Systems

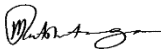
Faculty of Management, Commerce & Law

UNIVERSITY OF VENDA

30 September 2021

Declaration

I, **Nkhumbuleni Tendani Ratshitanga**, hereby declare that this research study titled, "**A Systems Perspective of Information Technology (IT) Governance: A Case of Higher Education Institution in South Africa**", submitted for the degree of Doctor of Philosophy in Business Information Systems (PhDBIS) in the Department of Business Information Systems, School of Management Sciences at the University of Venda, has not been submitted previously for any degree at this or another university. It is original in design and in execution, and all reference materials contained therein have been duly acknowledged.

Signature: 

Date: 30 September 2021

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Abstract

Failure to implement Information Technology Governance (ITG) frameworks in universities contributes to making Information and Communication Technology (ICT) not aligned with the organizational objectives; as a result, implementation of ICT fails to create organizational value. The main objective of this study was to conceptualise a model that contributes to improving ITG in Higher Education Institutions (HEIs). Viable systems model was used as the theoretical underpinning to establish the determinants of effective ITG and to identify ITG mechanisms and their roles. The study adopted an interpretivist research paradigm. A case study research strategy was employed in HEIs. Purposive sampling was used to sample ITG role players to participate in the study; and interviews were conducted to collect qualitative data. Secondary data was collected through perusing ITG documents. The collected data was analysed using thematic content analysis and ATLAS ti 8 software that was used. The results showed the following ITG determinants: complexity in terms of internetworking and interrelatedness of ITG mechanisms, synergy of and within ITG mechanisms, ability of ITG to respond to environmental changes, local autonomy in relation to decisions taken in different ITG levels, recursive within the HEIs ITG system and direct feedback among different ITG in HEIs. The results also showed ITG mechanisms and their roles. Council, ICT steering committee, CIO, Risk Committee and Audit Committee were amongst the identified ITG mechanism. The study concluded that Council is responsible for strategic envisioning; executive management is responsible for planning; Chief Information Officer (CIO) controls and directs ITG activities, ICT Steering Committee coordinates the development and implementation, Risk Committee and Audit Committee monitor the process, the ICT department; under the supervision of the CIO; and Sections within the ICT department are hands on regarding the implementation. The VIVHO ITG model is the outcome of the synthesis of the identified ITG determinants and ITG mechanisms.

Key words: IT governance; IT governance mechanisms, IT governance determinants, ICT strategy, Systems Thinking

Dedication

To the memory of my father, the late Chief Francis Ratshibvumo Ratshitanga and my sister, the late Munzhedzi Humbelani Ratshitanga.

With love, joy, pride, and lot of inspiration:

To my wife: Tshilidzi Cynthia Ratshitanga

To our children, Uhone Zwivhuya, Uhone Muano, Uhone Tendani and Uhone Zwavhudi

To my mother, Mrs. Ndidzulafhi Margaret Ratshitanga

To Makhulu Vho-Thifhelimbilu Rakhivhani-Funzani, Aluwani & Jacobus Funzani na Vhaduhulu vhothe vha vho Tshifhiwa Nelson Funzani

To my parents in law, Mr. Balanganani Maxwell and Mrs. Azwidohwi Virginia Tshitereke

To my sisters' families, Mrs. Hangwani & Adv. Dovhani Raphunga, Mrs. Dzivhuluwani & Mr. Dzivhuluwani Makwarela, and Mrs. Masala & Nthangeni Manugu

To my brothers, Makwarela, Thabelo, and Khumbelo

To my in laws, Mrs. Takalani & Steven Maluleke, and Ms. Livhuwani Tshitereke & Rudzani Tshitereke, Mrs. Londani & Rofhiwa Tshitereke

To Tshifhiwa Jonas Tshikundamalema & Thendo Ratshitanga and your families – The PhD seed germinated and developed during my stay with you. Namusi ndi na Ndivho nda dovha nda vha Mufhenyi.

To my cousin Mbavhalelo & Mukhethwa Nephawe

To my sister Takalani Constance Netshidzivhani Ramashia & Lucky Ramashia

To Rev. Khonani Maselesele, Rev Seani A. Mavhina & Rev/Dr. Robert Munthali and the Uniting Presbyterian Church

To Mpfariseni Kennedy Davhula, IT Manager, Thulamela, Vhembe District Municipality

To Maanda Nephawe, ene Mphiriseni Edwin nda sala zhinda la Vho-Makhadzi Vho-Vhulahani (On behalf of the descendants of Vho-Makhadzi Vho-Vhulahani)

To Bishop Peter Dimakatso & Suzan Mahlatji and the Christ's Kingdom Ministries (CKM)

To my friends: Vho-Reuben Netshifhefhe, Vho-Nditsheni Tshilongamulenzhe; Vho-Fhatuwani Muthivhi; Vho-Khathutshelo Muvenda & Vho-Tshengedzeni Mafadza

To my former schools: Luvhalani Primary School, Tshimbiluni Primary School, Phiphidi Primary School, Guvhukuvhu Secondary School and Mbilwi Secondary School

To the members of ISACA

To IT-Today Independent Combined School, and Mighty Power Christian Ministries

To Ratshitanga Primary School, Ngulumbi Community Creche and Library

To the Department of ICT Services and the University of Venda Community

To Mukondeleli Grace and Simson Salani Sidogi: my mentors in the Christian faith

To Vho-Khotsimunene Vho-Thiofhi Ratshitanga - the Ratshitanga Royal Family spokesperson and the former chairperson of the Ratshitanga Royal Council; and my mentor in the leadership arena

To Mukoni Ratshitanga – for competently and excellently contributing in strengthening the pride of the Ratshitanga family as a spokesperson for the former president of the Republic of South Africa – President Thabo Mbeki

To the Late Vho-Khotsimunene Vho-Tendamudzimu & Vho-Khotsimunene Vho-Rashaka Ratshitanga – for their positive contributions in the liberation of South Africa

To the Late Khosi Vho Makwarela Lazarus Ratshitanga – for starting and building a Ngulumbi Primary School in 1926 – the school from which other surrounding schools emanated

To the members of Ratshitanga Royal Council & the Royal Family, Vhaduhulu vha Khosi Vho-Makwarela na Khosi Vho-Makhuge;

To the Ngulumbi Community Structures, churches & businesses and the entire community

To His Majesty, Mailausumbwa M.P.K. Tshivhase and the Tshivhase Dynasty – *Vele la mbeu; Tshivhavhala tsha shango; Khakhamela; Nhane vha vhathu*.

Acknowledgements

To the Almighty God, I thank you for always taking care of our destiny. I thank you for the guidance and inspiration you provided to all who contributed to this study. *Ndi a livhuwa*. I thank you.

To my Promoter, Prof Nixon Muganda Ochara and co-Promoter, Prof. Armstrong Kadyamatimba. It is the quality of the supervision and support you provided that enabled me to continue to see the light at the end of the tunnel. Today we have a worth to share VIVHO ITG Model. I really appreciate it. *Ndi a livhuwa.* I thank you.

To my wife, Tshilidzi Ratshitanga, and our children, Uhone Zwivhuya, Uhone Muano, Uhone Tendani and Uhone Zwavhudi. You are the pillars of our achievements. We are a winning team. We have been in this study together from day one. I thank you for the words of encouragement and the quality of support you always provide to me. The PhD is now within the boundaries of our yard, but for our community, our country, and the entire World. *Ndi a livhuwa* – I thank you.

To my parents: My father, the late Chief Vho Francis Ratshibvumo Ratshitanga and my mother, Mrs. Ndidzulafhi Margaret Ratshitanga. (Former and retired School Principals) I thank you for providing us with the foundations that enable success. Thank you for teaching us to pray. The PhD mindset developed and flourished because you believed in us. I thank you for everything you have done for us. *Ndi a livhuwa*. I thank you.

To Bishop Peter Dimakatso & Suzan Mahlatji: Our friends and partners in the work of the Almighty God. You always asked this question: "*How far is your PhD studies*? This really inspired me. I also thank you for always praying and encouraging us. Indeed, God is always good. I thank you.

To Prof. Makondelele Makatu @ Department of Psychology, Dr. Annah Matodzi @ Library, Dr. Knowledge Shumba @ School of Management Sciences, Dr. Aubrey Khosa @ Department of Music, University of Venda; & Dr. Amos Mukwevho @ Vhembe District – Department of Education. I thank you for the encouragement, support, and guidance you always provided during my studies. I thank you. *Ndi a livhuwa.*

To my role models (PhD-wise):

These are the three PhD graduates who inspired my life regarding attaining doctorate which is the highest academic qualification.

- Dr. Mudzunga Junniah Davhula (My aunt, my mother's sister. A daughter to the late Mrs. Mukondeleli Grace and Mr. Khubana Jacobus Funzani, a sister to the late Seani Elisa Netshidzivhani and the late Tshifhiwa Nelson Funzani; and a wife to Mr. Mabalanyanye Nelson Davhula. You taught us not to give up. Muta wa ha Davhula, with all your contributions to my education, career, and my life in general. *Vha ntswikisele kha Vho-Davhula uri vhubva ndo balanganya, na i la thebvu ndo devha*. PhD has come home. *Ndi a livhuwa*. I thank you.

- Dr. Tshilidzi Ratshitanga (Mukololo, The late Edward Goma's descendent, a brother to Thendo, and a son to Mr. Olympus and Refilwe Ratshitanga). You always revive my inspiration. Thank you, *Mutavhatsindi*, for showing us that it is possible to achieve PhD qualification despite busy schedules. *Ndi a livhuwa*. I thank you.

- Dr. Nyelisani Clarence Tshiretereke. (My brother-in-law. My wife's brother. *Vha ri mini mulamu? I la levhulevhu yo khunyelela*. It is done. I always enjoy and gain from the way you analyse issues. In most cases, you start by asking questions. The same skill that brought the PhD at home. Thank for you for the light and the encouragement. *Ndi a livhuwa*. Thank you.

My role models (IT Governance):

These three role models shaped my career when coming to strategic thinking and IT governance matters.

- To Mr. Ndivhadzo Joel Vele (*Vele ndi vhele la mbeu*). The former ICT Director @ the University of Venda. The CIO @ University of Mpumalanga. You provided the base for most of my achievements, and hence, the base of this PhD. *Ri bva rothe kule*. In brief: You inspired me to be the best I can be in the ICT, management, and leadership arena. I thank you for exposing me to the environments and engagements which enabled me to grow. I thank you. *Ndi a livhuwa*.

- To Mr. Sam Khoza, the Director, ICT Services @ the University of Venda. I always tell people that we have a teacher at home. Your IT governance competencies and leadership enabled us amongst others to develop the 2021-2025 ICT Strategy and ICT roadmap – See Appendix K. This contributed enormously to the outcome of this study. The guidance you provided during the study is also appreciated. All the engagements we have as a department continue to capacitate us, and most of them also contributed positively to this study. *Ndi a livhuwa*. Hi a khentsa. Thank you very much.

- To Dr. Robert Martin, the Deputy Vice Chancellor and Principal, and the Chairperson of the ICT Steering Committee. Working under your supervision as the Acting ICT Director

afforded me the opportunity to drink from your fountain of wisdom. Thank you for enabling us to see things in the context of the whole. Thank you for believing in me. This PhD is the outcome of your system thinking lessons and your “deci-planning” approach. *Ndi a livhuwa.* I thank you.

To the participants of the study. I thank you for being available to contribute to the study. The quality of this thesis wouldn’t be what it is without your contributions. I thank you.

Finally, to the University of Venda, through the Vice Chancellor and Principal - Dr. Bernard Nthambeleni and DVC: Academic - Prof. Jan Ernst Crafford, thank you for the support granted to me during this PhD process.

Lushaka lwa ha Ratshitanga, ndi a livhuwa. Vhatavhatsindi, ndi a livhuwa, Vha sina ndevhe vha tshi vhona, ndi a livhuwa.

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List of Abbreviations

CHE	Council on Higher Education
CIO	Chief Information Officer
CRSA	The Constitution of the Republic of South Africa, Act 108 of 1996
DHET	Department of Higher Education and Training
DPSA	Department of Public Service and Administration
HEA	Higher Education Act 101 of 1997
HEI	Higher Education Institution
HOD	Head of Department
ICT	Information and communication technologies
IS	Information Systems
ISACA	Information Systems Audit and Control Association
IT	Information and related technologies; it also includes the communication technologies
ITG	Governance of information and related technologies or Information Technology Governance
ITGC	Information Technology Governance Committee
ITSC	ICT steering committee
NDP	National Development Plan
PHEI	Public Higher Education Institution
RCE	Resource constrained environment
SAM	Strategic Alignment Model
VIVHO	VIVHO ITG Model
VSM	Viable Systems Model

Chapter 1: Introduction

1.1 BACKGROUND OF THE STUDY

The approach to understanding the concept “systems thinking” in this research study, starts by defining what a “system” is. According to the Merriam-Webster dictionary, a “system” is a regularly interacting or interdependent group of items forming a unified whole ("*System"* | *Definition of System by Merriam-Webster*, n.d.). However, the term “systems thinking” was coined in 1987 by Barry Richmond who is a well-known leader in the field of systems thinking and systems dynamics (Arnold & Wade, 2015). Systems thinking is another name for “bigger picture” thinking since it aims to describe the aspects relating to a thorough understanding of the matter under consideration, and also, to the understanding of all the different components that are involved (Bowman et al., 2015). The idea of the “big picture” is also mentioned by Lindros (2017) when referring to IT governance (ITG) as an integral part of overall enterprise governance. According to Arnold and Wade (2015), most of the systems thinking definitions have the following in common: interconnections, the understanding of dynamic behavior, systems structure as a cause of that behavior, and the idea of seeing systems as wholes rather than parts.

On the other hand, information technology (IT) is considered to be an integral enabler and driver of efficiency and effectiveness of the organization (Derksen & Luftman, 2016). It is vital in supporting and enabling the growth and sustainability of all types of organizations (Wu et al., 2015). When applying systems thinking, IT and the performance of the organization should be considered together. Both Bianchi and Sousa (2016) and Debreceny (2013) show a connection between effective implementation of ITG in an organization, and how ICT investments facilitate the attainment of strategic and tactical goals. Effective ITG is also viewed in terms of its significant contribution in improving an organization’s performance. This connection was made by Huygh and De Haes (2019) and Paulo et al. (2012) who discoursed that the key element in ITG is the alignment of the ICT elements with the business model, since it leads to the achievement of projected business value. In a survey conducted by CIONET on 2,650 IT executives around the globe, it was found that their number one concern is the alignment of ICT and the business (Derksen & Luftman, 2016). In line with Yurtseven (2016) argument, systems thinking could contribute enormously in ensuring that the above mentioned concern is addressed in a holistic manner.

Systems thinking—is an approach to integration that is based on the belief that the component

parts of a system will act differently when isolated from the system's environment or other parts of the system—is generally referred to as systems theory, which is a great tool for solving many problems in the development of Information Technologies structures in any organization (Broks, 2016). According to Farkas (2017), from a Systems Theory perspective, ITG may be viewed as a system rather than an organizational process. The adoption of this view also implies that the ITG components are interconnected and interdependent with one another in the system, to the extent that one component cannot function properly without the support of other components (Lai & Lin, 2017). ITG as a whole is a part of surrounding medium, made from other systems (Broks, 2016).

Huygh and De Haes (2019) revealed that Peppard (2005) was the first one to link ITG with Beer's Viable System Model (VSM) which is a ground cybernetics (Beer, 1979; Beer, 1984; Huygh & De Haes, 2019). Huygh and De Haes (2019) also investigated ITG through VSM. In their study, they cited Flood and Jackson (1991) mentioning that the VSM also represents a systems thinking approach that also emphasizes active learning and control. Huygh and De Haes (2018) also conducted another study which was focused on gauging the applicability of the VSM as a lens to study the ITG construct. ITG is also viewed as a complex system (Omari, 2016; Huygh & De Haes, 2018). Complex systems exist in a dynamically changing environment since they have capabilities that enable them to respond accordingly (Huygh & De Haes, 2018).

ITG provides a structure for aligning ICT strategy with the organizational strategy. When formal ITG framework is followed, organizations are able to produce measurable results toward achieving their strategies and goals (Lindros, 2017). However, lack of executive support in the implementation of effective ITG is considered as a main obstacle in its effective implementation (Borja, Kim, Yoon, & Hwang, 2018). Specifically, this is because the overall scope of ITG is set at the management's and governing body's levels where the governing body should ensure that it gets the priority it deserves (Pratt, 2018; Van Grembergen & De Haes, 2007). However, most governing bodies have not demonstrated competence about what a good ITG demands (Borja et al., 2018; Parent & Reich, 2009). Principle 12 of King IV recommends that governing bodies should provide technology and information in a way that supports the organizations' setting and the achievement of their strategic objectives (Ramalho, 2016).

Ineffective ITG has the potential to negatively affect organizations' performance due to poor performance of ICT resources such as inefficient operating cost, and inaccurate information quality (Ali & Green, 2007; Huda et al., 2018; Pang, 2014). On the one hand, whereas Aasi (2018); Borja et al. (2018); Parent and Reich, (2009) and Weill & Ross, (2004) suggest that effective ITG should support organizations to perform their tasks better when it comes to delivering (a) cost-

effective use of IT, (b) effective use of IT for asset utilization, (c) effective use of IT for growth and (d) effective use of IT for business flexibility, on the other hand, for Khan and Bokhari (2018), they found that ITG is an effective enabler for managing, implementing, and sustaining ICT-enabled organizational transformation. Therefore, effective ITG will guarantee the alignment of the ICT environment to the business goals (Huda et al., 2018).

ITG provides a framework of best practices and controls for implementing IT in an organization (Lindros, 2017). The concept of ITG is a trend in public sector organizations in various countries (Amali et al., 2014). In 2017, a global association for information and technology audit, risk, governance and security professionals (ISACA) conducted a survey of more than seven hundred and thirty two (732) organizational leaders from around the world and found that nearly all of the survey respondents agreed that strong ITG is essential to strong business performance (Pratt, 2018). An area of critical concern is when the same report also shows that twenty percent (20%) of respondents don't use an ITG framework while another sixty nine percent (69%) of the respondents still need to establish clearer connections between business objectives and IT goals (Pratt, 2018). This is also a concern raised by Agustiono (2018) who mentions that despite the benefits of implementing IT in organizations, in most cases, the intended goals are unattained. Agustiono alluded to the fact that by assuring the ITG in both public and private organizations could contribute positively to curbing such challenges.

1.2 CONTEXT OF THE STUDY

In South Africa, the Department of Public Service and Administration (DPSA) developed the Corporate Governance of ICT Policy Framework which they suggest must be implemented in all government institutions, including higher education institutions (HEIs); the framework is aimed at creating business value through ICT enablement by ensuring a business and ICT strategic alignment. This framework was adopted by the Cabinet on the 21st of November 2012 (DPSA, 2014). However, according to Johl et al. (2014) none of South Africa's public higher education institutional statutes provide specifically for an ITG framework, notwithstanding the significant ICT investment that may be required in these institutions. The Regulations for Reporting by Public Higher Education Institutions as gazetted in 2014, also requires the Councils of HEIs to report annually to the DHET on ITG implementation and the report must include the alignment of ICT with the performance and sustainability objectives of the public HEI. According to the National Development Plan (NDP) 2030, universities need to become centres of excellence, at the cutting edge of technology and this also requires effective and efficient ITG (Presidency, 2012).

The survey conducted in 2012 by ISACA indicated that more than half of the respondents had implemented ITG frameworks (ISACA, 2012a). Contrary to the findings of this survey, three years later, Jairak et al. (2015) discovered that the number of universities implementing ITG frameworks was limited. Bianchi and Sousa (2016) reiterate that ITG in universities is a real challenge. Although research regarding ITG mechanisms in universities is still scarce (Bianchi et al., 2017; Wu et al., 2015), it is important to mention that implementation of ITG contributes in ensuring the alignment of ICT-related activities with the organization's strategic plan and objectives (Tiwana & Kim, 2015; Wu et al., 2015).

ITG is not happening in a vacuum; and it is an integral part of the overall corporate governance (Liell-Cock et al., 2009; Lindros, 2017). Therefore, since ITG is happening in a university setting; there is a need to provide an overview regarding how universities are established; and how they are governed. The discussion on this is mainly guided by relevant legislations while other documents are used to substantiate the existing set up.

1.2.1 Establishment of Universities

Section 29(1)(b) of the Constitution of the Republic of South Africa, Act 108 of 1996 (CRSA) states that everyone has the right to further education that the state must through reasonable measures make progressively available and accessible (Constitution of the Republic of South Africa, 1996). Therefore, the establishment of public Universities and other public institutions of higher education is an endeavour by the state to ensure the availability and accessibility of further education to everyone. Just like other public institutions of higher education, universities are established according to Section 20 (1) of the Higher Education Act (HEA) of the Constitution of the Republic of South Africa, and is the responsibility of the Minister for Higher Education, in consultation with Council on Higher Education (CHE) (Republic of South Africa, 1997).Furthermore, according to Section 5(1)(e) of the HEA, the CHE is also responsible for promoting the access of students to higher education institutions, therefore, any establishment of a university helps the CHE and the Minister of Higher Education attain this objective (Republic of South Africa, 1997). A university is a juristic person (Section 20(1) of HEA); and it is also considered as an organ of state since it is a creature of statute, in this case HEA (Republic of South Africa, 1997).

Table 1. 1: Authorities Controlling Public Higher Education Institutions in South Africa: 1990–1994

Responsible authority	**Universities**	**Technikons**	**Total institutions**
House of Assembly (for whites)	11	8	19
House of Representatives (for coloureds)	1	1	2
House of Delegates (for Indians)	1	1	2
Department of Education and Training (for Africans)	4	2	6
Republic of Transkei	1	1	2
Republic of Bophuthatswana	1	1	2
Republic of Venda	1	0	1
Republic of Ciskei	1	1	2
Total	**21**	**15**	**36**

Source: Bunting (2006)

a) An Overview of Public Higher Education Prior to 1994

Bunting (2006) and Mzangwa and Dede (2019) provide an overview of the higher education system which shows that it was a set-up divided into exclusive types of institutions prior to 1994, where there were twenty-one (21) universities and fifteen (15) Technikons, thus demonstrating that social inclusiveness was not valued by some HEIs. Moreover, these institutions were controlled by eight different government departments or authorities (See Table 1.1) (Bunting, 2006). Today, the country prides itself by the fact that the CRSA as the supreme law of the country was enacted with the objective of healing the divisions of the past (Preamble of the CRSA) (Constitution of the Republic of South Africa, 1996). Section 3 of HEA confirms that today the Minister for Higher Education and Training is the one in-charge of all the public higher education institutions in the Republic of South Africa (Republic of South Africa, 1997). The table below depicts the extent to which higher education system prior to 1994 was fragmented. In the same vein, another objective of the CRSA is to build a united and democratic South Africa (Preamble of the CRSA) (Constitution of the Republic of South Africa, 1996).

Table 1.2 adapted from Bunting (2006) confirms that the classifications of the controlling authorities were not only based on race, but also on the homelands arrangement; and this is

something that the Section 9(3) of the CRSA has addressed, so that no one may be unfairly discriminated on the grounds of race (Constitution of the Republic of South Africa, 1996). Bunting (2006) further groups the public universities and Technikons by racial origins; and also, as historically advantaged or disadvantaged.

b) Overview of Public Higher Education After 1994

In 2002, a process to merge some of the higher education institutions was embarked on, where a total of 36 public higher education institutions was reduced to 23 (Mzangwa & Dede, 2019). This happened during the time of the then Minister of Higher Education, Kader Asmal. This was due to the need to create a single, coordinated system of higher education without racialised inequalities (Jansen, 2003). Thereafter, in 2002 some institutions were merged, and some were closed. The number was the reduced from 36 to 26 institutions; and these includes the three newly established universities.

Table 1. 2: Classification of Public Universities and Technikons by racial origin and by historical advantage/disadvantage: 1994

Categories	Institutions included	Historically advantaged/disadvantaged
Historically black universities: RSA	• University of Durban-Westville, • Medunsa University, • University of the North, • Vista University, • University of the Western Cape, • University of Zululand	Historically disadvantaged
Historically black universities: TBVC	• University of Fort Hare, • North-West University, • University of Transkei, • University of Venda	Historically disadvantaged
Historically black Technikons: RSA	• ML Sultan Technikon, • Mangosuthu Technikon, • Technikon Northern • Transvaal, • Peninsula Technikon	Historically disadvantaged
Historically black	• Border Technikon,	Historically disadvantaged

Technikons: TBVC	• Eastern Cape Technikon, • North-West Technikon	
Historically white (Afrikaans) universities: RSA	• University of the Orange Free State, • University of Port Elizabeth, • University of Pretoria, • Potchefstroom University, • Rand Afrikaans University, • University of Stellenbosch	Historically advantaged
Historically white (English) universities: RSA	• University of Cape Town, • University of Natal, • Rhodes University, • University of the Witwatersrand	Historically advantaged
Historically white Technikons: RSA	• *Cape Technikon,* • *Free State Technikon,* • *Natal Technikon,* • *Port Elizabeth Technikon,* • *Pretoria Technikon,* • *Vaal Triangle Technikon,* • *Technikon Witwatersrand*	Historically advantaged
Distance education universities and Technikons	• University of South Africa (Unisa), • Technikon South Africa (TSA)	Historically advantaged

Source: Bunting (2006)

1.3 STATEMENT OF THE RESEARCH PROBLEM

Existing research elevates the role of ITG's influence on organizational performance (Leketi & Raborife, 2019; Martinho et al., 2015; Zahra et al., 2019). The roles of the governing body in achieving IT versus business strategic alignment are often not clear (Turel et al., 2017). Despite the fact that IT leadership plays a vital role in effective ITG implementation, there is also a lack of clear knowledge on how IT leadership can influence ITG (Waheed et al., 2018). There are few studies conducted to establish effectiveness of ITG mechanisms in HEIs (Bianchi et al., 2020;

Lunardi et al., 2017; Turel et al., 2017). However, research also continues to place ITG as critical to attaining strategic alignment (Leketi & Raborife, 2019; Lindros, 2017), particularly where there is active participation of, and collaborative relationship among, governing body, organizational executives and IT management (Lunardi et al., 2017). This confirms the need to govern IT, and also extending the organization's strategy and objectives into IT (Khouja et al., 2018).

However, research regarding ITG mechanisms in universities is still scarce (Bianchi et al., 2017; Wu et al., 2015). There is still a need for researchers to further investigate ITG in the context of higher education; in particular; the effectiveness of ITG mechanisms (Bianchi & Sousa, 2016). A study conducted by Ngqondi & Mauwa (2020) in one of the Universities in South Africa found that there were lots of ITG related gaps. For example, the University had a draft plan of ITG which was never implemented since its inception. Research also shows a mixed situation of ITG in HEIs mainly blamed on the lack of a single way to implement an ITG framework designed for HEIs (Khouja et al., 2018).

This is a problem as previous research has already shown that ineffective ITG might affect the organization performance, quality of services, management of operations and costs (Ali & Green, 2012; Bianchi & Sousa, 2016; Pang, 2014). This study 'plugs' into this gap, to adopt a systems perspective in ITG implementation in the context of HEIs. Failure to implement ITG frameworks in universities contributes to making management and governing bodies ineffective in ensuring the alignment of ICT and business; as a result, implementation of IT fails to create business value.

1.4 RESEARCH AIM & OBJECTIVES

The aim of the study was to conceptualize ITG from a Systems Perspective. The specific objectives of the study were:

a) To determine the mechanisms of the ITG in HEIs.

b) To identify roles and responsibilities of the identified ITG mechanisms.

c) To establish the determinants of effective integration of ITG in the ICT strategy Development.

d) To develop an ITG model based on the identified factors and ITG mechanisms.

1.5 RESEARCH QUESTIONS

The primary research question that guided this study was as follows: ***How can a systems perspective inform the design of a framework for ITG in HEIs of South Africa?*** The sub-questions that guided in addressing the primary research questions were as follows:

a) What are the mechanisms of ITG in HEIs?

b) What are the roles and responsibilities of the identified ITG mechanisms in HEIs?

c) What are the determinants of effective integration of ITG in the ICT strategy Development?

d) What is the ITG model that can be derived from the identified ITG factors and components?

1.6 JUSTIFICATION OF THE STUDY

The point of departure regarding the justification of the study should be to reflect on the benefits of applying systems perspective in the governance of ICT in HEIs. The developed model will enable its implementers to develop systems thinking skills as this will help them to gain significant interest as an all-inclusive approach to ITG. It will enable ITG role players to look at several ICT concepts and practical tools to be applied to have thorough understanding of the complexity of ICT in HEIs. Systems thinking will also enable the expansion of the range of choices available for solving ICT related problems by broadening their thinking and articulating problems in new and different ways. In the same vein, it will also allow the stakeholders to engage in debating ICT issues with the aim of understanding the different perspectives. System thinking will also enable everyone in the organisation to understand that they are all responsible for ensuring effective and efficient implementation of the ICT in HEIs. Furthermore, systems thinking will enable ICT role-players to look at every ICT aspect in the context of the whole. Hence, this will contribute to the process of obtaining and understanding synergies between ICT components or systems of the organization.

It is against the above-mentioned background on systems thinking, that the developed model will benefit individual HEIs, the government, and ITG body of knowledge as follows:

a) Higher Education Institutions (HEIs)

The developed model will help the HEIs to improve the implementation of ITG. This will in turn help them benefit from the implementation of ICT related projects. ITG role players will understand their roles and responsibilities in ITG as they will have a holistic view regarding the implementation ICT in the organization.

The developed model will enable the Council, as the governing body in HEIs, and the policy maker, to provide effective oversight over the implementation of IT in HEIs. The Council will be able to set clear ICT goals and expectations. It will also ensure open communication and

involvement of all relevant ITG stakeholders in the development and implementation of the ICT strategic plan. Additionally, the Council will be able to establish accountability and roles for each ITG role player, by ensuring the alignment of IT to the business of the organization.

The developed model will also help the management of the HEIs, as the ones responsible for developing organizational plans, to ensure the alignment of the ICT strategy with the organizational strategic plan. The CIO will be the lead role during the development and implementation of the organizational strategy. Monitoring and evaluation of the development and implementation of ICT Strategy will be enhanced. Recommendation for the approval of the ICT strategy to the University Council will be done after inputs and comments from relevant stakeholders are considered.

Audit Committee and Risk Committee as oversight committees of the Council will be able to monitor the roles and performance of ITG role players with clear understanding and knowledge of what each role player is expected to achieve. In other words, the model provides guidelines regarding what is expected from each team member. This includes monitoring the performance of the ICT Steering Committee and the management regarding the implementation of ICT strategy. Any ICT related risks will also be dealt with by these committees.

The ICT Steering Committee as the committee coordinating ICT related activities will also be able to coordinate and monitor the development and implementation of the ICT Strategy. This will also contribute to ensuring the alignment of the ICT strategy and the organizational strategic plan. The ICT Steering Committee will also be able to measure the performance of the ICT department.

A major role of the Chief Information Officer (CIO), who is at the centre of ITG, will be to provide direction regarding the development and implementation of the ICT strategy with clear understanding of the roles and responsibilities of different ITG stakeholders within each HEI. Assessment and evaluation of the performance of the ICT team will also be enhanced as they be done in line with the provisions of the developed ITG model. Most importantly, the development and implementation of the ICT strategy will be in line with the organizational strategy.

Performance of IT managers, as the heads of units within the ICT department, will also be guided by the approved ICT strategy. This will also enable them to ensure quality ICT services to the ICT users, which in turn makes the institution benefit from the implemented ICT.

b) Government

The developed model will ensure effective implementation of ITG in HEIs, which is also a requirement by the DPSA Corporate Governance of ICT Policy Framework. This in turn will

enhance the quality of teaching and learning in HEIs. It will also increase the student throughput rate and the quality of research output. The study hopes that the model will also reduce the wasteful and fruitless expenditures when it comes to ICT investments. Additionally, the tool may also assist the government, through auditors, to monitor the performance of ITG in HEIs. When this successfully happens, the government's vision and mission in relation to HE will be realised.

c) ITG body of Knowledge

The developed model is an addition to other existing ITG models that previous researchers have developed for the purpose of guiding the implementation of ITG in organizations. The results of this study contribute to the extension of the existing ITG theories by including new factors. At the same time, it will also confirm or refute previous findings. This also increases the body of ITG knowledge which academics and researchers will always have an opportunity to benefit from.

Additionally, this study hopes that this model will encourage ITG role players to view the implementation of ITG from the systems thinking point of view. This will enable them to see mechanisms of the ITG in the context of holistic view. The linking of ITG in this study with the VSM provided the researcher with the opportunity to identify the interconnections and interrelations amongst different ITG mechanisms that will ensure a viable ITG in an organization. Therefore, provisions of the developed model are also adding to the existing theoretical provisions in other ITG models. The model itself contains theory that can prepare an aspiring ITG role player to gain knowledge that would help him/her when assuming the ITG positions. The findings of the study will contribute to other ITG studies in future, as empirical literature review. Therefore, the conclusions that are driven from the analysis and discussions that are based on the findings of the study will also add to the existing ITG theories.

The developed model will also contribute to helping ITG practitioners and role players to understand the roles of different ITG mechanisms and process that is followed when developing and implementing ICT strategy. This will in turn make them perform better in their areas of responsibilities. In case, there are ITG issues in the organization, those tasked to address those issues might use this model to identify and fix the area which is causing the challenges. The model will serve as a roadmap, that will also guide those who are new in the ITG field.

1.7 DELIMITATIONS

The study was delimited to analyse the roles and responsibilities of the identified ITG mechanisms regarding the alignment of ICT and business; and it also analysed the factors that have influenced in the implementation of ITG in an organization. Thereafter, the study developed a model that

may be used by different role players in ITG to ensure the alignment of ICT and the organizational strategy.

The study was based on VSM, and it was based on the VSM components and principles. These are the VSM concepts that were used in the study: System 5 which is referred to as “policy”; System 4 which is also referred to as “Intelligence”, System 3 which is also referred to as “Control”, System 3 which is also referred to as “Monitoring”, System 2 which is also referred to a “Coordination” and System 1 which is also referred to as “Implementation”. The study also used the following VSM principles: Complexity, Synergy, Direct Feedback, Recursiveness, autonomy, Ability to respond to environmental changes.

The study was conducted in one of the historically disadvantaged institution which have shortage of resources; and this includes insufficient budget to run the organizational activities. This is a resource constrained institution. The scope of the study is only limited to the development and implementation of the ICT strategy.

1.8 OPERATIONALIZATION AND DEFINITION OF KEY TERMS

This section introduces key terms and concepts that have been used in this document. It starts by introducing the theoretical definition of each term or concept and then follows the operational definition of each term/concept.

Higher education institution: According to Higher Education Act 101 of 1997, “higher education institution” means any institution that provides higher education on a full-time, part-time or distance basis and which is — (a) established or deemed to be established as a public higher education institution under this Act; (b) declared as a public higher education institution under this Act; or (c) registered or conditionally registered as a private higher education institution under this Act.

ICT strategy: ICT strategy is a comprehensive plan drafted to outline how information and communication technologies should be used to meet ICT and organizational goals. It also details the factors that affect the organization's investment in and use of technology. Adopted from (Rouse et al., n.d.). In some other cases it is referred to as IT Strategy. Therefore, the purpose of this study was to develop a model that will guide the development and the implementation of ICT strategy in HEIs.

Organizational Agility: Agility is considered as a set of processes which allow the organization to detect and to effectively and efficiently respond to changes in the internal and external environment; it also allows organizations to learn from previous experience so as to improve the

organization's skills (Imgharene et al., 2017). In this study, business agility refers to organization's ability to detect and respond to internal and external changes accordingly.

IT and Organizational Alignment: IT and Organizational alignment refers to applying IT in an appropriate and timely way, in harmony with organizational strategies, goals and needs (Luftman et al., 2004). It is also referred to as the degree of congruence between business and ICT strategies (Shamekh, 2008). Organizational and ICT alignment is also considered as the mutual synchronization of organizational goals and IT services (Ullah & Lai, 2013); and it the degree to which the ICT strategy supports, and is supported, by the organizational strategy. In this study, IT and organizational alignment refers to the ability of IT to support and enable the HEI to achieve its business objectives. This also includes the degree to which ICT strategy is synchronized with the business strategy.

Information Technology (IT): Information technology (IT) covers any form of technology that handles information, this includes any equipment or technique. IT also incorporates computing, telecommunication technologies, and includes consumer electronics and broadcasting as it is getting more and more digitized (Grauer, 2001). IT can also be broadly defined as the use of computers, software (operating system/tools and applications), communications, and networks to ensure that the information needs of an organization are being satisfied (Tupper, 2011). In this study, IT refers to information and related technologies which contribute to manipulating information. This includes equipment, software, and communication technologies. Therefore, in this document IT and ICT are used interchangeably.

IT Agility: IT agility is the ability of an organization or a business to respond operationally and strategically to changes in the external environment through IT (Fink & Neumann, 2007). IT agility is also considered as the ability of a firm to adapt its IT capabilities to market changes; and this is all about reconfiguring or replacing your information technology systems when new marketplace realities change the way you have to do business (Sengupta & Masini, 2008). In this study, IT agility is the ability of the ICT department to ensure alignment of business and ICT by detecting and responding to both internal and external environmental changes; and this also ensures the alignment of ICT strategy with the business strategy.

IT Governance: IT governance (ITG) provides leadership, a structure of relationships, processes and mechanisms that guide and ensure the alignment the ICT strategy with organizational strategy, i.e. ITG should help IT to sustain and extend the organization's strategy and objectives (Kurti et al., 2014; Lindros, 2017; Van Grembergen, 2007). However, in this study ITG refers to

the mechanisms and processes that are involved in ensuring the alignment of ICT strategy with the organization strategy.

IT Governance Mechanisms: ITG mechanisms refers to strategies, goals, policies, strategic and steering committees, oversight authorities, processes, procedures, roles, job descriptions, plans, schedules, contracts, proposals, authorisations, standards and scorecards as they assist with the governance and management of information and related resources with a view of delivering value and minimising risk (Liell-Cock et al., 2009; Spremić, 2009). However, in this study ITG mechanism refers to any structures, oversight authorities, standards and processes that has a role in ensuring the alignment of ICT and business.

IT Governance role player: This refers to every person or structure that have a responsibility to perform in the ICT governance of an institution.

Stakeholders' involvement: Stakeholders involvement is when stakeholders are afforded an opportunity to have a say in determining what they expect from IT, and what their priorities are, in ensuring that expected value is being delivered (COBIT 5 Task Force, 2012). It is also about the participation of stakeholders in a planning or decision-making process (Hauck et al., 2014). Hence, that is also what stakeholders' involvement means in this study.

System: A system is a group or combination of interrelated, interdependent, or interacting elements forming a collective entity; a methodical or coordinated assemblage of parts, facts, concepts, etc (*Definition of "System,"* n.d.). However, in this study, system refers to the ITG mechanisms that interact for the purpose of ensuring effective ITG.

Systems Perspective: In line with the definition of system; system perspective in this study refers to the way in which ITG should be implemented. This refers to the interaction of the interrelated ITG mechanisms for the purpose of ensuring effective ITG.

Viable System Model: VSM provides a framework for understanding and designing flexible, adaptable organizations that balance external and internal perspectives as well as long and short-term thinking and they also supports the management of change (Espejo & Gill, 2011). Viability also refers to an organization's ability to maintain its separate existence and identity; and the ability to survive despite disturbances (Beer, 1979; Hildbrand & Bodhanya, 2015). In this study, viable system refers to HEIs to implement ITG in such a way that Council, executive management, CIO/Director IT and IT managers share responsibility regarding the evaluating, directing and monitoring of the use and implementation of IT in the institution. For an example, IT managers must be able perform their duties with minimal or without any supervision from the CIOs. The

same applies to CIOs, they must be able to make certain decisions without first consulting the executive management or council.

1.9 STRUCTURE OF THE THESIS

The structure of this study is as follows: Chapter 1 covers the background of the study, and it will be comprised of the following sections: background regarding ITG in HEIs, statement of the research problem, objectives of the Study, research questions, Justification of the Study, Delimitation, Operational Definitions, structure of the thesis and suggestions of reading the thesis. Chapter 2 provides a review of literature related to the governance of IT in organization and it will cover the following topics: overview of the establishment and governance of public universities, IT governance, strategic alignment, value creation, IT agility, IT governance mechanisms. The chapter concludes by a section showing research gaps. This study's Chapter 3 discusses the theoretical underpinnings of the ITG, in tandem with a literature review related to the systems thinking approach. The chapter also touches on the benefits of developing systems thinking skill. It also shows the link between systems thinking and systems theories. It shows different type of systems theories; and the category in which VSM falls in. The chapter also provides an overview of VSM since the study was based on it. A definition of viability is also provided in this chapter. It reviewed and discussed literature on systems and principles of VSM. A VSM diagram is also provided. A conceptual framework for the study was developed based on the systems and principles of the VSM.

In Chapter 4, the study presents the research methodology—the different aspects and components of the research methodology; which include the research paradigm, the research strategy, the research design which serves as a roadmap of the study, the study population and how sampling was done; data collection procedure for implementing the study, research limitations and delimitation, how data was analysed, and lastly, ethical principles that were adhered to. Chapter 5 follows with a discussion of the findings regarding the following research questions: (a) **What are the mechanisms of ITG in HEIs?** and (b) **What are the roles and responsibilities of the identified ITG mechanisms in HEIs?** The discussion is based on VSM. The results showed the roles of the identified ITG mechanisms, and they were presented in tables.

Chapter 6 presents and discusses the findings regarding the following question: **What are the determinants of effective integration of ITG in the ICT strategy Development?** The discussion is based on VSM principles. The results showed the determinants of effective ITG and the were presented in a table. While the previous chapters provided insights regarding the ITG mechanisms and determinants of the alignment of ICT and the organizational strategy. The study

was based on the principles and mechanisms of a viable systems model. Thus, the summaries and inferences drawn from Chapter 5 and 6 assisted and guided in the developed of the ITG model. Therefore, in Chapter 7, study provides an answer to the following research question: **What is the ITG model that can be derived from the identified ITG mechanisms and factors?** Hence, the development of the ITG model was the goal of this chapter. Finally, Chapter 8 provides conclusion of the thesis. It provides the overall summary of the thesis. The Chapter also provides a summary of the research methodology adopted. Insights or reflection from the study is provided. The Chapter also presents the study's contribution to knowledge. At the end it provides limitations and recommendations for future studies.

1.10 SUMMARY

In this chapter, the researcher has demonstrated through the existing literature that ICT is vital in supporting and enabling the growth and sustainability of an organization. Hence, the need for the governing body to ensure the development and implementation of an effective ITG to ensure effective utilization of ICT resources towards the attainment of strategic goals. It was also shown that the concept of ITG is now a trend in public sector organizations, in various countries. In South Africa, DPSA developed the Corporate Governance of ICT Policy Framework which must be implemented in all government institutions. According to the National Development Plan (NDP) 2030, universities need to become centres of excellence, at the cutting edge of technology and this also requires effective and efficient ITG (Presidency, 2012). However, the research still shows gaps in this regard. Based on the literature reviewed, a statement of the problem was established; and thereafter it triggered the drafting of research objectives and research questions. The chapter also shows the justifications for conducting the study; and amongst them, it was mentioned that the study will develop a model that will help the HEIs to improve the implementation of ITG; and this will in turn help them to benefit from the implementation of ICT related projects. The chapter also provided a highlight of the structure of the thesis.

Chapter 2: Empirical Review

2.1 INTRODUCTION

This chapter provides a review of literature related to IT governance. The main concepts that guided this study were strategic alignment; value creation, IT agility and ITG mechanisms. Previous studies related to these concepts in relation to implementation of ITG were reviewed. The chapter concludes with a section showing research gaps.

With IT implementation affecting major aspects of universities'/schools' academic and business affairs, an efficient and effective ITG is required to ensure that all kinds of expensive and complex information technology are appropriately governed; and most importantly, to ensure that the organization achieves its goals (Ajami & Al-Qirim, 2013; Levstek et al., 2018). There are several frameworks that have been developed and put in place to enable organizations to adhere to effective ITG with regard to service delivery and support; however, there is still no single way to implement an ITG framework designed for HEIs (Botha & Coetzee, 2012; Khouja et al., 2018).

2.2 IT GOVERNANCE

ITG is an integral part of corporate governance and is the responsibility of a governing body (Chege et al., 2018; Liell-Cock et al., 2009; Lindros, 2017; Octavianus et al., 2018). This implies that ICT in the organization should be linked to the business of the organization. According to Ako-Nai and Singh (2019); the governing body is the central controlling authority in organizations which is responsible for overseeing the overall operations and performance of the corporation. This includes overseeing the implementation of ICT in the organization. See **Figure 2.1**.

ITG is a management structure that establishes processes to ensure ICT sustains and extends the organization's objectives (Chege et al., 2018). Adherence to these processes has the potential to increase the benefits that an organization will get from their investment in ICT, especially when ITG is implemented as an integral part of corporate governance (Van Grembergen & De Haes, 2007). If successfully implemented, ITG can be an essential tool to supervise and control ICT investments and improve the performance of any IT service (Belhaj & Zahi, 2019). Hence, ITG requires well-defined structure of relationships, processes and mechanisms which are used to direct and control the allocation and usage of ICT resources (Campbell et al., 2009; Weill & Ross, 2004). This is in line with ISO/IEC 38500 that states that corporate governance of IT also involves evaluating and directing the use of IT to support the organization and monitoring this use to achieve plans.

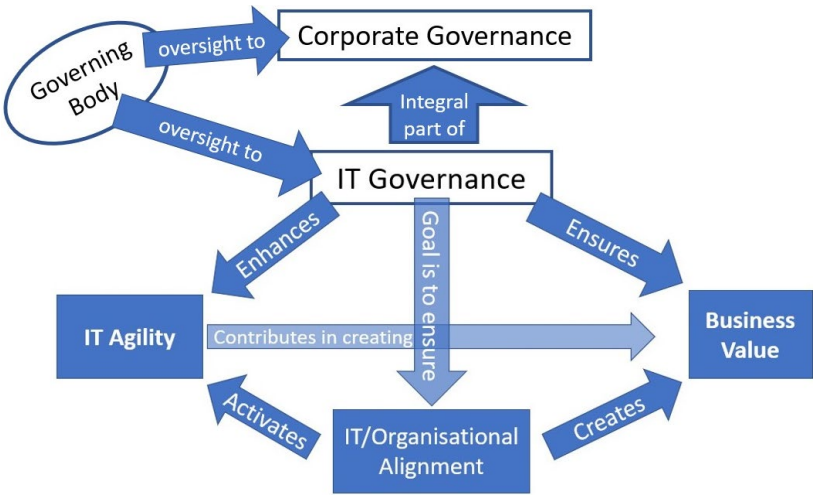


Figure 2. 1: Overview of ITG Diagram (Researcher, 2021)

ITG is also viewed as an instrument that may be used to control and manage ICT resources in any kind of organization, including universities (Bianchi et al., 2017). This might also mean that, through the implementation of ITG, ITG role players can also monitor performance and behaviour of employees in relation to the use of IT in the organization since it stimulates anticipated behavior (Veerankutty et al., 2018). ITG involves a set of high-level definitions, such as principles, values, and goals, operationalized through mechanisms (Bianchi et al., 2020; Wiedenhöft et al., 2017). However, these high-level definitions should be implemented within the following five important domains of ITG: (i) ICT strategic alignment; (ii) value delivery; (iii) risk management; (iv) resource management; and (v) performance measurement (Abdelsamie et al., 2014; Amali et al., 2014).

Levstek et al. (2018) defined ITG as the organizational capacity of the governing body—the executive management and IT management—to direct and control the development and implementation of ICT strategy in a way that also ensures the alignment of ICT and organizational requirements. It also deals with aspects related to how well the business strategy is connected to current ICT priorities, technical planning, managing risk, and budgeting (Luftman & Lyytinen, 2015). In effecting ITG, governing bodies should consider ICT projects that contribute to organizational sustainability, and those that positively add value to stakeholders (Ako-Nai & Singh, 2019). However, according to Chege et al. (2018), the goal of the alignment of ICT and the organizational priorities should be continuous because of the dynamic nature of the business. Therefore, ITG should always ensure the connection between the business strategy and the current ICT priorities, technical planning, managing risk, and budgeting (Luftman & Lyytinen, 2015). ITG also describes the distribution of ICT decision-making rights and responsibilities

among different stakeholders in the organization and defines the procedures and mechanisms for making and monitoring strategic ICT decisions (Peterson, 2004).

Organizations should develop ITG capabilities in accordance with their organizational and contextual specificities (Raymond et al., 2019). ITG also sustains and extends the enterprise's strategy (Rusu & Viscusi, 2017). An implementation of effective ITG in an organization ensures that IT is aligned with the organizational objectives (Levstek et al., 2018). Hence, the brief discussions below regarding the strategic alignment and value creation. When IT is aligned to the organizational objectives it creates value to the organization (Huygh & De Haes, 2019; Paulo et al., 2012). On the other hand, a nonaligned IT can bring disaster to the organizational performance (De Haes, 2015). A brief discussion also regarding aspects that hinders business and ICT alignment is also provided, in to a brief section on IT agility, since it enables IT to adapt to organizational changes which in turn guarantees the alignment of ICT and the organization's needs (Panda & Rath, 2018).

A brief overview of that confirms the role of ITG in the strategic alignment is also provided. However, for ITG to be implemented there should be ITG mechanisms which amongst others also include ITG frameworks. Hence, there are also sections that touches on the two aspects in the following sections.

2.2.1 Strategic Alignment

According to The Institute of Internal Auditors (IIA), ITG provides strategic direction of IT and the alignment of ICT and the business with respect to services and projects, business objectives, up-to-date ICT strategy, linkage between business objectives, and IT initiatives (The Institute of Internal Auditors, 2017). ICT and business alignment is a major component of ITG (Chege et al., 2018). According to Lindros (2017), ITG provides a structure for aligning ICT strategy with the organizational strategy. See **Figure 2.1** and **Table 2.5**. This implies that the issue of ICT and business alignment is the reason for implementing effective ITG framework in an organization. Strategic alignment is achieved when the ICT strategy is able to extend the organizational strategy by aligning its goals to organizational goals. This aligns to the approach used to connect IT with the business functions, and also how the business functions are connected to IT (Curtis, 2020; Luftman, 2000). In the study conducted by Panda and Rath (2018) to test a model in which the effect of strategic ICT and business alignment on organizational agility was examined; the findings showed the positive effect of ICT and business alignment on organizational agility.

Most researchers have already alluded to the fact that strategic alignment facilitates effective utilization of ICT resources to support organizational strategies which in turn maximizes return on ICT investments, fosters effective ICT and business process integration, and hence creates sustainable competitive advantage (Panda & Rath, 2018). Ensuring the strategic alignment has always been a top priority for the organizations (Panda & Rath, 2018). According to Tapanainen (2012), the role of the ICT department is to support this role for the organization. Tapanainen also mentioned that it becomes necessary for the ICT department to provide services that (1) match the needs of the organizational functions, and (2) changes according to the changing needs of the organization.

Alignment of business and ICT brings the following positive effects to the organization: increased operational efficiencies, innovativeness, additional competitive advantage, and ultimately, improved performance (Afandi, 2017). In general, ICT and business alignment is about the degree of congruence or harmony of an organization's ICT strategy and IT infrastructure with the organization's strategic business objectives and infrastructure (Plazaola et al., 2006). Paletta and Vieira (2013), Paletta and Malheiro (2021), and Williams (2005) contend that strategic alignment is one of the five domains within IT which in turn obligates the governing body to take responsibility for: (a) ensuring that ICT strategy is aligned with business strategy, (b) ensuring that IT delivers in accordance with strategy, (c) directing ICT strategy to balance investments appropriately among systems that support the enterprise as it is, or to transform the enterprise, or grow the enterprise, (d) making informed decisions about the focus and priority for the use of ICT resources, and (e) ensuring that appropriate IT and related business resources are available to enable IT to deliver on expectations.

Therefore, the implementation of an effective ITG can contribute positively to helping the governing body to attain these five responsibilities, which in turn minimizes the challenges that are brought about by IT that may not be effective to augment the business strategy, as already highlighted in the background. Various studies have shown that effective use of IT relies heavily on good ITG, since this framework ensures that: IT goals are met, IT risks are mitigated, so that all these strategies work together, and enable the investment in IT to generate greater value for the institution (Levstek et al., 2018; Luftman et al., 2010; Wu et al., 2015). ITG drives strategic alignment between IT and the organizational needs, and also helps in measuring performance (Levstek et al., 2018). It is necessary to consider ITG and its alignment with business strategy, as the process has significant, benefits, thus, confirming the positive relationship between ITG and business-ICT alignment (Broadbent & Kitzis, 2005; Khouja et al., 2018; Silvius et al., 2009).

2.2.2 Value Creation and Delivery

Value creation, in the context of this study, refers to how ICT users are positively benefitting from ICT resources (Kristensson, 2019). Implementation of ITG is an imperative initiative of organizational strategies because it is essentially concerned with goals that ensure that ICT delivers value to the business in a controlled and effective manner (The Institute of Internal Auditors, 2017). As far as value creation and delivery is concern, an organization needs a proper governance system to satisfy stakeholders' needs and also to generate value from the use of IT (Huygh & De Haes, 2019; ISACA, 2018b). ITG contributes by helping the organization's IT structure, and the business strategy, to create a partnership which is designed to ensure maximum business value is derived from IT (The Institute of Internal Auditors, 2017); in this view is also included organisations with scarce IT resources (Dawson et al., 2016).

Organizations are established with the intention of providing services that create value for their customers, stakeholders and shareholders; and this should be achieved at an optimal resource cost while minimizing risk (COBIT 5 Task Force, 2012; Curtis, 2020). It is for this reason that ITG role players should continuously ensure that ICT resources are strategically managed (Raymond et al., 2019). The relationship between business and ICT should be optimized to maximize the business value of IT; and also to increase efficiency and effectiveness of organizational processes (El-Mekawy et al., 2015). Several models on how alignment can generate value for the organization have been developed. These models confirm that value delivery cannot be attained without the effective connection of IT and the business (Alghazi et al., 2017; Fernández & Llorens, 2009 & ITGI, 2005). Value is delivered by executing the value proposition throughout the delivery cycle while at the same time ensuring the delivery of the promised benefits against the strategy (ITGI, 2003).

Therefore, implementation of effective ITG in an organization contributes to ensuring value creation and delivery, since it will facilitate the elimination of IT initiatives and assets that are not creating sufficient value for the organization (Huygh & De Haes, 2019; ISACA, 2018b). However, this can only be a reality, if ITG role players embrace a value-creation mindset when building a more sustainable ICT strategy and project portfolio (Miller, 2018).

2.2.3 IT Agility

Imgharene et al. (2017) define agility as a set of those processes that enable the organization to detect and to effectively respond to changes in the internal and external environment, and those that enable organizations to learn from previous experience, so as to improve the organization's

personnel's skills. Agility enables the organization to easily identify and speedily react to unforeseen changes in customers' demands, competitors' strategy, business environment (Panda & Rath, 2018). With this in mind, IT agility then, refers to the ability of IT to respond operationally and strategically to changes in the external environment. An organization achieves this by adapting its IT capabilities to market changes, and by reconfiguring or replacing IT systems when new marketplace realities change the way it does its business (Fink & Neumann, 2007; Lowry & Wilson, 2016; Sengupta & Masini, 2008). This definition also encompasses the capacity of an IT set-up to rapidly adapt to changing demands and opportunities (Leonhardt et al., 2017; Tiwana & Konsynski, 2010). However, Tiwana and Konsynski also considers IT agility as an antecedent to ICT alignment.

There is a need to first understand key factors that influence the performance of ICT departments, specifically how the organizational climate contributes to IT agility (Lowry & Wilson, 2016). Yousif and Pessi (2016) reveal that IT agility interplays with organizational agility as it plays a major role in the IT and the organizational strategy. Lowry & Wilson (2016) also suggest that IT capabilities are important resources that facilitate and enable organizational agility, because IT helps improve business agility by way of integrating data and communication throughout the business. Moreover, it can also contribute to increasing agility in the operations and logistics as an extension of flexibility (Heckler & Powell, 2016).

However, according to Lowry and Wilson (2016), despite the fact that there are still gaps in understanding how ICT resources support IT agility, aspects of IT agility continue to grow due to change of technologies, and the conviction that people will also find newer, creative solutions to solving business problems (Heckler & Powell, 2016). Note that the question regarding how IT agility can be measured was addressed by *COBIT 5: Enabling Processes* which states that agility is measured by: (a) the level of satisfaction of business executives with IT's responsiveness to new organizational requirements; (b) the number of critical organizational processes supported by up-to-date infrastructure and applications; and (c) average time to turn strategic IT objectives into an agreed-on and approved initiative (Imgharene et al., 2017). This confirms that IT agility has a major role to play in the alignment of ICT and business, which in turn also has influence on the ITG framework of the organization.

2.2.4 Barriers to Business and ICT alignment

According to Jonathan and Hailemariam (2020), for many organizations, despite substantial investments in IT, many of them fail to achieve the anticipated performance improvements.

Therefore, ITG role players should be aware of attributes that contribute to hindering the attainment of ICT and business alignment. Here below is a brief discussion of some of those barriers:

- **Unknown or Unclear Organizational Strategy:** If the organizational strategy is unclear or is unknown, it also presents a challenge to the development of the ICT strategy which in turn negatively affects the alignment of business and ICT (Majstorovic, 2016). This is referred to as 'expression barrier' and results in insufficient understanding of issues, and in lack of commitment to the organization's strategic focus by operations management (De Haes, 2015).

- **Failure to Involve ICT during the development of the Organizational Strategies:** It is also crucial ensure the alignment of the ICT strategy to the overall organizational outlook, by involving IT during the development business strategies. Leaving it out during this initial process, later becomes a barrier to the alignment of ICT and Business (El-Mekawy et al., 2015).

- **Failure to Involve ICT department during the development of the Organizational Strategies:** The executive management should involve the ICT department when developing organizational plans. On the other hand, business should also be involved when the ICT department is creating the IT strategies. When this does not happen, it also becomes a barrier to the alignment of ICT and Business (El-Mekawy et al., 2015).

A non-aligned ICT can have horrible consequences for organizations as it constrains them from realising their business strategies (De Haes, 2015). Furthermore, if the alignment is inadequate, the enterprise's processes would also not take full advantage of the ICT investments (Henderson & Venkatraman, 1993).

2.3 IT GOVERNANCE MECHANISMS

This study agrees with Almeida et al. (2013), and Bianchi et al. (2020), who revealed that the ITG mechanisms are not well defined among the literature. This is because it was also difficult for the researcher to get proper definition in this regard. Almeida et al. raises a concern regarding several researchers who use and propose ITG mechanisms but fail to describe them or tell what they are about.

However, this study adopted a COBIT 2019 Framework—ITG components as the definition of

ITG mechanisms. IT governance (ITG) mechanisms are referred to as components in COBIT 19 Framework (see **Table 2.1)**. Sentence 1 names processes and organizational structures amongst the components that COBIT defines to build and sustain a governance system. The very same components are named as mechanisms in Sentence 2. In the very same COBIT guide, Principles are also named as part of the components. The fact that in one instance things that are considered as ITG components were referred to as ITG mechanisms, is a confirmation that the ITG components are also referred as ITG mechanisms. This therefore implies that the two concepts - ITG components and ITG mechanisms can be used interchangeably.

Table 2. 1: ITG Components are ITG Mechanisms

Sentence	Source	
1	ISACA (2018a, p. 9)	"COBIT defines the components to build and sustain a governance system: **processes, organizational structures**, policies and procedures, information flows, culture and behaviors, skills, and infrastructure."
2	ISACA (2018a, p. 31)	"Periodically assess whether agreed-on governance of I&T mechanisms (**structures, principles, processes, etc.)** are established and operating effectively."
3	ISACA (2018a, p. 13)	"**Principles**, policies and frameworks translate desired behavior into practical guidance for day-to-day management."

In view of the above discussion, this study adopted the definition of ITG components put forward by ISACA (2018a) to be the definition of the ITG mechanism. Therefore, the concept ITG mechanisms, refers to all those factors that individually and together with others, contribute to the good operations of the organizational ITG (ISACA, 2018b).

ITG mechanisms influence ICT strategic alignment, which in turn influence the performance of an organization (Al-Ghazi et al., 2018). Organizations with effective ITG have actively adopted a set of ITG mechanisms that encourage behaviours consistent with the organization's mission, strategy, values, norms, and culture (Almeida et al., 2013; Weill, 2004; Wu et al., 2015). The benefits that come with implementing well-designed and orchestrated ITG mechanisms is that they contribute positively to supporting ICT related decisions, actions and assets that are clearly aligned with an organization's strategic and tactical intentions (Huang et al., 2010). In their study,

Bianchi et al. (2020) identified forty six (46) ITG mechanisms which were classified into structures, processes, and relational mechanisms for ITG (De Haes & Van Grembergen, 2004; De Haes & Van Grembergen, 2009; Peterson, 2004; Weill & Ross, 2004). Liell-Cock et al. (2009) also suggest that strategies, strategic and steering committees, and oversight authorities are amongst the ITG mechanisms that do assist in the governance and management of information and related resources with a view to delivering value and minimising risk. However, to identify and implement relevant ITG mechanisms for the organization is a complex endeavour (De Haes & Grembergen, 2004; Levstek et al., 2018). A brief overview of some of the ITG mechanisms are discussed next.

2.3.1 Governing Body

It has already been demonstrated in the previous sections that ITG is the responsibility of the governing body. This implies that the governing body has a major contribution to make in the implementation of ITG in the organization. The governing body, together with the senior management, is responsible for establishing the organization's IT objectives in alignment with the overall organizational strategy (The Institute of Internal Auditors, 2017). According to IIA, the governing body should also ensure the development and implementation of IT strategies to achieve business objectives. It also oversees and monitors the executive management to ensure that the approved strategy, structures, policies and operational plans are implemented and that the Chief Executive Officer (CEO) is providing effective leadership in this regard (Ramalho, 2016; The Institute of Internal Auditors, 2017). However, the governing body should also ensure availability of adequate ITG competencies among ITG role players as lack of such competencies could impede an organization's ability to align IT goals with business goals (Curtis, 2020; El-Mekawy et al., 2015).

2.3.2 IT Governance Committees

Different organizational structures can also be defined in each organization depending on the need; and these structures can sit in the governance space or the management space. According to Bianchi and Sousa (2016), the adoption of formal committees composed of executives (vice chancellors, directors, researchers) of HEIs, and IT professionals can affect the alignment of business and ICT positively. This depends on their composition and scope of decisions (COBIT 5 Task Force, 2012). Bianchi and Sousa (2016) further report that most of HEIs have already implemented many committees which have a role to play in the ITG of the institution. Here follows a brief overview of the structures or committees that plays a role in the ITG and the good practises to be considered when implementing those structures:

a) ICT steering committee: Steering committees for strategic ICT decisions are the most commonly implemented ITG structures in organizations (Hardin-Ramanan et al., 2018). This committee is established by top management and handles ICT related issues to ensure they are in line with organizational goals (Veerankutty et al., 2018).

b) IT Management: IT management is responsible for performing the day-to-day activities of an organization; and these include planning, executing, and monitoring the use of ICT resources to ensure the achievement of the strategies and policies established by the governing body (The Institute of Internal Auditors, 2017).

c) Internal Audit: Internal audit should remain independent so that it can be able to provide an excellent position to influence and recommend ICT related changes (The Institute of Internal Auditors, 2017). However, according to IIA, independence should not prevent provision of advice, what is crucial is that management should take full responsibility and accountability for implementation and operation of controls. Auditors assess the effectiveness of IT controls as part of their own audit assessments of the organization's internal control system (Sabry, 2018). In fact, it is imperative that audits of ITG are divided into both assurance and consulting activities depending on the robustness of the ITG system in place (The Institute of Internal Auditors, 2017). The internal audit should assess whether the ITG of the organization supports the organization’s strategies and objectives (Caluwe et al., 2021; IIA, 2017).

d) Other ITG related committees: The strategy committee is also one the committees that has the duty to ensure the alignment of ICT activities with the ICT strategy and ensure effective management of ICT investments and projects (Bianchi & Sousa, 2016). The ITG committee (ITGC) is one of the main mechanisms that can be used to evaluate, direct and monitor the implementation of ITG in HEIs. (Regulations for Reporting by Public Higher Education Institutions, 2014) requires the ITGC to include the following in the annual reports to DHET: (1) statement that the Council is responsible for the ITG and how the Council has fulfilled this role and that management is responsible for the implementation of an ITG framework; (2) comments on the alignment of ICT with the performance and sustainability objectives of the public higher education institutions; (3) comments on how Council monitors and evaluates significant ICT investment and expenditure; (4) how IT is an integral part of the public higher education institution's risk management; (5) a monitoring section showing that IT assets are managed effectively and (6) comments on how the Risk and Audit Committees assist the Council in carrying out its IT responsibilities.

e) Good practices: According to COBIT 5 Task Force (2012) there are good practices for organizational structures and here below are listed:

- **Operating principles** - The practical arrangements regarding how the structure will operate, such as frequency of meetings, documentation, and housekeeping rules.
- **Composition** - Structures have members, who are internal or external stakeholders.
- **Span of control** - The boundaries of the organizational structure's decision rights.
- **Level of authority/decision rights** - The decisions that the structure is authorised to take.
- **Delegation of authority** - The structure can delegate (a subset of) its decision rights to other structures reporting to it.
- **Escalation procedures** - the escalation path for a structure describes the required actions in case of problems in making decisions.

2.3.3 Standards

Regulations for Reporting by Public Higher Education Institutions (2014) mandates the HEIs to show, in their annual reports that Information Systems that are utilized throughout their organizations are developed and implemented in line with defined and documented standards, to achieve efficiency, effectiveness, reliability and security. For example; HEIs may opt to use the ITIL (Information Technology Infrastructure Library) of which according to Simplilearn (2020) has become the most effective standard in IT Service Management; and it helps organizations across industries offer their services in a quality-driven and economical way.

2.3.4 Policies

According to COBIT 5 Task Force (2012) policies are the vehicle to translate the desired behaviour into practical guidance for day-to-day management. In order to give effect to the ICT strategy, management must formulate policies that must be approved by the governing body and in the case of HEIs they must be approved by Council (Ramalho, 2016). However, IT policies in most organization are either not in place or out of date (Grachis, 2016). For those that already have policies in place, the question, are they effective, efficient, and easily accessible. Good policies achieve the stated purpose; and they ensure that principles are implemented in the most efficient way. Good policies also do not create unnecessary resistance; and they are easily accessible (COBIT 5 Task Force, 2012).

2.3.5 Processes

According to IIA (2018), governing body should also ensure the implementation of processes that ensure that the organizational IT supports the organization's strategies and objectives. These are organised set of practices and activities to achieve certain objectives and produce a set of outputs in support of achieving overall ICT related goals (COBIT 5 Task Force, 2012). However, some organizations, as part of ITG, have already implemented process mechanisms that facilitate things like IT strategic planning and yearly IT budgeting (Hardin-Ramanan et al., 2018). There are several frameworks and standards that contain processes that guides the implementation of ITG in organization. For example, COBIT 5 Governance Framework has thirty (37) governance and management processes that guides the implementation of ITG in an organization (COBIT 5 Task Force, 2012). Processes in ITIL standard are categorized into the following, ITIL Service Strategy, ITIL Service Design, ITIL Service Transition, ITIL Service Operation and ITIL Continual Service Improvement (Simplilearn, 2020).

2.3.6 IT Strategic Plan

The development and implementation of the IT strategic plan enables the ITG role players to define how new technologies can achieve the organization's vision, improve its business process, drive the competitiveness and improve its smartness (Korachi & Bounabat, 2019). IT strategies are implemented to ensure that ICT investments are evaluated for relevant risk and assist the business expectation (Veerankutty et al., 2018). However, unlike with operational plans, the strategy and strategic plan should be conceptual, visionary, and directional (Korachi & Bounabat, 2019).

2.3.7 Frameworks and Models

A challenge for ITG role players is how to "measure" the alignment of ICT and the business; and this is due to the fact that many studies on IT-business alignment have been conceptual and lacked good measurements (Khaiata & Zualkernan, 2009; Luftman et al., 2017). However, there are frameworks like risk management framework, strategic alignment model (SAM) by Henderson and Venkatraman (1993), and Luftman's Strategic Alignment Maturity Criteria that governing bodies can also adopt and implement as part of ITG to ensure that IT generates required value to the organization (Hardin-Ramanan et al., 2018).

However, there are several frameworks and models that have provisions to guide the alignment of business and ICT. The following sections provide brief discussions of strategic alignment

models by Henderson and Venkatraman (1993) and Luftman (2000) as well as the COBIT 5 and COBIT 2019 IT Governance Frameworks.

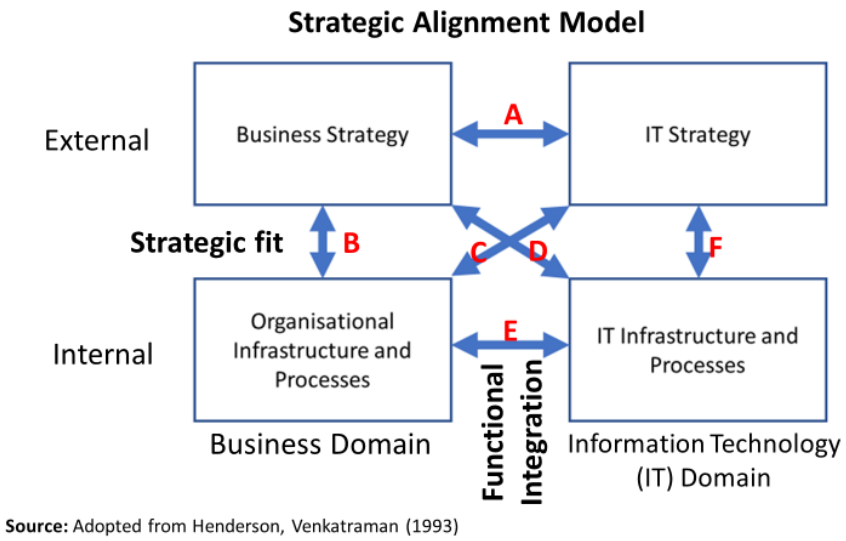
a) Strategic Alignment Model

One of the models developed that could assist ITG role players with the alignment of business and ICT was by Henderson & Venkatraman (1993) and it is referred to as the 'strategic alignment model' (SAM) as in **Figure 2.2.** They consider business-ICT alignment as ensuring the balance among the choices made across all four domains:

- **Organisational strategy:** This refers to the position of the organization in the market, and is also referred as business strategy (Kawtar et al., 2019);
- **ICT strategy:** This concerns the position of the organization in relation to the implementation of ICT (Kawtar et al., 2019);
- **Organizational infrastructure:** This relates to the design of the organization in terms of the infrastructure of the organization; the administrative structures such as services and departments (Kawtar et al., 2019); and
- **IT infrastructure:** This applies to the aspects related to information system covering the selection of architecture and skills required to develop, implement, and use the information system.

SAM model is based on strategic fit and functional integration. Strategic fit recognizes that the ICT strategy should be articulated in terms of *external domain* (how the organization is positioned in the marketplace) and *internal domain* (how the business and ICT processes, including infrastructure, are designed and structured) as shown by Double-sided arrows B and F in **Figure 2.2**).

Strategic functional integration links the business strategy to the ICT strategy reflecting the external components that are essential for the organization (Double-sided arrow A in **Figure 2.2**). Operational functional integration covers the internal domain and deals with the link between organizational infrastructure, processes and IT infrastructure (Double-sided arrow E in **Figure 2.2**). This model further shows the cross-domain relationships that exist amongst the four domains, and this are shown by double-sided arrows C and D in **Figure 2.2**.



Source: Adopted from Henderson, Venkatraman (1993)

Figure 2. 2: Strategic Alignment Model

According to Kawtar et al. (2019), the elements that are considered for mapping as part of an alignment can be at different levels of enterprise architecture (**EA**): organizational strategy, ICT strategy, business processes, information system, environment, and technical architecture. Therefore, it is for this reason that it is suggested to characterise the components for alignment by determining their positions in the organization.

b) Luftman's Strategic Alignment Maturity Criteria

Luftman (2000) provides a model that guides the assessment of the maturity of ICT and business alignment; the model has the following six criteria for consideration.

- **Communications maturity:** A matured ICT and business alignment is determined by effective communication between different departments of an organization to the extent where IT fully understands the nature and needs of the business. On the other hand, the business should also show full appreciation of the role that IT plays. This happens when there are effective ways of exchanging ideas between ICT and business (Alaceva & Rusu, 2014; Alghazi et al., 2017; Luftman, 2000). For example, IT cannot support academic business without first understanding what academics require of IT. Level of communication maturity has an impact on this alignment (Alaceva & Rusu, 2014; Alghazi et. al., 2017). However, alignment may only be considered mature when IT and other business functions adapt their strategies to each other (Luftman, 2000).

- **Competency/value measurement maturity:** COBIT 5 Task Force (2012) explicates that effective performance measurement depends on the following two key aspects: (a) the clear definition of performance goals, and (b) the establishment of effective metrics to monitor achievement of goals. Alghazi et al. (2017) mention that value measurements can also be conducted by evaluating the financial merits of deploying a particular ICT project. For example, a project can be deployed as a strategy to save costs, or to generate income for the organization. For IT to deliver expected value to the organization, Luftman (2000) suggests that there should be a service level agreement between IT and the business. This will also enable business to measure the performance of IT, which will in turn help the business to take appropriate actions based on the performance results. Stakeholders must approve performance goals and the management must accept accountability regarding the achievement of these performance goals (COBIT 5 Task Force, 2012).

- **Governance maturity:** Governance regarding the ICT and business strategic alignment has been one of the foremost concerns of top management for the past three decades (Alaceva & Rusu, 2014; Alghazi et al., 2017; Wu et al., 2015). Therefore, the decision-making authority must be clearly defined (Luftman, 2000). This requires the establishment of appropriate governance organizational structures by the governing body, with well-defined roles and responsibilities, providing clear ownership, and accountability for significant decisions and tasks (COBIT 5 Task Force, 2012). The way ICT related decisions are taken and implemented has either negative or positive impact on the alignment of ICT and business, which implies that governance can be an enabler or inhibitor of alignment (Luftman, 2000). Therefore, a matured organization with regard to IT-business alignment is identified by the effectiveness of its governance of reporting structures and hierarchies (Alghazi et al., 2017; El-Telbany & Elragal, 2014; Wu et al., 2015).

- **Partnership maturity:** The quality of the relationship between ICT and business also contributes, either, as an enabler or as an inhibitor of alignment. ICT and business must trust each other and work as partners to a point where IT enables and drives business processes and strategies. Hence, the level at which the two understand each other determines how mature an organization with regard to alignment (Alghazi et al., 2017; Luftman, 2000). The partnerships must demonstrate clearly the nature of the responsibility and accountability (COBIT 5 Task Force, 2012).

- **Scope and Architecture maturity:** Luftman (2000) contends that scope and architecture maturity are about assessing the maturity of the available IT infrastructure and architecture

in the organization; and this is achieved by establishing the extent to which IT is able to: provide quality support to ICT users, assume a role supporting a flexible infrastructure that is transparent to all business partners and customers; evaluate and apply emerging technologies effectively, and enable or drive business processes and strategies as a true standard for providing solutions customizable to customer needs.

The level of maturity of the IT infrastructure and architecture of an organization should also go beyond the back and front offices. One of the determining factors should be that of making all the stakeholders, i.e., business partners, and ICT users, to be aware of the presence of IT within a business, as a way of ensuring that the business gains a competitive advantage over its competitors (Alghazi et al., 2017; Aversano et al., 2012; Reynolds & Yetton, 2015).

- **Skills maturity:** Skills set that exist in IT are also an enabler or inhibitor of alignment of ICT and business. In this case, the environment and culture also play a huge role in ensuring alignment. Amongst other skills, innovation is necessary in ensuring the alignment of ICT and business (Luftman, 2000). The ICT related competences of those who have roles to play in the implementation of ITG matters for the alignment of ICT and the business (Alghazi et al., et al., 2017). Therefore, for an organization to be considered as matured with regard to IT-business alignment it should make good use of, and implement productive business ideas (Alghazi et al., 2017; Seman & Salim, 2013; Wu et al., 2015).

c) COBIT 5 and COBIT 19 Framework

To ensure alignment of ICT activities and business goals, COBIT 5 developed a goals-cascade approach – where IT goal must cascade from enterprise goal and an enabler goal must cascade from the IT goal. The enabler concept includes processes, organization structures and information (COBIT 5 Task Force, 2012).

COBIT 5 provides the following as ways to measure alignment of ICT and business strategy: (a) the percentage of the enterprise's strategic goals and requirements supported by IT strategic goals, (b) level of stakeholders' satisfaction with scope of the planned portfolio of programmes and services and (b) the percentage of IT value drivers mapped to business value drivers.

Table 2. 2: Governance and Management Objectives and their Domains

a) Governance Domain	• Evaluate, Direct and Monitor (EDM)
b) Management Domain	• Align, Plan and Organize (APO)
	• Build, Acquire and Implement (BAI)
	• Deliver, Service and Support (DSS)
	• Monitor, Evaluate and Assess (MEA)

COBIT 2019 Framework (ISACA, 2018b) is an upgrade of COBIT 5 Framework, which provides forty (40) governance and management objectives that are applied in relation to the following ITG mechanisms: process, organizational structures, information flows and items, people, skills and competencies, policies and procedures, culture, ethics and behavior and services, infrastructure, and applications. The 40 governance and management objectives are organized into five domains which are grouped within two main categories. See **Table 2.2**.

COBIT 2019 Framework also provides the following six principles for a governance system:

i. Each enterprise needs a governance system to satisfy stakeholder needs and to generate value from the use of I&T. Value reflects a balance among benefits, risk and resources, and enterprises need an actionable strategy and governance system to realize this value (ISACA, 2018b).

ii. A governance system for enterprise I&T is built from several components that can be of different types and that work together in a holistic way. This might be referred as IT governance mechanisms.

iii. A governance system should be dynamic. This means that each time one or more of the design factors are changed (e.g., a change in strategy or technology), the impact of these changes on the EGIT system must be considered. A dynamic view of EGIT will lead toward a viable and future proof EGIT system.

iv. A governance system should clearly distinguish between governance and management activities and structures.

v. A governance system should be tailored to the enterprise's needs, using a set of design factors as parameters to customize and prioritize the governance system components.

vi. A governance system should cover the enterprise end to end, focusing not only on the IT function but on all technology and information processing the enterprise puts in place to achieve its goals, regardless of where the processing is located in the enterprise.

The objective of all the ITG frameworks that were discussed above is to ensure effectiveness regarding the alignment of ICT and the business. **Table 2.3** provides key difference and key similarity amongst the three frameworks. **Table 2.4** shows the similarities of the previous discussed frameworks. In this case, COBIT 5 Framework and COBIT 2019 Framework are treated as one since 2019 is an upgrade of COBIT 5.

Table 2. 3: Differences amongst the Frameworks

	Strategic Alignment Model (Henderson & Venkatraman, 1993)	**Luftman's Strategic Alignment Maturity Criteria**	**COBIT 5/2019 IT Governance Framework**
Differences	The alignment is determined and ensured in terms of balancing alignment of the four (4) criteria.	The alignment is determined and ensured in terms of the maturity level of each of the six (6) criteria.	The alignment is determined and ensured in terms of percentages (%) the three (3) criteria.

Table 2. 4: Similarity among the Frameworks

Similarities	**Strategic Alignment Model (Henderson & Venkatraman, 1993)**	**Luftman's Strategic Alignment Maturity Criteria**	**COBIT 5/2019 IT Governance Framework**
Alignment of ICT strategy and organizational strategy	X	X	X

2.4 EMPIRICAL LITERATURE REVIEW

A review on the previous studies that also confirm the purpose for which ITG is implemented for was conducted. The reviewed also confirmed the link between ITG and the alignment of ICT with the business of the organization. It also confirmed the connection of ITG and the creation of value. For ICT and business alignment to continuously happen, ICT continuously adapts to the dynamic demands of the organization be always. Hence, previous studies also confirmed the role of ITG in ensuring their agility. See **Table 2.5** to **Table 2.9**.

2.4.1 Purpose of ITG

Table 2.5 shows several studies that also show the main purpose of ITG as that of ensuring better alignment of ICT and the business of the organization.

Table 2. 5: Main Purpose of ITG

Study	Text Excerpts	Text Analysis	References
IT Governance Measurement Tools and its Application in IT-Business Alignment	This key issue of aligning IT goals with business goals, which overlap two domains namely ICT and business is the primary goal of IT governance.	ITG is implemented for the purpose of ensuring the alignment of ICT and the activities/business of the organisation.	Nicho Robert and Khan (2017, p. 82)
IT Governance, IT/Business Alignment and Organization Performance for Public Sectors	IT Governance is a defined structure which aligns ICT strategy with business strategy.		Ghildyal and Chang (2017, p. 255)
Analysing the Relationship Between IT Governance and Business/ICT alignment Maturity	As a general conclusion, this research revealed that IT governance is indeed high on the agenda and that organizations with a mature mix of structures, processes and relational mechanisms indeed achieved a higher degree of business / ICT alignment		De Haes and Van Grembergen, (2008a, p. 9)

	maturity compared to other organizations.		
Practices in IT Governance and Business/ICT alignment	The goal of IT governance is to achieve better alignment between the business and ICT.		De Haes and Van Grembergen (2008, p. 1)
An Exploratory Study into IT Governance Implementations and its Impact on Business/ICT alignment	Many organizations started with the implementation of IT governance to achieve a better alignment between business and ICT.		De Haes and Van Grembergen (2009, p. 123)
The Evaluation and Improvement of IT Governance	IT governance essentially places structure around how organizations´ ICT strategy aligns with business strategy.	ITG is implemented to align IT and the activities/business of the organisation.	Pérez et al. (2013, p. 221)
The Relationship Between the Business-ICT alignment Maturity and The Business Performance for the Banking Industry in Kenya	IT governance springs from the simple and common desire to align ICT departments more closely with an organization's most important business needs.		Chege et al. (2018, p. 3)

ITG addresses alignment of ICT and business issues, thus implying that its main concern is to ensure that that the implemented IT in the organization remains relevant to the organizational needs. The ITG structured should always monitor the maturity level of ICT and business alignment. This also provides a platform for ensuring the alignment of the ICT strategy with the organizational strategy.

2.4.2 ITG Ensures Value Creation

The alignment of ICT and the business of the organization creates value to the organization. This has been shown also by the provisions of **Table 2.6**. This might suggest that the reason why the

main purpose of ITG is to ensure alignment of ICT and the business is to ensure that IT enables or supports the organization to generate value.

Table 2. 6: IT/Business Alignment and Value Creation

Study	Text Excerpts	Text excerpt	References
Business-ICT alignment Effects on Business Agility	The outcome of the deployment of the business and IS strategies and the resulting strategic alignment has a direct impact on IT business value in the organization.	Alignment of ICT and business enables organisational performance and create business value.	Koçu (2018, p. 61)
Developing a socio-technical framework for business-ICT alignment	Business-ICT alignment is one of the most important requirements that convert the IT-driven value into business performance.		Lee et al. (2008, p. 1168)

Once ICT is alignment to the organizational objectives, it enables the organization to perform in a manner that it successfully achieves its strategic objectives. In this way, the organization is getting value from the implemented ICT investments. This links to **Table 2.7** that shows several studies that also show ITG playing a role of ensuring the implemented IT in an organization delivers values. ITG is implemented to ensure that ICT users are benefiting from the implemented ICT in an organization. Without delivering required value, the implemented ICT becomes a wasteful or fruitless expenditure. Hence, a view that suggests that technology should not be implemented just for the sake of implementation. In other words, it must be seen utilised and generating value to the institution. Hence, when this happens, it might also be a sign to confirm the effectiveness of the ITG role players and mechanisms.

Table 2. 7: ITG Ensures Value Creation

Study	Text Excerpts	Text Analysis	References
IT Governance Measurement Tools and its Application in IT-Business Alignment	Globally, IT governance is concerned with two things: that IT delivers value to the business and that IT risks are mitigated, and both need measurement.	ITG is also implemented to ensure that IT creates business value. However, IT can only create business value while IT is properly aligned with the business.	Nicho Robert and Khan (2017, p. 81)
The Relationship Between the Business-ICT alignment Maturity and the Business Performance for the Banking Industry in Kenya	IT governance's emphasis on business value and oversight by senior executives are keys to avoiding investments in technology for technology's sake.		Chege et al. (2018, p. 3)
Business/ICT projects Alignment through the Project Portfolio Approval Process as IT Governance Instrument	Generally, IT governance aims to achieve the evidence that IT is a strategic asset and provides added value to the company businesses.		Juiz et al. (2012,p. 70)
IT Governance, IT/Business Alignment and Organization Performance for Public Sectors	IT Governance (ITG) – is a set of responsibilities on information technology systems, from procurement, to installation and maintenance, to management of human performance and training, as well as risk management to assure that the investments in IT generate business value.		Ghildyal and Chang, (2017, p. 256)
The Value of IT Governance	Strong governance of IT can extend business value by optimizing risk and managing resources to support the organization's mission, goals and objectives.		Curtis (2020, no page number)

Therefore, effective oversight on how ICT is generating value for the business is crucial. One of the provisions of **Table 2.7**, Ghildyal and Chang (2017), also mention a statement that seems to suggest that ITG, through senior executives, should also provide oversight even on the procurement of ICT resources.

2.4.3 ITG Enhances IT Agility

Table 2.8 shows studies that demonstrate how alignment of ICT and the business of the organization, enables IT to be in a position to respond to the always-changing demands of the organization. This is another aspect that is also crucial for the alignment of the ICT and the requirements of the organisation. This enables the ICT department to always familiarise itself with the developments of the organization and respond accordingly. The provisions of the table also show that the alignment between ICT and business can provide for this dimension of IT agility. This also implies that ICT should always implement strategies and processes that could enable and support the business.

Table 2. 8: IT/Business Alignment Activates IT Agility

Study	Text Excerpts	Text Analysis	References
Impact of Agility on the Business ICT alignment	The resulting alignment between IT and the enterprise strategy can activate the agility since essential changes in the strategy can be easily communicated to IT managers.	When IT is properly alignment with the business, it can effectively respond to the new business demands.	Imgharene et al. (2017, p. 234)
Information Technology (IT) Managers' Contribution to IT Agility in Organizations — Views from the Field	Alignment between ICT and business can provide for this dimension of IT agility	On the other hand, IT agility also ensures that IT is aligned with the business	Tapanainen (2012, p. 22)
	Thus, it is crucial for IT agility to examine how IT-business alignment is working in the organization.		Tapanainen (2012, p. 26)

However, for the above to happen; there should be effective communication between the ICT department and the business. This also provides a good platform for ICT and the executives to

always examine the level of ICT and business alignment. **Table 2.9** shows studies that also show enhancing IT agility as the role that should be played by ITG.

Table 2. 9: ITG Enhances IT Agility

Study	Text Excerpts	Text Analysis	References
Institutionalization of Information Technology Governance and the Behavior of Individuals in The Public Organizations Context	IT Governance amplifies organizational IT agility when aligned with the IT units' and line functions' peripheral knowledge.	ITG enables and enhances IT agility. In other words, ITG encourages that IT should be able to respond to the forever changing organisational demands.	Wiedenhöft et al. (2017, p. 1455)
Effect of Information Sharing Toward Equilateral Agility with Knowledge Exploitation and Exploration as an Intervening Variable	IT Governance enhances IT strategic agility.		Nurcholis and Cahyono (2019, p. 744)
Discriminating IT Governance	The belief is that the secret sauce for exploiting IT for strategic agility is how it is governed.		Tiwana and Kim (2015, p. 656)

The implementation of ITG in an organization also contributes to ensuring that IT strategies are developed and implemented in line with the changing needs of the organization. The excellence of the ITG could also be seen in the way IT responds to the dynamic nature of the organizational demands. IT should enable and support the organization all the time.

2.5 RESEARCH GAPS AND SUMMARY

According to Ako-Nai and Singh (2019) most studies on ITG focused more on managerial structures and decision-making, and less on the actual role of the governing body regarding the implementation of IT governance in the organization. The ITG framework reviewed in the previous section only applies to the ITG structures and processes without focusing on resource constrained environments. This has also been mentioned by Ngqondi and Mauwa (2020) who indicated that best-practice ITG frameworks do not describe the different contexts and how the practices must be applied. This supports the fact that research regarding ITG mechanisms in universities is still

scarce (Bianchi et al., 2017; Wu et al., 2015). There is still a need for researchers to further investigate ITG in the context of higher education; in particular; the effectiveness of ITG mechanisms (Bianchi & Sousa, 2016). Ngqondi and Mauwa (2020) also found that there were lot of ITG related gaps that still need to be closed. For example, in the University where they conducted their study, there was a draft of ITG which was never implemented since its inceptions. Research also showed a mixed situation of ITG in HEIs; which is due to lack of single way to implement an ITG framework designed for HEIs (Khouja et al., 2018).

Previous research has already shown that ineffective ITG might affect the organization performance, quality of services, management of operations and costs (Ali & Green, 2012; Bianchi & Sousa, 2016; Pang, 2014). Therefore, this study was implemented to close these gaps by adopting a systems perspective in ITG implementation in the context of HEIs.

Chapter 3: Theoretical Underpinnings of IT Governance

3.1 CHAPTER OVERVIEW

This chapter examines systems thinking as the main theoretical underpinnings of the study. The literature was reviewed for the purpose of answering research question on ITG mechanisms and the determinants of ITG.

The chapter is structured as follows: The first part provides literature review on systems thinking and systems theory which provide the foundation of the study. The second part provides the literature review on viable system model which is the model from which the conceptual framework portrayed in **Figure 3.5** was driven. This is then followed by a summary of the chapter.

3.2 WHAT IS SYSTEM THINKING?

Systems thinking is a concept that was initiated by Ludwig von Bertalanffy. He is considered to be the father of the systems thinking approach (Orgill et al., 2019). Orgill and colleagues further reveal that it was Bertalanffy who suggested that a complete understanding of organisms should focus not only on the parts of organisms, but also on their wholes. The aim behind systems thinking is to enable the understanding of relationships between components and their overall impact or influence on system outcomes; and how the very same system fits in the broader context of its environment (Amissah et al., 2020).

The systems thinking idea arose around 1960 as an approach of understanding the dynamic behavior of complex systems; and it is an interesting topic that is growing very fast for practitioners, government, military and researchers in diverse domains including, systems engineering, management, education, healthcare and others (Hossain et al., 2020).

Systems thinking is defined as a system of synergistic analytic skills which is used to improve the capability of identifying and understanding systems, predicting their behaviours, and devising modifications to them in order to produce desired effects (Arnold & Wade, 2017, 2015). Systems thinking is also viewed as an approach for reasoning and treating of real-world problems based on the fundamental notion of ‘system’ (Amissah et al., 2020). A system in this case refers to the assembled components that are interconnected and interact to achieve a particular purpose (Amissah et al., 2020). Systems thinking is also about seeing the whole beyond the parts, and also seeing the parts in the context of the whole (Shaked & Schechter, 2014, 2020).

3.3 FOUNDATION OF SYSTEMS THINKING

The foundations of systems thinking demonstrates the ability to identify connections between and among components of a system (Arnold & Wade, 2015; Hopper & Stave, 2008). The systems thinking approach enables, for example ITG role players, to view, understand, and interpret the complexity of different aspects that talk to the situation or the system (Mahaffy et al., 2019). Complexity happens as a result of the inter-relationship, interaction and inter-connectivity of components within a system and between a system and its environment (Chan, 2001a).

The emphasis of systems thinking is on holistic view of the components comprising a dynamic system. Systems thinking is about having a view of the whole picture; where one should have a view of the whole phenomenon and also of a specific situation (Shaked & Schechter, 2020). For example, the Department of Higher Education and Training should have an overall view of the ITG in the higher education sector and a view of the ITG in a specific HEI. On the other hand, anyone who is playing a role in the ITG of a particular HEI should also have an overall view of the ITG in the institution; and at the same time, he should also understand the performance of IT in a specific section. This is also in line with Mahaffy et al. (2019) and Pazicni & Flynn (2019), who mentioned that through systems thinking ITG players can have a holistic view of the system by way of being able to (i) visualize interdependencies, interconnections and relationships among the components of a system, (ii) examine the pace and impact of the change of behaviours over time, and (iii) examine how systems-level phenomena emerge from interactions between the components of that systems.

3.3.1 Cause-Effect Feedback Loops

Some of the components that are interconnected are the outcome of the activities of other components, this end up forming cause-effect feedback loops (Arnold & Wade, 2017, 2015). However, Morgan (2005) stated that no single factor can produce desired outcomes with any certainty or even a high probability. Morgan further mentioned that all outcomes can best be understood in terms of probabilities that are themselves subject to change; and this does not put forward a view of totally random outcomes.

According to Shaked and Schechter (2020), the notion of feedback loops challenges the basic reductionist perception of the connection between cause and effect, where the first event is considered to be responsible for the second one's occurrence. That is why understanding the system as a whole should be a prerequisite for decision-making, since there are situations where the first component influences the second, but the second also influences the first one (Shaked

& Schechter, 2020). Therefore, such components with this kind of connections should identified and understood with an intention to establish their influence and impact on the system behaviour (Arnold & Wade, 2015).

3.3.2 System Structure

A competent systems thinker should be able to change a system to make it perform in desired ways (Arnold & Wade, 2017, 2015), and this can be possible only if one has a thorough understanding the system structure. System structure is the way the system is organised and it is consists of components that relate to one another (Arnold & Wade, 2017, 2015). A thorough understanding of the system structure and how it facilitates and impacts on the system behaviour is very important.

Systems thinkers study a system by exploring its many connections, analysing the important from the unimportant while determining the properties of the connections themselves (Arnold & Wade, 2017). They also use a combination of logic, conceptual understanding, and evidence which is supported by scientific research to discern system structure (Betley et al., 2021). Monat et al. (2020) provide the following variety of situations or examples where systemic structures can be applied: organizational hierarchy, social hierarchy, interrelationships, rules and procedures, authorities and approval levels, process flows and routes, incentives, compensation, goals, and metrics, and corporate culture.

3.3.3 Ability to Differentiate Stocks, Flows and Variables

The ability to differentiate stocks, flows and variables according to Arnold and Wade (2015) is also critical for system thinking skill. Arnold & Wade mentioned that stocks refer to any pool of (physical or emotional) resources in a system. This was also confirmed by Kunpeuk et al. (2020) where referring to physical stock as accumulation of anything which can be quantified and changed over time. In an ITG environment example of physical stock can be laptops procured for staff members; and example of emotional stock can be the confidence or trust that ICT steering committee have in the CIO. Flows refers to the fluctuations or changes in these levels. For example, when IT steering start to lose confidence in the CIO.

According to (Kunpeuk et al., 2020) the flows relate to the direction of change occurring from any stocks which can be inflows or outflows. In the case of ITG, ICT users can increase or decrease their confidence (emotional stock) in the ICT Department based on the performance of the

department. It is the flows of information or material in and out of a system's stocks that contributes in creating a system's dynamics (Radzicki, 2008).

Variables represent the changeable parts of the system that affect stocks and flows, such as a flow rate or the maximum quantity of laptops that available in the storeroom. From this discussion one could infer that this system thinking skill also contribute to enhancing the planning and management of the resources.

3.3.4 Dynamic Behaviour of a System

According to Morgan (2005), systems thinking does not depend fully on planned, engineered solutions where there are also up-front detailed design. Therefore, this triggers the need for one to understand that the dynamic behavior of a system is one of the important systems thinking skill. Dynamic behaviour of a system come as a result of the way interconnections combine into feedback loops, and the way those feedback loops influence and consist of stocks, flows and variables (Arnold & Wade, 2015, 2017). In tandem, according to Morgan (2005) systems are also considered as having a dynamic nature of their own that is only slightly open to management and direction.

This also indicates the need understand that from the systems perspective, a decision should not be considered correct or absolutely right, since its correctness should be based on a situation, hence situated decision-making (Shaked & Schechter, 2020). This aspect moulds to the dynamic nature of a system, and that is why one of the key system thinking skills is the ability to effectively respond to changes in a system over time (Arnold & Wade, 2017).

3.3.5 Ability to Conceptually Model Different Components

Systems thinking skill that is also includes the ability to conceptually model different components of the system and view them in different ways in such a way that it contributes to reducing complexity (Arnold & Wade, 2015). This also enables theoretically the interpretation and assessment of greater complexity as the mind holds less detail about each whole (Dalal et al., 2021; Kellam et al., 2008; Wiek et al., 2011). It also enables the ability for consideration of cascading effects and feedback loops among system elements (Dalal et al., 2021; Warren et al., 2014).

3.3.6 Ability to Understand Systems at different Scales

It is one of the systems thinking skill for a person to be able to understand systems at different scales; and this also includes the ability to recognize systems of systems (Arnold & Wade, 2015). This might also imply that each element of a system might also be a system itself, and the system

under consideration might also be an element in a more complex system (Radius, 2020). Munday (2015) also confirmed this when he mentioned that it has been observed elsewhere where a "system" may be both an encompassing whole and be a subsystem – a system within a system. Acquiring this skill contributes in improving one's insight (Radius, 2020).

3.4 BENEFITS OF SYSTEMS THINKING

Systems thinking continues to gain significant interest as an all-inclusive approach to introducing organizational change and development (Westover, 2020). Westover further indicated that systems thinking enables several core concepts and practical tools to be applied in order to have thorough understanding of the complexity of each organization. Systems thinking also enables leaders and managers to expand the range of choices available for solving a problem by broadening their thinking and helping them articulate problems in new and different ways (Goodman, 2018). In the same vein, it also allows the stakeholders to engage in debating issues with the aim of understanding the different perspectives (Mchunu & Bhengu, 2011).

According to Amissah et al. (2020), systems thinking contributes in assisting leaders and managers to meet challenges of change in ways that other change methods do not. Amissah mentioned that it assists to meet the challenge of motivation by showing people how they unintentionally contribute to the very problem they are trying to solve, thus stimulating them to question their own intentions, thinking, and behavior. For example, through systems thinking, a chairperson of ICT strategy committee can also see his contribution to the non-performing ITG system. This contributes in enhancing the morale of the employees which also contributes in lessening the oversight that managers should provide (Sherman, 2019). System thinking helps to meet the challenge of collaboration and teamwork by showing role players how their actions not only impact others in the system but also impact themselves in unintended and often undesirable ways (Amissah et al., 2020). For example, when individual ICT steering committee members does not perform; the whole ICT steering committee is negatively affected; and the non-performing ITG in an organization also negatively affects those individual members. In fact, it is like a ball that is thrown on the wall, it comes back to the person who threw it. Organizational leaders with a systems-thinking mindset always consider change and development process as an opportunity to enhanced collaborations and innovation (Westover, 2020).

System thinking also makes everyone understand that they are all in the same boat, and therefore everyone needs to be responsible for redesigning the boat to be more functional (Amissah et al., 2020). However, this requires a competent with system thinking skills who can demonstrate to the team the interconnectedness and synthesis relate to the dynamic relationships between

various parts of a whole (Westover, 2020). Hence, according to Westover this also represents the process of obtaining and understanding synergies between parts of the organization. For example, when an organization is liquidated due to the non-performance of its stakeholders, everyone suffers the consequences; therefore, the best thing is ensuring that everyone performs to his or her level best.

The principles of systems thinking make managers and employees to be aware of the fact that there are no perfect solutions; the choices they make will always have an impact on other parts of the system or the organization (Goodman, 2018). However, systems thinking also provides a new perspective and specialised language of engagement and a set of tools to examine the root causes to problems in an insightful and informative manner (Mchunu & Bhengu, 2011).

Systems thinking also helps to meet the challenge of focus by guiding role players to target leverage points instead of leading them to assume that change occurs by doing as much as they can as fast as possible (Amissah et al., 2020). For example, an ITG role player should be able to identify areas that require intervention to improve the performance of ITG in the organization; and systems thinking approach could assist greatly in this regard. Through applying systems thinking skills, leaders are also able to effectively handle and manage situations that are characterised by dynamic change, diversity, and complexity (Mchunu & Bhengu, 2011).

The systems thinking approach can also strengthen the ties between the various horizontal disciplines that all may interconnect as relevant to a particular area of specialisation at a specific department (Mchunu & Bhengu, 2011). This happens when a skilled systems thinking leader also ensures that mechanisms for multiple feedback loops are established and effectively communicated among departments (Westover, 2020).

3.5 HOW SYSTEMS THINKING HELP ORGANIZATIONAL LEADERSHIP

Following from Shaked and Schechter (2014, 2020), adoption of systems thinking by the leadership of an organization contributes to making them enhance their leadership competencies. System thinking competencies will enable them to:

a) ***Lead wholes***, in other words, leadership start to have holistic perspective, oriented towards seeing the big picture and not only its individual parts (Shaked & Schechter, 2014, 2020). This contributes positively in making trade-off that optimise performance goals and constraints of the organizational processes (Lawrence et al., 2019). Lawrence et al., (2019) mention that how an organizational aspect is viewed impacts the approach that leaders use to make decisions related

to that process; that is, either by taking a holistic view that supports various levers of performance simultaneously or by taking a reductionist approach that applies a restricted view of the supply chain problem and its solution.

b) ***Influence indirectly***, this concerns leadership's ability to address organizational goals and challenges circuitously, based on their awareness that countless reciprocal influences are at play among various organizational elements, each of which is connected to others, affecting them, and being affected by them (Shaked & Schechter, 2014, 2020). This is due to the fact that systems are made out of sub-systems that interact and influence one another where one sub-system can have a direct impact on many of the other sub-systems and an indirect influence on the whole system (Åslund & Bäckström, 2017; Bicheno, 2008). Therefore, according to Åslund and Bäckström (2017) from the systems perspective, leaders are able to implement processes that directly and indirectly influence the initiatives that delivers the societal customer value.

c) ***Adopt a multidimensional view***, referring to leadership's contemplation of several aspects of a given issue simultaneously. Bhengu et al. (2020) provides an example of a school principal who should ensure an environment that is conducive to effective teaching and learning since it is one of the key elements. However according to Bhengu et al.; if there are no monitoring tools, if learning and teaching materials are also not made available, and staff commitment to the school vision is not solicited as part of the package, improving the quality of teaching and learning might be a fruitless exercise.

d) ***Evaluate significance***, referring to leadership's ability to envision components of organizational life according to their significance in terms of the entire system (Shaked & Schechter, 2014, 2020). Nadav et al. (2020) stated that leaders who can evaluate significance deal with the most important and significant issues and choose to share them with their team. Nadav et al. also mentioned that involving team members in such important issues may also contribute in promoting their feelings of empowerment, increasing their motivation and improving their job satisfaction.

3.6 SYSTEMS THINKING TOOLS

Several tools have been developed by systems thinkers to assist people think in a systematic way or to develop a systems mindset (Mchunu & Bhengu, 2011). In the next section, this study discusses the influence diagram and the iceberg model.

3.6.1 Influence Diagram

Howard and Matheson (2005) present an influence diagram—one of the tools that are used for decisions analysis, and for any formal description of relationship. According to them, the influence diagram is a sketch that describes the dependencies among random variables and decisions. This implies that an outcome of a particular activity might depend on the performance of other activities. Howard and Matheson (2005) suggest that when drawing an influence diagram, variables are represented by circles in which their names and numbers are written while decisions are represented by rectangles. Arrows are used to point from variable to another variable which means the outcome of one variable can influence the probabilities associated with another variable. An arrow pointing can also be pointed from one decision to another decision (Howard & Matheson, 2005).

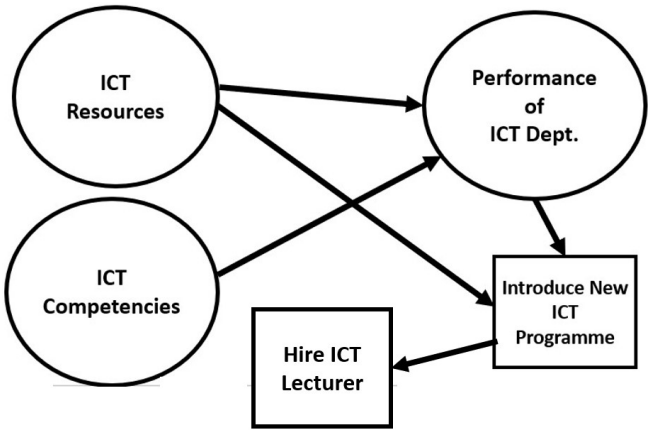


Figure 3. 1: Example of Influence Diagram (Howard & Matheson, 2005).

Figure 3.1 shows an example of an influence diagram. In the above diagram (Fig.3.1), the influence that ICT resources and ICT competencies have towards the performance of the ICT Department which in turn influences a decision to introduce a new ICT programme. On the other hand, a decision to hire an ICT lecturer is dependent on a decision to initiate the new ICT programme. However, the dependencies of the decision to introduce the new ICT programme are ICT Resources and Performance of the ICT department.

Therefore, from this example, we infer that an influence diagram assists its users in identifying aspects and elements that have an impact on a particular decision. From **Figure 3.1** one is also able to see how an influence diagram can systematically guide its users during decision making, and also shows the connections amongst different activities.

3.6.2 The Iceberg Model

The iceberg model is another systems thinking tool which was developed to assist people in discovering patterns of behaviour, supporting structures, and mental models that underlie a particular event (Mchunu & Bhengu, 2011). This tool (see **Figure 3.2**) provides four distinct but closely related levels which are: events or symptoms, patterns of behaviours, systemic structures and mental models (Nguyen & Bosch, 2013). These levels bring together variables on how people view the world (Mchunu & Bhengu, 2011). Blokland and Reniers (2020) stated that the event level deals with the basic information or data of events. This level according to Blokland and Reniers is concerned with directly observable facts, and the collectable data concerning an event. Whereas patterns level shows how events have changed over time, therefore providing richer and more meaningful sources of information than the events per se (Nguyen & Bosch, 2013). However, what is critical at this level of thinking, is to understand how these factors interact, so that we may be able to see the systematic structures behind the patterns, and how interactions are structured (Blokland & Reniers, 2020). According to Monat et al. (2020), the Iceberg Model postulates that in human-designed systems, repeated events and patterns are caused by systemic structures which are, in turn, caused by underlying mental models. Mental models portray the beliefs, values and assumptions that individuals or organizations hold, and they underlie the reasons why and how things are done (Blokland & Reniers, 2020). Monat et al. (2020) also mentioned that events and patterns are observable and systemic structures (stocks, flows, and feedback loops) and mental models are hidden.

Iceberg model is used in situations where there is a need to understand the systemic related issues that prevail in the organization (Mchunu & Bhengu, 2011). Cunliff (2018) provided an example of an event where an employee arrived late on a particular Tuesday; and an example of a pattern where the very same employee used to arrive late every Tuesday. Once a leader observes the repetition of an event that turned to become a pattern, they should start to have some concerns. Cunliff further suggests that at this point, the leadership should start considering started assessing the existing “structures”, including those policies that support and create behavior of employees. Then, Cunliff also looked at the “mental model” of the employees and also for the management, where trust and what the management values most in terms of

"productivity" and "face watch" were issues of great concern. Another example provided by Sheffield et al. (2012) regarding mental models is when a large organization sees all projects through the mental model of a prescriptive plan-driven project management methodology. According to Sheffield and colleagues, such an approach might lead to cost over-runs on simple projects since they might not need all the processes used for complicated projects. Dynamic projects might also fail due to the need to use agile approach to manage uncertainty and rapid change. Therefore, the two provided examples confirms the mental model aspects that have influence on systemic structures (Cunliff, 2018). See **Table 3.1** provides an example on how Iceberg Model can be applied in the ITG environment.

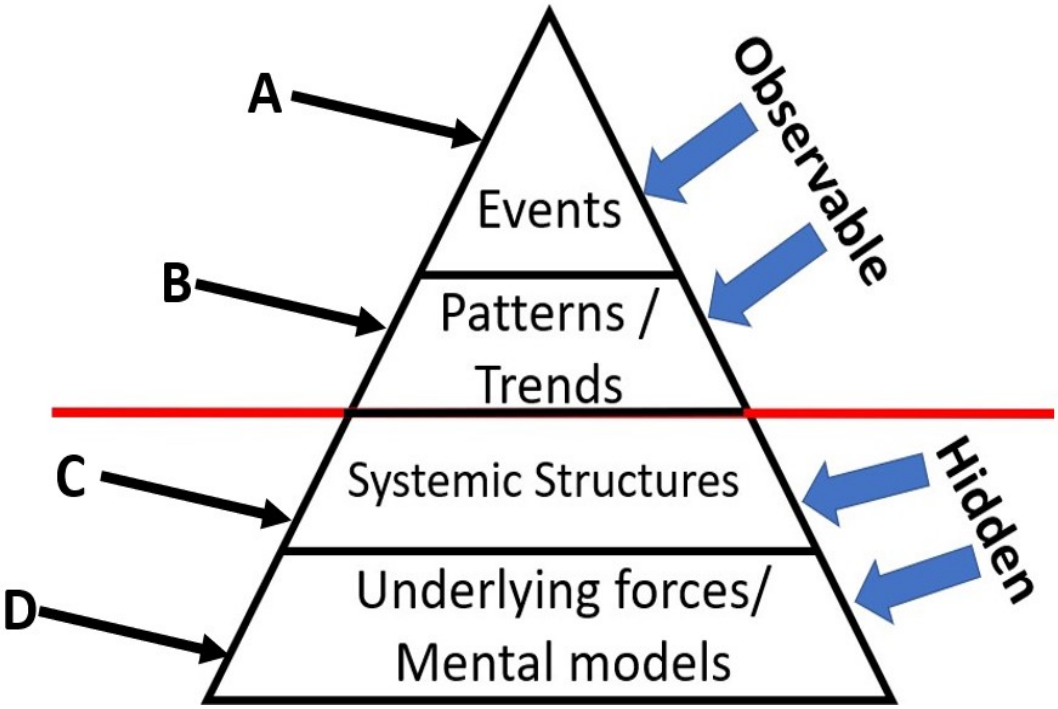


Figure 3. 2: The Iceberg Model

Drawing adapted from Monat et al. (2020)

Table 3. 1: Example of Application of Iceberg Model

	Iceberg Model Level	ITG Example No 1
A	Events	ICT steering committee member's failure to attend its first (1st) meeting.
B	Patterns	ICT steering committee member's failure to attend four of its meetings in series.
C	Systemic Structures	There might be a need to review the ICT Steering Committee Terms of Reference.
B	Underlying forces/ Mental Models	Priorities, Values, culture

3.7 SYSTEMS THEORY

According to Laszlo and Krippner (1998), the history of systems theories is composed of the contributions from such seminal thinkers as Alfred North Whitehead, Ludwig von Bertalanffy, Anatol Rapoport, Kenneth Boulding, Paul A. Weiss, Ralph Gerard, Kurt Lewin, Roy R. Grinker, William Gray, Nicolas Rizzo, Karl Menninger, Silvano Arieti, and, in more recent years, the dynamical systems theorists, the family systems theorists, and those who deal with holistic paradigms. Today, using systems theory is considered to be necessary for successful application of systems thinking in a diversity of contexts (Verhoeff et al., 2018). According to Verhoeff and colleagues, this implies that if the ITG is to adopt a systems' thinking approach, then systems concepts should be adopted. However, it should also be noted that different systems' theories use different systems concepts. Hence, Verhoeff et al. provided an overview of a general systems theory; dynamical systems theory; and cybernetic systems theory which we discuss in the following sections:

a) General Systems Theory

According to Laszlo and Krippner (1998), the idea of general systems theory (GST) was first presented by Ludwig von Bertalanff in a philosophy seminar at the University of Chicago in 1937; but his first publication on the subject was done only after World War II. He further instigated GST for all systems in 1968 (Drack & Pouvreau, 2015; Hossain et al., 2020).

GST provides a framework or structure of systems on which to populate particular subject matters in an orderly and coherent quantity of knowledge (Lai & Lin, 2017). It is an important means which enables systematic control, and instigation of the transfer of principles from one field to another (Von Bertalanffy, 1950). Its fundamental notion is the focus on interactions (Mele et al., 2010). GST plays a role in establishing relationships, structure, and inter-dependence in organizational theory (Schneider & Somers, 2006). It is the field from which systems thinking has evolved (Monat & Gannon, 2015). GST is considered as a doctrine of "wholeness" (Von Bertalanffy, 1950). It is basically concerned with how systems operate, and integrates a broad range of systems by naming and identifying patterns and processes common to all of them (Amagoh, 2008). GST is applied in organizations to ensure that they grow and achieve a dynamic equilibrium rather than simply return to a steady state; and this contributes to their survival (Chikere & Nwoka, 2014).

b) Dynamical Systems Theory

Dynamical systems theory (DST) is concerned with characterizing the behavior of systems over a particular period (Beer & Williams, 2015). Henri Poincare also made a major contribution in the growth of DST at the end of the 19th century on the stability of the solar system (Beer & Williams, 2015; Diacu & Holmes, 1996). His work carried a multitude of great ideas, among which a first glimpse of chaotic behaviour in a dynamical system which is a property that he discovered while trying to prove the stability result (Florin Diacu & Ratiu, 2001).

DST is concerned with systems that are characterized by what is called complete interconnectedness. In this case all variables are interrelated, and therefore, changes in one variable will have an impact on all other variables that are part of the system (De Bot et al., 2007). The focus for this system is on complex, self-organizing systems (Verhoeff et al., 2018). They develop not only by way of interacting with their environment, but also by way of internal self-reorganization (De Bot et al., 2007). However, a dynamic system refers to a system whose current state generates its successive state by a rule or principle of change (Van Geert, 2020). When DST is applied to a system that is by definition complex, such as a society or a human being, where uncountable variables may have various degrees of freedom, it becomes the science of complex systems (De Bot et al., 2007). De Bot also mentioned that dynamic systems are nested in the sense that every system is always part of another system where the same dynamic principles operate at all levels. According to Beer and Williams (2015), those dynamical systems whose dynamical law is fixed are called autonomous, whereas those whose dynamical law changes over time is called nonautonomous.

c) Cybernetic Systems Theory

Cybernetic systems theory (CST) originated from mechanical engineering and the term cybernetics refers to the control and communication in the machine system (Lai & Lin, 2017). Cybernetics was discovered in 1949 by Norbert Wiener who was a distinguished mathematician and engineer at Massachusetts Institute of Technology (Chikere & Nwoka, 2014). The term was from the Greek *kubernetes* meaning helmsman or cox, which is also where the word governor came from, which in turn has connotations of controller or regulator (Murray, 2006).

Cybernetics systems were found to be useful in explaining the behaviours of social systems extended from machine systems. They depend on different feedback or control mechanisms to help the system maintain a stable state alluded (Lai & Lin, 2017; Murray, 2006). For example, the feedback that the ICT department gets from the ICT users might be useful to improve the quality of the services provided by ICT. According to Verhoeff et al., (2018) the key concepts of cybernetic systems are feedback, self-regulation, and equilibrium; while its focus is on self-regulating closed networks. Cybernetics was also reinforced by the central notion of circularity in the sense that the feedback governed the changes in communication, which in turn changed behaviour, which then changed the communication, and so on, in a circular feedback loop that enabled a system to maintain a desired state (Murray, 2006; von Foerster, 1992).

For this reason, this study had adopted the cybernetic systems theory due to its capability to stabilize the situation through feedback and self-regulation processes. The above discussion also show that cybernetic systems can adapt to the ever-changing environment which also contributed in the decision to adopt the cybernetic systems. Hence, the study adopted VSM that had been developed by Stanford Beer which is also one of the cybernetics systems (Beer, 1979; Beer, 1984b; Flood & Jackson, 1991; Huygh & De Haes, 2019).

However, the justification with respect to the adoption of VSM in this study is alluded in brief in the overview of viable systems model which is the next section. Most importantly, VSM is a well-established framework compared to other models, one capable of enabling organizations to survive and thrive in complex operating environments, since it can be used either to design a feasible system or to diagnose weaknesses in an existing system (Hildbrand & Bodhanya, 2015; Lowe et al., 2020). Hence, it was the view of the researcher that the implementation of VSM in ITG will also contribute to ensuring its viability in HEIs. This will, in turn, contribute to closing the ITG gaps mentioned in Section 2.5.

3.8 OVERVIEW OF VIABLE SYSTEMS MODEL

VSM presets the necessary and adequate conditions for considering an organization to be viable in a scientific manner (Regaliza et al., 2017). Viability refers to (a) an organization's ability to exist independently; (b) ensuring that it has an identity; and (c) ensuring that it is can survive, despite disturbances (Beer, 1972; Hildbrand & Bodhanya, 2015; Regaliza et al., 2017). Schwaninger (2019) stated that according to the theory of the VSM., an organization is said to be viable if, and only if, it commands a set of management subsystems and the functions whose interrelationships are defined precisely.

VSM is user-friendly when coming to make sense or to understand the activities of the organization of interest (Harwood, 2019). This confirms the fact that it is indeed a firm framework that contributes in making organizations to survive and thrive in complex operating environments; and it can also be used either to analyze the design and feasibility of a system or to identify areas for improvement in an existing system (Hildbrand & Bodhanya, 2015; Lowe et al., 2020).

According to Arnold and Wade (2015), a definition of system thinking includes some of the following aspects: (1) Systems which refers to a combination of interrelated, interdependent, or interacting components or elements which form collective entities; (2) Characteristics that demonstrate synergy amongst the interacting of components; (4) Analytical skills, which encompass the ability to collect and analyse data/information, design and test solutions to problems, and formulating plans; (5) Identify - which refers to being recognised as being a particular thing; (6) Understand - to be thoroughly familiar with the character, nature, or subtleties of; (7) Predict - to be able to forecast based on a deducible consequence; and (7) Devise or develop modifications meaning to plan, or elaborate changes or adjustments. All these are also witnessed in VSM.

The VSM asserts that the viability of an organization hinges on keeping a well-adjusted relation with the environment in which it operates, and from which it gets its resources, such balance results from the existence and interactions between five key typologies of organizational functions (Systems 1 to 5) with their external and internal stakeholders at different levels of organization (Lowe et al., 2020) (See **Figure 3.3**).

Lowe et al. further stated that through VSM, organizations continuously adapt to changing environments by harnessing the principles of complexity and a variety of other factors. An overview of the factors that have influence of VSM are provided in the next section.

3.8.1 Conceptualisation of Systems of VSM

VSM is based on five systems and all of them must be in place for the organization to be effective (Espejo & Gill, 2011; Lowe et al., 2020; Walker, 2018). **Figure 3.3** and the discussion on components of the VSM confirms that the systemic thinking view of VSM that advocates a holistic view on the whole system as a set of elements, and the analysis of the relationships between these elements (Huygh & De Haes, 2018; Preece et al., 2013). The discussion of the six components of the VSM are discussed in the following sections.

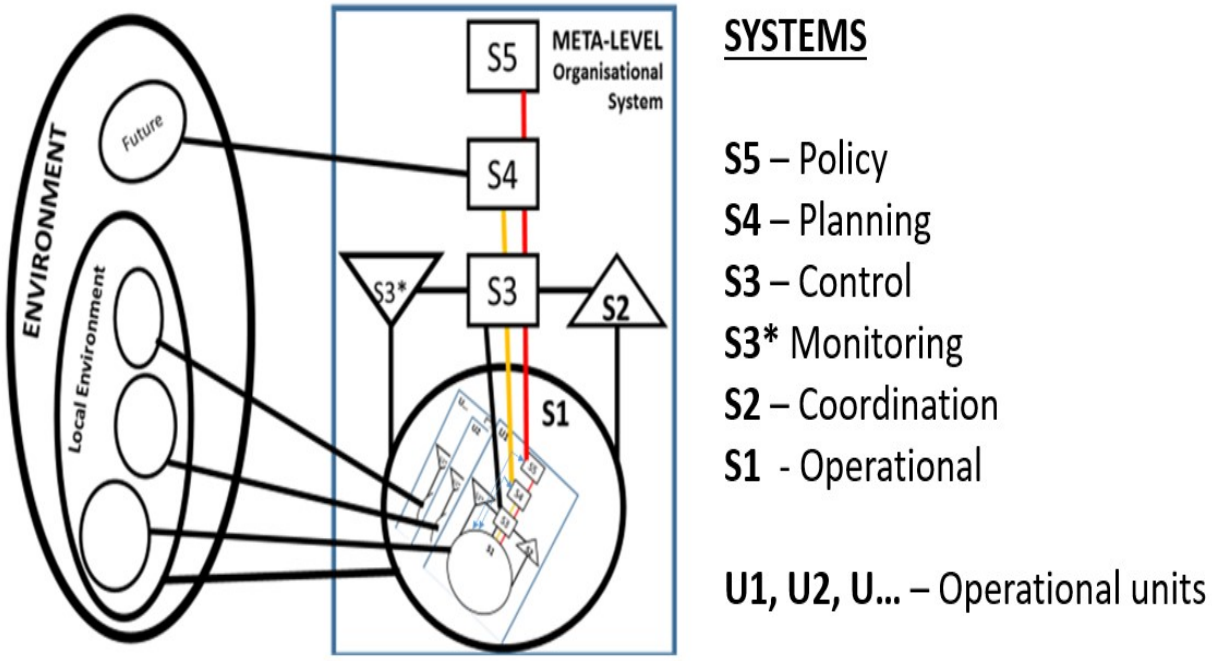


Figure 3. 3: Beer's Viable Systems Model

a) System 5: Governing Body

System 5: This is labelled as **S5** in **Figure 3.3,** and it is also referred to as **'Policy'.** It takes policy decision responsibilities and balances demands from different parts of organizational structure (Espejo & Gill, 2011; Selin & Santos, 2018). System 5 is the highest authority that is responsible for organizational policies, defines the identity, purpose, and in general, the ethos of the organization (Castro, 2019; Walker, 1998). It is the Board of the organization, responsible for the development of the supreme values, norms and principles, which govern the organization (Castro,

2019; Schwaninger & Scheef, 2016). System 5 also provides guidelines regarding interactions between Systems 3 and 4 as a way to ensure strategic alignment and coherence in the decision-making process (Castro, 2019; Panagiotakopoulos et al., 2016).

Table 3. 2: Literature Showing Board playing the Roles of System 5

References	Study/Aim/Document	Text Excerpts	Text Analysis
Panagiotakopoulos et al2016, p. 795)	Sustainability Management: insights from the Viable System Model	"Organizational entities, such as a Board of Directors, or the President are usually responsible for System 5 processes."	Board plays roles of System 5. This includes developing the vision and values of the organisation
		"System 5 (S5) provides closure to the whole organization. It defines and develops the vision and values of the organization through policies."	
Ramalho (2016, p. 62)	King IV: Report on Corporate Governance for South Africa 2016	"The governing body should approve policy that articulates and gives effect to its set direction on the employment of technology and information."	
Ramalho (2016, p. 47)		"The governing body should delegate to management the formulation and development of the organization's short, medium and long-term strategies."	

According to COBIT 5 Task Force (2012), the responsibilities of a governing body also include evaluating, directing and monitoring the implementation of ITG in organization. Unfortunately Parent and Reich (2009) found that governing bodies are failing to demonstrate competence about what a good ITG demands. **Table 3.2** presents literature that this study reviewed whose content demonstrated the roles and responsibilities of the governing body, or the council, that are in line with the roles of System 5**.** In the case of HEIs, these responsibilities are carried out by Council which is the highest decision-making body in these institutions.

b) System 4: Planning

System 4, labelled as **S4** in **Figure 3.3,** is also referred to as 'Intelligence'; and it should display a full understanding of the total environment of the organization's operation to perform intelligence functions (Espejo & Gill, 2011; Selin & Santos, 2018). According to Castro (2019), **System 4** is responsible for: (1) the long-term orientation; (2) modeling the organization in its environment (ecological, social, economic–technological); (3) overseeing the exploration of the "there and then" of the organization; and (5) the dialogue between S3 and S4, further acting as a homeostat is the core of the adaptation mechanism of the organization, anticipate changes and define proactive response to changes in the environment. Therefore, it is the responsibility of System 4 to scan the outside world and identifies opportunities and threats that may affect the viability of the whole organization, and without System 4, the organization would be unable to cope with the environmental changes (Panagiotakopoulos et al., 2016). In other words, the holistic view of the whole organization in terms of its model and its environment must be contained in the System 4, otherwise intelligent adaptation would be a wish never fulfilled (Selin & Santos, 2018). These systems are responsible for developing future plans and strategies, and ensuring adaptation to a changing environment (BusinessBalls, 2019; Walker, 1998).

It noteworthy to mention that the way ICT projects are managed today, has a big influence in determining how the future of the business will evolve, hence the need to consider criticality and importance of project delivery and reliability, as well as the economic rationale when planning and implementing the projects (Sabbaghi & Vaidyanathan, 2004). Henderson and Venkatraman (1993) contends that ICT strategy should also be articulated in terms of an external domain, that is, how the organization is positioned in the IT marketplace. Sabbaghi and Vaidyanathan (2004) also mentioned that SWOT Analysis can be a tool that can be used to help organizations to identify and use their strength to develop strategies to fight the identified threats and respond to the identified opportunities that are coming from the external environment.

In line with the above sentiments, in HEIs, System 4 can be considered as the executive management. For the ITG to be effective, they must play an active role in this regard (Ali & Green, 2012; de Haes & van Grembergen, 2009). Executives need to make decisions based on diverse opinions from organizational requirements and IT managers, auditors, and other stakeholders. It is important that they ensure the development of ICT plans that align ICT related activities with the organization's strategic plan and objectives (Tiwana & Kim, 2015; Wu et al., 2015). Isolated IT and organizational functions lead to misaligned and often conflicting strategies (De Vos, 2019). To avoid this, the executive management should also involve IT (or the CIO) in the development of the organizational strategy. If IT is not involved, the ICT strategy and organizational strategy might not be adequately related (De Haes, 2015). Hence the need for both IT and the management to be on the same page with regard to the operations and process of the organization before any strategies can be formulated (De Vos, 2019).

Table 3.3 illustrates literature that this study been reviewed in connection with the roles and responsibilities of the executive management that are in line with the roles of System 4 in the VSM.

Table 3. 3: Literature Showing Management playing the Roles of System 4

References	Study/Aim/Document	Text Excerpts	Text Analysis
COBIT 5 Task Force, 2012, p. 14)	COBIT 5: A Business Framework for the Governance and Management of Enterprise IT	"Management **plans**, builds, runs and monitors activities in alignment with the direction set by the governance body to achieve the enterprise objectives."	Management is responsible for planning; and planning is the role played by System 4.
Ramalho, 2016, p. 21)	King IV: Report on Corporate Governance for South Africa 2016	"To give effect to the organization's strategy management formulates policy and **operational plans**, also to be approved by the governing body."	

c) System 3: the "Control" - Chief Information Officer

System 3: This is labelled as S3 in **Figure 3.3.** System 3 is also referred to as 'Control'; and it not only serves as the operative management of the whole organization; but also as an interface

between Systems 4 and 5 (Espejo & Gill, 2011; Selin & Santos, 2018). It is responsible for the optimisation and the autonomy of all S1-units, which generates synergy between the units to ensure coherence throughout the system (Anderton, 1989; Castro, 2019; Schwaninger & Scheef, 2016; Walker, 1998). System 3 is also responsible for the allocation of resources and also for the overall control of System 1 units (Castro, 2019; Lewis & Millar, 2009; Schwaninger & Scheef, 2016). The **Table 3.4** shows literature that has been reviewed that show the roles and responsibilities of the Chief Information Officer that are in line with the roles of System 3 in the VSM.

Table 3. 4: Literature Confirming the Role of CIO which Corresponds to the VSM: System 3

References	Study/Aim/Document	Text Excerpts	Text Analysis
Penrod et al. (1990, p. 21)	The Chief Information Officer in Higher Education	"Some 80 percent of the survey respondents indicated that strategic planning for information technology is part of their role."	The CIO is the one at the center of ICT activities. Hence, he/she has control of ICT and control is the role played by System 3.
COBIT 5 Task Force (2012, p. 76)	COBIT 5: A Business Framework for the Governance and Management of Enterprise IT Role: CIO	"The most senior official of the enterprise who is responsible for aligning ICT and business strategies and accountable for planning, resourcing and managing the delivery of IT services and solutions to support enterprise objectives."	
Mark (2019) https://www.zdnet.com/article/what-is-a-cio-the-chief-information-officer-role-explained/	What is a CIO? Everything you need to know about the Chief Information Officer explained	"The role of the CIO is to help to set and lead the technology strategy for an organization."	
		"… the CIO is responsible for setting the ICT strategy and ensuring that this works with the broader business strategy."	
Lewis & Millar, (2009, p. 13)	The Viable Governance Model – A	"… the corporate CIO occupies a critical, but not an absolute, position."	

	Theoretical Model for the Governance of IT		
McLaughlin (2020)	CIO role 2020: Everything you need to know about today's Chief Information Officers	"CIOs are increasingly being handed the keys to drive digital transformation throughout the organization, including areas that have been traditionally outside their purview,"	

In line with the above, the chief information officer (CIO) is the leader of the IT functions whose main task is to represent IT to business functions and to work toward a continuous alignment between the ICT and business functions (Tapanainen, 2012). The CIO ensures that any ITG programme to be implemented results in mechanisms that will continually improve the relationship with, and alignment to the business, leads to better management of IT supply and demand, and improve the management of ICT related business risk (ISACA, 2012b). This shows that CIOs also plays a major role in evaluating, directing, and monitoring the implementation of ITG related programmes in an organization. System 3 (S3) in the case of HEIs can be referred to the Chief Information Officer (CIO) who is usually delegated and tasked with the responsibility to implement and execute ITG in an organization which includes developing and implementing ICT strategy (Liell-Cock et al., 2009).

d) System 3*: Monitoring

This is labelled as **S3*** in **Figure 3.3** and it is responsible for auditing and monitoring the performance of system one (**S1**) to take control action, in accordance with information it receives up from **S2** and **S3** (Nhlabathi, 2001) . The **Table 3.5** shows literature that this study consulted that shows and confirms that the roles and responsibilities of the Risk Committee, and Audit Committee, are in line with the roles of System 3* in the VSM.

Table 3. 5: Literature showing Role of Risk Committee and Audit Committee that Corresponds to VSM - System 3*

References	Study/Aim/Document	Text Excerpts	Text Analysis
ISACA (2012b, p. 72)	COBIT 5: Implementation	"ICT related business risk will be reported on and discussed as part of the risk management process in the risk registers presented to the relevant risk committee."	Risk Committee and Audit Committee, through internal audit services, monitors the implementation of ICT which is the role played by System 3*.
		"Internal audit services will provide assurance to management and the audit committee on the adequacy and effectiveness of GEIT." GEIT stand for Governance of Enterprise Information Technology	

Table 3.5 also may be put to use in the HEIs, where the Risk Committee, and Audit Committee, play the role to assist council, as the governing body, to monitor organizations' risks (Ramalho, 2016); and according to ISACA (2019), IT risk is a component of the overall risk universe of the organization.

e) System 2: Coordination

System 2 is labelled as **S2** in **Figure 3.3.** It is also referred to as 'Coordination' since it plays a coordination role to System 1 (Espejo & Gill, 2011; Selin & Santos, 2018). System 2 is responsible for stability and resolving conflict between operational units; and it also reduces alternations and enhances self-regulation by providing the following amongst others: information systems, operative plans, schedules and programs, teams, internal service and support units, standards of behavior, knowledge bases, and a great part of communication (Castro, 2019; Schwaninger & Scheef, 2016; Walker, 1998). The **Table 3.6** shows literature and previous studies that have been reviewed that show the roles and responsibilities of the ICT steering committee that are in line with the roles of System 2 in the VSM.

Table 3. 6: Literature confirming the Role of ICT steering committee which Corresponds to the VSM-System 2

References	Study/Aim/Document	Text Excerpts	Text Analysis
Luís Martinho et al. (2016, p. 1091)	The role of people and social context in promoting the IT organizational performance Evidence from Portugal Promoting the IT organizational performance	"… the creation of IT steering committees may provide a way to improve the integration of technical and business knowledge, and also IT-business coordination mechanisms …"	ICT steering committee coordinates ICT activities in the organisations; and this is the role which is played by system 2.
Schroeder et al. (2012, p. 6)	KM governance: The mechanisms for guiding and controlling KM programs	"IT steering committees' impact on project prioritisation, the choice of projects and the overall business alignment of IT programs."	
Cobanoglu et al. (2013, p. 2)	The Effect of Information Technology Steering Committees on Perceived IT Management Sophistication in Hotels	"Steering committees have been proposed as one way to improve IT decision-making and oversight and used as a solution to problems in IT adoption".	
		"The primary purposes of these committees are to ask the right questions …, ensure IT-business strategy alignment, and bridge the gap between business and ICT …".	

Therefore, the ICT steering committee has a role in the implementation of ITG in the organization (Bianchi & Sousa, 2016); and amongst other mechanisms, it can also use business cases to coordinate ICT projects and ensure that benefits are identified and monitored (ISACA, 2012b).

f) System 1: Implementation

System 1 is labelled as **S1** in **Figure 3.3.** System 1 is also referred to as 'Implementation' (Espejo & Gill, 2011). System 1 is an entire collection of interacting operational units that are responsible

for primary activities of the sub-system or system (Bianchi & Sousa, 2016; Pan et al., 2015; Walker, 1998). They are autonomous and adaptive entities that conduct and optimize the daily business (Schwaninger & Scheef, 2016). System 1 units have direct interaction with their respective environment; and are also viable systems in their own right (Castro, 2019; Lewis & Millar, 2009).

System1 (S1) refers to ICT portfolio (ICT department) which in turn contains subsections that are responsible for delivering services to the organization at operational level; and the emphasis is short term goals to ensure ongoing continuity of business service (Van Grembergen & De Haes, 2007). These are the sub-systems that are responsible for carrying out the value-adding tasks of the system-in-focus (Espejo & Gill, 2011). However, for the IT management to be effective, there should coordinated efforts in planning, organizing, controlling, and directing the implementation and use of ICT resources within the organization (Cobanoglu et al., 2013).

3.8.2 Literature Review on the Principles of VSM

In the following sub-sections, principles of VSM which were considered when discussing the

factors that contribute to ensuring that ICT enables the HEIs to achieve its objectives are presented in the following section:

a) Complexity and Variety

According to Beer (1979) any discussion on complexity should include the concept of variety as a measure of complexity. A system is viable when it is able to cope with variety (Huygh & De Haes, 2018). Viable systems are the result of the connectivity (i.e. communications and interactions) among primary and regulatory activities, and this makes ITG to be complex and multifaceted (Raul Espejo, 1990; ISACA, 2018b). Hence, complexity results from the inter-relationship, inter-action and inter-connectivity of elements or components within and between the IT systems and their environment (Chan, 2001; ISACA, 2018b). The complexity of prevalent ICT solutions increasingly relies on interworking components that were developed separate from the solution in which they are finally deployed (Roberts, 2006). In the same way, ITG is a system that is composed of interrelated subsystems that work together as a whole, where the subsystems include structures, processes and relational mechanisms (De Haes & Grembergen, 2004; Peterson, 2004). This makes ITG to be complex and dynamic in nature (Sambamurthy & Zmud, 1999; Weil & Ross, 2004). The “information technology” is an outcome of frameworks of partitions of the state space of the system realized by a serial-parallel decomposition into component systems (Gottinger, 1975).

Complexity is also considered as the dramatic increase in the number and heterogeneity of included components, relations, and their dynamic and unexpected inter-actions amongst IT solutions (Hanseth & Lyytinen, 2016). However, it is noteworthy that organizations have far less inner complexity than their environments (Espejo & Gill, 2011). Therefore, the complexity of the IT systems required in one department is far less than the complexity of the IT requirements for the entire institution. Complexity principle affords an organization to ensure efficient and effective governance and management of enterprise IT which represents a holistic approach and it also take into account several interacting components (COBIT 5 Task Force, 2012).

Lai and Lin (2017) mentioned that complexity can be decided by factors such as the number of components, density of relationships among the components, nonlinear relationships among the components, and whether the components can function independently. Complexity is the one that holds a holistic view on the whole system, as this is where a set of elements and the analysis of the relationships between these elements should be understood (Huygh & De Haes, 2018; Preece et al., 2013).

Causes of IT Complexity: A brief overview of the factors that contribute to causing IT complexity:

- **Number of Devices: Higher volume of data and IT innovation**

A survey conducted by the Enterprise Strategy Group (ESG) in 2019 showed that sixty-six percent (66%) of ICT decision makers believed that IT is now more complex for them than it was during previous years; and this was due to the increasing number of things to manage, the ever-increasing volumes of data, and the fact that IT innovations are constantly emerging (Sinclair & Keane, 2019). This might imply the need for a system or framework to assist in managing IT. See **Figure 3.4**.

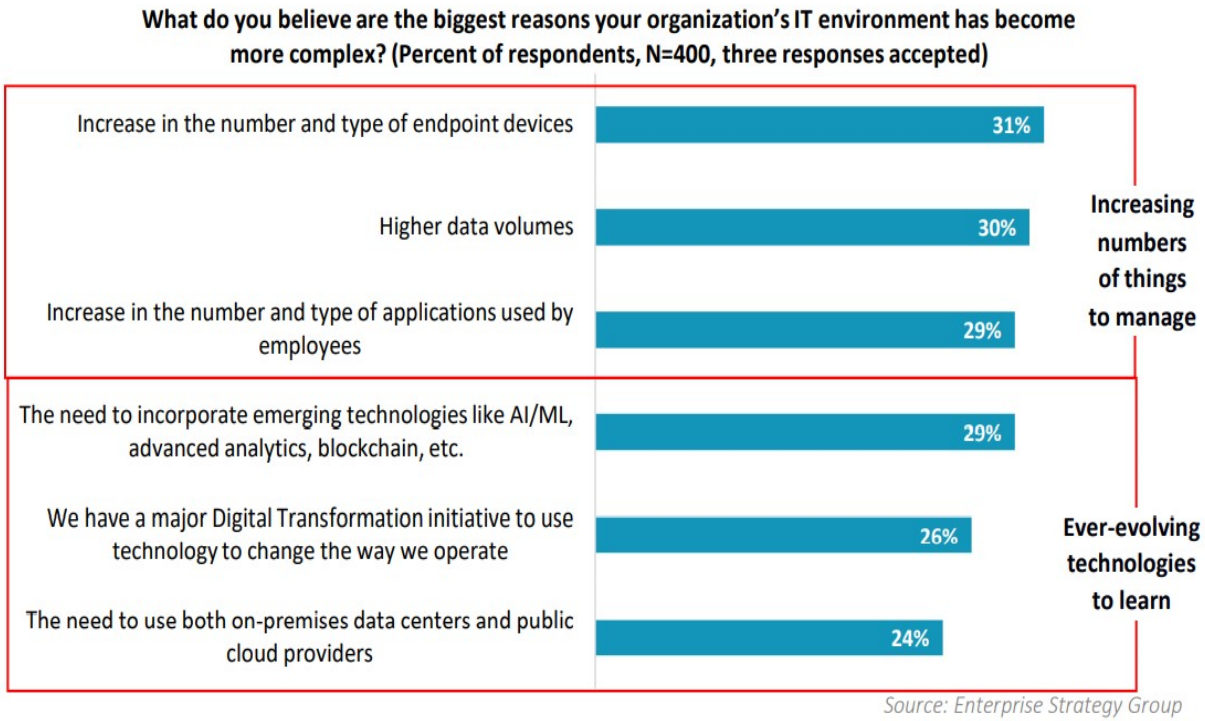


Figure 3. 4: Top Six Factors Driving IT Complexity (ESG, 2019)

- **Differentiations with the organization structures**

According to Tubin (2007), ICT generates the following three kinds of differentiations within the organization's structure viz., segmentation, stratification and functional differences. All these differences increase internal complexity and enhance organization adaptability, and in a recursive process, affect organization communication and its sensitivity toward further ICT integration. **Segmentation** in the IT environment might mean dividing ICT users into different groups based on common characteristics which also have impact of the effectiveness of the service which is provided (Shopify, n.d.); whereas **Stratification** refers to the division of something into different classes, layers or categories (*Stratification - Dictionary Definition : Vocabulary.Com*, n.d.; *Stratification Definition and Meaning | Collins English Dictionary*, n.d.). Lastly, **Functional differentiation** refers to the aspects related to a functional structure that divides the organization into departments based on their function; where each department is headed by a functional manager and employees are grouped as per their roles (Usmani, 2020).

- **Different Stakeholders**

The above paragraph confirms the complexity of the organization in terms different categories of stakeholders. Therefore, according to Harrison et al. (2015), for an organization to achieve its

objectives it should be effective in terms of harnessing the energy of stakeholders towards the fulfillment of those objectives. Harrison et al., further shows the need and benefits of managing stakeholders in a complex and turbulent environment which includes the availability of better information upon which to base their decisions.

b) Synergy

An inaction is synergistic when the accomplishment of the goals of the one contributes in the attainment of the goals of the other; which at the end contribute in the attainment of the organizational objectives (Nhlabathi, 2001; Rodríguez Fernández-Blanco et al., 2019). Nhlabathi (2001) contended that for the mechanisms of viability to function properly, the principle of synergy must be ensured. Different system elements and the systems themselves must be able to work together without or with minimum problems; this make the organization more effective than when each part of the system is acting alone. With synergy, the whole is greater than the sum of its parts; synergy is expected to occur whenever system elements or systems themselves interact alluded Nhlabathi. In other words, the outcome of part of the whole must be in alignment with the overall outcome of the whole. Hence, the concept “alignment” is relevant when discussing synergy. VSM enables stakeholders of the enterprise to interact as a synergetic whole; and this enable them to control complex projects, the integration and coordination of project teams (Mohamad, 2018). For example, the Council, the highest decision-making body, set direction regarding the implementation of ITG in the organization, executive management and the rest of the line managers must work towards that direction. What is important is that alignment should be ensured on an on an ongoing basis (De Vos, 2019). Another example from the ITG frameworks point of view is COBIT 5 which also has a goals-cascade approach where IT goals should cascade from the organizational goal; and an enabler goal that must cascade from the IT goal and the enabler concept includes processes, organization structures and information (COBIT 5 Task Force, 2012). Khaiata & Zualkernan (2009) mentioned that one key area of concern for ITG role players is the ability of the ITG implementers to “measure” the alignment of ICT and organizational performance. For example, this might include the ability to assess if the implemented IT is able to support or enable the organizational strategy. Therefore, synergy is one of the principles that can ensure successful implementation of ITG in HEIs.

The ITG Stakeholder Synergy Perspective: Tantalo & Priem (2016) also brought the concept of stakeholder synergy perspective into light. This emanates from the fact that there are multiple potential sources of value creation exist for all ITG stakeholder groups within an organization. Therefore, the stakeholder synergy perspective is where a single strategic action create value for

different ITG stakeholders simultaneously, synergistically, and without reducing the total value already created (Dyduch, 2019; Tantalo & Priem, 2016).

c) Local Autonomy

Local autonomy does not in any way mean separation but the freedom to act within a clear accountability; different structures have different levels of accountability with regard to the alignment of ICT in HEIs (Alqurashi et al., 2013). Lower recursive-levels are also granted decision-making power as long as there is coherence or alignment with the overall system (Schwaninger, 2006). Walker (2018) stated that operational units must be given as much autonomy (freedom) as possible, and the only restrictions involves system cohesion. Hence, ISACA (2012b) mentioned the RACI chart that guides the responsibility and accountability of different stakeholders in the implementation of ITG in an organization; and this has something to do with the kinds of decisions that stakeholders are authorized to make. One of the benefits of local autonomy is that it reduces turnaround time to resolve issues as they are handled immediately and directly by the lower level operational units (ISACA, 2019). Each system contains within itself the capacity to adapt to changing environment and to deal with the complexity that is relevant for it (Espejo & Gill, 2011).

d) Ability to Respond to Environmental Changes

This is a dynamic view that signifies the capability of a system to adapt through interacting with both internal and external environment; and it should be capable respond to environmental changes including those that were unforeseen at the time the system was designed (Beer, 1972; Yang et al., 2019). The same applies with the implementation of ITG in an organization; its capability to respond new business demands has a major contributing fact towards its viability and this must include those that are unforeseen at the time the system was designed or implemented (Beer, 1972; ISACA, 2018b)(Beer, 1972). With the influence of new digital technologies in conjunction with innovative thinking driving new business models, flexible organizational structures and optimized processes; it is essential for the organization ensure that ITG framework have provisions to adapt to such changes (Vejseli et al., 2019).

As one of the principles, COBIT 19 Framework recommends that a governance system should be dynamic, and ensure that each time one or more of the design factors are changed, the impact of those changes on the enterprise governance of information and technology (EGIT) system should also be considered (ISACA, 2018b).

e) Direct Feedback

Direct feedback guarantees effective communication channels, the proper design of information flow and reliable information systems (Alqurashi et al., 2013). In this case, a viable system will ensure effective communication between and/or among its components. Viable systems are results of the connectivity (i.e. communications and interactions) among primary and regulatory activities (Espejo, 1990). Furthermore, the organization's total transformation is thus produced by the synergistic communications of multiple autonomous units (Espejo, 1990). This also describes the aspects of stakeholders' involvement which is about the participation of stakeholders in a planning or decision-making process (Hauck et al., 2014). Stakeholders should be afforded an opportunity to have a say in determining what they expect from IT, and what their priorities are, in ensuring that expected value is being delivered (COBIT 5 Task Force, 2012). De Vos (2019) provided an example of scheduling brief weekly or bi-weekly ICT strategy and organizational alignment meetings with stakeholders to create strategic plans and assess the implementation of the ICT strategy. Klier et al. (2017) also confirmed the need for large number of stakeholders to contribute in ICT projects in public institutions where according to Berisha-Shaqiri (2015); ICT can also help to contribute in enabling them to participate and contribute in the programs and projects, regardless of their location and physical distance.

Therefore, the need to involve stakeholders is crucial to provide and get feedback; and also, the need to ensure effectiveness and efficiency in the way stakeholders are involved; hence the use of ICT as suggested in the paragraph above. Fernando (2019) provided a table that can serve as a guide in terms of the feedback that those who have a role in the ITG can use to get and provide feedback related to ITG as and when is needed. **Table 3.7** shows the elements of SCORE-card.

Table 3. 7: The Elements of a SCORE-card (Source: Fernando, 2019)

	Element	Description
S	**Social**	Measures the effects and impact of the ICT department on its stakeholders, starting within the department but extending to the University communities and the stakeholders outside the organization (**E.g.** quality of IT Services the ICT department provides to the University) (Fernando, 2019).
C	**Commercial**	This covers the ICT department in terms of financial and market terms and the effectiveness and efficiency of the services, market, organization development and the research and development that it drives (Fernando, 2019).

O	**Operational**	This covers feedbacks that can be provided in terms of all operational aspects of the ICT department across all activities, resources, data, suppliers, structure and governance, from the percentage of on-time, in-full deliveries through the number of reported incidents (Fernando, 2019).
R	**Reputational**	This covers the perceptions of key stakeholder groups, e.g., including customers, employees, and suppliers (e.g. academics, researchers, students and administrators) (Fernando, 2019).
E	**Environmental**	This covers the assessments regarding the impact of the IT activities or projects on natural resources (e.g. energy consumption, waste footprint) (Fernando, 2019).

f) Recursiveness

The term Recursive is used to indicate that a viable system contains, and is also contained in a viable system, i.e., any viable system, irrespective of the level of recursion that it occupies, it must contain five subsystems. This implies that each system or sub-system has self-organizing and self-regulatory characteristics (Beer, 1979; Beer, 1984a; Espejo & Gill, 2015; Regaliza et al., 2017). In this case, systems structured the same way, are nested in each other. Even the principles of the organization recur at all organizational levels, regardless of scale (Walker, 2018). Recursion is also used to handle and manage the complexity of a system by structuring the system into several recursive levels (Hildbrand & Bodhanya, 2015); and every level should be recursively in synergy with the previous level (Ríos, n.d.).

The principle of recursiveness ensures that the governance and management of IT is happening at every level of the organization (De Haes & Van Grembergen, 2015; Huygh & De Haes, 2018; Prasad et al., 2012). It should be seen happening at the interorganizational level, at the corporate level, at the business domain-level, at the project level and at the project task-level (Huygh & De Haes, 2018). Through a concept called goals cascade, COBIT 5 and COBIT 2019 Frameworks ascertain recursiveness in this regard by ensuring that each governance or management objective supports the achievement of alignment goals that are related to larger organizational goals (ISACA, 2018b).

3.8.3 Studies on the Determinants of Effective ITG

Table 3.8 shows provides a glimpse regarding previous studies that also mentioned the factors that are in line with the principles of viability as essential for the organizational strategy and ICT alignment.

References	Study/Aim	Results	VSM Principles
Laitinen, (2016)	Business and ICT alignment in a global industrial organization	Business and ICT alignment is a guiding principle that should be visible in all parts and levels of the cooperation between business and ICT.	• Recursive
Plazaola et al. (2006)	A metamodel for strategic business and ICT alignment assessment	One of the measures for alignment is the degree to which the authority making ICT decisions is defined and shared among management.	• Local Autonomy
Luftman et al. (2017)	Enhancing the measurement of information technology (IT) business alignment and its influence on company performance	The study confirms that communication activities (e.g., understanding of business by IT, Understand of IT by business), value analytics activities (e.g., ICT and business metrics), IT governance activities (e.g., strategic planning, reporting, budgeting), partnership activities (e.g., maintaining working relationship between business and ICT organizations),IT scoping activities (e.g., promoting the creation of a flexible IT infrastructure, its evaluation and application of emerging technologies, driving business process change, and delivering valuable customized solutions), and positioning and balancing business and ICT skills all form a part of the IT-Business alignment.	• Complexity • Synergy
Maes et al., (2000)	The aim of the study was to re-assess business – ICT alignment by repositioning it in	The study suggested that any further attempt to enhance organization and ICT alignment should at least take the following into consideration: • It should consider alignment as a dynamic process	• Ability to Respond to Environmental Changes

	a unified framework.	• It should consider alignment at different levels, ranging from strategy to implementation • It should take the relevant business and technological contexts into account It should pay clear attention to the human factors	• Synergy
Reich & Benbasat, (2000)	Factors That Influence the Social Dimension of Alignment Between Business and Information Technology Objectives	• Communication between ICT and business executives • Connections between ICT and business planning	• Direct Feedback
Chan et al., (2006)	Antecedents and Outcomes of Strategic IS Alignment: An Empirical Investigation	Organizational size affects alignment of the organization and IT since in general: • Small and medium size organizations tend to be structured around functions and use centralized structures to coordinate subunits. • Whereas in large organizations the decentralized governance structures make coordination more difficult and therefore more mechanisms and resources to ensure strategic alignment are needed.	• Complexity
Vessey & Ward (2013)	The Dynamics of Sustainable IS Alignment: The Case for IS Adaptivity	Organizations and IT are conceived as integral of several part that co-evolve over time; therefore sustainable ICT alignment results when an organization's IT adapt to remain in alignment with the constantly-changing organization's goals (Vessey & Ward, 2013).	• Complexity • Ability to Respond to Environmental Changes

3.9 CONCEPTUAL FRAMEWORK

The conceptual framework (CF) - **Figure 3.5** (displayed on page 68) provides a summary of the systems perspective for implementing effective ITG in an organization. The aim of the study was to develop an ITG system that will enhance the alignment of ICT strategy and organizational strategy in HEIs. Therefore, the ITG mechanisms and their roles in this CF were identified based on systems and factors of the VSM.

3.10 SUMMARY

The Chapter reviewed literature regarding systems thinking, systems theory and viable systems models. The benefits of systems thinking, and types of systems theory were also explored. It is from the concepts (i.e., systems and principles) of VSM where the conceptual framework portrayed in Figure **3.3** was derived.

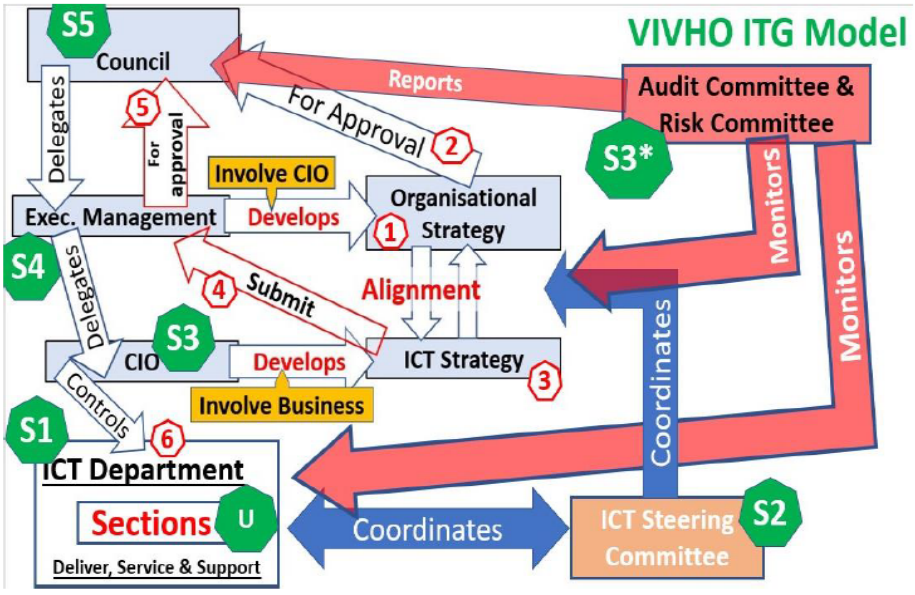


Figure 7. 1: VIVHO ITG Model

ICT STRATEGY DEVELOPMENT PROCESS

1. Executive develops organizational strategy (OS)
2. Involve the CIO/ICT
3. OS approved by Council
4. CIO develops ICT strategy
5. Involve the business
6. Submit to the executive management for approval and, for submitting it to Council
7. ICT strategy approved by Council
8. Implementation by ICT Department

Determinants of ITG

1. Complexity
2. Synergy
3. Recursiveness
4. Local Autonomy
5. Ability to respond to environmental changes
6. Direct Feedback

VSM Systems	What are the mechanisms of ITG in HEIs?	What are the roles and responsibilities of the identified ITG mechanisms in HEIs?
S5 System 5	Council	**Policy Decisions** • Strategic envisioning
S4 System 4	Executive Management	**Planning** • Develops organizational strategy • Ensure involvement of the CIO/IT
S3* System 3*	Audit Committee Risk Committee	**Monitoring**: • Ensure the alignment of the ICT strategy and the organizational strategy
S3 System 3	Chief Information Officer	**Controlling** • Develops ICT strategy • Involve the Business
S2 System 2	ICT steering committee	**Coordinating** • Development and implementation of the ICT strategy
S1 System 1	ICT department	**Implementation** • Implement provisions of the ICT strategy
U Units	Sections within the ICT Department	**Operational** • Deliver ICT services in line with the provisions of the ICT strategy

Figure 3. 5: Conceptual Framework: A Systems Perspective of ITG

Chapter 4 Research Methodology

4.1 INTRODUCTION

This chapter discusses different aspects and components of the research methodology that guided the study, and includes the research paradigm, the research strategy, the research design, the study population and how sampling was done. It also discusses data collection procedure implementing in the study, research limitations and delimitation, data analysis, and lastly, ethical principles that were adhered to. Research methodology is the procedure or process by which researchers go about their work of describing, explaining and predicting phenomena (Rajasekar et al., 2013). According to Kivunja and Kuyini (2017), it articulates the series of steps and flow of the systematic processes followed in conducting a research project, so as to gain knowledge about a research problem.

4.2 RESEARCH PARADIGM

A research paradigm is the worldview of the researcher as it constitutes the abstract of basic set of beliefs and principles that shape how a researcher sees the world, and it also looks or considers how the researcher interprets and acts within that world (Kaushik & Walsh, 2019; Lather, 1986). Nominating and adopting a research paradigm is the foundation for subsequent choices of research methodology, methods, literature, or research design. A research paradigm provides beliefs and dictates that influence what should be studied, the way knowledge regarding the study should be collected and interpreted (Kamal, 2019; Kivunja & Kuyini, 2017; Mackenzie & Knipe, 2006).

Through the research paradigm, the researchers can examine the methodological characteristics of their research projects to determine the research methods that will be used and how the data will be analysed (Kivunja & Kuyini, 2017). It is also considered as an approach to thinking about and doing research (Antwi & Kasim, 2015).

4.2.1 Types of Research Paradigm

Table 4.1 shows and discusses four different types of research paradigms.

Table 4. 1: Four Types of Research Paradigm

Research Paradigm	Description
Positivism	Positivism paradigm is grounded in what is known in research methods as the scientific method of investigation; and is relevant for the investigations that require observations to be interpreted and explained in terms of facts or measurable entities (Fadhel, 2002; Kivunja & Kuyini, 2017; O'Leary, 2004). It is mostly aligned with quantitative data collection and analysis (Mackenzie & Knipe, 2006). Kivunja & Kuyini (2017) further mentioned that conclusion of the research that are in this paradigm are derived based on deductive logic, formulation and testing of hypotheses, offering operational definitions and mathematical equations, calculations, extrapolations, and expressions.
Transformative	The transformative research paradigm allows for multiple realities in a society and promotes comprehension of the influence of social, political, cultural and economic perspectives (Malisa et al., 2019). In other words, researchers adopting this paradigm also take issues related to social justice into consideration; and they also ensure that their investigations are intertwined with economic issues, politics and political agenda with an intention to influence the change in the lives of the participants, the institutions in which they work or live, and the life of the researcher (Creswell, 2003; Malisa et al., 2019).
Pragmatic	Pragmatism is not only devoted to any one system of philosophy or reality (Mackenzie & Knipe, 2006). However, it provides a philosophical framework for mixed-method research; and by combining methods the researcher can expect to arrive at knowledge of greater completeness without compromising the rigor of the study (Alonge et al., 2019; Somekh & Lewin, 2004; Szyjka, 2012). This paradigm places the research problem and the researcher question to be central, data collection and analysis methods are chosen without worrying about being loyal to any philosophy or paradigm as the interest is to use those methods that are most likely to provide insights into the question (Creswell, 2003; Kankam, 2019; Mackenzie & Knipe, 2006). It enables a researcher to focus on the "what" and the "how" of the research problem (Creswell, 2003, 2009).

Interpretivism	Interpretivism paradigm is implemented in an endeavour to understand the subjective world of human experience; and it attempts to comprehend and interpret what the subject is thinking or the meaning he or she is making of the context (Guba et al., 1989; Kivunja & Kuyini, 2017). The ontological position of interpretivism is relativism since the proponents of this paradigm contend that knowledge is subjective and is interpreted through the perspective of the viewer rather than the viewpoint of the observer (Kivunja & Kuyini, 2017; Scotland, 2012; Szyjka, 2012). Interpretative paradigm is also suitable for exploring hidden reasons behind complex, interrelated, or multifaceted social processes, such as inter-organizational relationships or inter-departmental politics, where quantitative evidence may be biased, inaccurate, or otherwise difficult to obtain.(*Chapter 12 Interpretive Research | Research Methods for the Social Sciences*, n.d.)

4.2.2 Justification of the paradigm

Interpretivist researchers contend that there is neither universal truth nor worldview about an aspect (Kankam, 2019); this statement implies that different role-players in the ITG have different views regarding the implementation of ITG in the organization. In line with this view, employing this paradigm enabled the researcher to get different views regarding the implementation of ITG in an organization of HEIs. More especially on the identification of the ITG mechanisms and their roles, and the factors that influence ITG governance. The fact that this paradigm does not exclude empirical observation as a viable source of knowledge was also considered when adopting Interpretivism (Packard, 2017). Interpretivism afforded the researcher with the opportunity to consider and peruse ITG documents, e.g., ICT Governance Framework, when making conclusions.

According to Packard (2017), what interpretivists object to is the positivistic belief that such observations are representative and self-explanatory, and that they require no further inquiry into their causes. Packard also mentioned that interpretivists typically presume that knowledge emerges from both experiential (exogenous) and imaginative (endogenous) sources. Hence, the implementation of this paradigm afforded the researcher with the opportunity to establish certain causes of the certain ITG situation within the institution by way of observing and going through certain ITG documents; and also, by way of collecting data from different ITG role players.

Interpretivism approach also provided the researcher with the opportunity to comprehend, interpret, and understand the ITG related aspects for the ITG role players' perspective and also from his own angle (Kankam, 2019; Khan, 2014). For example, it also enabled him to establish performance and relationships amongst different ITG mechanisms. The researcher was also able to infer reasons or conclusions based on the analysis of the responses and data perused from the ITG documents.

Following Alharahsheh and Pius (2020), adopting interpretivist paradigm also brought the following qualities into play:

a) It enabled the researcher to focus on the whole experience regarding ITG in HEIs rather than considering certain ITG components.

b) The questions and problems identification and development of the research was mainly influenced by the researcher in terms of his interest in the ITG mechanisms and factors that have impact of the implementation ITG in the organization as well as commitment.

c) The interpretivist paradigm enabled the researcher to explore further depth of individual experiences through in formal discussions and interviews regarding ITG in the organization.

d) It also enabled the exploration of ITG role players' experiences in depth through adoption of qualitative designs and methodologies.

e) It enabled the usage of research and ITG experience as highly important aspects and contribution to support scientific research on ITG.

f) It enabled the researcher to further explore in depth, throughout individual role players' experiences rather than considering generalised measurements or expectations as given in the positivist paradigm.

4.2.3 Elements of Research Paradigm

According to Scotland (2012), epistemology, ontology, methodology and axiology are the four essential elements of research paradigm and they are briefly discussed in the sub-sections below.

a) Epistemology of the Study

The word comes from episteme which is a Greek word for knowledge and it is concerned with: (1) how to get to know something and (2) how to get to know the truth or reality (Kivunja & Kuyini,

2017). Epistemology is basically about the fundamentals of knowledge and it is concerned with its nature, and forms and how it can be acquired, and how it is communicated (Cooksey & McDonald, 2011; Kivunja & Kuyini, 2017; Slavin, 1984).

According to Slavin (1984), there are four sources of knowledge as mentioned and summarised below.

- **Intuitive knowledge:** This includes forms of knowledge such as faith, beliefs, and intuition.
- **Authoritative knowledge:** This includes data collected from people who know, books, leaders in organizations.
- **Logical knowledge:** The emphasis is on reason as the surest path to knowing the truth.
- **Empirical knowledge:** The emphasis on the understanding that knowledge is best derived from sense experiences, and demonstrable, objective facts.

In this study, the sources of knowledge were mainly people who participate in the ITG of the institution. These are people and structures that are authorised to perform certain ITG related roles within the institution. The outcome of the study was a result of the combination of authoritative knowledge, logical knowledge, and empirical knowledge on ITG related matters.

According to Bunniss and Kelly (2010), the nature of knowledge (epistemology) in interpretivism approach is subjective. There are multiple, diverse interpretations of single phenomenon or reality; and there is also no one ultimate or ‘correct’ way of knowing. It is in line with these provisions on epistemology which enabled the research to acquire diverse views from the different ITG role players on ITG matters and this contributed in having a holistic view of the ITG in the organization.

b) Ontology of the Study

Ontology as a branch of philosophy is concerned more about the assumptions that are made in order to believe that something makes sense or is real (Scotland, 2012). It is essential to a research paradigm because it helps the researcher to understand the things that constitute the world, as it is known (Scott & Usher, 2004). According to Kivunja and Kuyini (2017), the above makes the researcher to make meaning of the data he/she gathers, since these assumptions, concepts or propositions contribute in orientating his/her thinking about the research problem, its significance, and how he/she might approach it so as to contribute to its solution. In this study,

this was taken care of in the literature review sections where different literature in the field of ITG were consulted to establish the current realities regarding the implementation of ITG in HEI.

Interpretivists adapt a relativist ontology in which a single phenomenon may have multiple interpretations, the nature of reality is considered to be subjective and changing; and there is no one ultimate truth (Bunniss & Kelly, 2010; Lan, 2018). The same applies to ITG in an organization; different role players have different view on its contribution to the alignment of ICT and business. Hence, the need to understand and comprehend those views before coming up with the conclusions. The fact that there is no ultimate truth; provided the researcher with the opportunity to collect data to assist him to respond to research questions from different ITG role players; and then, the collected data provided the views about ITG in the organization.

In interpretivism paradigm, a truth that is not determined by a process of measurement (Lan, 2018). Using this paradigm, allowed the researcher to have in-depth discussions with ITG role players. This also afforded the researcher to gain more knowledge than he would have gained if he used measuring tools.

c) Methodology

Methodology is concerned with the general research strategy followed to conduct research (Alharahsheh & Pius, 2020). This includes the overall activities of the research as it deals with why, what, from where, when and how data is collected and analysed (Scotland, 2012). It details the logic and flow of the systematic processes which are followed in conducting a research project, to gain knowledge about a research problem (Kivunja & Kuyini, 2017). This would also identify the methods to be used and match with the outlined research strategy (Alharahsheh & Pius, 2020).

However, Abdelsamie et al. (2014) in their studies found that there is a very close relationship or connection between interpretivist paradigm and qualitative methodology. Hence a section on research method and research design provides details regarding the adoption of qualitative research method in this study.

d) Axiology

Axiology refers to the ethical issues that the researcher had to take into consideration when planning and conducting a research; and this involves defining, evaluating and understanding concepts of acceptable and unacceptable behaviour or conduct relating to the research (Kivunja & Kuyini, 2017). Axiology plays an important role as it suggests values, standards and requirements for acceptable research approach and research techniques for this research; and

this ensures rigour for action in research (Aliyu et al., 2015; Kroeze, 2011). The aim of axiological perspective of a research paradigm is also to ensure the level of consistency and reliability during the research process (Aliyu et al., 2015).

However, the focus of the positivists' axiology is on the honesty, integrity, and trust of the researchers (Thapa & Hajboluri, 2020). On the other hand, the focus of the interpretivists axiology is on a balanced viewpoint, understanding the context, and developing a rapport with the community (Thapa & Hajboluri, 2020). As this study is interpretivist, the focus of axiology was on balancing and understanding different points of view from the ITG role players regarding the implementation of ITG in HEIs. This was the most important guiding principle for the study.

Note that before the researcher started conducting the study, he had to apply to the University Research Ethics Committee using the preapproved application templates that require the applicant to justify how is he/she going to deal or address key or critical ethical issues during the study. The Research Ethics Committee approved application and the researcher was awarded ethical clearance certificate.

4.3 RESEARCH METHODS

According to Alharahsheh and Pius (2020), research methods are more related to the techniques that are used to collect and analyse data in order to produce and develop knowledge. The researcher can either adopt quantitative or qualitative research; however; in some other studies both two techniques are used as mixed-methods (Alharahsheh & Pius, 2020). This study adopted interpretivism paradigm with an intention of getting in-depth understanding ITG in HEIs through collection and interpretation of qualitative data that leads to deep insight and conclusions (Alharahsheh & Pius, 2020). Hence, the research method used was qualitative research. The adoption of qualitative research enabled the researcher to get a thorough understanding of the ITG mechanisms and factors that have influence on the ITG in HEIs.

The qualitative research enabled the researcher to conduct the study in the natural setting; and this enabled him to have a holistic picture regarding ITG in HEIs as he was able to interview ITG role players (Khan, 2014). The researcher also managed to peruse ITG documents which included the ICT Governance Framework, ICT Steering Committee Terms of Reference, minutes of the ICT Steering Committee, Draft of the Univen ICT Strategy 2021 to 2025; and ICT Steering Committee Report Final 01 September 2020. Copies attached as **Appendix H**, **Appendix I**, **Appendix J** and **Appendix K** respectively.

Bearing in mind that according to Alharahsheh and Pius (2020), qualitative research is also aimed to attain deep understanding of a specific case with in-depth exploratory studies to enable finding quality responses, the qualitative responses from participants enabled the researcher to acquire new knowledge regarding ITG in HEIs; from which a holistic view of the ITG in the HEI was established. The researcher was also able to make follow-up and clarity seeking questions during the data collection process.

4.4 RESEARCH STRATEGY

A research strategy transforms the ontological (nature of reality) and epistemological (theory of knowledge) principles into guidelines that provides the overall direction and process which specify how the research is to be conducted (Abeysekera, 2019; Sarantakos, 2005). The research strategy covers the following surveys, experiments, case study method, action research, and ethnography (Abeysekera, 2019). Therefore, this study adopted a case study in which qualitative research was adopted.

According to Aspers and Corte (2019), the premise to depart from is that from a qualitative perspective, quantitative research is about numbers and counting, and from a quantitative perspective, qualitative research is everything that is not about numbers. However, it is also worthy to note that each research methodology has its own relative weakness and strength (Tuli, 2010).

The quantitative traditionalists articulate assumptions that are consistent with positivist paradigm and believe that social observations should be dealt with as entities in much the same way that physical scientists treat physical phenomena (Krauss & Putra, 2005; Tuli, 2010). Whereas the qualitative traditionalists also called interpretivist or constructivist reject the positivist assumption and contend that reality is subjective, multiple and socially constructed by its participants (Krauss & Putra, 2005; Tuli, 2010).

According to Aspers and Corte (2019), qualitative research is considered as multimethod in focus which involves an interpretative, naturalistic approach to its subject matter. The research is conducted in the natural settings as an attempt to make sense of, and/or interpret, phenomena in terms of the meaning participants bring to the researcher. Most qualitative researchers studying human phenomena collect data through interviews with individuals or groups; and the selection of the type of interview also depends on the purpose of the study and the resources available (Carter et al., 2014). The researcher in the case of qualitative research interacts with what is being researched (Abeysekera, 2019). For the researcher to collect data from the ITG role player, he

had to interview them. This is one of the benefits that qualitative research provided during the study.

In quantitative research, data mostly consists of variables on different scales, such as ordinal, but frequently ratio and absolute scales, and the representation of the numbers to the variables (Aspers & Corte, 2019). For example, quantitative could be helpful in a research where the researcher seeks to establish the number of ICT steering committee meeting, the response in this regard would be in terms of numbers. However, even though the justification of the assignment of numbers to object or phenomenon is not questioned, the validity is the one that may be questioned (Aspers & Corte, 2019). This is where the researcher is concerned about the extent of the accuracy of the number provided (Heale & Twycross, 2015).

Unlike in the quantitative research methodology, in the qualitative research methodology, the researcher has unlimited freedom of movement between the steps of research due to its flexible design (Tuli, 2010). A good example to demonstrate the flexibility is the freedom of the researcher to be able to go back to the participant and seek clarity on certain aspects if there are gaps in the response he provided during the interview.

Although both the qualitative research strategy and quantitative research strategy are recognized as a means to conduct research, the relative preference of each research methodology depends on philosophical issues related to the question of ontology and epistemology (Abeysekera, 2019; Tuli, 2010). Therefore, following a brief overview of the nature of reality and the nature of knowledge as highlighted in the ontology and epistemology subsections; in this study, the researcher adopted the qualitative research strategy.

4.5 RESEARCH DESIGN

The research design is a plan that shows how the researcher will systematically collect and analyse the data that is needed to answer the research questions and it distinguishes research from other forms of observation (Bertram & Christiansen, 2014). According to Bertram and et al, research design should provide clarity on the following issues: (1) the data that the researcher must collect in order to answer the research question; (2) the data collection methods that will be used; (3) what the researcher will do with the data once it is collected; and how the researcher is going to analyse and make meaning from the collected data. They further suggested that it is worth noting that the research design is not a fixed plan, but flexible, and it can be customized as and when necessary. This enabled the researcher to also change the data collection method

during Covid-19 Lockdown Level 5 from semi-structured interviews to sending the interview guide with questions to participants.

A case study is an intensive investigation of a phenomenon in a particular unit under consideration; and this investigation happens within the natural settings, employing multiple methods to gather information from one or a few entities - people, groups, or organizations (Benbasat, 1984; Bonoma, 1985; Kothari & Garg, 2014). It is also defined as intensive study about a person, a group of people or a unit, which is aimed to generalize over several units (Gustafsson, 2017). Gustafsson indicated that a Multiple case study is when a study includes more than one single case.

In line with the above, the researcher employed case study as a research design since it ensures in-depth and intensive study of the phenomenon; and in this study, it also enabled the researcher to dig deeper into the issues related to the implementation of ITG in HEIs (Kothari & Garg, 2014). Nieuwenhuis (2016a) mentioned that the researcher must also decide on whether the case study must consist of single or multiple cases. Therefore, in this study, it consisted of a single case since the researcher conducted an in-depth study of ITG in a rural based historically disadvantaged institution. See **Figure 4.1** that outlines the research design of the study.

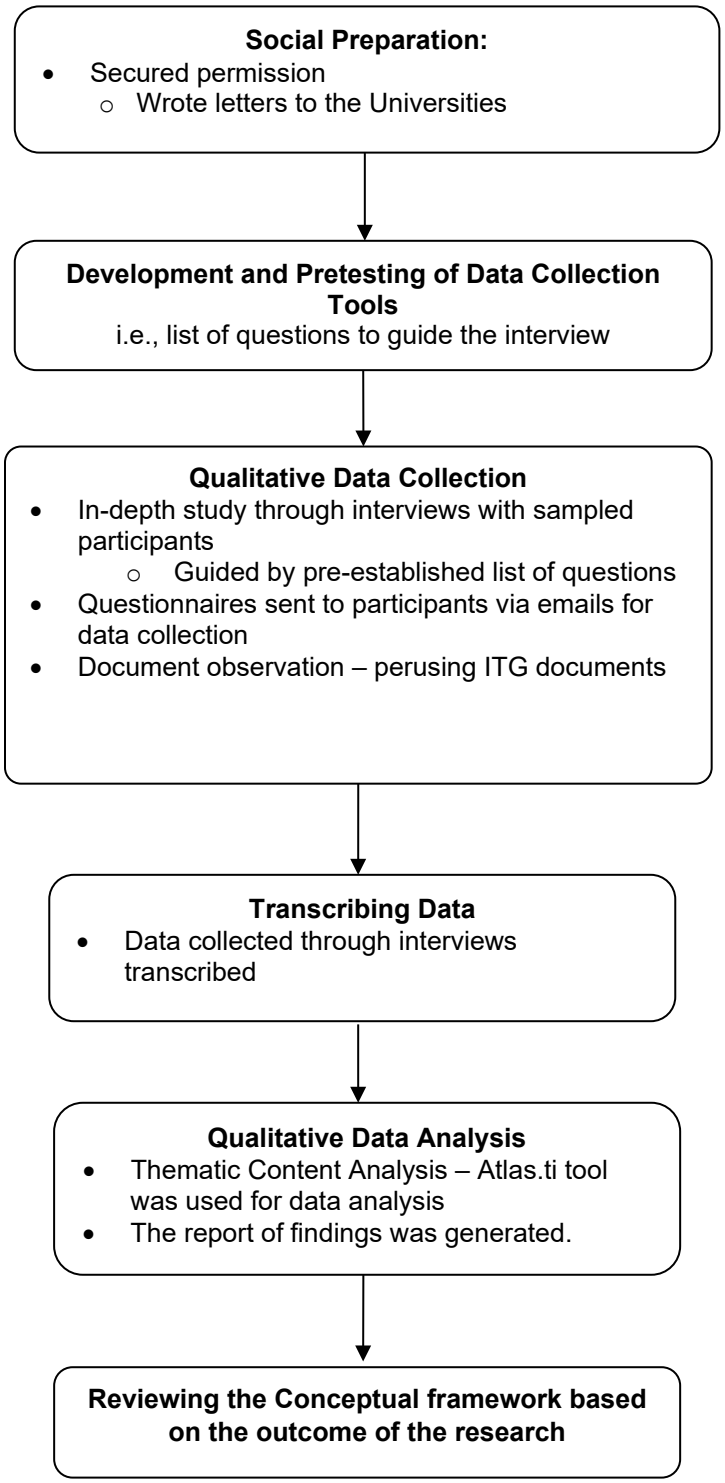


Figure 4. 1: Research Design of the Study

4.6 DATA COLLECTION

Research relies on evidence or information that researchers collect in order to find answers to the questions they have. It is the research questions, research designs and the research paradigm that determines the data to be collected and how it is collected (Bertram & Christiansen, 2014). This process begins after a research problem has been defined and research design or plan has been drafted (Kothari & Garg, 2014). These are research plans that cannot help the researcher with anything if there is no data to study. The same applies in this study, the researcher had to collect data to come up with the findings related to the problem that eventually contributed to bringing the solution to the identified problem.

Therefore, there are two types of data that researchers can use in their studies. There is primary data which is collected afresh and for the first time; and there is also secondary data which is already collected by someone else (Kothari & Garg, 2014). In this study, the researcher collected primary data by way of interviewing ITG stakeholders, by sending the list of questions to the respondents via email. The researcher collected secondary data by way of perusing the following documents: University Strategic plans, ICT Governance Framework, ICT Steering Committee Terms of Reference and minutes of the previous ICT steering committee meetings.

4.6.1 Data Collection Methods

There are several methods of data collection that can be used across investigations that are classified as qualitative, quantitative or mixed methods; and these differences are usually due to the restrictions related to the enquiry, freedom and flexibility in the structure and approach in gathering data, and the depth and freedom given to the researcher in probing to obtain answers to the research questions (Kumar, 2014). Therefore, the researcher must select the most relevant method(s) and measuring instrument to obtain the most relevant information for a study; every data collection method has its own advantages and disadvantages (Bertram & Christiansen, 2014; De Vos, A et al., 2011). This suggests that researchers will have to choose the methods that are effective and efficient in their study. The primary data was collected using the interviews and observations data collection methods as they are briefly discussed here below.

a) Interviews

Interviewing is one of the research techniques that are used to collect data from subjects or respondents (Adhabi & Anozie, 2017). Through research interviews, researchers explore the views, experiences, beliefs and/or motivations of individuals on specific matters (Gill et al., 2008).

In this study, the researcher had to choose semi-structured interviews with respondents from the three interview data collection methods as discussed below:

i. Unstructured interviews

Unstructured interview does not reflect any predetermined theories or ideas and are performed with little or no organization (Gill et al., 2008). They are also considered as controlled conversations that are aimed at bending towards the interests of the researcher; and they enable researchers to have the freedom to ask whatever he/she wants if it is in line with the objectives of the study (Adhabi & Anozie, 2017). However, the researcher did not use it for it lacks the establishment of a guide that provides order in terms of the questions to be responded to.

ii. Structured interviews

The structured interviews are, basically, verbally administered questionnaires by use of which the researcher follows a predetermined set of questions, using same wording and order of questions as specified in the interview schedule (Gill et al., 2008; Kumar, 2014). Interview schedule is a list of written open-ended or closed-ended questions which is meticulously pretested for standardized wording, meaning and interpretation, prepared for use by the researcher. Structured interview is relatively quick and easy to administer since the interview schedule levels the ground for collecting uniform information and it is also easier for the comparability of data (Gill et al., 2008; Kumar, 2014).

However, if the researcher requires a data collection method that would enable him or her to get in-depth information for the respondents, structured interviews may not the most relevant method to use (Gill et al., 2008). According to Gill and colleagues, structured interviews only allow for limited participant's responses since there is little or no variation and with no provision for follow-up questions to responses that warrant further elaborations. Therefore, the fact that the researcher could not make follow-ups on participants' responses when using structured interviews contributed to the decision not to use it as data collection method in this study.

iii. Semi-structured Interviews

Semi-structured interviews are also guided by the interview schedule or guide with interview questions for the analysis of the objective knowledge; and participants have the freedom and flexibility to respond to these open-ended questions in the way they wish (McIntosh & Morse, 2015). In this regard, the researcher developed an interview guide; and the questions in it were designed in such a way that the respondent was free to provide any information which he or she felt was relevant for the question (Copy attached as **Appendix G**).

The same applies to the researcher, whereby he or she may probe the responses that are provided by the respondent. It is because of this flexibility regarding the responses, and the ability of the researcher to probe responses that constitute the semi-structured aspect of this interview method (McIntosh & Morse, 2015). Even, in this study the researcher was able to make follow-up questions; and this contributed in the quality and in-depth of information that he acquired from the respondents. The respondents freely shared their experiences and provided lot of insight and knowledge regarding ITG in the organization.

b) Observation

Observation is a data collection method which is a purposeful, systematic and everyday process of collecting primary data through recording the behavioural patterns of participants, objects and occurrences without necessarily questioning or communicating with them; and it is a scientific tool when it serves a formulated research purpose; and it is also subjected to checks and controls on validity and reliability (Kothari & Garg, 2014; Kumar, 2014; Nieuwenhuis, 2016a). However, data collection in which direct observation methods like systematic and participant observation, or indirect observation methods like questionnaires and interviews are used, can be controlled using appropriate statistical techniques (Mouton, 2009).

According to Barker (1980), researchers must be aware of the important advantages that make observation to be best suited for certain kinds of studies. Kothari and Garg (2014) also advise that researchers must always keep in mind the following when using observation as a data collection method: What should be observed? How should the observation be recorded? This should also talk to the style of recording those observations.

However, in this study the researcher also collected data through document observation. As highlighted in Section 4.2. the researcher perused ITG documents which included the ICT Governance Framework, ICT Steering Committee Terms of Reference, minutes of the ICT Steering Committee, Draft of the Univen ICT Strategy 2021 to 2025; and ICT Steering Committee Report Final 01 September 2020. Copies attached as Appendix H, Appendix I, Appendix J and Appendix K, respectively.

4.6.2 Data Collection Instrument

This subsection hinges on the fact that this was a qualitative research which collected qualitative data. The researcher collected primary and secondary data; and primary data was collected from ITG role players through semi-structure interview which was guided by an interview guide.

According to Kumar (2014), an interview guide is a data collection instrument which is used in structured interviews. In this study, it was a semi-structure interview. The guiding questions were designed in a manner which addresses the research questions. Questions 3.1 to 3.10 focused on establishing the ITG mechanism and their roles in HEI. Hence the data collected addressed the following research questions: What are the mechanisms of ITG in HEIs? and What are the roles and responsibilities of the identified ITG mechanisms in HEIs? Data gathered data through responses to Questions 2(a) to 2(g), Questions 4(a) to 4(f) and Questions 5(a) to 5(e) addressed the following research question: What are the determinants of effective integration of ITG in the ICT strategy Development?

A voice recorder was used to record responses of the participants. The researcher made use of the Outlook email facility for make appointments with the prospective research participants; and through this facility the researcher was able to attach relevant documentations including the approval to conduct research from the University management. The participants also used this facility to confirm their availability to participate in the study.

4.6.3 Validity and Reliability of Data

Validity, credibility, and reliability have major impact on the overall quality of the study. Therefore, the coming subsections provide a brief discussion in this regard.

a) Validity

According to FitzPatrick (2019), validity hinges on the purpose and context of the research, in so saying, they address the legitimacy of the conclusions that are reached, based on particular methods used to address validity threats that are pertinent to a particular research study. The key to validity criterion for data collection is “reliability” (Mouton, 2009). Ensuring the alignment of data collection methods with your research questions while getting results that are similar to other previously published data increases validity (Castleberry & Nolen, 2018). This was achieved by ensuring that the questions in the interview guide were aligned with the research questions and research objectives.

However, for one to comprehend and trust the validity of this study as it adopted qualitative research methodology, one should accept the trustworthiness of qualitative research in general (FitzPatrick, 2019). FitzPatrick also mentions that the existence of different views regarding validity makes it difficult and challenging to establish and write about validity in qualitative research. He further alluded that the aspect of validity implies the use of the following multiple

terms such as trustworthiness, credibility, dependability, confirmability, authenticity, rigor, plausibility, goodness, soundness, transferability, and quality assessment.

b) Credibility and Reliability

This subsection concerns itself with the aspects related to how the researcher ensured the credibility and reliability of the study during the research process. The credibility in qualitative research, according to Abdalla et al. (2018) and Kvale (1995) can be realised by way of ensuring the following:

a) The problem statement should be consistent with the theoretical foundations of the case. In this study, the researcher first did a literature review which ended up contributing to the confirmation of the existences of the identified research problem.

b) Structuring research in such a way that validity also involves the adequacy of the research design and of the methods used in each topic, besides the objectives that give some direction to the study. This was taken into consideration in this study since the researcher provided a definition or description and a brief literature review of each topic. This step confirms that the researcher had a thorough understanding of each section before he attempted to work on it.

c) Processing of data collection in such a way that credibility materialises in the careful data review, in respect to what is being evidenced by participants. In this regard, Castleberry and Nolen (2018) recommend that for researchers to increase reliability, they should use sound research methods for collecting and analysing data. This addresses the concerns regarding methodological accuracy and validity of the findings in different research works as raised in (Abdalla et al., 2018). In this study, in order to ensure credibility of the data collected, the participants were sampled from people who have a role to play in the ITG. Hence, the profiles of the participant in relation to the implementation of ITG in HEIs also means a lot as far as trusting the outcome of this study. See Table 3.1 and Table 3.2. The researcher relied on the first-hand information provided by current and previous ITG role players for data collection.

d) Interpretation of data in such a way that questions are displayed in the text, and to the sense of given interpretations (Abdalla et al., 2018). In this regard, the researcher also followed the recommendation of Castleberry and Nolen (2018) with regard to using sound data analysis methods to ensure reliability; he used thematic analysis and Atlas.ti for analysing data. This enable the researcher to be guided by the thematic data analysis steps that has already been proven to generate reliable results.

e) Verification when it is related to both credibility of knowledge produced and the types of validation that are relevant in specific studies, including the decisions of what is relevant for the community (Abdalla et al., 2018; Kvale, 1995). The researcher also developed and piloted the interview guide before implementing it in the main interview. This was in a way a verification method. There was also a step during data analysis in which he had to review the themes; and this was done for the purpose of ensuring credibility of the data analysis process.

4.6.4 Pilot Study

According to Malmqvist et al. (2019), if a researcher wants to ensure trustworthiness and value of a study; a substantial pilot study is an essential requirement in advance of the main study. Babbie et al. (2010) also contends that no matter how careful a researcher is, after designing a data collection instrument such as a questionnaire, there is always the possibility of errors, and in order to identify and address them, the researcher must first do a pre-test or a pilot study. Welman et al. (2011) explains that a pilot study is administering the instrument. Conducting a pilot study has a major contribution in the quality of the overall study (Malmqvist et al., 2019); and that is why even the researcher took the route of piloting the interview guide before the actual study was conducted.

Therefore, in order to ensure that the developed interview guide was flexible enough to make it possible to investigate ITG conditions in the institution as advised by Malmqvist et al. (2019); the researcher requested the Director ICT Services to interrogate it before it was used in the semi-structured interviews. The ITG competencies in terms of experience and knowledge related to ITG were considered when the ICT director was requested to contribute in piloting the interview guide by adding and adjusting some of the questions in line with the researcher objectives. This enabled the researcher to identify and improve weaknesses in some the questions. As guided by Malmqvist et al. (2019), the engagement the researcher had with the Director ICT Services regarding the pilot study also played an important part in the overall design of the research study; and his suggestions werealso adapted in the main study. Initially, the interview guide was only consisting of four main questions. Hence, the engagement with the Director: ICT Services, enabled the researcher to developed sub-questions for each and every main question. He also provided guidance in terms of ensuring that questions are related to a particular ITG structures.

4.7 UNIT OF ANALYSIS

A unit of analysis is the entity on which there are data which will be subjected to statistical analysis.

That is, the unit of analysis is the subject of the study about which an analyst may generalize; and it answers the question 'what' and 'who' is being studied (Kumar, 2018; Murray, 1998). It is also considered as the most basic element of a scientific research project (Lewis-Beck et al., 2012). Kumar further alludes that if the unit of analysis is not clear, researchers struggle with defining the research problem, making hypothesis also becomes a challenge, researchers cannot even decide on the sampling method to be used and the right measuring instrument for data collection; and deciding on the valid data analysis option and generalizing the results to a population also becomes a huge fight.

In this study, the unit of analysis was the implementation of ITG in HEIs as an organization. This means that respondents participated in the study on behalf of the organizations.

4.8 POPULATION

Monette, et al. (2008) define population as all possible cases of what the researcher is interested in studying. For this study, the population was only delimited on public HEIs that are categorised as universities. The definition of the HEIs is covered in section 1.8.

There are twenty-six (26) public universities in South Africa; these was the population of the study. Copy of the list of the public universities attached as **Appendix K**. This population is composed of the public universities that were historically disadvantaged universities and those that were historically advantaged universities. This was a results of the apartheid policies that were enforced between 1948 and 1994 which prompted a culture of discrimination against the majority, 'non-white' South Africans by various means, thus promoting white supremacy (Nyahodza & Higgs, 2017). "Non-white" South Africans were only allowed to attend to the then "non-white" universities that were poorly equipped hence today they are referred to as the historically disadvantaged universities; and the "white" South Africans attended their tertiary education in the "white only" universities that were well equipped hence today they are referred to as historically advantaged universities (Nyahodza & Higgs, 2017; Singh, 2004).

4.9 SAMPLING

A sample is a small number representative of the whole and the most basic considerations in sampling are size and representativeness (De Vos, A et al., 2011). In this study, the researcher used purposive sampling to select the university where the study was conducted since it is sampling which is done with specific purpose in mind (Maree & Pietersen, 2009). The study was conducted in one of the twenty-six (26) universities which was selected because it is one of the historically disadvantaged institutions; and it is also a Resource Constrained Environment (RCE)

in the sense that it is characterised by significant scarcity of resources. Amongst others the characteristics of RCEs may also include shortages of skills, budget, infrastructure, poor Internet facilities, devices, technology and in some other cases lack of power source (Bauer & Gallagher, 2020; De Silva & Uyarra, 2016). Boughey and McKenna (2011) also mentioned that historically disadvantaged institutions still struggle financially. This is a major challenge for administrators of the institutions (Michael, 1996) as resource constraint is also the primary cause of the delay of most projects (Chaudhary & DakshinaMurthy, 2019).

In line with Lopez and Whitehead (2013), the primary purpose of sampling was to select suitable populations in order to ensure that the focus of the study can be appropriately researched as inappropriate sampling procedures may seriously affect the findings and outcomes of a study. Lopez and Whitehead further mention that sampling in qualitative research is referred to as non-probability sampling which means that participants of a qualitative study population do not have an equal chance of being selected. This gives the researcher liberty to 'specifically' approach identified people to be participants of the study.

The researcher used a combination of the following non-probability sampling methods as briefly summarised by Lopez and Whitehead (2013):

4.9.1 Purposive sampling

Purposive sampling is where researcher purposively selects participants to their study and/or data sources that can answer the research question. This is the most prevalent approach to qualitative research (Chun Tie et al., 2019; Lopez & Whitehead, 2013). Participants are requested to participate in the study based on the preselected criteria relevant to the research aims/questions of the study (Lopez & Whitehead, 2013). In this study, purposive sampling was used to sample participants within the university. Purposive sampling is designed to provide information-rich cases as participants are those who have the required status, experience, or knowledge of interest to the researcher (Lopez & Whitehead, 2013). In this study, people with relevant knowledge and experience regarding the ITG in HEIs were identified and approached to participate in the semi-structured interview. These included people in the IT management positions, members of the executive management; members of ICT steering committee, of whom most are deans and heads of departments; members of Risk Management Committee and Audit committee; and lastly members of Council. The researcher recruited these people to be part of the study because of the positions that they hold and the knowledge regarding the implementation of ITG in the HEIs.

4.9.2 Convenience sampling

Convenience sampling is where the researcher invite people to participate in the study because they are conveniently available regarding access, location, time and willingness; and this is a relatively fast and easy way to achieve the sample size needed for the study (Lopez & Whitehead, 2013). In this study, the institution where the research was conducted was selected using this method of sampling since the researcher is an employee there; hence it was easy and affordable to access the participants. The researcher also targeted those prospective participants who have several roles to play in ITG since they would be able to provide their views with respect to performance and effectiveness of different forums and offices regarding the implementation of ITG. In this case, the researcher also requested the secretary of the ICT Steering Committee to participate in the study due to the vast of information related to the performance of ICT steering committee that she has.

4.9.3 Snowball sampling

Snowball sampling is also known as the ‘chain referral’ or ‘networking’ sampling It occurs when the researcher starts gathering information from one or a small number of people and then through them the researcher gets connected with other respondents, who may be friends, relatives, colleagues or other significant contacts to the initial study respondents (Lopez & Whitehead, 2013). The researcher used this sampling method to reach three former Council members of the institution. See **Table 4.2** and **Table 4.3**. They were identified through other people who had worked with them before, and were requested to participate in the study, which they graciously agreed to.

4.9.4 Theoretical sampling

This sampling method is mostly used in grounded theory studies but is increasingly being used to gather data for the purpose of theory generation (Chun Tie et al., 2019; Lopez & Whitehead, 2013). In this study, theoretical sampling was used for selecting a participant who was the former ICT Director in the organization; and during the time of the study, he was working as a Chief Information Officer in one of the HEIs in South Africa (See **Table 4.2**). The influence regarding this was to close the gaps that were not covered with the first eighteen participants; and also tap from his vast ITG related experience. In this regard, the researcher could say theoretical sampling was partially part of the overall sampling, since identifying the ninetieth participant was a bid to ensure that the outcome of the research provides a sound theoretical framework for those who would opt to use the thesis and the developed model in future.

Table 4.2 summarises the sampling methods discussed above, categories of the participants and the structures in which are member of.

Table 4. 2: Sampling Method, Category and Participants

Sampling method	Category	No. of participants	SMC	Senate	ITSC	Risk Com	Audit Com	EMC	Council
Purposive	Deputy Vice Chancellors	2	2	2	1	2	2	2	2
	Directors (Academic Centres)	3	3	3	3	1	n/a	n/a	1
	Directors (Administration)	2	2	2	1	1	n/a	n/a	1
	Deans	3	3	3	3	n/a	n/a	n/a	n/a
	IT Managers	1	n/a	n/a	1	n/a	n/a	n/a	n/a
	Risk Officer	1	1		1	1	1	n/a	n/a
Convenience	Secretary of the ICT steering committee	1	n/a	n/a	1	n/a	n/a	n/a	n/a
	Research Administration Coordinator	1	n/a	n/a	1	n/a	n/a	n/a	n/a
	Academic HOD	1	n/a	1	n/a	n/a	n/a	n/a	n/a
Snowball	Former Council Members	2	n/a	n/a	n/a	n/a	n/a	n/a	2
	Former Student Representative Council (SRC) member	1	n/a	1	n/a	n/a	n/a	n/a	1
Theoretical	Former ICT Director	1	1	1	1	1	1	1	n/a
TOTAL		**19**	**12**	**13**	**13**	**06**	**02**	**03**	**08**

4.10 DATA ANALYSIS

The researcher used qualitative data analysis which according to Patton (2002) and Raskind et al. (2019), it is the process of transforming the collected qualitative data (i.e. fieldwork data) into findings that might also lead to substantive and actionable conclusions. Thematic analysis which is the process of identifying patterns or themes within qualitative data was used to analyse data (Braun & Clarke, 2006; Friese et al., 2018; Maguire & Delahunt, 2017). It is the first qualitative method of analysis that provides core skills that are useful for conducting many other forms of qualitative analysis. Onr of its benefits is its flexibility (Braun & Clarke, 2006). According to Friese et al. (2018), depending on the type of thematic content analysis the researcher is using, data can be analysed inductively or theory-based in a top-down deductive fashion. In the case of inductive analysis, the analysis is driven from the data itself and the analysist does not try to fit the data into a pre-existing coding frame. Whereas, a theoretical thematic analysis the researcher's theoretical or analytic interest in the area is the one that drives the analysis and the researcher may opt not to code the content of the entire data set (Friese et al., 2018). In this study, the researcher used the theoretical thematic analysis, the analysis was driven by the provisions of the systems and the principles of VSM.

The researcher was guided by the following six stages provided in Braun and Clarke (2006), and Maguire and Delahunt (2017) for analysing data using thematic analysis; and these stages are named and briefly described as follows:

a) Stage 1: Become familiar with the data

In line with Friese et al. (2018), the researcher started to familiarised himself with data during data collection and even when he was transcribing it. Going through the transcripts again and again was the first step in qualitative analysis that enable the researcher to be familiar with the entire body of data before he went to the next stage. Following Braun and Clarke (2006) and Maguire and Delahunt (2017) the researcher also captured some notes in his laptop. The more the researcher continues with the process of in-depth reading the more the ideas for patterns and meanings progressively emerge (Friese et al., 2018).

In this study, Atlas.ti was used to analyse the collected data since it is a powerful workbench for the qualitative analysis of large bodies of textual, graphical, audio, and video data It has capabilities and tools to accomplish the tasks associated with any systematic approach to unstructured data, i.e., data that cannot be meaningfully analysed by formal, statistical approaches (Friese, 2020). Following Friese et al. (2018), the researcher created a project in

Atlas.ti 8.2.32 titled Ratshitanga PhD Analysis Final. Thereafter all the twenty-four (24) documents were uploaded into Atlas.ti for the purpose of conducting the analysis. The documents uploaded included (a) those that were transcribed from the interviews, (b) ITG documents which are ICT Governance framework, and ICT Steering Committee Terms of Reference, and (c) minutes of the ICT Steering committee meeting. The uploaded documents were put in the same group since twenty-four (24) is a small number that could be easily managed. The documents were read before they were uploaded. However, the reading continued even after they were uploaded. This enabled the researcher to have a through understand of their contents.

b) Stage 2: Generate initial codes

This stage involved organizing data in a more meaningful and systematic way. Following Braun and Clarke (2006) and Maguire and Delahunt (2017), data was reduced into small chunks of meanings through coding and the coding method to be used is determined by the researcher's perspective and research questions. At this stage, the researcher began with data analysis process using Atlas.ti, hence an attitude of openness for ensuring the extraction of appropriate emerging codes from the documents for further analysis. The analysis was done through constant comparative technique of qualitative data analysis which enabled the researcher to identify key words and themes that are grounded in the data (Rahman & Salih, 2015). This was achieved by following a process referred to as Open Coding through which concepts that emerged from the raw data were grouped into conceptual categories as highlighted in (Khandkar, n.d.). This has been repeated until the research process had reached saturation and this is the state where the data that have been collected or analysed already have brought the research to a state where further data collection and/or analysis are unnecessary (Saunders et al., 2018).

Generating codes using Atlas.ti are amongst the things to be done in this this phase (Friese et al., 2018). The codes were guided by the provisions of systems and principles of the VSM and the research questions. Therefore, ATLAS.ti Code Manager was used to generate the codes; and data with related views was grouped into codes. Creating codes is the foundation of data analysis and the screen dumps below shows portion of the list of codes that have been created. Codes were created by way of highlighting text in the uploaded documents and selected the In Vivo Coding option if the selected text is to be considered as a code name otherwise a code was created by selecting Open Coding option in the shortcut menu that appears after right-clicking on the selected text. The highlighted text can be a word, a phrase, or a sentence. With Open Coding, the researcher had to type the names of the code. Therefore, during the analysis one hundred and fifty-two (152) codes were created.

In this phase, a researcher can build a structured code system by way of working with the list of codes in the Code Manager in such a way that they are be grouped together, renamed; replaced or build categories (Friese et al., 2018); and this is actually what the researcher followed when manipulating the codes until he ended up with one fifty two (152) codes.

c) Stage 3: Search for themes

Braun and Clarke (2006) and Maguire and Delahunt (2017) explained that a theme is a pattern that captures something significant or exciting about the data and/or research question; and there are no hard and fast rules about what makes a theme. Theme comes as a results of coding; however codes are rarely themes (Friese et al., 2018). In some other cases, one finds that there is considerable overlapping between the coding stage and the identification of initial themes (Braun & Clarke, 2006; Maguire & Delahunt, 2017).

With regard to linking the relationship between a theme and a category, Friese et al. (2018) mentioned that a higher order category may reflect a theme, even though this is not always the case. Therefore, in this study for the researcher to make sense of data, various codes were then categorised into groups guided by their commonality (Nieuwenhuis, 2016b). A theoretical thematic analysis was used since the researcher had made the components or systems and the principles of VSM to be the themes or categories which the data should be aligned with. To group the codes into those categories the researcher had to keep on comparing the codes and the established themes. This had been repeated for all the cases that emerged from the data collected. Therefore, during the analysis seventeen (17) code groups were created.

d) Stage 4: Review themes

At this stage, following Braun and Clarke (2006) and Maguire and Delahunt (2017) the preliminary themes that were identified at Stage 3 were reviewed, modified, and developed. The researcher then checked if the initial themes were established in line with the provisions of the principles and systems of VSM; and those themes were checked in relation to all the data gathered that is relevant to each theme. The themes identified were all linked to the categories in which the codes are. In this study, the refining of themes was not necessary as they were established in line with the principles and systems of the VSM. There were twenty-seven (27) networks that were established and there were no memos that were written. The next step was to think about whether the themes work in the context of the entire data set (i.e. across all the available data for the study) (Braun & Clarke, 2006; Maguire & Delahunt, 2017).

e) Stage 5: Define themes

This is where the final refinement of the themes happens; and the aim is to identify the core of what each theme is all about (Braun & Clarke, 2006; Maguire & Delahunt, 2017). The researcher reflects on what the theme is saying. The researcher establishes if there are subthemes and how they interact and/or relate to the main theme. The relationship of the themes themselves is also established (Braun & Clarke, 2006; Maguire & Delahunt, 2017). However, in this study, this was not relevant since the themes when driven from the principles and systems of VSM.

f) Stage 6: Write-up

In line with Braun and Clarke (2006) and Maguire and Delahunt (2017); the final stage of a research was to produce this report which is a thesis and also writing journal articles. The thesis also contains an ITG model that has been developed based of the findings of the study. This is in line with Nieuwenhuis (2016b) who mentioned that the objective of interpreting data is to draw conclusions; and each conclusion should be based on the findings from the data and the triangulated in terms of that which have been presented in the literature review and/or the framework. Hence, also in this study the interpretations and the discussions of the findings were also supported by the literature reviewed which was mainly based on systems and principles of the VSM. Conclusions were drawn and summarised at the end of Chapter 5 and Chapter 6. It is those two tables that contributed to deriving a model that will ensure effective alignment of ICT strategy and organization strategy. See Chapter 7.

4.11 ETHICAL ISSUES

This section presents ethical considerations that guided the planning and implementation of the study. This was necessary for the purpose of ensuring credibility of the study. Therefore, provisions of this section will also refer to the attached Appendices. Ethical issues are also part of the essential elements of a research paradigm that is referred to axiology and these issues were considered when planning and implementing the study. This involves issues of morality by defining, evaluating and understanding concepts of right and wrong behaviour relating to the research (Babbie, 2008; Saunders et al., 2018). Ethical issues also talk to the appropriateness of the researcher's behavior in relation to the rights of the subjects of the researchers' work (Saunders et al., 2000).

The research proposal was approved by the University Higher Degrees Committee – Copy attached as **Appendix A**. Thereafter, the researcher applied for ethical clearance from the University of Venda Research Ethics Committee; and it was assigned Ethical Clearance Number:

SMS/19/BIS/04/2211. Copy attached as **Appendix B**. The researcher applied to conduct research within the University of Venda, the application included the Ethical Clearance. Copy attached as **Appendix C**. The researcher adhered to the following ethical conduct:

- **Informed Consent:** (Saunders et al., 2000) categorise possible participant's consent into three - the situation where the participant does not have any clue of the research and yet he/she is made to participate through deception, when the participant does not fully understand his/her rights, and lastly, when the participant's consent was given freely and based on full information about his/her rights and the possible uses of the data. In this study, all the participants were given full information of the study. Formal requests for permission to conduct the study in the selected university was done through a letter that contain details of the study (**Appendix C)**. Emails when used to request participants to contribute to the study. Copy attached as **Appendix E**. Participants were also given full information about the purpose and objectives of the study before they participate in the study. They were also requested to sign a consent form (**Appendix F)**. However, some of the participants declined to sign. The researcher also allowed the respondents to seek clarity before they start participating in the study. Those who were not willing to participate in the study were excluded.

- **Voluntary participation:** (Babbie, 2008) cautions that no one should be forced to participate in a research, hence, research participants have the right to withdraw partially or completely from the process (Saunders et al., 2000). Therefore, the researcher ensured that respondents participated voluntarily and there were also free to withdraw their participation whenever they wanted to. However, no one withdrew from the study. Meetings were scheduled via MS Teams as a way to allow respondents open spaces for the semi-structured interviews in their busy schedules – Copy attached **Appendix D**.

- **Confidentiality and Anonymity:** (Saunders et al., 2000) states that confidentiality and anonymity are essential in gaining access to organization and individuals. Once the researcher promises that the collected information will remain confidential or that the participants will remain anonymous, it is important that the researcher maintain the promise. The researcher, therefore, will make sure that the names of the participants are kept anonymous, and the collected information is kept confidential. Hence, those who declined to sign the consent were allowed to do so.

- **No harm to the participants:** Social research should never injure the people being studied, regardless of whether they volunteer for the study or not (Babbie et al., 2010) In this

study, the participants were never exposed to situations where they would be emotionally or physically harmed. Hence, during the Level 5 Lockdown, the research had to collect data by way of sending the interview guide to respondents who in turn responded to the questions provided in the guide and sent them back via email. Copy attached as **Appendix E**.

Chapter 5: Contextual ITG Mechanisms in HEIs

5.1 OVERVIEW OF THE CHAPTER

This chapter focuses on the analysis of findings related to the following research question: (a) What are the contextual ITG Mechanisms related to HEIs? By contextual ITG mechanism, we mean the role players, in terms of structures and administrative officers, in the ICT strategy and the organizational strategy alignment in HEIs. This also includes the contributions that are made by the identified role players.

The chapter is structured as follows: The first part summarizes the demographic profile of those who were sampled in the study. This is then followed by a deductive theoretical thematic analysis of the findings guided by the Viable System Model. The extracts from ITG documents and the responses from the interviews were captured as text excerpts in Table 5.2 to Table 5.8, while the interpretation is captured in the text analysis column. The discursive practices column links the interpretation to the theoretical concepts based on VSM. This approach has been used in other studies, such as the one by Ochara and Fadhili (2013). A summary of the findings is then provided at the end.

5.2 SUMMARY OF RESPONDENTS PROFILE

Out of the nineteen (19) participants of the study; seventeen (17) provided responses regarding the research questions that were designed to establish the ITG mechanisms and their roles in the alignment of ICT and the organization strategy. Table 5.1 shows list of respondents; their responsibilities at the organization; and the organizational structures in which they are members.

Table 5. 1: Profile of the Respondents

Respondents	Occupation	Remarks	No. of Years in HEI
Respondent 1	Dean – School of Mathematics and Natural Sciences	• Member of the senior management committee (SMC); Senate, and ICT Steering Committee • Chairperson of the School Board meetings • Has PhD qualification	More than fifteen (15) years
Respondent 2	Risk Officer	• Member of Risk Committee • Attends SMC; Senate, ICT Steering Committee, and Audit Committee as a resource person	More than five (5) years

Respondent 3	Dean: School of Law	• Member of SMC, Senate, ICT Steering Committee • Chairperson of School Board meeting • Has Doctorate (LLD) qualification • Advocate of the High Court of South Africa • Professor	More than five (5) years
Respondent 4	Director: Human Resources	• Member of ICT Steering Committee, SMC, and Risk Committee • Attends Senate and Audit Committee as resource person	Less than five (5) years
Respondent 5	Director: Community Engagement	• Member of Council, SMC, and member of ICT Steering Committee • PhD Qualifications	More than Fifteen (15) years
Respondent 6	Director: Communications	• Member of the Senior Management Committee (SMC) • PhD Qualifications	More than fifteen (15) years
Respondent 7	DVC: Operations	• Chairperson of the ICT Steering Committee • Executive responsible for the ICT • Member of Council, executive management (EMC), SMC, risk committee and audit committee. • Participated in the development of the 2021-2025 University Strategic Plan • Has PhD qualification	More than ten (10) years
Respondent 8	Dean of School of Education	• Member of the Senior management committee, ICT Steering Committee • Participated in the development of the 2021 – 2025 University Strategy • Has doctorate (DEd) qualification • Professor	More than fifteen (15) years
Respondent 9	Research Administration Coordinator	• Member of the ICT Steering Committee • Vast experience in the administration of research which is part of the core business of HEIs. • Has two Master's qualification, one of them is in Project Management	More than five (5) years

Respondent 10	Former Council member	• Member of council • Graduate with a bachelor's degree	More than fifteen (15) years
Respondent 11	Director: Library Services	• Member of the ICT steering committee, SMC, and Senate • Pioneered and coordinated the implementation of library systems, e.g., SIERA • Post graduate qualification	More than fifteen (15) years
Respondent 13	Director: CHETL (Centre for Higher Education Teaching and Learning)	• Member of the ICT Steering Committee; Senate, and SMC • Responsible for the implementation of the learning management system, i.e. Blackboard which is faced out, and is to be replaced by Moodle • Has PhD qualification	More than fifteen (15) years
Respondent 14	DVC: Academic	• Member of Council, Risk Committee, Audit Committee, executive management, SMC, and Senate • Previously served as a dean in the School of Mathematics and Natural Sciences • Has PhD qualification	More than twenty (20) years
Respondent 15	Secretary of the ICT Steering Committee	• Resource person responsible for capturing minutes during the ICT Steering Committee proceedings • Employee in the ICT Department responsible for ICT ServiceDesk • Participated in the development of the 2021 to 2025 ICT Strategic Plan • Has COBIT and ITIL certification • Has B. Tech. qualification currently pursuing Masters in Information Technology (IT Governance)	More than fifteen (15) years
Respondent 16	Head: Systems Operations in the ICT Department	• Worked as ICT consultant for HEI in the Enterprise Resource Planning (ERP) System • Responsible for ERP and the development and implementation of business systems in HEI • Member of the ICT management in HEI	More than five (5) years

		• Member of the ICT Steering Committee • Involved in the development of the 2021-2025 – ICT Strategic plan • Experience in the planning and implementation of ICT projects • Has post graduate ICT qualification	
Respondent 18	Head in the School of Environmental Sciences	• More than ten (10) years of experience coordinating ICT related activities in the School • Member of Senate • Member of school board in HEI • Has PhD qualification	More than twenty (20) years in HEI
Respondent 19	Former ICT Director	• Currently the CIO in a HEIs • ICT Director for more than twenty-five (25) years • More than 25 years of experience in developing IT Strategic plans • Member of Executive Management, SMC, Senate and ICT Steering Committee • Attend Risk Committee and Audit Committee as resource person • Has Master of Business Management (MBA)	More than twenty-five (25) years

5.3 ITG MECHANISMS AND THEIR ROLES

In this section, the study will discuss its findings on the ITG mechanisms and their role in HEIs. These ITG mechanisms are discussed based on the interviews conducted, with the ITG role players, and the ITG documents that the researcher perused. The analysis was based on the systems and principles of VSM.

5.3.1 Strategic Envisioning

The concept “strategic envisioning” is derived from the following two words, strategic and envisioning. “Strategic” refers to the way in which an organization decides what it wants to achieve and plans actions and use of resources over time (Cambridge-Dictionary, n.d.-a); and “envisioning” refers to imagining that something is a likely or desirable possibility in the future (Cambridge-Dictionary, n.d.). From these definitions, it can be safe to infer that strategic

envisioning refers to the activities that are performed in order to articulate and define the future of the organisation.

Therefore, this subsection is intended to establish the ITG mechanisms that is responsible for strategic envisioning in the ITG in HEIs. Amongst others, setting ICT strategic goals and the approval of the ICT strategy and policies are included as the main responsibilities of Council. Table 5.2 provides analysis and discussion of the findings of the study regarding strategic envisioning in HEIs.

From the findings, text analysis and the phrases captured in discussive practices; it is safe to infer that the University Council (Council) have the responsibility of strategic envisioning. The point of departure in this regard is that according to King IV, Council as a governing body has ultimate decision making on ITG matters and should ensure the development and approval of ICT strategy and IT policies (Ramalho, 2016). This implies that it is also responsible for the development of the ITG framework, which amongst other stipulates the roles and responsibilities of different ITG role players, including the role of the CIO and the executive management regarding ITG in HEIs.

Table 5. 2: Strategic Envisioning

Text Excerpts	**Text Analysis**	**Discursive Practice**
"Council is accountable to ensure that: *The ICT strategic goals of the institution are aligned and integrated with the business strategies and goals of the institution"* (Univen-ICT-Team, 2019) ***Section 6.1.1 (b) in Page 7 of the ICT GOVERNANCE FRAMEWORK***	These findings of the study show that Council has ultimate authority over ITG, and it has to provide oversight and strategic direction regarding ICT in the organization. This includes setting out an overall ICT vision and defining the key ICT strategic objectives, policies and processes for the period under consideration. This is done with understanding that the ICT strategy will serve as the blueprint for future ICT service delivery programmes. It should also enable the organization to exploit and leverage on existing and emerging	Ultimate authority • Strategic envisioning • Setting ICT objectives • ICT roadmap • Approvals of ICT strategy and IT policies • Delegates management
"The Council is responsible for providing oversight of the strategic direction of information and		

communications technology within the University." **(Respondent 10)**	technologies and best practices to transform business processes through simplification and agility, to achieve digital transformation as set out in the organization strategic goals. It is also responsible for approving ICT strategy and IT policies, including the ITG framework. The ICT strategy goes together with the ICT roadmap which is a document that contains ICT projects that are going to support the ICT strategy, which in turn support the organizational strategy. This implies that, when it is not satisfied with whatever has been put in the ICT strategy, it might as well decline to approve it.	
"They must be looking to issues of operations; implementation; effectiveness; efficiency and develop policies that they can then engage and get approval. Policies that should make them work better." **(Respondent 5)**		
"The Council is responsible for the establishment and development of strategic objectives and decisions …." **(Respondent 10)**		
"The ICT Director as the delegated ICT Governance champion as per the King IV code which says that the governing body should delegate to management the responsibility to manage IT effectively."(Univen-ICT-Team, 2019) **Page 12, Section 7.1 of the ICT Governance Framework**		
"Is to assemble necessary evidence and data and produce policy discussion documents." ***(Respondent 5)***		

Therefore, Council should ensure that the ICT strategy set out the overall vision regarding the implementation of IT in and organization. The ICT strategy should also define the key IT strategic objectives, policies, and processes for the period under consideration (e.g., five-years). This is done with understanding that the ICT strategy will serve as the blueprint for future IT service

delivery programmes. It should also enable the organization to exploit and leverage on existing and emerging technologies and best practices to transform business processes through simplification and agility, to achieve digital transformation as set out in the organization strategic goals (Univen-ICT-Team, 2020). Council should provide technology and information in a way that supports the organizations' setting and the achieving of their strategic objectives (Ramalho, 2016).

Link to the VSM: From the above inference it might be safe to infer that the role of strategic envisioning is the same as those of System 5 (S5) in the VSM (**Figure 3.3**) which is also referred to as "Policy". Council is the highest authority that is responsible for ICT strategy and IT policies. This is also the case with System 5, it is also the highest authority that is responsible for organizational policies, defines the identity, purpose, and in general, the ethos of the organization (Castro, 2019; Walker, 1998). The fact that Council ensures the development of ITG implies that it is the one that provides direction regarding the roles of the CIO and also of the executive management regarding implementation of ITG. S5 also provides guidelines regarding interactions between Systems 3 and 4 as a way to ensure strategic alignment and coherence in the decision-making process (Castro, 2019; Panagiotakopoulos et al., 2016). Therefore, the Council assumes the responsibilities of System 5 component in VSM. Hence, it is responsible for strategic envisioning in ITG in the HEIs; and this includes the approval of the ICT strategy and IT policies. **Figure 5.1** provides a summary of Strategic Envisioning as per text excepts in **Table 5.2.**

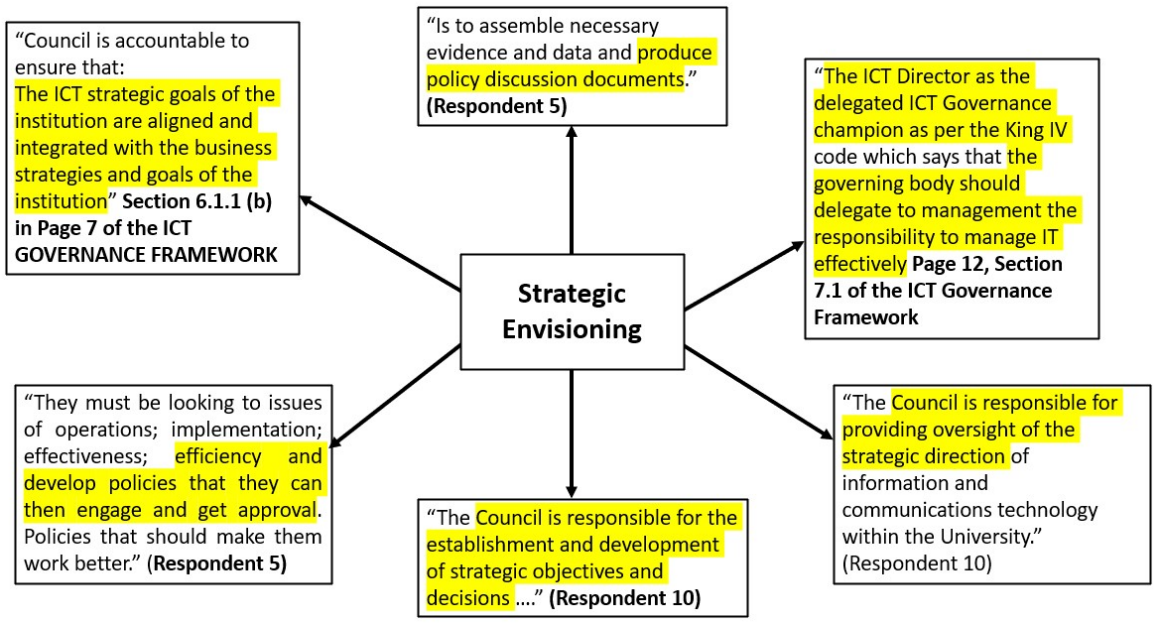


Figure 5. 1: Strategic Envisioning **(Source: Researcher, 2021)**

5.3.2 Development of the Organizational Strategy

This section discusses the ITG mechanism that is responsible for the developing organizational plans of which even the ICT strategy is one of them. As depicted in **Table 5.3,** this study provides an analysis and discussion of the findings of the study with regard to the development of the ICT strategy in HEIs.

From the findings, text analysis and the phrases captured in discussive practices; it is the management that have the responsibility of developing or formulating organizational plans. The management should also ensure the alignment of the ICT strategy with the organizational strategy. Therefore, involving stakeholders, including IT and Senate, could contribute positively in ensuring that everyone understand the provisions of the organizational strategy; and this also ensures that the organizational strategy is IT-informed. Overby (2017) also confirms that even experts and CIOs agree that effective ICT strategy begins with an IT-informed business strategy. The worst scenario could be witnessed when the ICT is not aware of the provisions of the organizational strategy; since it could not be able to develop strategies that enable or support it. The reason being that there were no efforts made to ensure that the two (organizational strategy and ICT strategy) are adequately related (De Haes, 2015). For the successful implementation of ITG in an organization, a collective efforts between different management levels and staff groups in the organization should be ensured, with the effect of external parties and regulations (Alreemy et al., 2016).

Table 5. 3: Development of Organization Strategy

Text Excerpts	Text Analysis	Discursive Practice
"University management is responsible for the strategic planning, decision making, making cost saving reduce risks with IT due to adequate management and be always at its disposal for evaluation and achieve compliance by acquiring quality by implementing the relevant and necessary regulatory compliance." **(Respondent 10)**	The development of strategic plans is the responsibility of the management, and this includes the development of the ICT strategy. The management should also ensure its alignment with organizational strategy and the annual performance plan. The executive managements	Management formulates strategy • Stakeholders' involvement • ICT and business alignment • Organizational agility

"Executive management ensure alignment of the ICT strategy to the university Strategic plan and institutional Annual Performance Plan (APP)" **Section 6.2, Page 9 of the ICT Governance Framework.**	should ensure that the developed strategies are able to adapt to the everchanging demands of the organization. The ICT department and other stakeholder like Senate should also be involved during the development of the organizational strategy.	
• **"***The Director ICT to participate during the development of the University strategic plan.***"** • **"***The Director ICT to be part of University's strategic committees***."** **Section 6.2, Page 9 of the ICT Governance Framework.**		
"Senate has influence in the development of ICT strategy plan." ***(Respondent 6)*** *"Senate has advisory role and approval role since academics are the ones who are going to use the system, they are best ones to advise on the suitability and architecture of the system."* ***(Respondent 7)***		

What is critical during the development of the organizational strategy is to ensure that it can adapt to the everchanging environment; and is relevant to the aspects of organization agility. The management should always scan the outside world and identify opportunities and threats that may affect the viability of the organization (Panagiotakopoulos et al., 2016). Hence, Henderson & Venkatraman (1993) also contended that the organizational strategy should also be articulated in terms of an external domain. SWOT Analysis can be one of the tools can be used in the development of organizational strategies (Sabbaghi & Vaidyanathan, 2004). Management should always be vigilant and proactively respond to the developments that could affect the performance of their organization.

Link to the VSM: From the above inference it might be safe to infer that the role of the developing the organizational strategy relates to the role of System 4 (S4) in the VSM (Figure 3.3); which is also referred to as intelligence. S4 in VSM is responsible for developing future plans and strategies; and it also ensures that the organization adapts to the changing environment (BusinessBalls, 2019; Espejo & Gill, 2011; Walker, 1998). Therefore, the executive management (EMC) assumes the responsibilities of System 4 component in VSM. Hence, it is responsible for the development of the organizational strategies in the HEIs; and this includes the development of the ICT strategy and IT policies. **Figure 5.2** provides summary of the development of the ICT Strategy as per text excepts in **Table 5.3**.

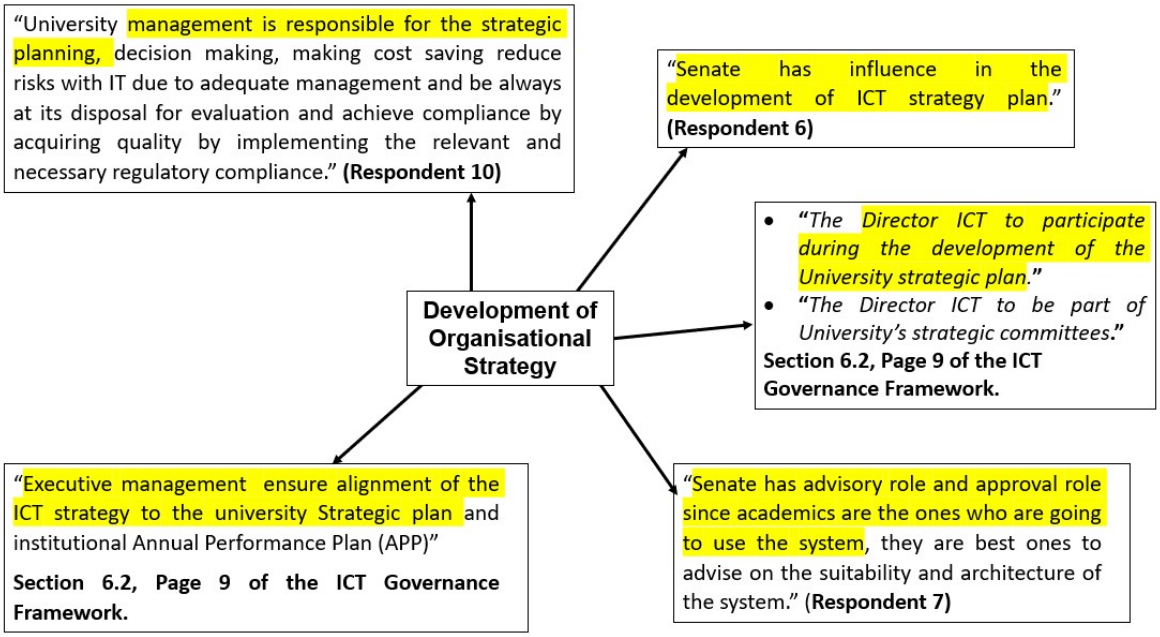


Figure 5. 2: Development of the Organizational Strategy

5.3.3 Controlling ITG Activities

This section intended to establish the role in HEIs which is responsible for controlling the ITG activities. Therefore, **Table 5.4** provides analysis and discussion of the findings of the study regarding controlling ITG activities in HEIs.

Therefore, from the provisions of **Table 5.4** in terms of findings and the interpretation concerning the control of ITG activities in HEIs, the study found that the CIO is in charge of these activities. The CIO is the ITG champion in the organization and he/she should ensure effective communication of the ICT goals. The CIO should set and provide leadership for the ICT strategy

for the organization (Mark, 2019). That is, he/she is responsible for the development and implementation of the ICT strategy; hence he/she should have thorough understanding of the provisions of the organizational strategy. This responsibility for CIOs is also mentioned in Liell-Cock et al. (2009). However, he/she should ensure effective communication between the CIO and members of his/her management team by way of inviting input during the planning of the strategic planning workshops and in the draft of the ICT strategy. Ensuring alignment of the ICT strategy and the organizational strategy is the core of the CIO's responsibilities. Hence, he/she should ensure the development of an ICT roadmap with projects that will enable or support the organizational strategy. The fact that he/she also controls the IT budget affords him/her with the opportunity to also consider the availability of funding/budget when prioritising the ICT projects. The CIO should also approve the procurement of any IT equipment.

Table 5. 4: Controlling the ITG Activities

Text Excerpts	Text Analysis	Discursive Practice
Vision of the ICT Strategy *"The CIO makes sure that the ICT strategy is aligned to the University strategy. The CIO communicates the Vision of ICT the vision should support the vision of the University". (***Respondent 19)**	The findings show that the CIO is at the center of ITG since he/she is a delegated ITG champion according to King IV in the institution. This implies that he/she should have a holistic view regarding the implementation of ICT in the organization. He/she has to formulate and lead the ICT strategy; and hence, the issue of ICT and business alignment is at the core of his/her responsibilities. This would also require him/her to be familiar with the organizational objectives so that he/she can ensure the development of ICT roadmap that will enable and support the organizational	Delegated ITG champion • Ensures ICT and business alignment • Communicate vision of the ICT Strategy • Controls ICT budget
Control of the ICT Budget *"… we would think that during the budgeting process the ICT department consult us, year after year, so that at least they would be able to budget as per our needs for that particular year..."* **(Respondent 18)**		
CIO is ITG Champion *"The ICT Director as the delegated ICT Governance champion as per the King IV code …"*(Univen-ICT-Team, 2019). **Page 12, Section 7.1 of the ICT Governance Framework**		

"The University of Venda ICT Department completed a workshop to develop an ICT strategy that aligns with University strategic goals and priorities. The workshop was facilitated by the ICT management team and took place over three days from 23 to 25 November 2020." **Text except from of the draft of the University of Venda ICT 2025 Strategy**	strategy. The fact that he/she is also responsible for the IT budget; also relates to the prioritization of ICT projects. His/her approval is needed when coming to the procurement of ICT related resource. Without a good communication skill, the CIO could not be effective when coming to performing his/her roles, since he/she should also communicate the ICT vision to the entire organization; and also, to his/her team. What is also important to note is that the CIO also works with members of his/her management team. These are people who head sections within the ICT Department; in other words; these people are under his/her supervision. (See the text excerpts on the left column).	
Understand Business of the HEI *"ICT enterprise alignment occurs when the ICT strategy is aligned to the University strategic plan…* • *The Director ICT to participate during the development of the University strategic plan."* (Univen-ICT-Team, 2019) **Section 6.2, Page 9 of the ICT Governance Framework.**		
Request for Comment/inputs *"Attached please find the draft ICT strategy for comment and inputs."* **Excerpt of the email from the ICT Director to the ICT staff on the 19th of December 2020**		

Link to the VSM: From the above inference it might be safe to infer that the role of the CIO of controlling the ITG activities in HEIs is similar to the role of System 3 (S3) in the VSM (Figure 3.3). It is also the responsibility of S3 to control and allocate resources in VSM (Schwaninger & Scheef, 2016). According to King IV, the CIO is has a delegated authority to champion ITG in the organization (Ramalho, 2016). This implies that he/she is in control of ITG. The development of ICT strategy, ICT roadmap and prioritising of ICT projects also confirms that the CIO control the activities of ITG.

The sections within the ICT department which the CIO oversees can be considered as the System 1 elements; and according to Lewis & Millar (2009), System 3 in VSM is responsible for the overall control of System 1 elements. According to Schwaninger and Scheef (2016) this is the operative management of the whole department; and System 3 is responsible for the optimisation and the autonomy of all S1-units and at the same time it generates synergy between the units to ensure coherence throughout the system (Anderton, 1989; Walker, 1998).

Therefore, the CIO assumes the responsibilities of System 3 component in VSM. Hence, it is responsible for controlling the ITG activities in the HEIs; and this includes ensuring the alignment of ICT and the organizational activities. **Figure 5.3** provides a summary regarding the control of the development and implementation of ICT strategy as per text excepts in **Table 5.4**.

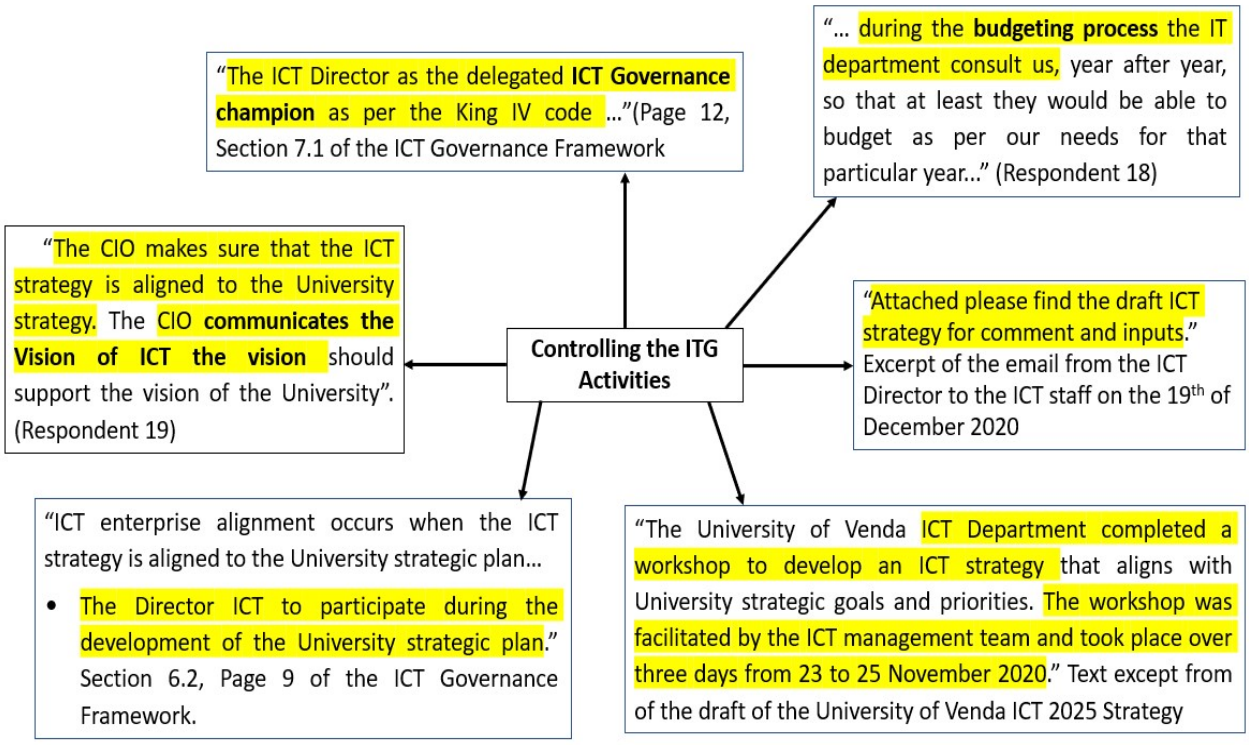


Figure 5. 3: Controlling the ITG Activities

5.3.4 Coordination of the ICT strategy

This section intended to establish the role that has the responsibility to coordinate the development and implementation of the ICT Strategy. Therefore, **Table 5.5** provides analysis and discussion of the findings of the study regarding the coordination of the ICT strategy in HEIs.

Table 5. 5: Coordination of the ICT strategy

Text Excerpts	Text Analysis	Discursive Practice
"I do not see this committee as playing an effective role when it comes to coordinating *and monitoring the implementation of IT in the university."* **(Respondent 13)** *"Yes, it is effective. All their project activities* always *form part of the agenda to determine the progress."* ***(Respondent 9)*** ***"****They make sure that* their *IT operational plan is align with the development and the demand of the university needs."* ***(Respondent 9)*** *"Not effective due to poor attendance. The ICT steering committee is not effective regarding the coordination and monitoring of the implementation of IT due to poor attendance."* **(Respondent 15)** *"The ICT Steering Committee Responsibilities:* • *To oversee the ongoing development of a University-wide ICT Strategic Plan.* • *To monitor the implementation of the ICT Strategic Plan."* **Page 4. Section 2.5.4 of the ICT Steering Committee Terms of Reference and Code of Conduct**	The findings of the study show that the ICT Steering Committee has a role to coordinate and monitor the development and implementation the ICT strategy. However, it was also established that it was not doing enough in this regard since in some other cases there is poor attendance of ICT Steering Committee meetings. Yet another view that the results show is that it is effective since ICT projects are always part of its agenda to monitor their progress. All the views confirm the coordinating role that the ICT steering committee plays in the development and implementation of ICT strategy. For example, the results show that the ICT steering Committee ensures the alignment of ICT operational plan with the organizational needs. See **Text Excerpts** in the left column.	ICT steering committee Coordinates the ICT strategy • Effectiveness • Alignment • ICT roadmap

The inference which is based on the findings and the interpretation regarding the coordination of the ICT strategy is that the ICT steering committee (ITSC) is the one that coordinates the ICT strategy. The ITSC should ensure the development of the ICT strategy which is aligned to the organizational strategy. It should also ensure that the ICT projects that are in the ICT roadmap

can enable the organizational strategy. Projects progress reports should be submitted to the ITSC on a regular basis. Members of the ITSC should also be aware of the fact that the effectiveness of the ITSC is also determined by the members commitment in the activities of the committee.

The ITSC should always ensure the alignment of ICT plans with the developments and demands of the university needs as this will enable the organization to meet its organizational goals and objectives (Da Silva & Neto, 2014). Should there be something that is not going according to the ICT strategy, the ITSC should raise concerns and recommend that it be addressed.

Link to the VSM: The roles of the ITSC regarding the coordination of the ICT strategy is the same with the role that is performed by System 2 (S2) of the VSM (Figure 3.3); which is also referred to as “Co-ordination” (Espejo & Gill, 2011). This system is responsible for stability and resolving conflicts between operational units (Walker, 1998). Schwaninger and Scheef (2016) mention that System 2 reduces alternations and enhances self-regulation by providing the following amongst others: information systems, operative plans, schedules and programs, teams, internal service and support units, standards of behavior, knowledge bases, and a great part of communication. These are exactly the roles that are played by the ITSC.

Therefore, the ITSC plays a coordination role regarding the ICT strategy, and this is the role played by system 2 (S2) of the VSM. **Figure 5.4** provides a summary of the coordination of the development and implementation of the ICT strategy as per text excepts in **Table 5.5**.

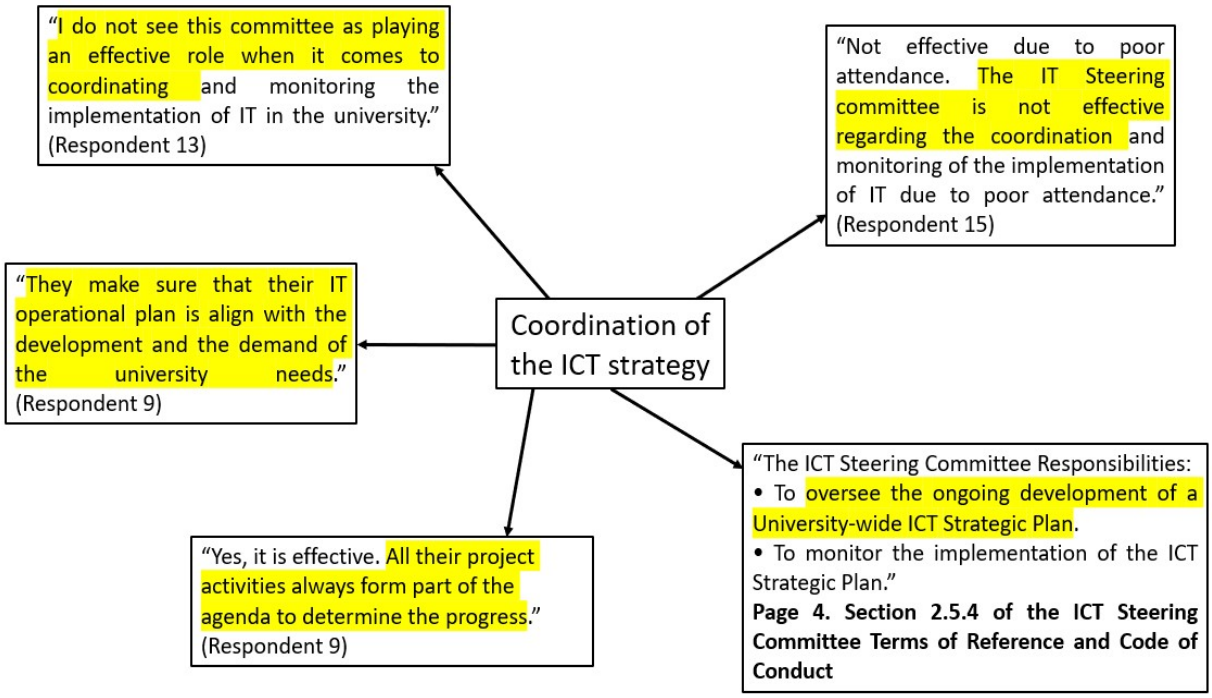


Figure 5. 4: Coordination of the ICT Strategy

5.3.5 Monitoring the ICT strategy

This seeks to identify the components of the ITG system that are responsible for monitoring and auditing the processes related to the development and implementation of the ICT strategy in the HEIs. Table 5.6 provides analysis and discussion of the findings of the study with regard to monitoring of the development and implementation of the ICT strategy in HEIs.

Table 5. 6: Monitoring the ICT strategy (@Strategic Level)

Text Excerpts	Text Analysis	Discursive Practice
Executive Management The VC is responsible to ensure: *"The VC is responsible to ensure that ICT strategic decision-making and its related expenditure are made in compliance with the ICT Governance Framework."* **Page 8, Section 6.1.2. (c) of the ICT Governance Framework** *"Monitor through the ICT steering committee where the DVC is chairperson there."* **(Respondent 7)** *"Executive line manager evaluates, directs and monitors the ITG in the University."* **(Respondent 14)**	The Vice Chancellor (VC) is the chief accounting officer of the University. VC works with a team of executive and senior management. Therefore, by virtue of their positions, they should evaluate, direct and monitor everything that is happening in the institution. Hence, the results of the study show that the VC and the designated executive management are responsible for evaluating, directing, and monitoring; and this includes ensuring that ICT strategic decision-making and its related expenditure are made in compliance with the ITG. It is safe to say that the VC and executive management monitors ICT strategy at strategic level. See **Text Excerpts** in the left column.	Monitoring
Senate *"Senate is there to keep people on their toes."* ***(Respondent 1)*** *"It should monitor the implementation."* ***(Respondent 3)*** *"Senate monitors implementation through the ICT steering committee reports that serve at its meetings."* ***(Respondent 11)***	The implementation of IT in the organization is done to enable and support the academic business. Therefore, involving academics in the implementation contributes to enhancing the performance of IT in the organization. In this regard, Senate as the highest decision-making structure on academic matters also monitors the performance of	Monitoring

ICT steering committee *"Oversees ICT strategy and project implementation."* **(Respondent 11)** *"The ICT steering committee plays a monitoring role during the implementation of the IT Strategic Plan."* **(Respondent 15)** *The ICT Steering Committee Responsibilities include:* • *To oversee the ongoing development of a university-wide ICT Strategic Plan.* **Page 5 of the ICT Steering Committee: Terms of Reference and Code of Conduct**	IT as it also affects the performance of the academic programme. The ICT steering committee (ITSC) also monitors performance of IT on behalf of the academic project. Therefore, the draft of the ICT strategy and the IT roadmap is also submitted to the ITSC for its approval before it is submitted to Council for final approval. The ICT department submits progress report with regard to ICT projects that are implemented. This is also a sign of ITSC role regarding monitoring the IT strategic plan. See **Text Excerpts** on the left column.	Monitoring

Table 5.6 shows the monitoring which is done by internal structures on behalf of the executive management. This also shows that the VC has a role to ensure the alignment of ICT and the organisational activities. The table also confirms that ICT users as represented in Senate and in the ICT Steering Committee also monitor the implementation of ICT in the organisation. However, there are also some roles to play about the development and implementation of ICT strategy. Therefore, they cannot be referees and players at in the same game. Hence, that is where provisions of **Table 5.7** come in.

Table 5. 7: Monitoring the ICT Strategy (@Governance Level)

Text Excerpts	Text Analysis	Discursive Practice
Audit Committee *"According to King 4 Audit Committee of Council provides oversight of ICT Governance."* **(Respondent 14)** *"Yes, through the audit findings. Because remember, when audit findings are raised, they would be raised against our business strategy and ICT governance strategy to say you fall short when it comes to this particular point. Please, improve."* ***(Respondent 2)*** *"Audit and Risk Management Committee is responsible for:* *a) Assisting Council in carrying out its oversight function related to Governance of ICT and ICT risk management."* ***Section 6.1.6.(a) in Page 8 of the ICT GOVERNANCE FRAMEWORK***	The results of the study also show that both Audit Committee and Risk Committee provide oversight over ITG on behalf of Council through audit findings. These two structures also audit all other ITG role players including the performance if ICT steering committee. Unlike ITSC committee that also coordinates the implementation of the ICT strategy; Audit Committee and Risk Committee only monitor if whatever that has been planned has been achieved. Hence, the monitor the implementation of the ICT strategy. This ensures that the risks identified and captured in the ICT operational risk report in relation to the development and implementation of ICT strategy are addressed. Internal and external auditors are the vehicles that Risk Committee and Audit Committee use to monitor; and every section of the ICT department is audited since they are the ones responsible for the implementation of the ICT strategy. See **Text Excerpts** on the left column	Oversight • Monitor on behalf of Council
Risk Committee *"They approve the ICT Operational Risk report. The ICT Operational Report will reflect those ICT risks that may affect the University during the strategy implementation. The Committee monitors the implementation of the operational risk report."* **(Respondent 19)** *"They do. The Internal Auditors audit the ICT strategy assessing the alignment and findings are tabled at the Committee to make sure that the findings are addressed."* **(Respondent 19)**		

From the findings and the interpretations in **Table 5.7** concerning the monitoring of the ICT strategy, Audit Committee and Risk Committee are the ones that perform this role monitoring on behalf of Council. The VC and his/her executive team; ITSC and Senate monitor the ICT strategy at strategic level. The Audit Committee and Risk Committee monitors the ICT strategy at governance level; and that is these two committees are also able to monitor the performance of the VC and his/her executive committee, ITSC and the CIO with regard to monitoring the ICT strategy. However, it might be safe to also mention that internal auditors play a major role in this regard as it works hand in hand with the Risk Committee and the Audit Committee. The ICT related risks are captured in the ICT operational risk report and it in turn becomes a tool that is used for monitoring progress regarding addressing the identified risks.

Link to the VSM: The role of the Audit Committee and Risk Committee regarding the monitoring of the ICT strategy is the same with the role that is performed by System 3* (S3*) of the VSM (Figure 3.3) (Nhlabathi, 2001). System S3* is responsible for auditing and monitoring the performance of system one (S1) and take control action, in accordance with information it receives from the S2 (ITSC) and S3 (the CIO) (Nhlabathi, 2001) .

Therefore, Audit Committee and Risk Committee assume the responsibilities of System 3* component in VSM. Hence, they are responsible for monitor the implementation of ICT strategy in the HEIs. Figure 6.5 provides the summary regarding monitoring the ICT strategy as per text excepts in Table 6.7.

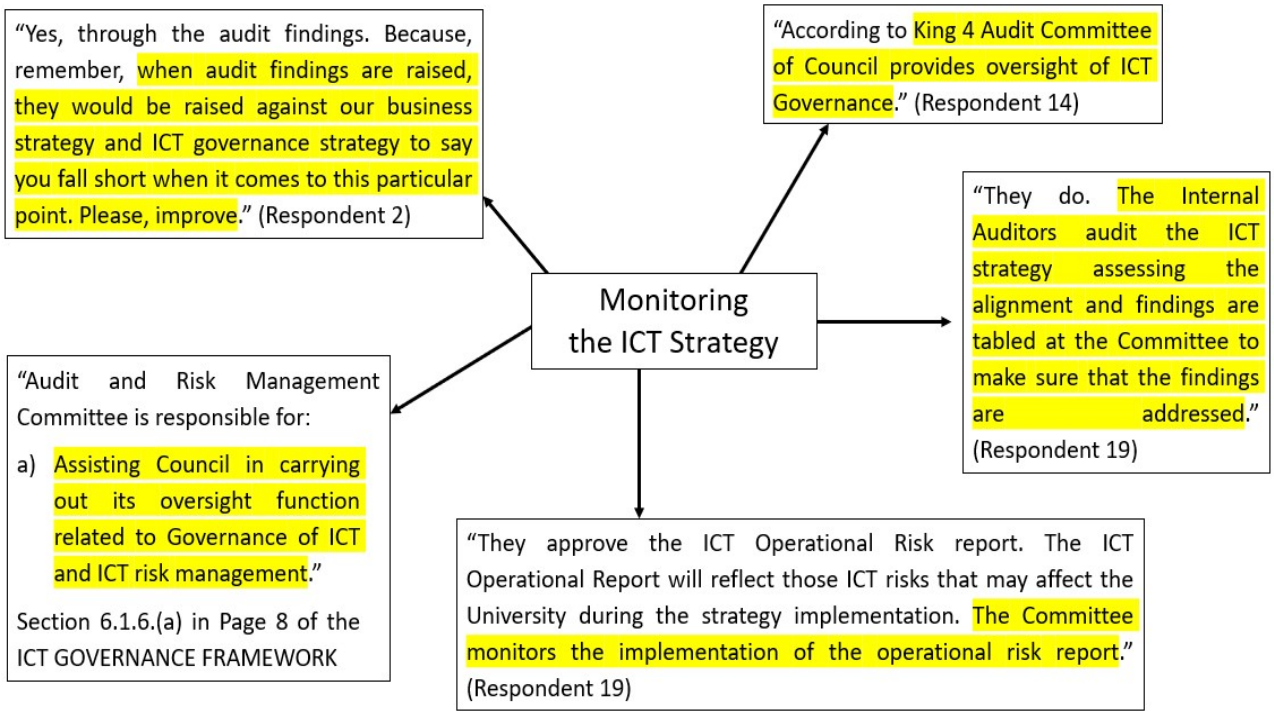


Figure 5. 5: Monitoring the ICT Strategy

5.3.6 ICT strategy Implementation

This section intended to establish ITG mechanisms which are responsible for the primary activities regarding the implementation of the ICT Strategy. These components make sure that the provisions of the ICT strategy are put into action. Table 5.8 provides analysis and discussion of the findings of the study with regard to the implementation of the ICT strategy in HEIs.

From the findings and the interpretations in Table 6.8 regarding the implementation of the ICT strategy, it was shown that sections within the ICT department are the ones that perform this role under the leadership of the CIO or the Director: ICT. The provisions of the ICT strategy and the ICT projects that are captured in the ICT roadmap are implemented by sections within the ICT department and the CIO provides leadership. These sections are responsible for the day-to-day operations. This implies that the individual sections with the guidance of the CIO develops operational plans that talk to the ICT strategy; and this is what is referred to as goal cascade (COBIT 5 Task Force, 2012). During the implementation, the Heads of Sections and the CIO should ensure that best quality of service of provided to ICT users; and another way to measure the performance of IT in this regard is to develop, negotiate and implement service level agreement (SLA) with the ICT users.

Table 5. 8: ICT strategy Implementation

Text Excerpts	Text Analysis	Discursive Practice
"Is to ensure that what we have put in the ICT strategy gets implemented; because sometimes you find that you go out there and strategies, you come back with this nice document, saying that you are going to do 1 2 3, but if you are not going to put action there nothing will happen. So, is to ensure that the action takes place." **(Respondent 16)** *"These strategies will (once approved) then be cascaded down to all subordinate sections into plans, activities and objectives and measurable critical performance areas to ensure successful execution."* **Text except from the draft of the University of Venda ICT 2025 Strategy** *"I think we have frontline people, unless we teach them that the staff or the students that they deal with them are clients or customers and they need to treat them with respect, we are not gonna go far."* **(Respondent 4)** *"The ICT Department cannot afford to focus on technology and internal processes without considering the quality of the ICT services and focusing on the relationship with university community. The ICT service management is crucial in ensuring that the ICT Department deliver quality service to the business users."* **Text except from the draft of the University of Venda ICT 2025 Strategy**	The results of the study show that the ICT strategy should be cascaded down to all subordinate sections. Operational plans, activities and objectives should be developed and implemented in line with the ICT strategy and the roadmap. There should be measurable critical performance areas to ensure successful execution of the provision of the ICT strategy which are also derived from the ICT roadmap. However, during the implementation, customer care should also be given highest priority. This implies that the ServiceDesk and IT Technicians as frontline staff should display the highest quality of services. This requires the CIO and Heads of Sections to be on top of their game with regard to ensuring that the provisions of the ICT strategy and the projects in the ICT roadmap are effectively implemented. The best to address the challenges related to customer services is for the ICT department to develop, negotiate and implement a service level agreement with the customers.	ICT strategy implementation • Operational plans • Quality of service

Link to the VSM: The role of the Sections, which are the ICT Department, regarding the implementation of the ICT strategy is the same with the role that is performed by System 1 (S1) of the VSM (Espejo & Gill, 2011). S1 is also referred to as 'Implementation' (Espejo & Gill, 2011). According to Walker (1998), System 1 (i.e. ICT Department) is an entire collection of interacting operational units that are responsible for primary activities of the sub-system or system (Bianchi

& Sousa, 2016). They are autonomous and adaptive entities that conduct and optimize the daily business; and this is the responsibility which is performed by the sections with the ICT Department (Schwaninger & Scheef, 2016). System 3 (i.e. CIO) is the one which is responsible for the overall control of System 1 units (i.e. Sections within the ICT Department) (Lewis & Millar, 2009). Figure 6.6 provides the summary regarding the implementation of ICT strategy as per text excepts in **Table 5.8**.

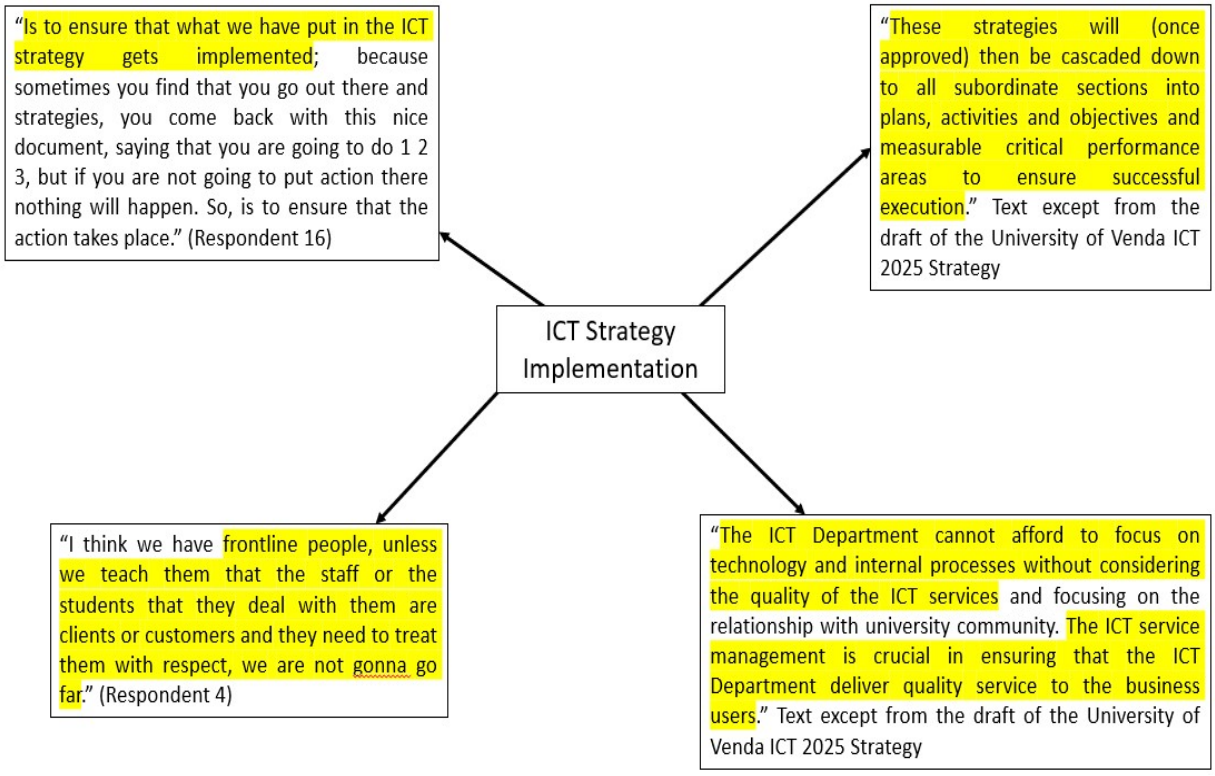


Figure 5. 6: ICT strategy Implementation

5.4 Summary of ITG Mechanisms and the Roles

Table 5.9 to **Table 5.14; and Figure 5.7** provide summaries derived from interpretations and discussions of the findings of the study as captured from **Table 5.2** to **Table 5.8.** They also provide answers in relation to the following research questions: (a) What are the ITG mechanism in HEIs? and (b) What are the roles and responsibilities of the identified ITG mechanisms in HEIs?

Table 5. 9: ITG Mechanisms: Council

ITG Mechanisms: Council		**VSM:** System 5
Main Role: Strategic Envisioning		
Roles and Responsibilities		
• Ensures the development of the ICT strategy that sets out the overall vision regarding the implementation of ICT in the organization. • Ensures that the ICT strategy is aligned to the organizational strategy. • Ensures that the ICT strategy defines the key ICT strategic objectives, policies and processes for the period under consideration (e.g. five-years). • Ensures that the roles and responsibilities of different ITG role players, including the roles of the CIO and the executive management regarding ICT strategy in HEIs are explicitly stipulates in the ITG framework. • Ensures the development and availability of the ICT roadmap that contains list of ICT projects that will be realised by the ICT strategy. This will enable the ICT strategy to serve as a blueprint for future ICT service delivery programmes. • Ensures that the ICT strategy enables the organization to exploit and leverage on existing and emerging technologies and best practices to transform business processes through simplification and agility, to achieve digital transformation as set out in the organization strategic goals. • Approves the ITG framework, ICT Strategy and ICT policies. • Monitor the implementation of the ICT Strategy through Audit Committee and Risk Committee		

Table 5. 10: Develop Organizational Strategies

ITG Mechanisms: Executive Management		**VSM:** System 4
Main role: To develop organizational strategies		
Roles and Responsibilities		
• Executive management is responsible for formulating organizational plans, including the organizational strategy. • Ensures the alignment of the ICT strategy with the organizational strategy. • Ensures the involvement of stakeholders, Senate in an endeavour that everyone understands the provisions of the organizational strategy; and this in turn ensures that the organizational strategy is IT-informed. • Ensure ICT involvement in the development of the organizational strategy since effective ICT strategy begins with an IT-informed business strategy. • Ensures that the ICT strategy is aligned with the organizational strategy. • Ensures that the organizational strategy is capable of adapting to the everchanging environment, and concerns aspects of organization agility. • The management should always scan the outside world to identify opportunities and threats that may affect the viability of the organization. • Vigilant and proactively respond to the developments that could affect the performance of their organization. • The CIO should be involved in the development of the organizational strategy.		

Table 5. 11: Controls the ICT Strategy

ITG Mechanisms: Chief Information Officer		**VSM:** System 3
Main Role: To control the development and implementation of the ICT Strategy		
Roles and Responsibilities		
The Chief information officer: • Champions the ITG in the organization • Controls the development and the implementation of ICT strategy. • Develops and communicate the vision and ICT goals of the ICT Strategy. • Should ensure the alignment of the ICT strategy and the organizational strategy. • Affords members of the ICT management and the ICT department opportunity to comment and provide inputs in the drafted ICT strategy before it is finalised. • Should involve different structures, including the ICT steering committee, regarding ICT matters. This includes the implementation of the strategy. • Should thoroughly understand of the provisions of the organizational strategy. This will enable him/her to align the ICT strategy with the organizational strategy. • Ensures effective communication between himself/herself and members of his/her management team. • Provides direction and leadership to the ICT management and the entire ICT department. • Ensure the development of an ICT roadmap with projects that will enable or support the organizational strategy. • Controls the ICT budget and this affords him/her. • Prioritise the ICT projects to be implemented based on the availability of budget and the organizational needs.		

Table 5. 12: Monitor the ICT Strategy

ITG Mechanisms: Internal auditors		**VSM:** System 3*
Main role: To monitor ICT strategy		
Roles and Responsibilities		
• Internal auditors play a major role with regard to auditing the ICT. • The ICT related risks are captured in the ICT operational risk report, which is a tool that is used for monitoring progress regarding addressing the identified risks that threatens the attainment of the ICT strategic objectives. • This report is used by the CIO, VC and executive team, Risk Committee and Audit Committee to monitor ITC risks.		
ITG Mechanisms: Senate Committee ICT steering committee		**VSM:** System 3*
Main Role: To monitor ICT Strategy at strategic level		
Roles and Responsibilities		
• These are executive management's structures that have influence in the implementation of the ICT strategy. • They also monitor the development and implementation of the ICT strategy through ICT reports.		
ITG Mechanisms: Risk Committee Audit Committee		**VSM:** System 3*
Main Role: To monitor ICT strategy at Governance Level		
Audit Committee and Risk Committee are committees of Council that: • Monitor the ICT strategy at governance level through audit findings. • Monitor performance of the VC and executive committee, ITSC and the CIO regarding monitoring the ICT strategy.		

Table 5. 13: Coordinates the ICT Strategy

ITG Mechanisms: ICT steering committee		**VSM:** System 2
Main Role: Coordinates the development and implementation of the ICT strategy		
Roles and Responsibilities		
The ICT steering committee: • Coordinates the development and implementation of the ICT strategy. • Ensures the alignment of ICT strategy with the organizational strategy. • Ensures that the ICT projects that are in the ICT roadmap are capable of enabling the organizational strategy. • Ensures progress in the ICT projects that are to be implemented. Hence, the need for the projects progress reports to be submitted to be part of the ITSC agenda. • Members of the ITSC should also be aware of the fact that the effectiveness of the ITSC is also determined by the members commitment in the activities of the committee. • Ensures the alignment of ICT plans with the developments and demands of the organizational needs as this will enable the organization to meet its organizational goals and objectives. Should there be something that is not going according to the ICT strategy, the ITSC should raise concerns and recommend that it be addressed.		

Table 5. 14: Implementation of ICT Strategy

ITG Mechanisms: ICT department under the supervision of the CIO		**VSM:** System 1
Main Role: Implement provisions of the ICT strategy		
Roles and Responsibilities		
• The ICT department achieves its operational objectives in relation to the implementation of the ICT strategy through different sections within it.		
ITG Mechanisms: Sections within the ICT Department		**VSM:** Units

Main role: Implement provisions of the ICT strategy
Roles and Responsibilities
• Sections within the ICT department are responsible for the implementation of the provisions of the ICT Strategy. • These sections are responsible for the day-to-day operations. • Therefore, strategies should be cascaded down to all subordinate sections into plans, activities and objectives and measurable critical performance areas to ensure successful execution. • ICT projects that are captured in the ICT roadmap are implemented and the CIO provides leadership. • Individual sections under the guidance of the CIO develops operational plans that talk to the ICT strategy. • Ensure that best quality of service of provided to ICT users. • In order to measure performance of the ICT, Service Level Agreement (SLA) should be developed, negotiated and implemented with the ICT users.

Figure 5.7 provides helicopter view of the ITG mechanisms and their main roles in relation to ensuring the alignment of the ICT strategy and the organizational strategy.

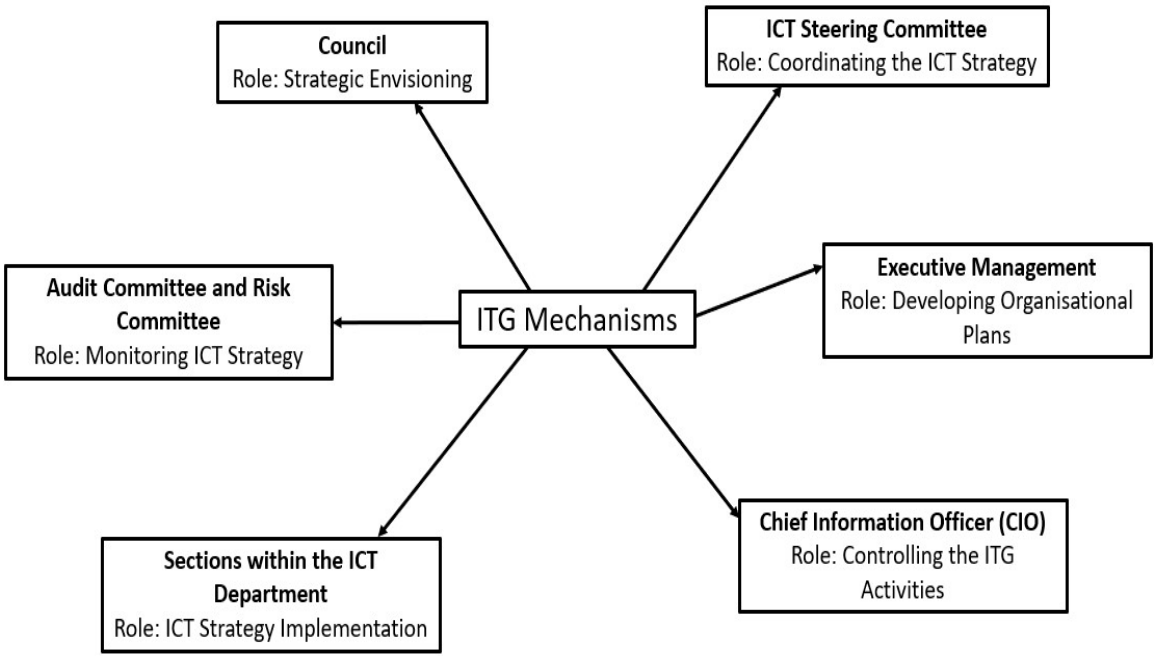


Figure 5. 7: ITG Mechanisms

The University of Venda has implemented the recommended ITG mechanisms like ICT steering committee, Risk Committee and Audit Committee. These structures assist management and Council with coordinating and monitoring the implementation of IT in the institution. However, there is still a need to enhance the performance of all the ITG mechanisms in terms of ensuring their effectiveness and efficiency. The ITG role players need to have a thorough understanding regard the impact and influence of their roles towards the overall performance of the organisation as this is still lacking. ITG role players should continue to provide influence the full integration of ICT and the business as from the study one could infer that there is them (ICT Department) and us (business). This will also enable all the ITG stakeholders to view other ITG mechanisms in the context of the overall ICT goal in the institution and vice versa. ITG role players should view themselves as components of the ITG system that should perform in order for the overall organization to perform.

Chapter 6: Determinants of ITG

6.1 OVERVIEW OF THE CHAPTER

This chapter focuses on the analysis of findings related to the following research question: What are the determinants of effective integration of ITG in the ICT strategy development? This represents those aspects that ITG role players should consider when implementing ITG in HEIs to be effective and efficient.

The chapter is structured as follows: The first part summarizes the demographic profile of those who were sampled in the study. This is then followed by a deductive theoretical thematic analysis of the findings also guided by the Viable System Model. The extracts from ITG documents and the responses from the interviews were captured as text excerpts in **Table 6.3** to **Table 6.8**, while the interpretation is captured in the text analysis column. The discursive practices column links the interpretation to the theoretical concepts based on VSM. This approach has been used in other studies, such as the one by Ochara and Fadhili (2013) as mentioned in the previous chapter. A summary of the findings is then provided at the end.

6.2 PROFILE OF RESPONDENTS

Table 6.1 shows profiles of the respondents to the question that intended to establish the factors that contribute toward effective ITG. The table also show their occupation, remarks and the number of years working in HEIs. From the table, one is able to establish the experience of the respondents in HEIs and also the roles that the play in the ITG arena.

Table 6. 1: Profiles of the Respondents

Respondents	Occupation	Remarks	No. of Years in HEI
Respondent 1	Dean – School of Mathematics and Natural Sciences	• Member of the senior management committee (SMC); Senate, and ICT Steering Committee • Chairperson of the School Board meetings • Has PhD qualification	More than fifteen (15) years

Respondent 3	Dean: School of Law	• Member of SMC, Senate, ICT Steering Committee • Chairperson of School Board meeting • Has Doctorate (LLD) qualification • Advocate of the High Court of South Africa • Professor	More than five (5) years
Respondent 4	Director: Human Resources	• Member of ICT Steering Committee, SMC, and Risk Committee • Attends Senate and Audit Committee as resource person	Less than five (5) years
Respondent 5	Director: Community Engagement	• Member of Council, SMC, and member of ICT Steering Committee • PhD Qualifications	More than Fifteen (15) years
Respondent 6	Director: Communications	• Member of the SMC • PhD Qualifications	More than fifteen (15) years
Respondent 7	DVC: Operations	• Chairperson of the ICT Steering Committee • Executive responsible for the ICT • Member of Council, executive management (EMC), SMC, risk committee and audit committee. • Participated in the development of the 2021-2025 University Strategic Plan • Has PhD qualification	More than ten (10) years
Respondent 8	Dean of School of Education	• Member of the Senior management committee, ICT Steering Committee • Participated in the development of the 2021 – 2025 University Strategy • Has doctorate (DEd) qualification • Professor	More than fifteen (15) years

Respondent 9	Research Administration Coordinator	• Member of the ICT Steering Committee • Vast experience in the administration of research which is part of the core business of HEIs • Has two Master's qualification and one of them is on Project Management	More than five (5) years
Respondent 10	Former Council member	• Member of council • Graduate with a Bachelor's degree	More than fifteen (15) years
Respondent 11	Director: Library Services	• Member of the ICT steering committee, SMC, and Senate • Pioneered and coordinated the implementation of library systems, e.g., SIERA • Post graduate qualification	More than fifteen (15) years
Respondent 12	Former Council Member	• Member of Council • Masters qualifications	More than ten (10) years
Respondent 13	Director: CHETL (Centre for Higher Education Teaching and Learning)	• Member of the ICT Steering Committee; Senate, and SMC • Responsible for the implementation of the learning management system, i.e., Blackboard which is faced out, and is to be replaced by Moodle. • Has PhD qualification	More than fifteen (15) years
Respondent 14	DVC: Academic	• Member of Council, Risk Committee, Audit Committee, executive management, SMC, and Senate • Previously served as a dean in the School of Mathematics and Natural Sciences • Has PhD qualification	More than twenty (20) years

Respondent 15	Secretary of the ICT Steering Committee	• Resource person responsible for capturing minutes during the ICT Steering Committee proceedings • Employee in the ICT Department responsible for ICT ServiceDesk • Participated in the development of the 2021 to 2025 ICT Strategic Plan • Has COBIT and ITIL certification • Has B. Tech. qualification currently pursuing Masters in Information Technology (IT Governance)	More than fifteen (15) years
Respondent 16	Head: Systems Operations in the ICT Department	• Worked as ICT consultant for HEI in the Enterprise Resource Planning (ERP) System • Responsible for ERP and the development and implementation of business systems in HEI • Member of the ICT management in HEI • Member of the ICT Steering Committee • Involved in the development of the 2021-2025 – ICT Strategic plan • Experience in the planning and implementation of ICT projects • Has post graduate ICT qualification	More than five (5) years
Respondent 17	Former Student Representative Council president	• Former member of Council by virtue of being the SRC president • Has Masters in Business Information Systems qualification	More than five (5) years
Respondent 18	Head in the School of Environmental Sciences	• More than ten (10) years of experience coordinating ICT related activities in the School • Member of Senate • Member of school board in HEI	More than twenty (20) years in HEI

		• Has PhD qualification	
Respondent 19	Former ICT Director	• Currently the CIO in a HEIs • ICT Director for more than twenty-five (25) years • More than 25 years of experience in developing IT Strategic plans • Member of Executive Management, SMC, Senate and ICT Steering Committee • Attend Risk Committee and Audit Committee as resource person • Has Master of Business Management (MBA)	More than twenty-five (25) years

6.3 THE LINK AMONG DIFFERENT PRINCIPLES

Even though VSM principles were individually discussed in Section 3.8.2; each principle either has an influence or link with of other VSM principles. This has been confirmed by different sources of literature reviewed. Consider **Figure 6.1** and **Table 6.2** respectively.

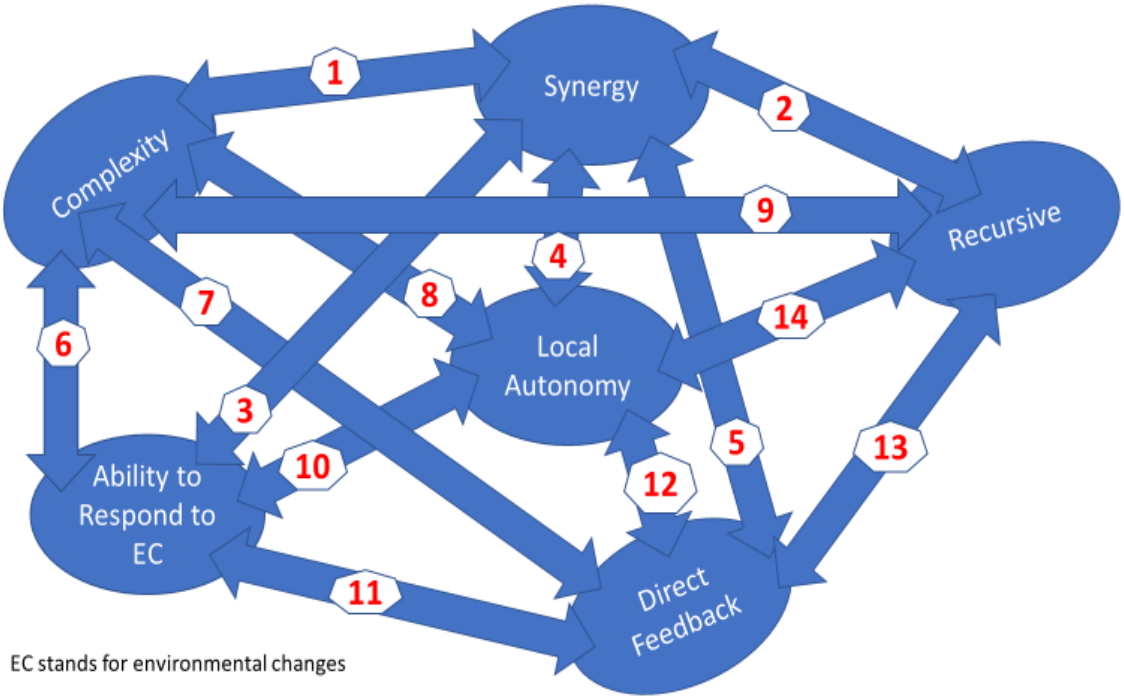


Figure 6. 1: How each Principle is Related to other Principles (Source: Researcher, 2021)

The **Table 6.2** provides a brief description of **Figure 6.1**. The first column shows the **Arrow Number** which is the number of the double-sided arrow that shows the link of two VSM principles; the second column is VSM Principles which shows the two principles that are linked by the double-sided arrow; and the last column is a description that shows the link between the two principles based of the literature reviewed.

Table 6. 2: Interpretation of Figure 6.1

Arrow Number	**VSM Principles**		**Describing the link between the two principles**
1	Synergy	Complexity	VSM enables stakeholders of the enterprise to interact as a synergetic whole; and this enable them to control complex projects, the integration and coordination of project teams (Mohamad, 2018).
2		Recursive	Every level should be recursively in synergy with the previous level (Ríos, n.d.).

3		Ability to Respond to Environmental Changes	A **synergistic** communications of multiple autonomous units is required for the organization's total **transformation** (Espejo, 1990).
4		Local Autonomy	There should be **synergy** among **autonomous units** (Espejo, 1990); and this grants lower recursive-level decision-making power as long as coherence (synergy) of the overall system is guaranteed (Hildbrand & Bodhanya, 2015).
5		Direct Feedback	**Synergy** is expected to occur whenever system elements or systems themselves **communicate** or **interact** (Nhlabathi, 2001).
6	Complexity	Ability to respond to Environmental Changes	Differentiations of organizational structures increase internal **complexity** and enhance organization **adaptability**, and also through a recursive process (Tubin, 2007). Furthermore, each system contains within itself the **capacity to adapt to changing environment** and to deal with the **complexity** that is relevant for it (Espejo & Gill, 2011).
7		Direct Feedback	Viable systems are results of the connectivity (i.e. **communications** and interactions) among primary and regulatory activities (Espejo, 1990). Hence, **complexity** which results from the inter-relationship, inter-action and inter-connectivity of elements within and between the IT systems and their environment (Chan, 2001b).
8		Local Autonomy	Each **autonomous unit** contains within itself the capacity to adapt to changing environment and to deal with the **complexity** that is relevant for it (Espejo & Gill, 2011).

9		Recursive	**Complexity** of the system can be handled and managed by structuring the system into several **recursive levels** (Hildbrand & Bodhanya, 2015).
10	Ability to Respond to Environmental Changes	Local Autonomy	Each **system or autonomous unit** contains within itself the capacity to **adapt to changing environment** and to deal with the complexity that is relevant for it (Espejo & Gill, 2011).
11		Direct Feedback	The organization's total **transformation** is thus produced by the **synergistic communications** of multiple autonomous units (Espejo, 1990).
12	Direct Feedback (Communication)	Local Autonomy	There should be synergistic **communications** of multiple **autonomous units** for organization's transformation to happen (Espejo, 1990).
13		Recursive	The control (management) is composed of three functions: policy, intelligence and control; and the relationships between these functions show that the **feedback** between intelligence and control functions must take into account the objectives of the system at its **recursion** level (Herrera et al., 2011).
14	Recursive	Local Autonomy	**Recursion** also includes the principle of **local autonomy** which is another core feature for ensuring a viable system; and this principle grants lower recursive-level decision-making power as long as their activities do not threaten the coherence of the overall system (Hildbrand & Bodhanya, 2015).

From the **Figure 6.1** and **Table 6.2** one can interpret that all the above mentioned VSM principles should be considered collectively if the viability of a system or organization is to be ensured.

6.4 ANALYSIS: RESULTS PRESENTATIONS, INTERPRETATION AND DISCUSSIONS

This section provides results from data analysis regarding the factors that have influence on the alignment of ICT and the operations of the HEIs. The responses from the interviews were captured as respondent excerpts as shown from **Table 6.3** to **Table 6.8,** while the interpretation is captured in the text analysis column. The discursive practices column links the interpretation to the VSM concepts. This approach has been used in other studies, such as the one by Ochara and Fadhili (2013).

6.4.1 Complexity of ICT Governance in HEIs

This subsection was intended to establish the overview regarding complexity of ITG in terms of the interconnectedness, interaction, inter-activities, and interrelatedness of different heterogenous ITG mechanisms and systems in HEIs; and this amongst others includes processes, structures, infrastructure, etc. **Table 6.3** provides analysis and discussion of the findings of the study regarding complexity of ITG in HEIs.

Table 6. 3: Complexity of ITG in HEIs

Text Excerpts	Text Analysis	Discursive Practice
"Currently our students are studying online; and through the assistance of IT all these systems like Blackboard are put into place. We also have Wi-Fi installed in our University, in our schools, and this is another way which I see IT helping us to achieve the objective of learning and teaching. This would also go a long way, in terms of us doing our research online, and working with other Universities – international and national universities. This can only be attained when we involve ICT projects." **(Respondent 8)**	***ICT projects as a Proxy to Digital Infrastructure Platforms*** for Learning Management Systems, Wi-Fi Connectivity, Online Studying and Doing Research Online.	Complexity • ICT infrastructure ○ Interconnection ○ Interrelatedness ○ Interaction
Processes	Efficiency of processes and capacity of staff have major contribution in the	Co-operation amongst departments

"Implementation of some projects is too slow due to lack of internal capacity and slow procurement processes." ***(Respondent 11)*** *"Leasing laptops is too expensive, that is my worry. IT takes time to replace old laptops and it is affecting our performance negatively."* ***(Respondent 3)***	implementation of ICT projects and also in the procurement of IT equipment.	
The ICT Services Report submitted to the 01st of September 2020 ICT Steering Committee (Page 15-40) *Individual Sectional Heads were only responsible for providing reports for their individual sections only while the Director: ICT Services was responsible for the whole ICT Steering Committee agenda.*	The environment in which the Director: ICT Services operates is more complex than the environment in which individual Heads of Sections in the ICT Department operate. The evidence provided here shows the Heads of Sections providing reports about their individual sections only while the Director: ICT Services was responsible for the whole department.	Ability to see part in the context of the whole.
"Council is accountable for the governance of ICT in the University. Council has to ensure that there are also structures that assist in the implementation of ICT governance within the institution. … *Executive Management members should play an active role in determining ICT strategy.* *The VC should provide organizational structures to support the implementation of ICT strategy.* *The Director ICT Services must be business-oriented and provide a bridge between ICT and the institution.* *The ICT Director as the delegated ICT Governance champion as per the King IV code which says that the governing body should delegate to management the responsibility to manage IT effectively.*	Different ITG levels in HEIs also contributes to the complexity of ITG. This also implies the need to cascade and nest the responsibility of ITG into different levels. Each level has roles to contribute in the ICT strategy. Despite the nature and level of complexity, all the ITG levels (Council, executive management, ...) have one common goal which is to implement ITG and for they should work synergically in this regard.	Different ITG levels contributes to the complexities of ITG.

Executive Management should become involved in the ICT Steering Committee through regular feedback reports." **Page 12-13, Section 7.1 of the ICT Governance Framework**		
"An Audit, Risk and ICT Governance Committee should be constituted to assist Council in carrying out its oversight function related to Governance of ICT and ICT risk management." **Page 8, Section 6.1 (d) of the ICT Governance Framework**	Oversight structures plays a very important role in ITG. Their existence also contributes to the complexity of ITG.	Oversight structures in ITG
ICT projects and ICT Strategy *"The rollout of facial recognition can assist the University with data management of class attendance and staff attendance. The ICT strategy about improving access control through Facial recognition has lot of spin off in that the university can generate class list and attendance register. University move to fully online teaching and learning."* **(Respondent 14)**	The SMART Campus as an ICT Strategy consists of several ICT projects that are inter-related. Example in this case is facial recognition project that assists with generating class attendance register for both students and staff. **Consider Text Excepts in the left column**	Provisions with the ICT Strategy in terms of the ICT roadmap and the ICT projects within the roadmap.
Complexity due to different Stakeholders *"The membership of the ICT Steering Committee shall comprise of:* *The Chair of the ICT Steering Committee will be the DVC Operations.* • *The Deputy Chair will be the Director ICT Services* *Other Members:* • *Three members from the ICT Department (Technical Resource)* • *Director Library Services* • *Director Finance*	Diversity in terms of composition of the ICT steering committee; and this represents the Stakeholders' involvement. Number and competencies of ICT steering members contributes to the complexity and performance of a committee. **Consider Text Excepts in the left column.**	Composition of committees contributes to complexity.

• *Representative for the Registrar Academic"* **Page 2, Section 2.1 of the ICT Steering Committee Terms of Reference and Code of Conduct** *"Workshops are conducted. IT also goes to the department, and sometimes the department have ICT projects that need ICT department for implementation. Both the IT and the department can identify ICT projects to be implemented."* ***(Respondent 15)***		

The way different components of the ICT infrastructure are interconnected and also the way they interact contributes to the complexity of the ITG. In the case of online teaching and learning for example, ICT projects enable online teaching and learning confirms the complexity aspect in the ITG. ITG is also viewed as a system which is composed of interconnected and interrelated subsystems that work together as a whole, where the subsystems include structures, processes and relational mechanisms (Peterson, 2004; Lopez & Whitehead, 2013). ITG is considered to be complex and dynamic in nature (De Haes & Grembergen, 2004; Sambamurthy & Zmud, 1999).

The quality of cooperation amongst role players also have influence on the complexities in the ITG. This is supported by Hyötyläinen (2010) who mentioned that the provisioning of ICT services itself is a complex, highly social process generally involving the cooperation of several organizational units and their personnel.

The ability to see every component of ITG system in the context of the whole matters is a skill that ITG role players should aspire to have. For example, ICT projects should be viewed in line with the ICT strategy and the organizational goals. This is what is referred to as the "big picture". In other words, ITG role players should strive to have holistic view of ITG in the organization. That is a subsystem should be considered in the context of the entire system as its performance might have impact on the performance of the entire system. For example, the impact of unavailability of Wi-Fi and Internet will always have negative impact of the online teaching and learning. ITG mechanisms or subsystems should work together as a whole, where the subsystems include structures; systems; processes; infrastructure; Wi-Fi, Learning Management System, stakeholders; skills and competencies; and information; and this makes ITG to be complex and

dynamic in nature (De Haes & Grembergen, 2004; Sambamurthy & Zmud, 1999).

ITG role players should also appreciate the complexities and diversities that are caused by the existence of different levels; and the same is the case with existence of oversight structures like Audit Committee. This is also supported by Tubin (2007) segmentation, stratification and functional differentiations increase internal complexity. This implies that any form of categorisations and/or groupings in relation to the implementation of ITG in the organization has influence on the complexity of IT in the organization. In a way, the established ITG levels also contribute in reducing complexity as even Hildbrand and Bodhanya (2015) also mentioned that complexity of the system can be handled and managed by structuring the system into several recursive levels.

The results also show that key ICT projects are identified through joint meetings with departments and/or directorates, which also confirms that there are inter-actions amongst relevant structures. Harrison et al. (2015) harnessing the energy of stakeholders during the identification of ICT projects will contribute to helping the organizations towards the fulfilment of those objectives. ICT Steering committee also plays an important role in this regard. What is important is that there should be effectiveness in the coordination of different categories of stakeholders (Chan, 2001b). This is also relevant to the Complexity VSM principle (Hildbrand & Bodhanya, 2015).

Link to the VSM: The above discussion confirms the interactions and interrelationship amongst different ITG mechanisms and systems; and relates to complexity which is also one of the principles of VSM (Espejo, 1990). **Figure 6.2** provides a summary of complexity of ICT Governance in HEIs as per text excepts in **Table 6.3**.

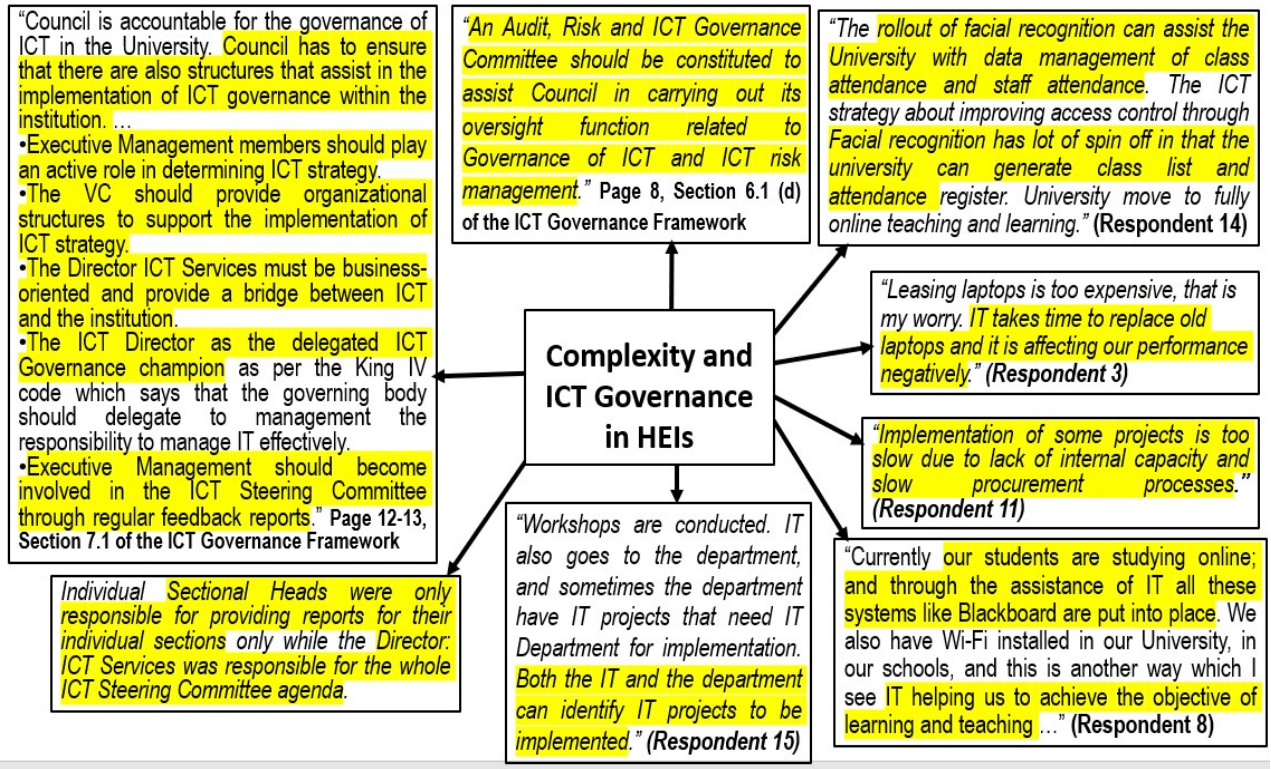


Figure 6. 2: Complexity of ICT Governance in HEIs

6.4.2 Synergy of ICT Governance Components in HEIs

Synergy seeks to establish if different components of ITG in HEIs work together without or with minimal problems towards enabling the attainment of the organizational objectives. Table 6.4 provides analysis and discussion of the findings of the study with regard to synergy in ITG in HEIs.

Table 6. 4: Synergy of ITG mechanisms in HEIs

Text Excerpts	Text Analysis	Discursive Practice
"In developing this 2025 ICT strategy, it was therefore necessary to ensure alignment *with the University of Venda 2025 business Strategic Plan approved by the Council."* **(Draft of the University of Venda ICT 2025 Strategy)**	For the ICT to enable and support the organizational objectives; there should be effectiveness with regard to the alignment of ICT strategies and the organizational strategies. This implies that the ICT roadmap should contain ICT projects that will enable the achievement of the organizational objectives.	Alignment of ICT and the business • ICT Strategy and organizational strategy • Strategic and operational plans

"They make sure that their IT operational plan is align with the development and the demand of the university needs." **(Respondent 9)**		• ICT projects and ICT roadmap
"… but I think if you are actually developing a budget for one or several departments it is actually good to understand their needs, and try to see which of the needs that we might have specified for that year ..." **(Respondent 18)**	The provisions of the ICT budget should talk to the provisions of the ICT strategy and the ICT roadmap. Operational plans and implementation plans should also be based on the availability of the budget.	Link between ICT budget and ICT plans
"The speed of Internet, it is really better, and it does enable me to do my work ..." **(Respondent 5)**	The results of the study show that show the interconnection between capabilities and performance of the infrastructure and the performance of staff.	Capabilities of the infrastructure and staff performance
Learning Management System; Wi-Fi and Studying Online *"Currently our students are studying online; and through the assistance of IT all these systems like Blackboard are put into place. We also have Wi-Fi installed in our University, in our schools, and this is another way which I see IT helping us to achieve the objective of learning and teaching …"* **(Respondent 8)**	The findings of the study show number of systems that work together towards ensuring the researching and studying online by students. However, what is important is to view the components in the context of the whole. Hence, LMS and Wi-fi should be looked at in line with online learning. These systems are interconnected and interacting to achieve the teaching and learning objectives with minimal disruptions.	Synergy • Systems • ICT projects
"Executive Management should become involved in the ICT Steering Committee through regular feedback reports." **Page 13, Section 7.1 of the ICT Governance Framework**	The findings of the study also show the need for the Executive Management to be involved in the ICT Steering committee through regular feedback. This suggests synergistic communications among different ITG systems or components.	Synergy through reporting
"Senate is responsible for the core business of the institution. Senate cannot be separated from IT. IT must work closely with Senate as it is the highest decision-making body in terms of academic matter." ***(Respondent 6)***	The findings also show the need for ICT department to work very closely with Senate, and this is only possible when there is effective and efficient	

	communication between IT and Senate.	
"Council is accountable for the governance of ICT in the University. Council has to ensure that there are also structures that assist in the implementation of ICT governance within the institution. … • *Executive Management members should play an active role in determining ICT strategy.* • *The VC should provide organizational structures to support the implementation of ICT strategy.* • *The Director ICT Services must be business-oriented and provide a bridge between ICT and the institution.* • *The ICT Director as the delegated ICT Governance champion as per the King IV code which says that the governing body should delegate to management the responsibility to manage IT effectively.* • *Executive Management should become involved in the ICT Steering Committee through regular feedback reports."* **Page 12-13, Section 7.1 of the ICT Governance Framework**	The findings show structures, levels and roles that exist in the ITG of HEIs.	The ITG level's decisions should be in synergy with the decisions previous level
"There should be a more integrated approach. The support directorate must be part of all the academic strategic planning events in the division. Sufficient academic representation on the ICT steering committee and ICT Directorate representation at academic divisional meetings." **(Respondent 14)**	The findings also show that the respondents further mentioned the need for stakeholders to work together; and hence they advised ICT to ensure integrated approach when involving stakeholders. This might imply the need to channel team's effort towards a particular goal as a team. Consider **(Respondent 14)**	Working together Integrated Approach: Structure and Directorate Interconnected, interaction, and Interrelation

The alignment of ICT strategy and the organizational strategy is the point of departure as far as ensuring that ICT can enable the attainment of the organizational objectives. For example, according to Afandi (2017) successful alignment of ICT and the business increases operational efficiencies, innovativeness, additional competitive advantage, and ultimately, improved performance. Hence, there is always a need to ensure that the ICT is aligned with the organizational activities at all levels of the organization. The same applies with the ICT projects in the ICT roadmap, they should be prioritised based on their needs to enable and support the organizational needs and demands.

Without ICT budget that addresses the ICT needs in the institution the ICT department cannot make it as even Afandi (2017) confirmed link between the ICT budget and the operational plans of ICT services. Campbell et al. (2009) mentioned that many public sector agencies struggle to cope with reduced or inadequate IT budgets and that makes them to continuously look for ways to extract maximum value from ICT resources. The capacity and capabilities of the ICT infrastructure also has major influence in the performance of staff which in turn affects the overall performance of the organization. This also talk to the ICT projects that are implemented; they should amongst other things focus on enhancing the performance of the organization. However, those projects should be budgeted for. Therefore, ICT budget is crucial for the alignment of ICT and the business.

ITG mechanisms and stakeholders should work harmoniously with one another to ensure effectiveness regarding ICT creating value to the stakeholders. On the other hand, Dyduch (2019) and Tantalo and Priem (2016) show that a single strategic action can create value for different ITG stakeholders simultaneously, synergistically, and without reducing the total value already created. Luftman (2000) who stated that alignment is considered mature when IT and other business functions adapt their strategies together. Stakeholders play a major role in the alignment of ICT and the business. Espejo (1990) mentioned that a synergistic communication of multiple autonomous units is required for the organization's total transformation**.** Therefore, the coming together of different stakeholders in the form of ICT Steering committee; and, the ability of the ICT Department to work closely with Senate as a major stakeholder is a sign of synergistic communication.

ICT decisions should be consistent with the ICT and organizational strategic objectives irrespective of the level in which they are taken. The RACI chart is a tool that can also play a role in ensuring synergy as apart from showing who is accountable or responsible for a particular

activity, it also shows who must be informed and who must be consulted Debreceny (2013). This is also supported by (Ríos, n.d.) who mentioned that every level should be recursively in synergy with the previous level. For example, ICT Department should ensure that its ICT related decisions are aligned with the ICT related decisions taken by the executive management.

Link to the VSM: The provisions of the discussion above has a link VSM since according to VSM there should be synergy among autonomous units (Espejo, 1990); and this grants lower recursive-level decision-making power as long as coherence (synergy) of the overall system is guaranteed (Hildbrand & Bodhanya, 2015). It was also mentioned that Synergy is expected to occur whenever system elements or systems themselves communicate or interact (Mohamad, 2018; Nhlabathi, 2001). **Figure 6.3** provides a summary of Synergy of ITG mechanisms in HEIs as per text excepts in **Table 6.4**.

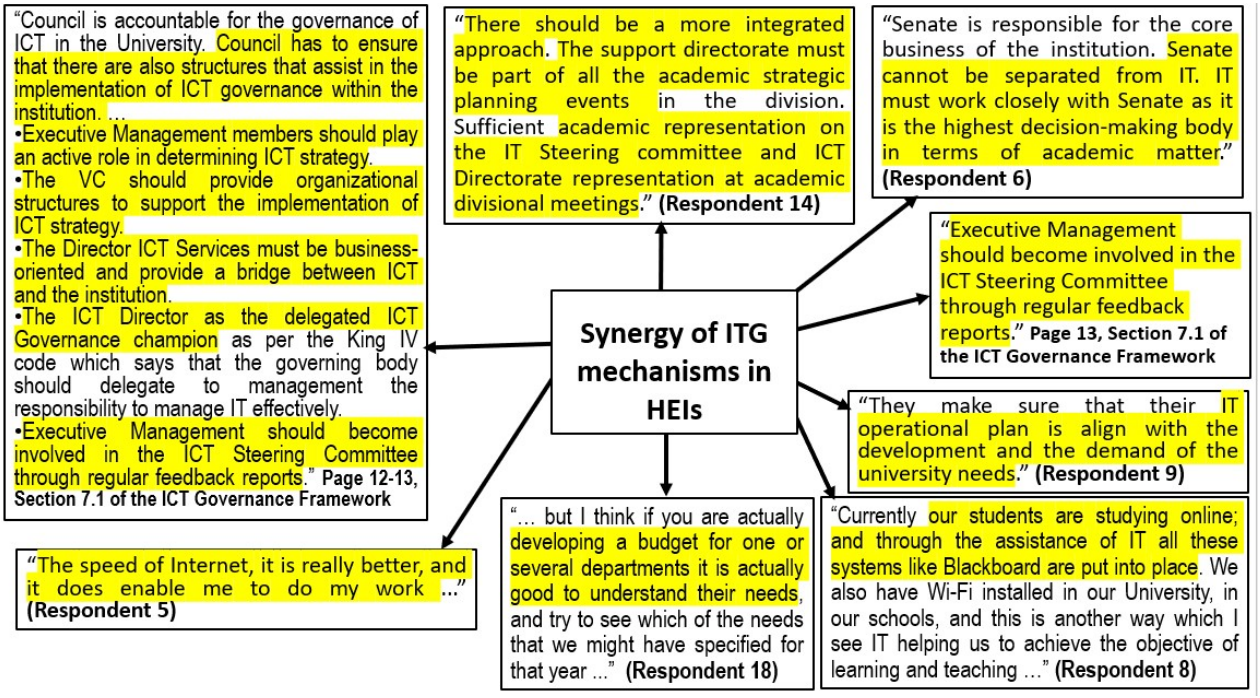


Figure 6. 3: Synergy of ITG Mechanisms in HEIs

6.4.3 Ability of ITG in HEIs to Respond to Environmental Changes

Ability of the ICT governance in HEIs to Respond to Environment Changes also applies to the aspect related to the ICT adapting and responding to organizational changes and demands. For example, according to Rouse et al. (n.d.) ICT strategy and the related documentations should be

flexible enough to change in response to new organizational circumstances, market and industry conditions, business priorities and objectives, budgetary constraints, available skill sets and core competencies, technology advances, and user needs. **Table 6.5** provides analysis and discussion of the findings of the study regarding the ability of ITG in HEIs to respond to environmental changes of ITG in HEIs.

Table 6. 5: Ability of ITG in HEIs to Respond to Environmental Changes

Text Excerpts	**Text Analysis**	**Discursive Practice**
"The ICT technology solution strategy provides a guide to direct the evolution and transformation of ICT technology solutions that enable Univen strategy, deliver value, ROI and promote a "single version of the truth" Text excerpt from the **Draft of the University of Venda ICT 2025 Strategy** *"The ICT Department realises that for any strategy to be effective and add true value to the university, this document needs to be a live document, regularly updated (at least once per annum for now) with the latest information and trends."* Text excerpt from the **Draft of the University of Venda ICT 2025 Strategy**	The results show that ICT should enable the organization to adapt to the everchanging business needs. Therefore, there should be provisions in the ICT strategy that talk to the aspects of ICT agility; hence it is considered a live document that should be updated regularly. The same should apply to the ICT policies. Different units within the organization should be involved to ensure effective adaptation of ICT to the changing business.	Adapt to everchanging business demands • ICT agility • ICT policies should be updated regularly
"Policies must be reviewed often, especially now that technology seem to have overtaken events." ***(Respondent 12)*** *"The E-Learning team works in collaboration with IT so the possibility is that they respond to the implementation of new technologies."* ***(Respondent 13)***		

"Even many HODs don't use computers. They still prefer to use handwritten letters. If you have a request, you must write a letter and then you submit it. But nowadays, things have changed. We are living in a digital world whereby we just have to use electronic means, gadgets maybe a laptop, email or phone. So, I think they are not yet advance. Training is needed to assist these people." ***(Respondent 17)***	Regular trainings and workshops should be provided to ensure the alignment of the existing ICT skills with the existing and new technologies. This will also enhance the capability of the organization to respond to the new business demands/needs.	• Regular ICT related training to upgrade ICT skills for users.
The Minutes of the ICT Steering Committee Dated: 01 September 2020: *"Six computers were installed at the main gate with a system to assist with the screening of staff and students as per COVID-19 regulations"* ***Goal:*** *"To comply with COVID-19 Regulations"*	This applies to ICT agile. However, ICT should scan the environment regularly to establish and provide services and facilities that the organization could require from it.	• Proactiveness • Compliance

From the provisions of **Table 6.5** it is clear that the ICT strategy should be a living document and together with the ICT policies, it should be reviewed on a regular basis as to enable them to respond to the new organizational demands; and this is in line with Vo (2018) who mentioned that strategic plan is a living document which should not be put on the shelf to collect dust; however, people should live by it. This has also been provided for on Beer (1972) who mentioned that for a system to be considered viable; it must also be capable of responding to environmental changes; and it must include those that were unforeseen at the time the system was designed. This may also apply to the ICT agility which is the ability of an organization to respond operationally and strategically to changes in the external environment through ICT; and this concept interplays with organizational agility (Fink & Neumann, 2007; Yousif & Pessi, 2016). ICT capabilities are important resources that facilitate organizational agility (Lowry & Wilson, 2016). ICT improve organizational agility by integrating data and communication throughout the organization; and it can also increase agility in the operations and logistics as an extension of

flexibility (Heckler & Powell, 2016). This in turn will ensure the enablement of the organizational strategy, delivery of value and return on investment.

The provision of trainings that equip ICT users with competencies relevant to the new technological changes also contributes to the viability of the entire organization. This enhances their ICT capabilities which are considered to be important resources to facilitate organizational agility in HEIs (Lowry & Wilson, 2016). Therefore, those in ITG should ensure that ICT users and the ICT team are regularly empowered with ICT competencies that are relevant to the new organizational demands.

Each system or autonomous unit contains within itself the capacity to adapt to changing environment and to deal with the complexity that is relevant for it (Espejo & Gill, 2011). Hence, the ICT Department was able to respond to the required demands during COVID-19 Lockdown without waiting for the ICT Steering Committee to give it a go ahead.

Link to the VSM: The above discussion shows that ITG should be capable of responding to the changing environment or demands; and this is connected to the VSM principle which shows that each system or autonomous unit in VSM contains within itself the capacity to adapt to changing environment and to deal with the complexity that is relevant for it (Espejo & Gill, 2011). **Figure 6.4** provides a summary of the ITG in HEIs' ability to respond to environmental changes as per text excepts in **Table 6.5**.

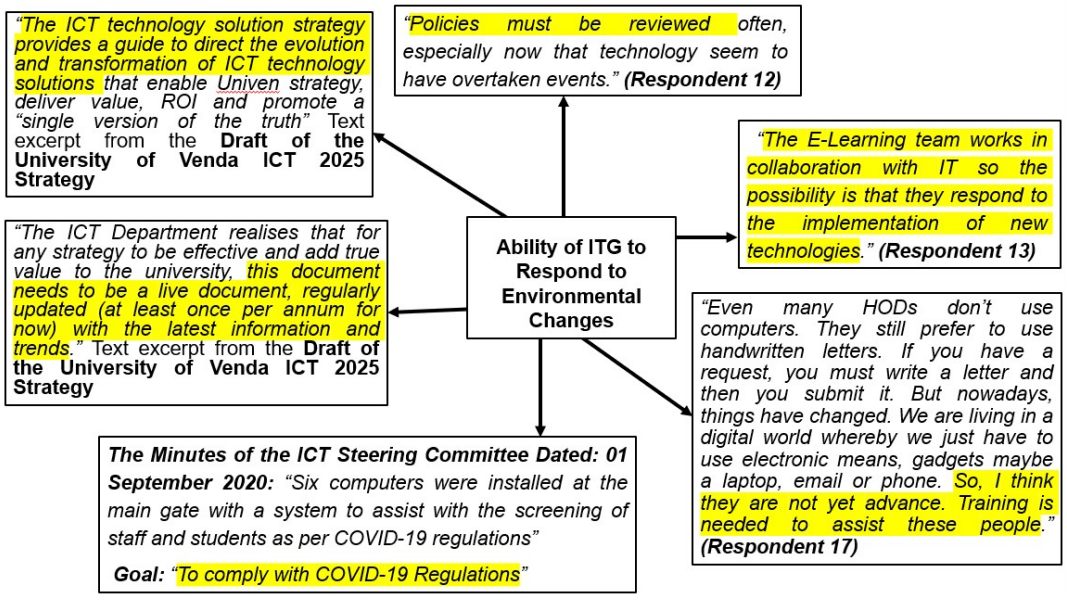


Figure 6. 4: Ability of ITG in HEIs to Respond to Environmental Changes

6.4.4 Local Autonomy at Different ITG Levels

Local autonomy relevant to the decision-making powers that are granted to different levels of the ITG structures in HEI. This also applies to the consistency and alignment of those decisions in relation to overall ITG system. Table 6.6 provides analysis and discussion of the findings of the study regarding the local autonomy in relation to decisions taken in different ITG levels.

Table 6. 6: Local Autonomy at Different ITG Levels

Text Excerpts	Text Analysis	Discursive Practice
*"There is ICT Steering Committee – **ICT as a department must take the lead.** The ICT steering committee has been implemented for the purpose of advising management. ICT must be a key role player in that committee."* ***(Respondent 7)*** *"ICT reports to the DVC operation – there is a direct line."* ***(Respondent 7)***	ICT department reports to the DVC: Operations which is the executive position. The ICT Department provides leadership on ICT matters. This implies the ICT Department is empowered to take ICT related decisions. A good example provided in this section is the This shows the existence of recursion that also goes with the autonomy of ICT Department in the ITG in HEIs.	Decision making capacity • Governance decisions • Strategic decisions • Operational decisions
"Council monitors the implementation of the ICT strategy through the Audit Committee. There is an ICT standing report that is submitted to the audit committee." **(Respondent 14)** ***The ICT Services Report submitted to the 01st of September 2020 ICT Steering Committee*** *Improvements Regarding Logging Calls implemented by the ICT Service during the COVID-19 Lockdown are summarised in Page 21 of the agenda pack.* *In addition to the current ServiceDesk support tool and the ICT Services has introduced the*	The fact that Council has the ultimate authority over ICT in an organization implies that there are ICT related decisions that it takes at governance level. The executives also have ICT decisions that they take without first approaching the Council which are referred to as strategic decisions. The Director: ICT department is also empowered to implemented strategic and operational plans. Meaning that there are decisions that he/she takes without approaching Council or executive management. What is important is that those decisions should talk to one another.	

following in order to continue supporting users remotely: *ICT Service Desk email: ICT users can log calls by sending emails to ICTServicedesk@name.ac.za. These emails are received and logged into the ServiceDesk system by IT Technicians.* *087 number: IT Technicians are allocated 087 numbers that they are used to support users remotely. These numbers are linked to the University VoIP system.* *Enabling users to log calls Off Campus: The ICT Services is currently working on a project that will enable users to log calls through the ServiceDesk System while they are off-Campus.* *Process Flow: A process flow for logging the calls has been developed and circulated to the university community*	However, there are also ICT decisions that are taken by the ICT steering committee that the CIO or the ICT Director should implement. The same applies with the Head of Sections, there are certain decisions that the take without consulting their superiors. A good example of operation decisions is demonstrated by one of the findings which shows the improvements regarding logging calls which were implemented by the ICT Service during the COVID-19 lockdown. These improvements were part of the report to the ICT Steering Committee by the were implemented without first seeking their approval. However, in order to ensure alignment, the decisions should be guided by the provisions of the ICT strategy.	

The provisions of **Table 6.6** show the difference ICT related decisions that are taken at different levels. There are ICT decisions that are taken at governance level, some are taken by executives at strategic level and there are those that are taken at operational level. However, what is important is that these decisions should talk to one another. This is in line with Hildbrand and Bodhanya (2015) who mention that **recursion** also includes the principle of **local autonomy** which is another core feature for ensuring a viable system; and this principle grants lower recursive-level decision-making power as long as their activities do not threaten the coherence of the overall system.

The findings also show that even though ICT department reports to the Office of the DVC: Operations which is an executive position; the ICT department should take the lead regarding the implementation of ITG. This implies that the department of ICT also has some decision-making powers. This implies that the ICT department is empowered to implemented strategic and operational plans. Hence, one of the benefits of local autonomy is that it reduces turnaround time to resolve issues as they are handled immediately and directly by the lower level operational units (Lewis, 1997). The fact that the results also show some of the decisions that ICT Services took

during the COVID-19 Lockdown in relation to the improvements regarding logging of calls; which were implemented without waiting for the ICT Steering Committee to sit; it shows that the ICT Services Department has local autonomy. This principle contributes to ensuring that the implementation of ITG in an organization is viable, which in turn makes ICT to enable the organization to achieve its objectives.

Link to the VSM: The fact that ITG decisions are taken at different level shows the local autonomy of the lower-levels structures and/or department/sections. This is in line with VSM principle of local autonomy. This is also supported by Schwaninger (2006) and Walker (2018) who mention that one of the principles of VSM is that of granting lower recursive-level decision-making power as long as there is coherence or alignment with the overall system. **Figure 6.5** provides a summary of the local autonomy of ITG role players at different levels as per text excepts in **Table 6.6**.

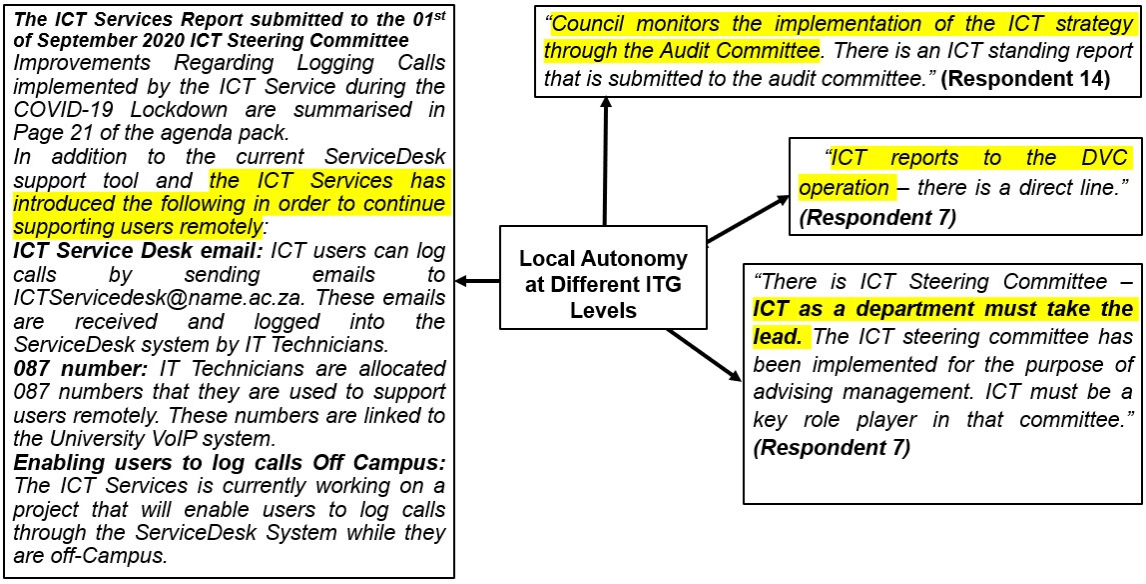


Figure 6. 5: Local Autonomy at Different ITG Levels

6.4.5 Recursive within the HEIs ITG system

This section intended to establish existence of ITG subsystems within the ITG system of HEI that are accountable or responsible for the implementation of the IT. In this case, the existence of sections within a department or departments within a division. **Table 6.7** provides analysis and discussion of the findings of the study regarding the recursive within the ITG in HEIs.

Table 6. 7: Recursive within the HEIs ITG system

Text Excerpts	Text Analysis	Discursive Practice
"The Council is responsible for providing oversight of the strategic direction of information and communications technology within the University, ensuring the alignment of ICT and business strategy, and the implementation of an IT Governance system in the University of Venda." ***(Respondent 10)*** *"EMC has the executive oversight over the implementation and must ensure that council decisions are implemented."* ***(Respondent 14)*** *"ICT reports to the DVC operation – there is a direct line."* ***(Respondent 7)***	The governing body cannot afford to be Jack of all trades, or it cannot be everywhere at the same time. This implies that it has to ensure that there are roles and structures that it can delegate on its behalf. To achieve this council repeat itself at strategic level. That is, the delegated structure will also have a chairperson like Council has; and this is the executive management. This structure is replicated at operational level. Each structure is self-regulatory, i.e., it can also take its decisions.	Recursive of ITG mechanisms

This is a clear show of a nested arrangement of the organization in relation to the implementation of ITG in HEIs, relevant to recursion. In other words viable systems are recursive; this means that Systems structured exactly the same way, are nested in each other, therefore, each system or sub-system has self-organizing and self-regulatory characteristics (Beer, 1984a; Espejo & Gill, 2011). This principle is referred to as recursive. It assists HEIs cope with complexity within the diversity of ITG by creating many levels in the implementation of ITG; these levels can also be listed in this fashion, governance, strategic, programme and projects, and operational. Within the ICT Department there are sections that provides ICT Services at operational level.

Link to the VSM: The above paragraph demonstrated the principle of recursiveness which is also found in VSM. This also confirmed by Beer (1979) who mentioned that a viable system contains and is also contained in a viable system. **Figure 6.6** provides a summary of the recursiveness within the ITG system in HEIs as per text excepts in **Table 6.7**.

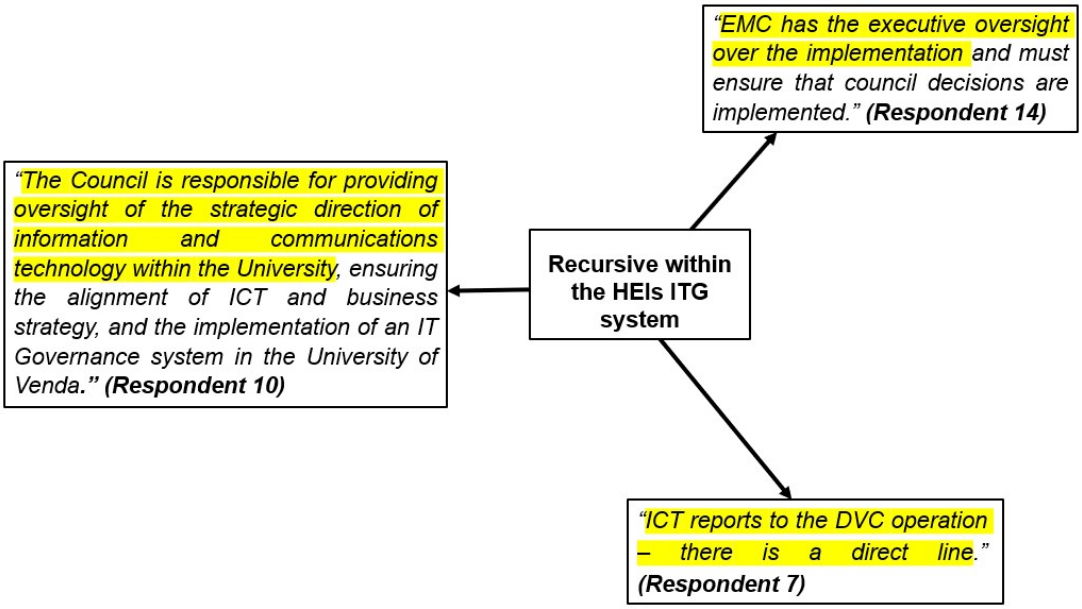


Figure 6. 6: Recursive within the HEIs ITG System

6.4.6 Direct Feedback among ITG Mechanisms in HEIs

This section was intended to establish and guarantee effective communication channels, the proper design of information flow and reliable information systems in HEIs which is referred to as direct feedback amongst ITG Mechanisms. Therefore, **Table 6.8** provides analysis and discussion of the findings of the study in connection to direct feedback among ITG mechanisms in HEIs.

The alignment of ICT and the business effectively happens when there is a better communication between ICT and the stakeholders. Therefore, ITG role players should ensure that the mechanisms that are used to communicate and/or involve stakeholders on ICT matters are effective. The examples provided as findings of the study includes, ICT steering committee which should be effective, sending of emails, conducting online meetings through MS Teams, and meeting with individual departments. Even Hauck et al. (2014) supports that ICT Stakeholders should be involved in decision-making processes as to ensure the delivery of the expected value; and the challenge is that if they are not involved, the project might fail (Alreemy et al., 2016).

ICT should also be considered as a vehicle that enables better communication possible since it can enable stakeholders to participate and contribute in the programs and projects, regardless of their location and physical distance (Berisha-Shaqiri, 2015). A good example in this regard; is found in the results of the study that show that during COVID-19 Lockdown ICT Steering Committee meetings were held using MS Teams. This enabled the ICT Services to provide

feedback to the business and to get feedback from the business. This in turn helps the organization to attain its objectives through the ICT investments.

Table 6. 8: Direct Feedback among ITG Mechanisms in HEIs

Text Excerpts	Text Analysis	Discursive Practice
"Better communication." ***(Respondent 1)*** *"There is ICT Steering Committee – ICT as a department must take the lead. The ICT steering committee has been implemented for the purpose of advising management. ICT must be a key role player in that committee."* ***(Respondent 7)*** *"I sit in the ICT Steering Committee, and I also on one-to-one level engage a lot with the Director: ICT and we sit in the Operational Divisional meetings together. So, I should say, I'm fairly involved."* **(Respondent 4)** *"IT sends emails to users and publish on the website to invite users to the meeting."* ***(Respondent 15)*** *"I think the best way is communication. We have to communicate with all departments. They must know that everything that they might need that concern IT, actually, everything now involves IT, there is nothing that University can do without IT. The best thing to do is to communicate with those people. They should know that if there is anything that involves IT they should come and consult IT first. If you want to introduce a new course, or another mechanism of paying – Actually, the most important thing is communication. IT must keep on reminding people, because people tend to forget. Just keep on sending emails."* ***(Respondent 17)*** ***Minutes of the ICT Steering Committee Meeting for the 4th of June 2020.***	There are different approached that ITG role players can implement to ensure direct feedback or effective communication amongst ITG role players. This also concerns synergy. Therefore, the findings of the study show that in order to ensure better communication amongst role players, the following communication methods can be implemented: • ICT steering committee • One-to-one engagement with ICT users • Emails, MS Team/Skype can also be utilized. • Meet individual department • Bosberaad kind of setup When a combination of these methods is utilized; the quality of communication can be enhanced.	Better communication • ITSC advise management • One-to-one • Emails and Online teams • Skype meetings • Meeting individual departments

"Minutes of an ordinary meeting of ICT Steering Committee held on Thursday, 04 June *2020 online using Microsoft teams at 10:00."*		
"For the past two years that I have been here, I can say yes because you know when I started there were challenges with the network being slow and sometimes down. There has been a lot of improvement. I will score it around 7." **(Respondent 16)** *"ICT projects also contribute to cost cutting, e.g. Paperless meeting which makes the University not to print documents anymore. Skype meetings contributes in cost cutting as University no longer spend money accommodation and travelling."* ***(Respondent 15)***		
"Rather than assembling all members in a single venue on a Bosberaad type of approach, the ICT team and the facilitator visited or had sessions with different University functions and discussed ICT strategic issues. The approach allowed for a wider participation from staff. The process was done for academic schools throughout the University. Separate sessions were held with each executive. i.e. The VC and the two DVC. A special session was held with the ICT Steering Committee." **(Respondent 19)**		

Fernando (2019) provided the SCOREcard which is an acronym that provides an acronym of the type of feedbacks that one can get or provide from the implemented ICT strategy of initiatives. This includes ICT related feedback regarding the social, commercial, operational, reputational and environment impact that ICT department has on its stakeholders. This tool can help ICT role players to plan the future of ICT in the institution based on the information collected. According to Ackermann and Eden (2011b); during the development and implementation of ICT strategy,

stakeholders should be involved in such a way that there is a proper management of the interface between the many demands of an organization's different stakeholders in relation to its strategic goals. Therefore, the approach outlined in the findings enables this to happen. In addition to the above, according to Boonstra et al. (2018); gaining insight on the perspectives of the stakeholders and understanding where they overlap, complement or contradict the IT field's own logic contributes to a fruitful ITG engagements.

Link to the VSM: The study as per above paragraph and provisions of **Table 6.8** shows the need for better communication amongst different ITG mechanisms; and this relates to the VSM principle of direct feedback. Hence, viable systems are results of the connectivity (i.e., communications and interactions) among primary and regulatory activities (Espejo, 1990). **Figure 6.7** provides a summary of direct feedback among ITG mechanisms in HEIs as per text excepts in **Table 6.8**.

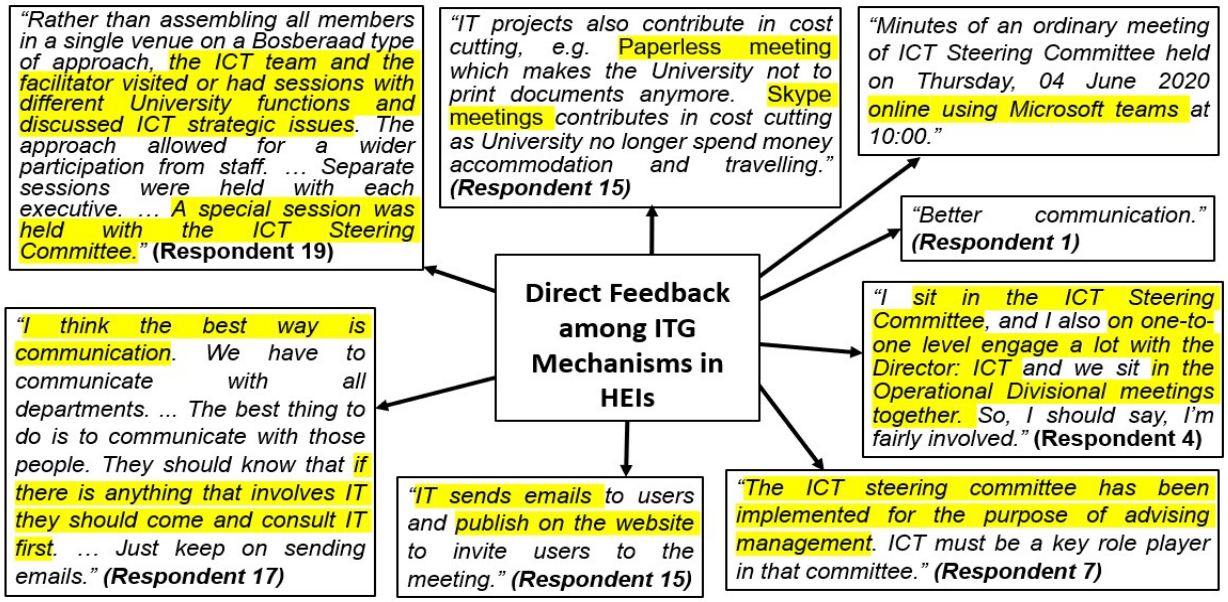


Figure 6. 7: Direct Feedback among ITG in HEIs (Source: Researcher, 2021)

6.5 SUMMARY OF THE DETERMINANTS OF ITG

Figure 6.9 provides a summary regarding the determinants that contributes to ensuring effective ITG in HEIs which are text excerpts of the findings of the study as captured in **Table 6.2** to **Table 6.7**. It provides text excerpts from the findings from which after interpretation and discussions provisions of **Table 6.9** were derived.

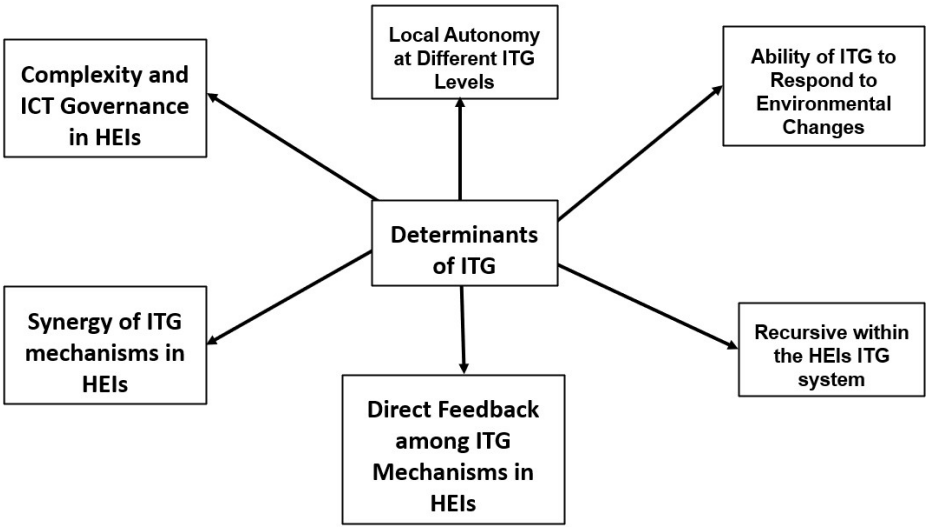


Figure 6. 8: Determinants of ITG

Table 6.9 provides inferences derived from interpretations and discussions of the findings of the study as captured from **Table 6.3** to **Table 6.8**. It provides answers in relation to the following research question: What are the determinants of ITG in HEIs?

Table 6. 9: Determinants of ITG

Determinants of ITG	Description
Complexity of ITG mechanisms in HEIs	• The implementation of ICT strategy is achieved through the ICT roadmap which contains ICT projects to be implemented during a particular time period. Therefore, mastering the ICT roadmap provides a big picture in terms of the implementation of ITG. • The ITG roles players should be able to see ITG mechanisms or components in the context of the whole. For example, ICT Steering Committee should be viewed in the context of its roles in the ITG of the organization. • Ensure effective and efficient understanding and coordination of the integrated, interconnected, and interrelated ICT infrastructure, ITG systems/ mechanisms and ICT departments/ sections. • ITG stakeholders should interact as a synergetic whole so that they can also be able to control the implementation of complex ICT related projects, and this will also enable successful integration and coordination of project teams.

	• ITG role players should be aware of the fact that internal ICT complexity in an organization is also influenced by:
	  ○ segmentation,
	  ○ stratifications and
	  ○ functional differentiations
	• The above could be due to the categories or groupings of ITG role players or the way ICT users are grouped in the organization.
	• The capacity of the ITG structure, e.g., ICT Steering Committee, in terms of its composition; ICT competencies of its members and their commitment also has influence in the performance of the ITG.
	• ITG role players should also understand and ensure the implementation of structures at different ICT levels. ICT should be implemented at Governance level, strategic level and operational levels. This brings another dimension of complexity.
	• The existence of oversight structures in ITG also plays a major role in the alignment of ICT and the business. Hence, the need to ensure the effectiveness.

Local Autonomy in Relation to Decisions Taken in Different ITG Levels	• The decision-making responsibility should be granted and shared amongst different ITG levels. • The alignment and consistency of the decisions in relation to the ICT strategy and the organizational strategy should be monitored and maintained. • There should be synergy among autonomous units, i.e. the ITG units or systems should be able to interact and work together with minimal or without failure. • The lower recursive level should be granted decision-making powers as long as they are in coherence (synergy) with overall ITG system
Recursive within the HEIs ITG system	• ITG should be structured in such a way that the following levels are visible: Governance, Strategic, Programme and Projects; and Operational • Every ITG level should be recursively in synergy with the previous level. For example, the activities that are happening at strategic level should be in line with the expectations of the Council as a governing body. • There should be units or sections within the HEI's ITG systems (e.g. ICT Department) that are accountable or responsible for the implementation of the ICT strategy. • These units should report to the ICT Director or the CIO.

Direct Feedback among different ITG mechanisms in HEIs	• Ensure effective and efficient communication channel pertaining to ITG; the proper design of information flow and reliable information systems in HEIs.
	• The feedback regarding ICT initiatives or ICT strategies to be provided or collected should also consider the following aspects:
	  ○ Social,
	  ○ Commercial,
	  ○ Operational,
	  ○ Reputational, and
	  ○ Environmental.
	• There should be effective mechanisms to involve ITG stakeholders and ICT users. These should include the following:
	  ○ ICT Steering Committee
	  ○ One-to-one engagements
	  ○ Emails and Online meetings (E.g., Ms. Teams and Skype meetings)
	  ○ Meeting individual departments
	• Rather than assembling all stakeholders in a single venue on a Bosberaad type of approach, the ICT should also visit or have sessions with different organizational functions and discussed ICT strategic issues. The approach allowed for a wider participation from staff.
	• Ensure effective communication amongst oversight structures; and this should include Audit Committee and Risk Committee.

Synergy of ICT Governance in HEIs	• Synergy is expected to occur whenever system elements or system themselves communicate or interact. i.e. The ITG components and systems should be able to work together towards the attainment of common goal with minimal or without interruptions or failure. • A single ITG strategic action should be able create value for different ITG stakeholders simultaneously, synergistically, and without reducing the total value already created. • The ICT plans should be aligned with the developing organizational IT demands and needs. • The IT budget should take into consideration the provisions of the ICT plans. • The ICT department should be able to work very closely with major stakeholders, e.g. ICT steering committee and SENATE in case of HEIs.

Ability of ITG in HEIs to Respond to Environmental Changes	• ICT should have a technology solution strategy to provide direction regarding the evolution and transformation of ICT technology solutions that enable the organizational strategy, deliver value, and return on investment (ROI). • ICT Strategy document should be a live document which is regularly updated with the latest information so that it can be effective and add true value. • ICT should be capacitated and capacitate ICT users with competencies that enable them to respond to environmental changes which also includes the technological changes. • For ICT to respond effectively and appropriately to the everchanging demands there should be synergistic communications among different autonomous ITG units or systems or components. • Differentiations and recursiveness of ITG organizational structures increase internal complexity and enhance organization adaptability. • Each ITG component or system should contain within itself the capacity to adapt to changing environment and to deal with the complexity that is relevant for it.

ITG role players in HEIs should consider ensuring the implementation of the ITG determinants during implementation of ITG as guided by the provisions of **Table 6.9**. This will address challenges pertaining to synchronising the ICT related decisions from Council level to the operational units. The enhanced synergy between the ICT Department and business units (academics and administrator) will contribute to improving the way ICT respond to the ever-changing organizational demands. ITG role players should be aware of the existing complexities in the IT environment since this enable them to respond appropriately to different IT needs.

Chapter 7: ICT Governance Model Construction

7.1 OVERVIEW OF THE CHAPTER

This chapter attempts to provide an answer to the following research question: **What is the ITG model that can be derived from the identified ITG mechanisms and determinants?** Hence, the development of the ITG model was the goal of this chapter. The developed ITG model was based on the ITG mechanisms and their roles, and the ITG determinants that came out as findings in Chapter 5 and Chapter 6. Therefore, this chapter seeks to establish how the identified ITG mechanisms and ITG determinants are related. This includes how they are connected and how they interact. Thereafter, an ITG model was developed, and a summary on how it can be used was also presented.

7.2 SYNTHESIS OF THE FINDINGS

Whetten (1989) advises that researchers should first identify factors, in this case concepts, that should logically be part of the explanation of the phenomena of interest. Therefore, the findings of the study as presented in Chapter 5 and Chapter 6 were the concepts, that fall within the ITG mechanisms and ITG determinants, that were synthesised with the intention to develop an ITG model. Hence, here follows a brief discussion on each of those concepts.

7.2.1 ITG Mechanisms

The interpretations and discussions of the findings of the study in Chapter 5 provided light regarding the roles and responsibilities of different ITG mechanisms in ITG as shown in **Figure 5.7** which replicated as **Figure 7.1**. These figures are summary of **Table 5.8** to **Table 5.13.** Hence, this section presents the role of the ITG mechanisms as per two mentioned figures. These ITG mechanisms are also the major components of the model as portrayed in **Figure 7.3**.

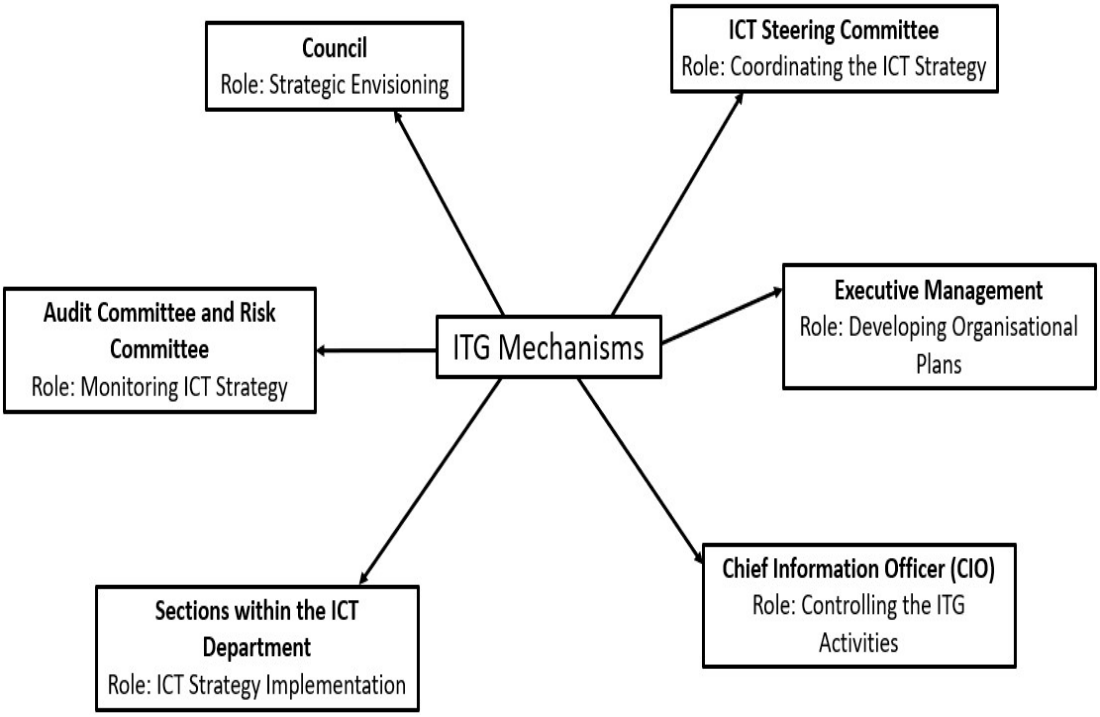


Figure 7. 1: ITG Mechanisms

a) Council

Council is responsible for strategic envisioning. This amongst other things include ensuring the development of the ICT strategy that sets out the overall vision regarding the implementation of ICT in the organization. They (Council) should also ensure that the ICT strategy defines the key ICT strategic objectives, policies, and processes for the period under consideration (e.g., five-years). Hence, Council should delegate the responsibility of developing the organisational plan to the executive management. They should also ensure that the ICT strategy enables the organization to exploit and leverage on existing and emerging technologies and best practices to transform business processes through simplification and agility, to achieve digital transformation as set out in the organization strategic goals. They should also ensure the development and availability of the ICT roadmap that contains list of ICT projects that will be realised by the ICT strategy. This will enable the ICT strategy to serve as a blueprint for future ICT service delivery programmes. It is also Council that should approve the ICT strategy and ICT related policies, and it should also monitor the implementation of the ICT Strategy through Audit Committee and Risk Committee.

b) Executive Management (EMC)

EMC is responsible for developing organizational strategies. They (EMC) should formulate organizational plans, including the organizational strategy. However, in case of the ICT strategy, the CIO is the one delegated to develop and implement it. EMC should ensure the alignment of the ICT strategy with the organizational strategy. They should also ensure the involvement of stakeholders, Senate in an endeavour that everyone understands the provisions of the organizational strategy; and this in turn ensures that the organizational strategy is IT-informed. It is also on the shoulders of the EMC to ensure that ICT is involved in the development of the organizational strategy since effectiveness of the ICT strategy begins with an IT-informed business strategy. The alignment of the ICT strategy and the organisational strategy should always be monitored. Hence, EMC should also ensure that the ICT strategy can adapt to the everchanging environment; and concerns the aspects of organization agility.

c) Chief Information Officer (CIO)

The CIO is responsible for controlling ITG activities. This role amongst other things includes the development and the implementation of the ICT strategy. The CIO develops and communicates the vision and ICT goals of the ICT Strategy. He/she should afford members of the ICT management and the ICT department opportunity to comment and provide inputs in the drafted ICT strategy before it is finalised. The CIO should also involve stakeholders, including the ICT steering committee, regarding ICT matters, which includes the implementation of the strategy. It is also within responsibilities of the CIO to ensure the alignment of the ICT strategy and the organisational strategy; hence, the reason for him/her to thoroughly understand the provisions of the organisational strategy. He/she should provide direction and leadership to the ICT management and the entire ICT department. Moreover, the CIO controls the ICT budget, therefore this affords him/her opportunity to prioritise the ICT projects to be implemented based on the availability of budget and the organisational needs. Hence, the need for him/her to ensure the development of an ICT roadmap with projects that will enable or support the organisational strategy.

d) Audit Committee and Risk Committee

The role of Audit Committee and Risk Committee is to monitor and provide assurance regarding the development and implementation of the ICT strategy. Internal auditors play a major role regarding assisting the two committee by auditing ICT in HEIs. The ICT related risks are captured in the ICT operational risk report, which is a tool that is used for monitoring progress regarding addressing the identified risks that threatens the attainment of the ICT strategic objectives. This

report is used by the CIO, VC and executive team, Risk Committee and Audit Committee to monitor ITC risks.

e) ICT steering committee (ITSC)

ICT steering committee is responsible for coordinating the development and implementation of the ICT strategy. This includes amongst others ensuring the alignment of ICT strategy with the organisational strategy. ITSC ensures the alignment of ICT plans with the developments and demands of the organisational needs as this will enable the organisation to meet its organisational goals and objectives. This committee also ensures that the ICT projects that are in the ICT roadmap can enable and support the organisational strategy. In an endeavour to ensure progress regarding the ICT projects that are to be implemented; ICT projects progress reports are always required to be part of the ITSC agenda. Should there be something that is not going according to the ICT strategy, the ITSC should raise concerns and recommend that it be addressed. However, the effectiveness of the ITSC is determined by the members' commitment in the activities of the committee.

f) Sections within the ICT Department

The sections within the ICT department are responsible for the implementation of the provisions of the ICT Strategy. That is why strategies should be cascaded down to all subordinate sections into plans, activities and objectives, and measurable critical performance areas to ensure successful execution. These sections, under the guidance of the CIO, implement ICT projects that are captured in the ICT roadmap. They develop operational plans that talk to the ICT strategy. These sections are also responsible for the day-to-day operations. What matters most is that they should provide best quality of service to ICT users. However, to measure performance of the ICT, Service Level Agreement (SLA) should be developed, negotiated with ICT users, and implemented.

7.2.2 ITG Determinants

The interpretations and discussions of the findings of the study in Chapter 6 provided light regarding the determinants of effective ITG as shown in **Figure 6.8** and **Figure 7.2**. These figures provide summary of **Table 6.9.** Hence, this section presents the determinants of ITG as per two mentioned figures. These ITG determinants are also listed in **Figure 7.3**.

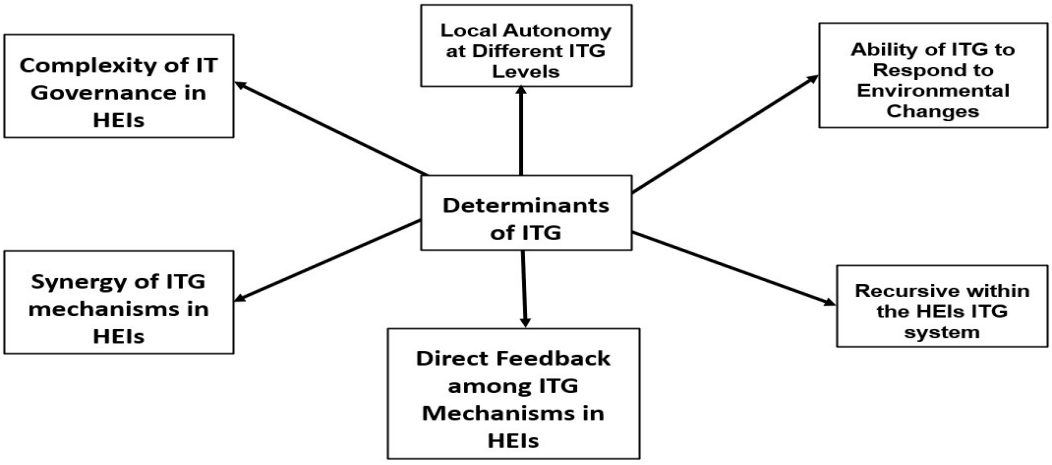


Figure 7. 2: Determinants of ITG

a) Complexity of IT Governance

ITG role players should ensure that they have thorough knowledge and understanding of the integrated, interconnected, and interrelated ICT infrastructure and ITG mechanisms. They should be able to see ITG mechanisms in the context of the whole. For example, ICT Steering Committee should be viewed in the context of its roles in the ITG of the organization and how it interacts with other ITG mechanisms. The implementation of ICT strategy is achieved through the ICT roadmap which contains ICT projects to be implemented during a particular period. Therefore, mastering the ICT roadmap provides a big picture in terms of the implementation of ITG. ITG stakeholders should interact as a synergetic whole so that they can also be able to control the implementation of complex ICT related projects, and this will also enable successful integration and coordination of project teams. ITG role players should also be aware of the factors that influence ICT complexity in an organization. The capacity of the ITG structure, e.g., ICT Steering Committee, in terms of its composition; ICT competencies of its members and their commitment also has influence in the performance of the ITG. ITG role players should also understand and ensure the implementation of structures at different ICT levels. ICT should be implemented at governance level, strategic level, and operational levels; and this brings another dimension of complexity. The existence of oversight structures in ITG also plays a major role in the alignment of ICT and the business. Hence, the need to ensure the effectiveness.

b) Synergy of the ITG Mechanisms

Synergy is expected to occur whenever ITG mechanisms interact. The ITG mechanisms should be able to work together towards the attainment of common goal with minimal or without

interruptions or failure. ITG role players should be aware of the fact that there are times where ITG strategic action could create value for different ITG stakeholders simultaneously, synergistically, and without reducing the total value already created. Hence, they should always seek for such opportunities so that they can take advantage of them. The ICT plans should be aligned with the developing organizational ICT demands and needs. The ICT budget should also take into consideration the provisions of the ICT plans. The ICT department should be able to work very closely with major stakeholders, e.g., ICT steering committee and SENATE in case of HEIs.

c) Direct Feedback among different ITG mechanisms in HEIs

There should be effective and efficient communication channel pertaining to ITG; also relevant to the establishing proper design of information flow and reliable information systems in HEIs. The feedback regarding ICT initiatives or ICT strategies to be provided or collected should also consider the following aspects: social, commercial, operational, reputational, and environmental. There should be effective mechanisms to involve ITG stakeholders and ICT users. These should include using the following means: ICT Steering Committee, one-to-one engagements, emails, online meetings (e.g., Ms. Teams and Skype meetings), and meeting individual departments. Rather than assembling all stakeholders in a single venue on a Bosberaad type of approach, the ICT should also visit or have sessions with different organizational functions and discuss ICT strategic issues.

d) Recursive within the HEIs ITG system

ITG should be structured in such a way that the following levels are visible: governance, strategic, programme and projects; and operational. Every ITG level should be recursively in synergy with the previous level. For example, the activities that are happening at strategic level should be in line with the expectations of the Council as a governing body. There should be units or sections within the HEI's ITG systems (e.g., ICT Department) that are accountable or responsible for the implementation of the ICT strategy. These units should report to the ICT Director or the CIO.

e) Local Autonomy in Relation to Decisions Taken in Different ITG Levels

The decision-making responsibility should be granted and shared amongst different ITG levels. The alignment and consistency of the decisions in relation to the ICT strategy and the organizational strategy should be monitored and maintained. There should be synergy among autonomous units, i.e., the ITG units or systems should be able to interact and work together

with minimal or without failure. The lower recursive level should be granted decision-making powers as long as they are in coherence (synergy) with overall ITG system.

f) Ability of ITG in HEIs to Respond to Environmental Changes

ICT should have a technology solution strategy (TSS) that provide direction regarding the evolution and transformation of ICT technology solutions that enable the organizational strategy. What matters most is that the TSS should ensure value delivery and return on investment (ROI). ICT Strategy document should be a live document which is regularly updated with the latest information so that it can be effective and add true value to the institution. ICT should be capacitated and capacitate ICT users with competencies that enable them to respond to environmental changes which also includes the technological changes. For ICT to respond effectively and appropriately to the everchanging demands there should be synergistic communications among different autonomous ITG units or systems or components. Differentiations and recursiveness of ITG mechanisms increase internal complexity and enhance organization adaptability. Each ITG component or system should contain within itself the capacity to adapt to changing environment and to deal with the complexity that is relevant for it.

7.3 DEVELOPMENT OF THE MODEL

The next step according to Whetten (1989), after identifying the concepts, one should establish how they are related. Therefore, how the ITG mechanisms are related or connected can be drawn from the discussion on individual ITG mechanism in section 7.2.1. Therefore, the next paragraph provides an overview regarding how the ITG mechanisms interact or are connected.

Council delegates the executive management (EMC) the responsibility to develop organisation plans, and ICT strategy is one of those plans that the EMC should ensure that it is developed. The executive management delegates the CIO the responsibility to develop and implement the ICT strategy. The EMC should involve the CIO during development of the organisational strategy. The organisational strategy should be approved by Council. The CIO should develop the ICT strategy which is aligned to the organisational strategy. Both the EMC and Council should approve the ICT strategy. Audit Committee and Risk Committee monitor the development and implementation of the ICT strategy; and ICT steering committee plays a coordinating role in this regard. The CIO, through the sections within the ICT department, should also ensure the implementation of the ICT strategy. How the ITG mechanisms interact is depicted in **Figure 7.3**.

Section 7.2.2 provides a discussion on the determinates of effective ITG. In other words, these are the aspects that those who have roles to play in the ITG mechanisms should consider ensuring effective and efficient implementation of ITG as depicted in Figure 7.3.

This model – the VIVHO ITG Model, whose name is derived by abbreviating the first letters of the following concepts:

a) **Vision:** Council is responsible for strategic envisioning which amongst others includes setting ICT strategic objectives.

b) **Intelligence:** According to VSM, management is also referred to as 'Intelligence' since its main role is to develop plans; this concerns the adaptability of the organization. The CIO is part of the management. Hence, ICT agility.

c) **Value Delivery:** ICT is implemented to deliver value to its intended beneficiaries; and to enable and enhance the performance of the organization. Hence, the reason to ensure its alignment with the organizational activities.

d) **Holistic View:** The application of systems thinking in ITG enables ITG role players to have "holistic view" or "big picture" of the ICT environment. Hence, the need for one to understand the complexity of the overall ICT and ITG environment.

e) **Oversight:** Effective implementation of ICT in HEIs requires the implementation of oversight and monitoring structures. This includes Audit Committee, Risk Committee, Senate and ICT Steering Committee.

7.4 APPLICATION OF THE VIVHO ITG MODEL

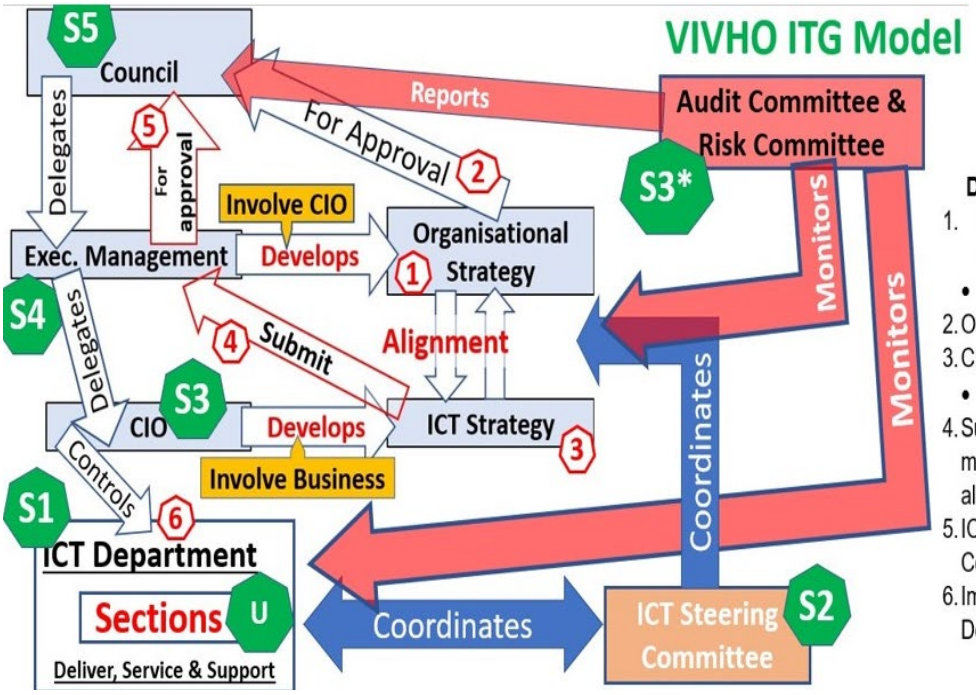
Therefore, for the Council, as it is responsible for strategic envisioning, they should delegate the responsibility to do organizational plans to the management (EMC). Therefore, as the first step in ensuring the alignment, the CIO should be part of the team which is developing the organizational strategy. The second step should be to submit the organisational strategy to Council for approval. This will enable them (Council) to also ensure that the strategy also cater for ICT. The third step is for the CIO who is responsible for controlling the implementation of ICT in the organisation to ensure the development of the ICT strategy; and the CIO should also involve the business. The ICT steering committee should ensure its alignment with the organizational strategy; and this implies that the CIO should also submit the ICT strategy to the ICT steering committee. The fourth step should be to forward the ICT strategy to the executive management (EMC) for approval. EMC is the one which has been delegated for planning. The EMC should also ensure that the

developed ICT strategy is in alignment with organisational strategy. Once EMC is satisfied that it is aligning with the organisational strategy; then the fourth step kick in. The EMC then forward the ICT strategy to Council for approval, and this can be done through Risk Committee and Audit Committee which are committees of Council tasked for monitoring ITG. Council should also verify its alignment with the organisational strategy.

ICT steering committee should coordinate the development and implementation ICT strategy on behalf of the executive management. This implies the CIO should submit the ICT strategy and other ICT related reports to the ICT steering committee meetings for their consideration.

The Risk Committee and the Audit Committee should monitor the development and implementation of the ICT strategy on behalf of Council. This implies that there should be ICT related reports that are forwarded Council through these two structures.

The ICT Department, through the sections within it, plays a great role regarding the implementation of the ICT strategy. This should happen under the leadership of the CIO and the heads of sections. These sections should deliver the services in line with the provisions of the ICT strategy.



VSM Systems	What are the mechanisms of ITG in HEIs?	What are the roles and responsibilities of the identified ITG mechanisms in HEIs?
S5 System 5	Council	**Policy Decisions** • Strategic envisioning
S4 System 4	Executive Management	**Planning** • Develops organizational strategy • Ensure involvement of the CIO/IT
S3* System 3*	Audit Committee Risk Committee	**Monitoring**: • Ensure the alignment of the ICT strategy and the organizational strategy
S3 System 3	Chief Information Officer	**Controlling** • Develops ICT strategy • Involve the Business
S2 System 2	ICT steering committee	**Coordinating** • Development and implementation of the ICT strategy
S1 System 1	ICT department	**Implementation** • Implement provisions of the ICT strategy
U Units	Sections within the ICT Department	**Operational** • Deliver ICT services in line with the provisions of the ICT strategy

Determinants of ITG

1. Complexity
2. Synergy
3. Recursiveness
4. Local Autonomy
5. Ability to respond to environmental changes
6. Direct Feedback

Figure 7. 3: Interactions of the VIVHO ITG Model (Researcher, 2021)

7.5 CRITIQUING THE VIVHO ITG MODEL

There are differences in opinions as to whether findings from a single case study can be generalized. One school of thought consider it inappropriate to generalize case study findings to an entire population (Jingyao et al., 2021; Tsang, 2014a; Wikfeldt, 2016; Yin, 2012); while another school of thought suggests that findings from case studies can be generalized to an entire population (Copestake , 2021; Walsham, 1995; Wikfeldt, 2016; Yin, 2012). For instance from the latter school of thought, they suggest that findings from a case study can be generalized, particularly to support development of theory for cases in similar contexts as the case study under focus (Walsham, 1995; Wikfeldt, 2016; Yin, 2012). This study aligns to the second school of thought that support generalization of findings in theory development. Thus, The VIVHO ITG Model has been developed from the findings of the ITG case study conducted in a HEI, and the results from its evaluation confirmed that the model can be applied to other HEIs.

Wikfeldt (2016) further provided the following analogy, the conclusion that “All swans are white” is not suitable to case research as it can be proven to be not true. However, what can be said: “since this case study shows that this swan is white, other cases of swans are likely to be white as well.” Therefore, based on this analogy provided by Wikfeldt and Yin, there could be other HEIs where the VIVHO ITG Model could be found to be relevant and suitable. Hence, the HEIs referred to in this section are those where the VIVHO ITG Model could be found to be relevant and suitable. This is in line with Tsang (2014b) who mentioned that for theoretical generalization, the scope of a developed theory is determined by the populations and settings that the theory can be applied to explain the phenomenon concerned.

This Model has been subjected to evaluation by experts in the field of ITG. It has also been evaluated against the provisions of COBIT 2019 ITG Framework which is provides best practices in the field of ITG. This section is concluded by the researcher’s views regarding the Model.

7.5.1 Evaluation of the Model by Experts

A communication to request the experts to evaluate the VIVHO ITG Model was drafted and forwarded to seven experts who were identified following the Delphi approach as guided by Wentholt et al. (2012). Communication sent to experts attached as Appendix L. The requested experts participate in the ITG structures in their institutions. Five of the experts are in higher education institutions. The other two are ICT Directors in government departments; and one of the two was once a Council member in a HEI. Two of the experts are Directors in the ICT Department in HEIs. One of them has a Corporate Governance of Enterprise IT (CGEIT)

certification which is a highly respected qualification in the area of ITG. They all agreed that the VIVHO ITG Model can contribute positively in ensuring the alignment of IT and the organisational activities in HEIs. The following paragraphs summarises the assessment by the experts.

The fact that the model emphasises on the alignment between the ICT Strategy and Organisational Strategy which is key; makes one to be convinced that it can add value with the HEIs. The Model can be applied in the ICT environment, and it can also be easily aligned with other governance frameworks. The model also emphasises on the involvement of the CIO when developing the Organisational Strategy as well as the involvement of the business when developing the ICT Strategy. Hence, according to the experts, stakeholders' involvement is critical in ensuring alignment between the Business and ICT as well as ensuring that the business derive value from ICT enabled investments.

The model is relevant for the adoption of an ITG in respect to its broad coverage regarding ICT Strategy development. This study reasons that the Model provides and outlines the role of various governance structures with ITG in this regard; and it has covered the organization from end to end, i.e., from Council to Head of Sections. The model will contribute to improving the decision-making capability within the organisation. The Model is realistic and implementable.

According to King IV, Principle 12, the governing body is responsible for ICT strategic goals and VIVHO model also states that the Council is responsible for setting up the ICT strategic objectives. The model also refers to intelligence as the second step which comprises the development of plans led by the CIO. The third step is Value Delivery which is the execution of the plans and implementation of ICT projects to support the business goals. Holistic view in the understanding of the experts can be aligned with integration of business processes and development of organisational reference model or architecture that will give the big picture on how business departments are interconnected. Again, oversight is critical as it is also mentioned in King IV and governance encourages monitoring of the ICT projects implementation and day to day running of ICT function.

The experts, however, also highlighted areas to be considered for improvement. However, some of their areas of concern were already covered and addressed in the thesis itself. They put emphasis on the need to ensure the differentiation between management and governance function. The Model should be clear in terms of where the evaluation of ICT takes place. The role of Council as a governing structure is to evaluate, direct and monitor the role and performance of ICT in the organisation. Act as custodian of corporate governance by steering the institution and setting strategic direction through approving policies and plans that give effect to that direction.

Council also oversees and monitors the implementation and execution of governance frameworks, policies, and strategy by the management. Therefore, it is of great importance to ensure that the ICT Strategy is consistently evaluated throughout its lifecycle to ensure that it remains relevant and aligned to the changing business needs/requirements.

The Model should also be clear regarding the fact that executive management is accountable to Council as Council is charged with providing oversight as well as governing ICT in a way that supports institutional settings that it results in the integration of people, technology and information and processes. Council should ensure ICT alignment with the institutional performance and sustainability objectives. These can be achieved when executive management is accountable to Council.

7.5.2 Critiquing the Model Against COBIT 2019

The VIVHO ITG Model was evaluated against the governance and management objectives in COBIT 2019 IT Governance Framework. COBIT 2019 is one of the ITG best practices developed by ISACA (ISACA, 2018a). It has five governance objectives grouped in **Evaluate, Direct and Monitor** domain (**EDM**). See **Figure 7.4**. Therefore, the implementation of VIVHO ITG Model contributes to attaining EDM01. This requires organisations to ensure the establishment and maintenance of a governance framework. Hence, the implementation of this model HEIs will be a great step towards attaining best ITG practises. The Model aims to ensure effective alignment of ICT and business in HEIs. Therefore, when this successfully happens, HEIs will always benefit from ICT investments which enables attainment of EDM02 as it requires ITG role players to ensure that organisations are getting value from ICT investments.

In line with the above, implementing the Model further contributes to attaining COBIT 2019 AP002 Management Objective which is Managed Strategy. This is critical for effective management and alignment of ICT with the business. The fact that the Model defines the roles and responsibilities of the executive management, CIO & IT management contributes to enabling Management Objective AP007 – Managed Human Resources. See Figure 7.4.

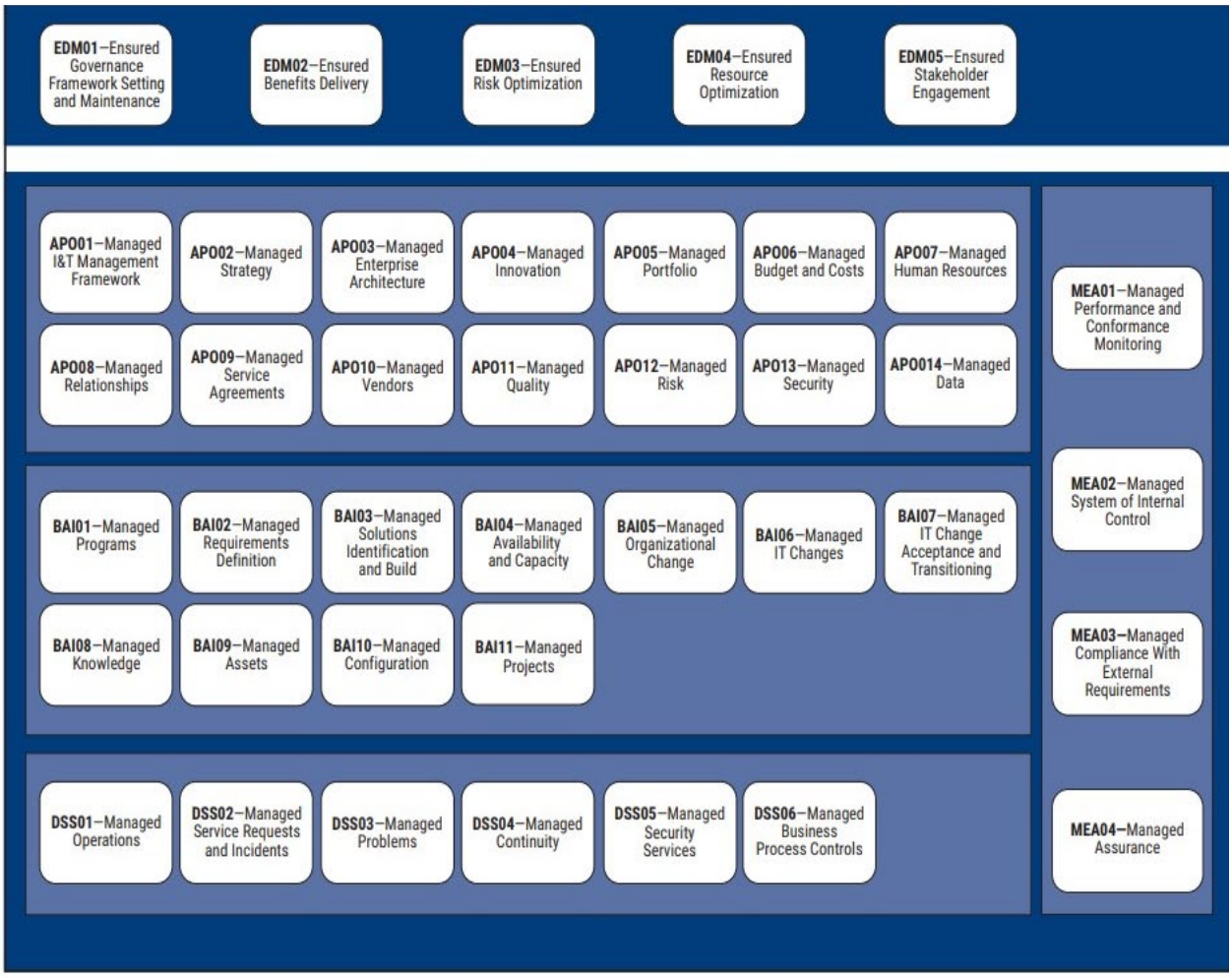


Figure 7. 4: COBIT 2019 Governance and Management Objectives (Source: ISACA, 2018a)

The model provides ITG role players with the opportunity to monitor and mitigate any risks that can be arise due to ICT which is aligned to the organisational requirement. This enables the attainment of EDM03; which requires the management of risks to be optimised. The model also ensures optimal usage of ICT resources. Proper alignment of ICT and business also reduces wasteful and fruitless expenditure. This is line with EDM04 which requires organisations to ensure that ICT resources are utilised optimally. The VIVHO ITG model also enables the CIO to always involve ICT stakeholders; and this is in line with EDM05 which requires ITG role player to ensure that stakeholders are always involved in every ICT matter that affects them.

Hence, the model also suggests and promotes the channels of communication and the provision of feedback. For example, the CIO will forward the ICT strategy for approval to the Council via EMC. This implies that even the Vice Chancellor and Principal and those executive members who

might not be part of the ICT Steering Committee will also have an opportunity to engage with it before it is submitted to the committees of Council and/or Council.

Furthermore, COBIT 2019 provides **Monitor, Evaluate** and **Assess** (**MEA**) domain which contains management objectives that encompasses monitoring ICT implementation in an organisation (ISACA, 2018a). This is critical for ensuring that the implementation of ICT supports and enable the attainment of the organisational objectives. Hence, the Model makes provision for the EMC's structures and the Council structures to monitor the development and implementation of the ICT strategy. This implies that the ICT strategy cannot be forwarded to Council without going through the ICT Steering Committee, Risk Committee, and the Audit Committee. Additionally, this denotes the provisions of King IV that requires the governing body, in this case, Council to govern ICT in a way that supports and enables the organisational objectives (Ramalho, 2016). Ramahlo further requires that the ICT Steering Committee, Risk Committee and Audit Committee to monitor and oversee the implementation of ICT in an organisation. Hence, the Model also ensures the involvement and participation of these structures in the implementation of ICT in HEIs.

The Model in Figure 7.3 also describes the aspects related to goal cascade concept which is recommend by COBIT 5 which is one of the ICT governance frameworks, (COBIT 5 Task Force, 2012). In this case, organisational goals should be cascaded down to ICT strategic goals; and ICT strategic goals should in turn be cascaded down into ICT operational objectives. This applies to the synergy principle. Hence, in this Model, Council delegates the executive management to develop organisational strategy while the CIO have to develop ICT strategy which is in alignment with the organisational strategy. This refers back to COBIT 2019 that mentions that management plans, builds, runs and monitors ICT activities, in alignment with the direction set by the governance body, to achieve organisational objectives (ISACA, 2018a). In line with the Deliver, Service and Support (DSS) domain in COBIT 2019, the Model also shows that the sections within the Department of ICT Services delivers ICT services in line with ICT strategy.

7.5.3 The Researcher's View on the VIVHO Model

The researcher has noted that the Model in **Figure 7.3** does not show how the above-mentioned structures will have a glance of the developed ICT strategy. Therefore, **Figure 7.5** provides a detailed version of the VIVHO ITG Model regarding the steps, in terms approvals process, to be followed from its development stage to the stage where it is implemented.

Steps 1 to 3 are the same with those in **Figure 7.3**. However, in **Figure 7.5**, after the CIO develop the ICT strategy, Step 4, it should be forwarded to the ICT Steering Committee for its recommendations. Step 5 it should be submitted to the executive management committee (EMC). This is where even the executive management members who do not sit in the ICT Steering Committee will also get some updates on the matter. Step 6, the ICT strategy is then forwarded to the Risk Management Committee for further recommendations.

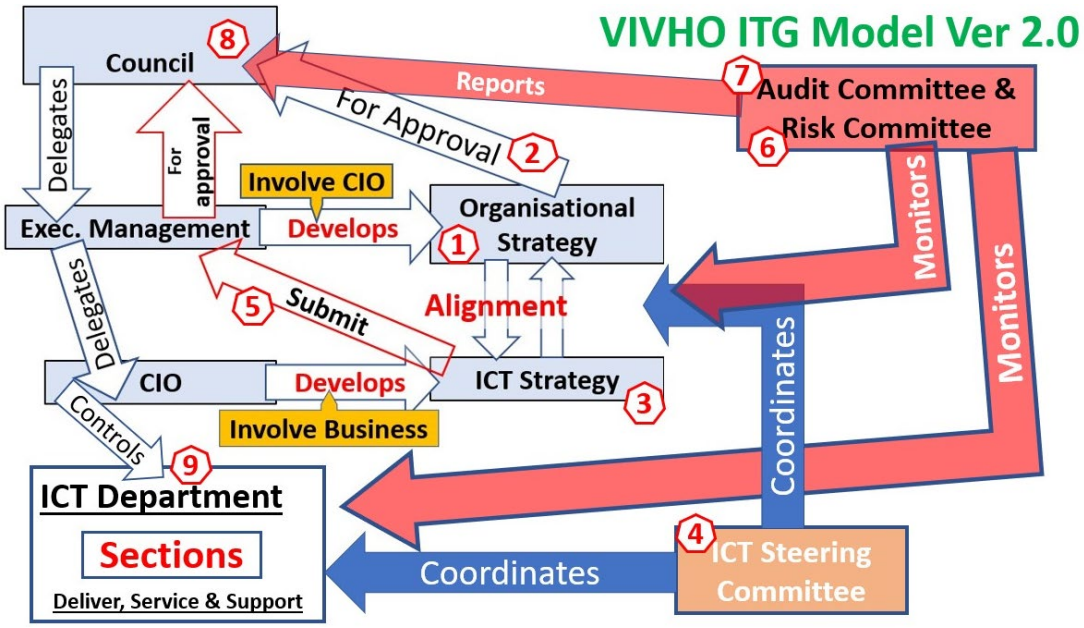


Figure 7. 5: The VIVHO ITG Model Ver 2 Diagram (Researcher, 2021)

Step 7, the ICT strategy is further forwarded to Audit Committee, with recommendations from the Risk Management Committee, for further approval, and recommendation for final approval to the Council. Step 8, the ICT strategy is approved by Council. Thereafter, Step 9, the ICT strategy is implemented. With this version, one is able to see where and when the ICT steering committee comes in.

However, if the provisions of this model are followed in totality; there could be a major improvement regarding the alignment of ICT and the activities of HEIs. The reason being that the model is explicit in terms of the responsibilities of each ITG mechanism. The model is also clear in terms of the determinants that should be considered for the ITG to be effective and efficient.

However, it is the hope of the researcher that there will be future ITG studies that might contribute to enhancing it. That's the researcher's critique in brief.

Chapter 8: Conclusions

8.1 OVERVIEW OF THE CHAPTER

This chapter presents conclusions of the study.

8.2 SUMMARY OF THE THESIS

The aim of this study was to respond to the primary research question that guided the study: ***How can a systems perspective inform the design of a framework for ITG in HEIs of South Africa?*** This question was responded to by addressing the following sub-questions:

a) What are the ITG mechanisms in HEIs?

b) What are the roles and responsibilities of the identified ITG mechanisms in HEIs?

c) What are the determinants of ITG?

By responding to the above questions, the study managed to develop a model which addressed the following research question:

d) What is the ITG model that can be derived from the identified ITG factors and components?

The above questions were looked at with an intention to mitigate ITG related problems as articulated in the statement of the problem in Section 1.2.

In Chapter 1, the study provided the background of ITG in HEIs and also provided the statement of the research problem. As part of the justification of the study; it was shown that the developed model will help HEIs to improve the implementation of ITG; and this will in turn help them to benefit from the implementation of ICT related projects. ITG role players will understand their roles and responsibilities in ITG; and they will also have a holistic view regarding the implementation ICT in the organization.

Chapter 2 provided a review of literature related to ITG, and it also discussed the following concepts: strategic alignment; value creation, IT agility and ITG mechanisms. It also presented previous studies related to those concepts in terms of their relatedness to the ITG concept. **Figure 2.1** was used to portray how these concepts relate to one another within the ambit of ITG. The chapter was concluded by a section showing research gaps. From Ako-Nai and Singh (2019) it was shown that most studies on ITG focused more on managerial structures and decision-

making, and less on the actual role of the governing body regarding the implementation of IT governance in the organization. Another aspect shown was that the research also showed a mixed situation of ITG in HEIs; which is due to lack of single way to implement an ITG framework designed for HEIs (Khouja et al., 2018).

Chapter 3 examined systems thinking as the main theoretical underpinnings of the study. The literature was reviewed for the purpose of answering research questions on ITG mechanisms and the determinants of effective ITG. Amongst other things it was shown that the foundation of system thinking is the ability to identify connections between and among components of a system (Arnold & Wade, 2015; Hopper & Stave, 2008). The study also showed that systems thinking approach enables, for example ITG role players, to view, understand and interpret the complexity of different aspects that talk to the situation or the system (Mahaffy et al., 2019). Complexity happens because of the inter-relationship, interaction, and inter-connectivity of components within a system, and between a system and its environment (Chan, 2001a). It was also revealed that systems thinking enables leadership to have holistic perspective of a situation and makes them to be oriented towards seeing the big picture and not only its individual parts (Shaked & Schechter, 2014, 2020). Literature regarding Beers viable systems model (**Figure 3.3**) was reviewed. Thereafter the conceptual framework, as portrayed in **Figure 3.5**, was developed from the VSM concepts (i.e., systems and principles). The VSM provided different six (6) systems and their roles.

Chapter 5 provided the analysis of the findings related to the following research question: (a) What are the contextual ITG Mechanisms related to HEIs? This is in terms of structures and administrative officers, who have role to play in the alignment of the ICT strategy and the organizational strategy in HEIs. This also included the contributions that are made by the identified role players. This is where it was established that the role of Council is strategic envisioning, and this includes approving the ICT strategy. It was also established that the main role of the executive management is to plan for the institution while the CIO control the implementation of ITG. Risk Committee and Audit Committee are there for monitoring while ICT steering committee exists to coordinate ITG activities. **Figure 5.7**. provides the role of the identified ITG mechanisms.

Chapter 6 provided the analysis of the findings related to the following research question: What are the determinants of effective integration of ITG in the ICT strategy development? **Figure 6.8** and **Table 6.9** provided a summary regarding the determinants of ITG in HEIs which are text excerpts of the findings of the study as captured in **Table 6.2** to **Table 6.7**. Amongst other

identified ITG determinants, the results of the study had shown complexity of ITG mechanisms and synergy of the ITG mechanisms.

Chapter 7 provided an answer to the following research question: What is the ITG model that can be derived from the identified ITG mechanisms and determinants? This was the goal of the study. The ITG model was developed was based on the synthesis of the ITG mechanisms and the determinants of ITG as drawn from Chapter 5 and Chapter 6. Hence, both the ITG determinants and the mechanisms of the proposed ITG model were based on the provisions of the VSM. The model was given the name *VIVHO* ITG Model. The model was portrayed in **Figure 7.1**. However, in this case, the name VIVHO was derived by abbreviating the first letters of:

a) **Vision:** Council is responsible for strategic envisioning which amongst others includes setting ICT strategic objectives.
b) **Intelligence:** According to VSM, management is also referred as Intelligence since its main role is to develop plans; and this also applies to adaptability of the organization. The CIO is part of the management. Hence, ICT agility.
c) **Value Adding:** ICT is implemented in order to add value in the activities and performance of the organization. Hence, the reason to ensure its alignment with the organizational activities.
d) **Holistic View:** The application of systems thinking in ITG enables ITG role players to have “holistic view” or “big picture” of the ICT environment. Hence, the need for one to understand the complexity of the overall ICT and ITG environment.
e) **Oversight:** Effective implementation of ICT in HEIs requires the implementation of oversight and monitoring structures. This includes Audit Committee, Risk Committee, Senate and ICT Steering Committee.

8.3 SUMMARY OF THE RESEARCH METHODOLOGY ADOPTED

To achieve the overall goal of the study interpretivism paradigm was adopted. This was implemented in an endeavour to understand the subjective world of human experience; and through this paradigm the researcher attempted to comprehend and interpret what the participant were thinking or the meaning they were making regarding the ICT and ITG as guided by Guba et al. (1989) and Kivunja and Kuyini (2017). In this study, the sources of knowledge were mainly people who participate in the ITG of the institution.

The researcher employed case study as a research design since it ensures in-depth and intensive study of the phenomenon; and in this study, it also enabled the researcher to dig deeper into the issues related to the implementation of ITG in HEIs. **Table 4.2** provided details of the sampling methods (purposive, convenience, snowball and theoretical) that were used to sample participants. The study was guided by the six stages provided in Braun and Clarke (2006) and Maguire and Delahunt (2017) for analysing data using thematic analysis. Figure 4.1 provided research design of the study.

8.4 REFLECTIONS/INSIGHTS FROM THE STUDY

The study provides several insights that can be presented as per research questions. The insights gained from the two research questions (*What are the ITG mechanisms in HEIs? and What are the roles and responsibilities of the identified ITG mechanisms in HEIs?*) involves considering the different roles that exists within the ITG area. The study was able to identity ITG mechanisms and explicitly stated the main roles of each ITG mechanism. This enhances the performance of ITG. Aasi (2018) even confirmed that there are authors who confirmed the importance defining and expressing the roles and tasks unambiguously concerning the involved people in ICT.

The role of Council had been identified as crucial in the implementation of ITG since it should provide direction regarding ITG implementation in an institution. Hence, it is responsible strategic envisioning. However, commitment of Council on ICT matters should be demonstrated by ensuring that it is always part of the agenda. PricewaterhouseCoopers (PwC) and its International Survey Unit (ISU) conducted a study in 2008 on more than 600 global enterprise leaders on behalf of IT Governance Institute (ITGI & PWC, 2009). Amongst others, the study was to establish the frequency in which ICT is part of the governing body agenda. The results showed that the vast majority, 95 percent do make ICT to be part of their agenda, although they differ in the frequency with which they address it. This shows that the practice to include ICT in the governing body agenda has been there for some time.

The ICT strategy should also play an active role in monitoring the performance of ITG, and this is consisted to the IT governance literature that shows that senior management commitment to IT governance has a positive impact on organizational performance (Turedi & Zhu, 2019). The fact that Council should also monitor the development and implementation of the ICT strategy through Audit Committee and Risk Committee presented the two structures as major role players in the ITG. This has a potential to ensure value delivery since the two structures are considered to be neutral. This is consistent with the provisions of The Institute of Internal Auditors (2017) that

mentioned that ITG is fundamentally concerned with goals that ensure that ICT delivers value to the business in a controlled and effective manner.

The role of ICT steering committee as an ITG mechanism is also crucial for ensuring the implementation of ICT which is fit for the intended purpose. This structure is crucial to be part of ITG since it is composed of academics and administrators who are the users and consumers of the ICT services. Therefore, their inputs and views are important for the successful implementation of ITG in the organisation. It has also been shown that this structure is used by the executive management to monitor ICT allocation of resources and the performance of ICT in the organisation. This insight is consistent with the previous studies that also show that ICT is important to the alignment of ICT and the organisational activities (Claude et al., 2019; Korachi & Bounabat, 2019; Luftman, 2003).

At the centre of ITG there is the CIO who liaises with ITG stakeholders from time to time. The CIO is the one tasked with the responsibility to develop and implement ICT strategy. He/she provides leadership to the entire ICT Department. This implies the CIO should work hand in hand with the heads of sections in an endeavour to provide effective service delivery to ICT users. Amali et al. (2014) supports this insight when mentioning the CIO's responsibility as that of coordinating the planning, realization, daily operations and internal evaluation, co-operation with work units and other users.

In addressing research question no 2 (*What are the determinants of ITG?*) the six determinants of ITG were identified. The insights provided by this research question are worth to be appreciated as they talk to the aspects that have influence in the effectiveness of ITG. ITG role players should understand the complexity of the ITG within their areas of responsibilities since this also describes the aspect of holistic view and the "bigger picture". They should be able to view ITG components in the context of the whole. There should be synergy regarding the interconnected, inter-related and interacting ITG components. Effectiveness of ITG could also be realised by ensuring that the exiting ICT enables the organization to respond to ever-changing environment. Decision-making responsibility should be granted and shared amongst different ITG levels as this contributes in ensuring the quality of service. Every ITG level should be recursively in synergy with the previous level. E.g., the activities that are happening at strategic level should be in line with the expectations of the Council as a governing body. Effective communication channel pertaining to ITG should be ensured as it enables other effective ITG. However, the way ICT function is organized within an organization is a major determinant of effective ITG (Kurti et al., 2014; Van Grembergen & De Haes, 2007).

8.5 CONTRIBUTIONS TO KNOWLEDGE

According to (Whetten, 1989), the mission behind developing a theory is also to extend existing knowledge. Therefore, the discussions tin the following sections show how the study will contribute to the theory, methodology and to practice.

8.5.1 Theoretical

The researcher was guided by Whetten (1989) who mentions that a complete theory must contain the following four essential elements: what which describes factors (variables, constructs, concepts) that logically should be considered as part of the explanation of the social or individual phenomena of interest. Therefore, the study contributed to the development and growth of systems perspective of implementing ITG. In other words, the ITG mechanisms that were driven from the VSM, how they are interconnected and interrelated, and how they interact add value to the thinking that ITG is a system. Hence, the complexity of ITG mechanisms and synergy of the ITG mechanisms are amongst the concepts that were brought into light in the study. The strategic envisioning role of the Council is also one of those concepts that the study introduced in relation to the ITG in HEIs. The VIVHO ITG Model is by itself also a model that puts the following concepts strategic envisioning role, intelligence or planning, value adding, holistic views and oversight into picture. These concepts already exist in the existing ITG theoretical knowledge.

The second element addresses how the identified set of factors are related (Whetten, 1989). Therefore, the way the ITG mechanisms and ITG determinants are connected to form the VIVHO ITG Model provides researchers with the opportunity to critique the model. This in turn will contribute in the development of the ITG related studies. That is where complexity of the ITG environment comes in again.

The third element looks at the why part of the theory (Whetten, 1989). Even though addressing the why question is the most fruitful, according to Whetten is the most difficult avenue of theory development. The justification of the study provided in Section 1.6. might also be used to justify the implementation of other ITG related studies. However, the alignment of ICT and business remains the core or the reason to implement ITG. Hence, the VIVHO ITG Model is an addition to a pool of ITG theories that can also be used as a justification for developing ITG frameworks.

The last element talk to addressing the who, where and when will the theory be used (Whetten, 1989). The provisions of the thesis will be used by the ITG scholars, and researcher who will be conducting studies related to the systems perspective of implementing ITG might consider citing

this study in the empirical literature review. The contributing factor being that most scholars don't generate a new theory from scratch; instead, they improve what already exists (Whetten, 1989). Parts of the thesis will also be published in different journals and library databases so that they can be accessible to their potential users which amongst others include academics and researchers. The ITG mechanisms and determinants might be included the provisions of the HEIs ITG frameworks

8.5.2 Methodologically

The study demonstrated the benefits of adopting interpretivism paradigm. Alharahsheh and Pius (2020) mentioned that interpretivist paradigm enabled the researcher to focus on the whole experience regarding ITG in HEIs rather than considering certain ITG components. This was also the experience of the researcher. The interpretivist paradigm enabled the researcher to explore further depth of individual experiences through in the semi-structured interviews regarding ITG in HEIs. These are some of the benefits of using the interpretivist paradigm that forms part of the knowledge that one could wish to acquire from this paradigm.

The use of the case study research strategy enabled the researcher to create theoretical concepts in line with the VSM that were synthesised to develop VIVHO ITG Model which is consistent with Eisenhardt Graebner (2007). Therefore, those who might opt to adopt case study research strategy in their studies might also consider adopting some of the provisions of this study.

As guided by Malmqvist et al. (2019), the researcher had an engagement with the Director ICT Services regarding piloting the study. The Director ICT Services provided guidance regarding the overall design of the research study; and his suggestions were also adapted in the main study. A lesson to be learnt regarding this is that researcher could also involve people around with expertise to shape and add value in their study.

The study also demonstrated the benefits of using different sampling methods as it employed four different types of sampling methods. The four methods are purposive, convenience, snowball and theoretical. A brief overview of each method was provided and thereafter **Table 4.2** was developed to show how each method was employed. This provides knowledge on how several sampling methods could be applied in the same study. For example, the profile of the participant that was sampled using theoretical sampling confirmed his excellent ITG competencies, and this was done in line with Eisenhardt Graebner, (2007) who mentioned that participants identified for theoretical sampling should have unusually revelatory or extreme exemplars. Therefore, going

through the profiles of the participants could provide lessons to be learnt regarding the aspects that contribute in the credibility of study. Of which credibility of the participants is one of those.

The researcher was guided by the six stages provided in Braun Clarke (2006) and Maguire Delahunt (2017) for analysing data using thematic analysis. This demonstrated the use of the existing theories or guidelines during the analysing of data. This includes the lessons that could be learnt from using a theoretical thematic analysis as the researcher used provisions of VSM.

8.5.3 Practically

The study through, VIVHO ITG model, will enhance the skills and competencies of ITG role players when coming to the development and implementation of ICT strategy. The model also provides clarity of roles of different ITG mechanisms. Those who want to learn about ITG might also use this thesis as a guide. For example, **Table 5.9** to **Table 5.14** provide the roles and responsibilities of each of the ITG mechanisms in detail. This means that this thesis can also be used during the inductions of ITG role players. **Table 6.9** provides determinants of ITG. In other words, through the provisions in this thesis, ITG role players could be empowered with the ITG knowledge which in turn will enhance their ITG competencies.

Performance of individual ITG mechanism can also be measured based on the provisions of the two tables. Through the implementation of the model, organizations will enhance the performance of the ICT department which in turn enhance the performance of the overall organisation. The model will also minimise fruitless and wasteful ICT related expenditure as the application of the model will enhance the alignment of ICT and the business.

The fact that the model requires the CIO to be involved during the development of the organisational strategy will contribute positively to making the CIO to acquire and enhance the knowledge regarding the organization. This, in turn, will contribute to ensuring the alignment of ICT and the business. The model also requires the business (academics and administrators) to be involved during the development and implementation of the ICT strategy, this will contribute to making academics and administrators to be aware of the provisions of the ICT strategy and also of the progress regarding its implementation. This will make the ICT Department to provide quality services as they will be providing IT solutions and services that are relevant to the business.

Even though the CIO is the one who is at the centre of ITG, the model requires him/her to submit the ICT strategy for approval to Council via the executive management. In other words, the model is enforcing and/or promoting the need to follow the channels of communications. This concerns the direct feedback and synergy which are the two of the six ITG determinants.

The VIVHO ITG model also contains steps which the role players could follow when developing ICT strategy. This provides ITG role players with some form of systematic approach of ITG. It makes them to be aware of the critical role players in the development and implementation of ICT strategy in an institution. For an example, the CIO will be aware of the roles of the Audit Committee; and he/she will never confuse the with the roles of the executive management.

8.5.4 Closing the Research Gap

One of the issues raised in Section 2.6 regarding the research gap is that most studies on ITG focused more on managerial structures and decision-making, and less on the actual role of the governing body regarding the implementation of ITG in the organization (Ako-Nai & Singh, 2019). However, it was also mentioned in earlier sections that the ITG framework reviewed only focuses on the ITG structures and processes without focusing on the resource constraint environments. Therefore, following Noor (2018), to make progress towards closing the research gap, the study reviewed literature on system thinking (VSM to be specific). The data collected during the study was then thematically analysed in line with the VSM systems and principles; and different ITG mechanisms and their roles in HEI were established, including the role of the governing body or Council. The determinants of ITG were also identified. Through VSM, the study was also able to establish that executive management is considered as intelligence since it is responsible for planning. In this process, the executive should take into consideration the environment in which it is operating, that is, in resource-constrained environments.

The reviewed system theory literature, the findings of the study and the developed model addressed the research questions that the study intended to as per Section 1.5. Therefore, the adoption of the VSM, a cybernetic system theory, contributed in addressing the research questions for the study. This in turn contributed positively towards closing the existing ITG research gaps.

8.6 LIMITATIONS AND RECOMMENDATIONS FOR FUTURE

The adoption of interpretivism paradigm limited the study to qualitative approaches in terms of data collection and analysis. The researcher only captured ITG related experiences and perceptions of participants for his data as the chosen paradigm could not allow him to capture numbers of statistics.

Purposive sampling was used to sample the institution where research was conducted and to sample some of the research participants. This brought some form of biasness. The fact that only few identified participants contributed to the study deprived the researcher to also get the views

from those who were not sampled. The issue of availability of participants was also a challenged since some of the ITG who were approached could not be available to contribute due to their commitments. For example, the Vice Chancellor and Principal could not be available to contribute. All the participants were coming from the public institutions of higher learning; and this did not afford the researcher an opportunity to compare the performance of ITG in public HEIs with private HEIs or from other sectors. The adoption of VSM which is one of the cybernetics theories in systems thinking limited the researcher to a particular was of thinking; and hence the ITG determinants and ITG mechanisms were interpreted from the provisions of the VSM.

The identification of ITG mechanisms and the determinants that have influence on ITG has major contribution in addressing the challenge regarding scarcity of the ITG frameworks in HEIs (Bianchi et al., 2017; Wu et al., 2015). However, there is still a need for researchers to continue investigating ITG in the context of HEIs; in particular; the effectiveness of ITG mechanisms is still far from coming to an end (Bianchi & Sousa, 2016). Therefore, the assumption of the researcher is that the VIVHO ITG Model in HEIs has contributed in reducing problems associated with lack of ITG framework in an institution. This is still one the problems mentioned by the previous research that is making organizations to fail in their development projects, loss of competitive advantage, and even collapse (Ali & Green, 2007). Therefore, to ascertain the above-mentioned assumption; the researcher recommends that future studies also consider conducting a study to establish the effectiveness regarding the implementation of the VIVHO ITG Model in HEIs; and a study to establish if HEIs implement the developed ICT Strategies. The reason for the need to have the above-mentioned studies in future is that; documents can be developed and never get implemented or adhered to their provisions. Which also contributes to the ineffectiveness of ITG in HEIs.

This study was conducted in an endeavour to close this gap, to adopt a systems perspective in ITG implementation in the context of HEIs. Failure to implement ITG frameworks in universities contributes to making management and governing bodies ineffective in ensuring the alignment of ICT and business; as a result, implementation of IT fails to create business value. Therefore, the researcher also recommends that ITG role players should continue to valuate, direct, and monitor the implementation of ITG in HEIs with the intention of responding to the demand and needs as and when it is necessary. In the same vein, the researcher also recommends the implementation, monitoring and evaluation of the VIVHO Model as depicted in **Figure 7.5** with an intention to contribute to enhancing the quality of knowledge and implementation of ITG in HEIs.

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APPENDIX A – APPROVAL OF THE RESEARCH PROPOSAL BY THE UNIVERSITY HIGHER DEGREES COMMITTEE

UNIVERSITY OF VENDA

OFFICE OF THE DEPUTY VICE-CHANCELLOR: ACADEMIC

TO : MR/MS N.T RATSHITANGA

SCHOOL OF MANAGEMENT SCIENCES

FROM: PROF. J.E CRAFFORD

DEPUTY VICE-CHANCELLOR: ACADEMIC

DATE : 09 OCTOBER 2019

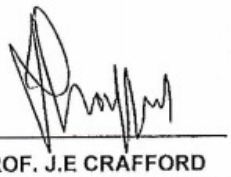
DECISIONS TAKEN BY UHDC OF 09th OCTOBER 2019

Application for approval of Thesis Proposal Report in Management Sciences:
N.T Ratshitanga (11564816)

Topic: "A system Perspective of Information Technology (IT) Governance: A Case of Higher Education Institutions in South Africa."

Promoter	UNIVEN	Prof. N.M Ochara
Co-promoter	UNIVEN	Prof. A. Kadyamatimba

UHDC approved Thesis proposal



PROF. J.E CRAFFORD
DEPUTY VICE-CHANCELLOR: ACADEMIC

APPENDIX B - ETHICAL CLEARANCE FROM THE UNIVERSITY OF VENDA RESEARCH ETHICS COMMITTEE

RESEARCH AND INNOVATION
OFFICE OF THE DIRECTOR

NAME OF RESEARCHER/INVESTIGATOR:
Mr NT Ratshitanga

Student No:
11564816

PROJECT TITLE: A systems perspective of Information Technology (IT) governance: A case of higher education institutions in South Africa.

PROJECT NO: SMS/19/BIS/04/2211

SUPERVISORS/ CO-RESEARCHERS/ CO-INVESTIGATORS

NAME	INSTITUTION & DEPARTMENT	ROLE
Prof NM Ochara	University of Venda	Promoter
Prof A Kadyamatimba	University of Venda	Co- Promoter
Mr NT Ratshitanga	University of Venda	Investigator – Student

ISSUED BY:
UNIVERSITY OF VENDA, RESEARCH ETHICS COMMITTEE

Date Considered: November 2019
Decision by Ethical Clearance Committee Granted
Signature of Chairperson of the Committee: ....
Name of the Chairperson of the Committee: Senior Prof. G.E. Ekosse

University of Venda
PRIVATE BAG X5050, THOHOYANDOU, 0950, LIMPOPO PROVINCE, SOUTH AFRICA
TELEPHONE (015) 962 8504/8313 FAX (015) 962 9060
"A quality driven financially sustainable, rural-based Comprehensive University"

UNIVERSITY OF VENDA
DIRECTOR
RESEARCH AND INNOVATION
2019 -11- 22
Private Bag X5050
Thohoyandou 0950

APPENDIX C - APPROVAL TO CONDUCT RESEARCHER AT THE UNIVERSITY OF VENDA

P. O. Box 39
Sibasa
0970
03 December 2019

Dr. NB Nthambeleni
The Vice Chancellor and Principal
University of Venda

Dear Dr. Nthambeleni

Request for Permission to Conduct a Study within the University of Venda

The study is about the implementation of IT governance in Higher Education Institutions. The researcher is a registered student of Doctor of Philosophy in Business Information Systems (PhDA) Degree, School of Management Sciences at the University of Venda. For the researcher to successfully complete the degree; it is a requirement that he must submit a thesis. The main objective of this study is to develop a model that will improve the implementation of ITG in Higher Education Institutions. The specific objectives of the study are: (a) To establish the extent to which IT and business are aligned in higher education institutions; (b) To determine the effectiveness of ITG mechanisms in higher education institutions; (c) To evaluate the level of dissatisfaction or satisfaction of the ITG stakeholders regarding their IT's responsiveness to new business' requirements in higher education institutions; and (d) To evaluate the level of dissatisfaction or satisfaction of the ITG stakeholders regarding the benefits that higher education institutions derive from IT investments

Approach for Study: The means of study will be through semi-structured interviews and self-administered questionnaires. The target population is composed of IT Directors and/or Chief Information Officers, IT management; senior and executive management; members of IT steering committees and Council.

Confidentiality and Anonymity: The interviews and questionnaire data collection will be done under anonymity and strict confidentiality in accordance to ethics protocol as approved by the University's Ethics Committee (see attached Informed Consent and Research Ethics Clearance Certificate Number: **SMS/19/BIS/04/2211**). Information would be used for scholarly purposes of the research only. Participation is voluntary, with consent protocol adhered to.

Therefore, it is against the above background that the researcher would like to apply for the permission to conduct the study in your organization.

Attached hereto this request please find copies of the following: Informed Consent, Approval of Proposal by University Higher degrees Committee and Research Ethics Clearance Certificate – Certificate Number: **SMS/19/BIS/04/2211**.

Persons to Contact in the Event of Any Problems or Queries: The researcher, Ratshitanga NT @ 082 976 7336, Researcher's supervisors: Prof. Ochara at 015 962 8532 or muganda.ochara@univen.ac.za and Prof. A. Kadyamatimba at 015 962 8707 and Armstrong.kadyamatimba@univen.ac.za or the University Research Ethics Committee Secretariat on 015 962 9058. Complaints can be reported to the Director: Research and Innovation, Prof GE Ekosse on 015 962 8313 or Georges Ivo.Ekosse@univen.ac.za

Your positive response in this regard will contribute to the successful attainment of the purpose of the study.

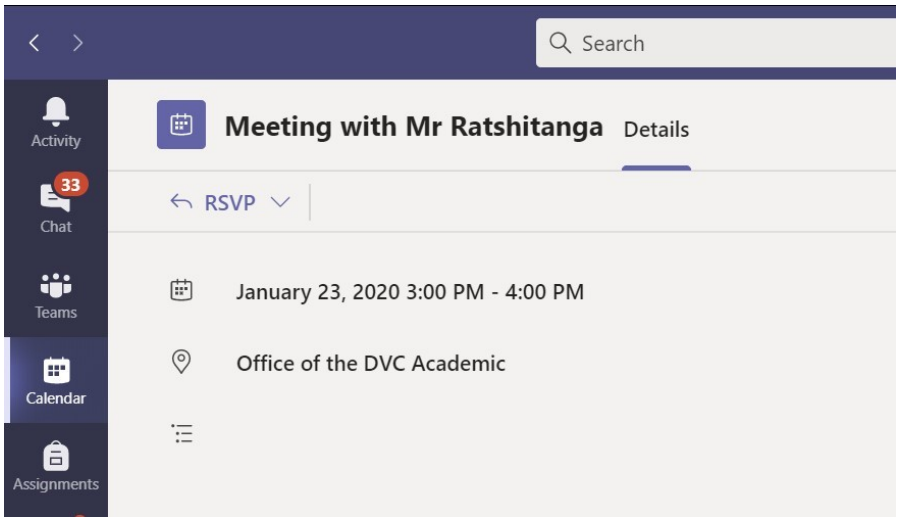
Kind regards,

Ratshitanga N.T. **(The PhD Candidate - The Researcher)**

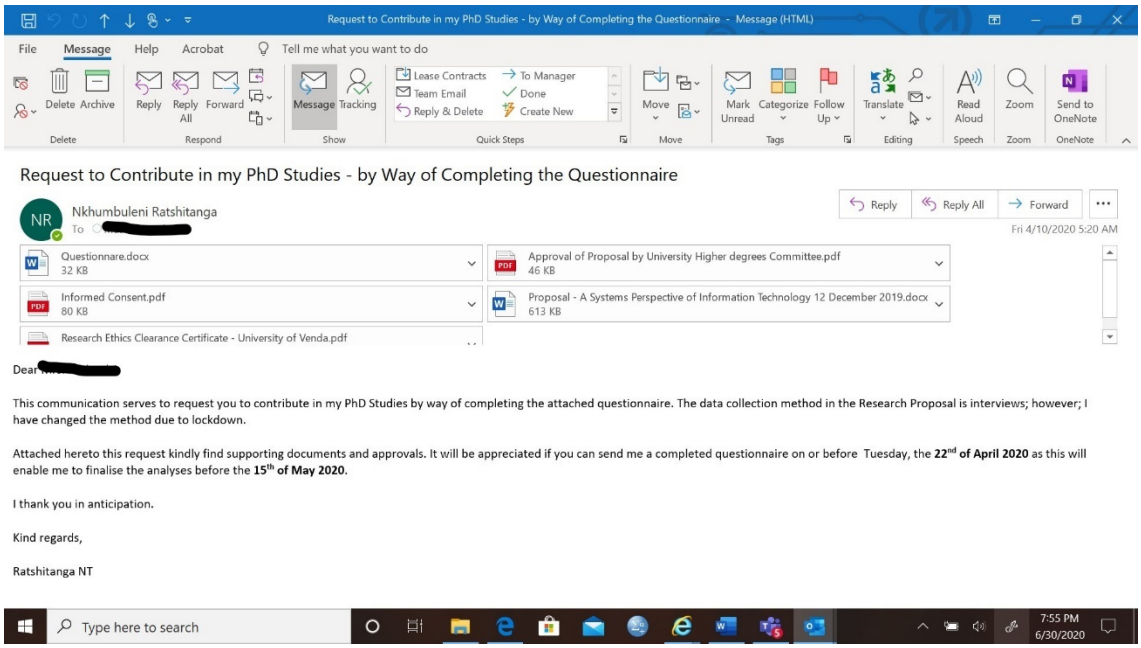
03 December 2019
Date

Approved.
10.12.19

APPENDIX D - USING TEAMS TO BOOK MEETINGS WITH PARTICIPANTS



APPENDIX E - EMAILS SENT TO PARTICIPANTS



APPENDIX F – INFORMED CONSENT

Informed Consent

The study is about the implementation of IT governance in Higher Education Institutions. The researcher is a registered student of Doctor of Philosophy in Business Information Systems (PhDA) Degree, School of Management Sciences, at the University of Venda. For the researcher to successfully complete the degree, it is a requirement that he must submit a thesis. The researcher will ensure that the participant have read this form carefully and allow the participant to ask any questions he/she may have. Before the participant starts responding to the semi-structured interview and/or survey questionnaire, the researcher and the subject participant should sign two copies of this form. The participant will be given one copy of the signed form.

Persons to Contact in the Event of Any Problems or Queries: Please contact the researcher, Ratshitanga NT @ 082 976 7336, my supervisors, Prof. Ochara at 015 962 8532 or muganda.ochara@univen.ac.za and Prof. A. Kadyamatimba at 015 962 8707 and Armstrong.kadyamatimba@univen.ac.za or the University Research Ethics Committee Secretariat on 015 962 9058. Complaints can be reported to the Director: Research and Innovation, Prof GE Ekosse on 015 962 8313 or Georges Ivo.Ekosse@univen.ac.za

Consent to Participate in a Research:

1. I volunteer to participate in this study conducted by Mr. NT Ratshitanga from the University of Venda. I hereby confirm that I have been informed by the researcher about the nature, conduct, benefits and risks of this study. **Research Ethics Clearance Number: SMS/19/BIS/04/2211**
2. I also understand that I will be one of approximately 60 people who will be participating in this study.
3. I understand that I will not be paid for my participation and I may withdraw at any time without penalty.
4. Even if other participants in the study find the discussion interesting and thought provoking. If, however, I feel uncomfortable in any way during my participation, I have the right to decline to answer any question or to stop participating in the study.
5. My participation involves responding to the semi-structured interviews and/or survey questionnaire from the researcher from the University of Venda.
6. 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.
7. I understand that the researcher will not identify me by name in any reports using information obtained from this study, and that confidentiality will be accorded any information I provide. Subsequent uses of records and data will be subject to standard data use policies which accords anonymity to individuals and institutions.
8. In view of the requirements of research, I agree that the data collected during this study can be processed in a computerized system by the researcher.
9. I agree that the researcher may use voice recorders as part of data collection; and that the collected data can be stored both on paper and digital form and it can also be re-used for other IT governance related studies.
10. In case of a foreseeable risk exists, participants will be fully aware. However; they will not be required to give a waiver if any claim arises from the research.
11. I understand that this research study has been reviewed and approved by the relevant bodies within the University of Venda.
12. I have read and understood the explanation provided to me. I have had all my questions answered to my satisfaction, and I voluntarily agree to participate in this study.
13. I acknowledge that have been given a copy of this consent form.

Participant's names: _____ **Signature:** _____ **Date:**_____

Researcher: Nkhumbuleni T. Ratshitanga **Signature:** _____ **Date:**_____

APPENDIX G – INTERVIEW GUIDE QUESTIONS

The interview will be guided by the following research questions:

a) What are the mechanisms of ITG in HEIs?

b) What are the roles and responsibilities of the identified ITG mechanisms in HEIs?

c) What are the determinants of effective integration of ITG in the ICT strategy Development?

1. What role do you play in the governance of IT in the University?

2. To what extent is the IT strategy aligned with the business strategy?

a. Is the ICT department involved during the development of the Business (University) Strategy?

b. Is the business (i.e. administrators and academics) involved during the development of the IT Strategy? If the answer is yes, describe how?

c. What other mechanisms does the ICT department utilize to involve stakeholders during:

i. The development of the IT Strategy.

ii. Implementation of the IT Strategy.

iii. How effective are those mechanisms?

d. How does the ICT department identify key IT projects to support the business strategy?

e. Are the IT projects helping you to attain the business objectives?

f. Is the existing IT infrastructure enabling you to attain your business objectives?

g. Does the existing IT team have the relevant competencies to support and enable the business strategy?

Research Questions:

a) What are the mechanisms of ITG in HEIs?

b) What are the roles and responsibilities of the identified ITG mechanisms in HEIs?

3. ITG Mechanisms

3.1 How is your IT governance reporting structure?

3.2 Council

a. What role(s) does Council play in the governance of IT of the University?

b. Does council have a subcommittee or a member which evaluates, directs and monitors the implementation of IT in the University on its behalf?

c. Is Council effective with regard to the role(s) that it plays in the governance of IT in the University?

d. What role(s) does council play during the development of the IT strategic plan?

e. What role(s) does council play during the implementation of the IT strategic plan?

3.3 SENATE

a. What is the role of SENATE in the implementation of IT in the University?

b. Is SENATE effective with regard to monitoring the implementation of IT in the University?

c. What role(s) does SENATE play during the development of the IT strategic plan?

d. What role(s) does SENATE play during the implementation of the IT strategic plan?

3.4 IT Steering Committee

a. What role(s) does IT Steering committee play with regard to the implementation of IT in the University?

b. Is the composition of the IT Steering Committee representative of all stakeholders?

c. Is the IT Steering committee effective with regard to coordinating and monitoring the implementation of IT in the University?

d. What role(s) does IT Steering Committee play during the development of the IT strategic plan?

e. What role(s) does IT Steering Committee play during the implementation of the IT strategic plan?

3.5 Executive Management

a. What role(s) does the executive management play with regard to the implementation of IT in the University?

b. Does the executive management evaluate, direct and monitor the implementation of IT in the University?

c. What role(s) does executive management play during the development of the IT strategic plan?

d. What role(s) does executive management play during the implementation of the IT strategic plan?

3.6 Director: IT Services

a. What role(s) does the Chief Information Officer/Director: IT Services play with regard to the implementation of IT in the University?

b. The Chief Information Officer/Director: IT Services also evaluates, directs and monitors the implementation of IT in the University?

c. What role(s) does CIO/Direct: IT Services play during the development of the IT strategic plan?

e. What role(s) does CIO/Direct: IT Services play during the implementation of the IT strategic plan?

3.7 IT Managers

a. What role(s) does the IT Managers play with regard to the implementation of IT in the University?

b. The IT Managers also evaluates, directs and monitors the implementation of IT in their respective sections?

c. What role(s) does IT Managers play during the development of IT strategic plan?

f. What role(s) does IT Managers play during the implementation of IT strategic plan?

3.8 Audit Committee

a. What role(s) does the audit committee play with regard to the implementation of IT in the University?

b. How effective is the audit committee with regard to monitoring the implementation of IT in the University?

c. Does Audit Committee monitor the alignment of IT strategy and the business strategy?

d. Does Audit Committee monitor the implementation of the IT strategy?

3.9 Risk Committee

a. What role(s) does the roles committee play with regard to the implementation of IT in the University?

b. How effective is the risk committee with regard to monitoring the implementation of IT in the University?

c. Does Risk Committee monitor the alignment of IT strategy and the business strategy?

d. Does Risk Committee monitor the implementation of the IT strategy?

3.10 IT Policies

a. How effective are the IT policies?

b. How often are they reviewed? **Hint:** is it once per year or as and when there is a need?

c. Are they accessible by the intended audience?

4. What is the level of dissatisfaction or satisfaction of ITG stakeholders regarding the IT's responsiveness to new business requirements?

a. Are you satisfied with the way IT responds to new business requirements?

b. How does the business respond to the implemented new technologies?

c. .Are you involved during the implementation of new technologies?

d. .What role do you play during the implementation of new technologies?

e. Are IT enabled changes delivered on time?

f. .Are the deliverables of IT projects meet business expectations? (**T**ime, **B**udget and **D**eliverables)

g. What mechanisms does IT use to proactively respond to new business requirements?

5. To what extent are the ITG stakeholders dissatisfied or satisfied with regard to the benefits the University get from IT investments?

a. Is the University realising benefits from the IT investments?

Hints: Cost cutting, improving efficiency,

b. Do you have a role to play during the identification of the key IT projects that support the business strategy?

c. Is the University community using IT resources/facilities optimally?

d. Are there mechanisms that measures the benefits that stakeholders get from IT investment? (E.g. Business case, project plans, etc.)

e. How do the University deal with fruitless and/or wasteful IT expenditures?

APPENDIX H – ICT GOVERNANCE FRAMEWORK

University of Venda

ICT GOVERNANCE FRAMEWORK

ICTGF: Version 1

Document review and approval

Revision history:

Version	Author	Date	Revision
1.0	NT Ratshitanga	14 November 2018	Initial document

This document has been reviewed by:

Reviewer	Date reviewed
Sam Khoza	09 March 2019
ICT Department	06 April 2019
ICT Steering Committee	16 April 2019
Risk Management Committee	03 May

This document has been approved by:

Name	Surname	Date	Job Title

2 Table of Contents

Glossary of terms, definitions, abbreviations and acronyms

ARIGC	Audit, Risk and ICT Governance Committee
Director	Director ICT Services
COBIT™	Control Objectives for Information Technology

Corporate Governance	The set of responsibilities and practices exercised by the board and Executive Management with the goals of providing strategic direction, ensuring that objectives are achieved, ascertaining that risks are managed appropriately and verifying that the enterprise's resources are used responsibly." (ICT Governance Institute: CGEIT® Glossary:5)
Council	The Council of the University of Venda
Executive Management	This is the Executive Management Committee of the University, normally referred to as EXCO
ICTGF	ICT Governance Framework
Governance Principles	The vehicle to translate the desired behaviour into practical guidance for day-to-day management
ICT	Information and Communications Technology
ICT Governance	"The system by which the current and future use of ICT is directed and controlled. It involves evaluating and directing the plans for the use of ICT to support the organisation and monitoring this use to achieve plans. It includes the strategy and policies for using ICT within an organisation." (ISO 38500: 2008:9)
ICT Steering Committee	ICT Committee as constituted in terms of University of Venda ICT Steering Committee Terms of Reference
ICTSC	ICT Steering Committee

Institution	The University of Venda
ICT	Information and Communication Technology
KING IV	The King Code of Corporate Governance for South Africa 2018
EXCO	Executive Management
Univen	University of Venda
VC	Vice-Chancellor

List of tables

Introduction

ICT Governance entails those processes by which decisions are made around ICT strategy and ICT investments, and the processes by which those decisions are implemented. It also defines who and how these decisions are made, who is accountable and how the results of decisions are measured and monitored in all parts of ICT Governance.

ICT Governance at Univen is the integral part of the Enterprise Governance and is in accordance with the King Code of Governance for South Africa (hereafter referred to as King IV). The ICT Governance is defined as "the system by which the current and future use of ICT is directed and controlled. It involves evaluating and directing the plans for the use of ICT to enable and support the business of the UNIVERSITY and monitoring the use of ICT to achieve the plans and objectives of the Institution. It includes the strategy and policies for using ICT within the Institution." (SANS 38500: 2008:9).

Council is accountable for the governance of ICT and the VC is responsible to ensure that the governance of ICT is implemented in the institution in line with this framework.

PURPOSE OF THE ICT GOVERNANCE FRAMEWORK

The ICT Governance Framework is developed and implemented to ensure:

- consistent approach, integrated and aligned with the institutional governance approach
- the ICT related decisions are made in line with the institution's strategies and objectives,
- that ICT related processes are overseen effectively and transparently, compliance with legal and regulatory requirements are confirmed, and the governance requirements for the council members are met.

BENEFIT OF ICT GOVERNANCE FRAMEWORK

Here below are the benefits of implementing ICT Governance in the institution:

a) Improve quality of teaching and learning;

b) Increased productivity;

c) Increased access to information and services;

d) Improved return on investment in ICT;

e) Improved management of risks associated with ICT;

f) Improved communication;

g) Improved delivery of ICT service;

h) Improved trust between ICT department and the business;

i) Increased alignment of investments in ICT and strategic goals of the University;

j) Continuous improvement of business and ICT alignment; and

k) Improved ICT programme and project management.

Regulatory reference

- King IV Report on Corporate Governance.
- Public Service Corporate Governance of Information and Communication Technology Policy Framework.
- Corporate Governance of Information and Communication Technology; Assessment standard.
- Implementation Guideline for Corporate Governance of Information and Communication Technology Policy Framework.
- Control Objectives for Information Technology (COBIT™).
- The public Service Act and Regulations.
- Public Finance Management ACT.
- The DPSA ICT Governance Framework.
- Higher Education Act (101/1997): Regulations for Reporting by Public Higher Education Institutions

Governance Mechanisms

The successful implementation of ICT Governance also depends on the effectiveness of the governance mechanisms that are put in place. This includes strategies, goals, policies, steering committees, oversight authorities, processes, procedures, roles, job descriptions, plans, schedules, contracts, proposals, authorisations, standards and scorecards with a view to deliver value and minimise risk (e.g., business continuity).

Therefore, Council should monitor that those given responsibility to deploy governance mechanisms acknowledge and understand their responsibilities. The Council should also monitor the performance of those given responsibility in the governance of IT.

THE PRINCIPLES FOR THE GOVERNANCE OF ICT

The Governance of the ICT Framework (GICTF) is based on the following Governance Principles as explained in the international standard for ICT Governance, ISO/IEC 385003, King IV report and COBIT™.

ICT Governance Accountability and Responsibility

Table1: Accountabilities and responsibilities for ICT Governance at University of Venda

	Accountabilities / Responsibilities
1.	Council is accountable to ensure that: a) An ICT Governance Framework is implemented in the Institution; and b) The ICT strategic goals of the institution are aligned and integrated with the business strategies and goals of the institution. This will ensure that ICT is governed in a way that supports and enables the University business. c) ICT governance should form an integral part of the institution's risk management. d) An Audit, Risk and ICT Governance Committee should be constituted to assist Council in carrying out its oversight function related to Governance of ICT and ICT risk management.
2.	The VC is responsible to ensure: a) The implementation of the Governance of ICT in the institution. b) That Governance of ICT is on the strategic agenda of the Institution. c) That ICT strategic decision-making and its related expenditure are made in compliance with the ICT Governance Framework. d) That the management practices of the Governance of ICT embrace the concepts of delegation of authority, personal responsibility, and accountability and performance management. e) The development of an ICT management policies for the institutional management of ICT. f) The monitoring of the effectiveness of the Governance of ICT and ICT risk management.
3.	Executive Management is accountable to ensure that:

	a) ICT operations and expenditure are aligned with the strategic and business objectives of the Institution; b) Business related ICT goals are cascaded throughout the institution for implementation; and c) A fit for purpose ICT capacity and capability is created and maintained to meet current and future business requirements.
4.	Executive Management is responsible for: a) Ensuring that support and advice is provided to Council in defining and formulating ICT strategic goals. b) Creating and appointing such management structures deemed necessary to assist in executing its responsibilities. c) Ensuring that the implementation of the Governance of ICT is delegated and communicated to the relevant management structures for business and ICT management. d) Ensuring that the necessary structures, policies, procedures, processes, mechanisms and controls regarding all aspects of ICT use (business and otherwise) are clearly defined, implemented and enforced e) Ensuring that everyone in the institution understands and accepts his/her responsibilities towards the link between business and ICT objectives and with respect to the supply and demand for ICT and related services. f) Ensuring that ICT assets, privacy and security are effectively managed based on industry best practices. g) All ICT investments and expenditure are informed by the enterprise architecture, motivated on sound business case considerations and are monitored and evaluated accordingly.
5	ICT Steering Committee shall: a) Review, on an annual basis, policies and procedures implemented, to ensure that uniformity exists in all ICT procurement activities of Univen b) Establish the necessary framework to assist ICT related projects and monitor its success and effectiveness on an annual basis c) Ensure that its activities comply with all relevant legislation

6	Audit and Risk Management Committee is responsible for: a) Assisting Council in carrying out its oversight function related to Governance of ICT and ICT risk management. b) Ensuring that all significant ICT risks, from strategic to business perspective, are managed in an appropriate manner.

ICT Enterprise Alignment

The pervasive nature of ICT makes it an integral part of the business that is fundamental to support, sustain and grow the business.

ICT enterprise alignment occurs when the ICT strategy is aligned to the University strategic plan. This in turn ensures that every activity performed by the ICT Department contributes in the attainment of the strategic objectives of the University. This also ensures that ICT investments and ICT projects are approved, funded and prioritized in alignment to strategic business objectives of the University. Enterprise Alignment concentrates on ensuring that the business gets value for money on every ICT investment and they should meet the objectives of the business.

To ensure enterprise alignment Executive Management will:

- Ensure alignment of the ICT strategy to the University Strategic plan and institutional Annual Performance Plan (APP).
- Ensure the alignment of ICT capabilities and strategy to implement the Business roadmap.
- Ensure that ICT delivers against strategy through clearly defined and measurable objectives.
- Ensure a culture of openness and collaboration among business and functional units of University.
- Consider current and future technologies and the associated costs, risks and benefits these entails for the business of the university.

Actions:

- The University will have an approved ICT Strategy and implementation plan;
- The Director ICT to participate during the development of the University strategic plan.
- The Director ICT to be part of University's strategic committees.
- Executive Management should approve the ICT Department's APP and Operational Plans;
- Executive Management should monitor ICT expenditure to ensure that it has sufficient funds to execute its responsibilities.

ICT Value Delivery

COBIT approach state that the value delivery is about executing the value proposition throughout the delivery cycle, ensuring that IT delivers the promised benefits against the strategy, concentrating on optimising costs and proving the intrinsic value of IT. The University exists to create value for its stakeholders, and this will be achieved by means of realising benefits at an optimal resource cost while optimising risk. Therefore, in order to ensure ICT value delivery, the Executive Management will be responsible for directing and monitoring the ICT Management. This will be achieved by ensuring that:

- ICT projects and services are delivered with appropriate quality, on time and within the specified budget.
- Measure the cost of current ICT and whether this provides sufficient value to the business.
- Measure the capability of the Univen's Department of ICT Services to deliver current and future levels of service to the business, and the extent of change and investment this may require.

ACTIONS:

- ICT management will always involve stakeholders when implementing ICT projects.
- ICT Management to implement projects based on a best practice methodology.

- The Director ICT Services should be business-oriented and should strive for value-for-money balanced with need for state-of-the-art facilities when seeking approval for ICT projects. The cost evaluation should reflect total cost of ownership (TCO).
- The Department of ICT should keep all stakeholders informed on status of service or project provided.
- Procurement of ICT service should take cognizance of value proposition to the University and its business objectives.

ICT Risk Management

ICT Risk Management is the art of identifying, analysing and responding to ICT related risks and this is done to ensure the achievement of the organisation's objectives. It protects and ensures the availability of ICT assets, Disaster Recovery and Business Continuity of ICT operations.

Despite the fact that ICT risks are operational and information risks, there are also strategic risks in the sense that ICT has now become an enabler of the University business. It is for this reason where the University should manage risk by:

- Ensuring transparency about the significant ICT risks to the University business and provide clarity about risk-taking or risk-avoidance measures.
- Knowing that the final responsibility for risk management rests with the VC.
- Ensuring that the system of internal control is in place and it has the capacity to manage risks in a manner that ensures cost-efficiency.
- Ensuring that risk management be embedded in the operations of the University.
- Ensuring quick responses to changing risks and report immediately to appropriate levels of management, supported by agreed principles of escalation.

Actions:

- Management of risks associated with ICT should form an integral part of the management of risks in the institution.
- Risks associated with ICT should be managed by addressing the safeguard of ICT assets, developing and implementing disaster recovery and continuity of business operations of the institution.
- Maintain an ICT Risk Register as part of the University risk register.

- Implement ICT policies and procedures and ensure that everybody understand their role.
- Putting internal control in place for management and monitoring of transversal systems.
- Develop, approve and implement an Information Systems Security Framework (ISSF) that will comprise of the Systems Security Policy and Procedures (SSPP) as well as security measures.
- Implement an ICT Business Continuity Plan (BCP) and Disaster Recovery Plan (DRP) to ensure that the Institution can recover from technological failures.
- Purchase and implement appropriate information systems security solutions to safeguard the network, data and systems such as anti-virus, patch management, firewall and network monitoring tools.
- ICT risks and progress made with regard to addressing them will be regularly reported to the ICT Steering Committee.

ICT Performance Measurement

ICT Performance Measurement is essential for the successful implementation the ICT governance, and it can be achieved determining the following:

- Enterprise contribution — how do executives view the ICT function?
- User perception — how do users view the ICT function?
- Operational excellence — how effective and efficient are the ICT processes?
- Future orientation — how well is ICT positioned to meet future needs?

Actions:

- The ICT function will report quarterly to Executive Management against the APP.
- The ICT function will report all projects to the ICT Steering Committee.

ICT Resources Management and Accountability

Executive Management will be accountable for and manage ICT resources by:

- Ensuring that appropriate methods and adequate skills exist in the organization

to manage ICT projects.

- Assess that the benefits accruing from any service procurement are real and achievable.
- The tracking of all ICT projects deliverables and monitoring of ICT Services.
- Committing to improving the efficiency and effectiveness of the ICT infrastructure and its use.
- Sustaining an adequate investment in ICT staff development and training for continuous improvement of ICT services, operations and developments.

Actions:

- The Director ICT Services to continuously report to Executive Management and ICT Steering Committee on ICT developments.
- Executive Management to ensure the availability of adequate resources for latest fit-for-purpose technology deployment.
- The Department of ICT Services to develop an ICT skills training plan for ICT personnel as well as initiatives to improve ICT literacy and specific applications training for all Univen employees.
- ICT management to put mechanism in place to encourage optimal use of resources.
- ICT management to put mechanism in place to reduce wasteful and fruitless expenditures.

ICT Governance in Practice

Role of Leadership

Council is accountable for the governance of ICT in the University. Council has to ensure that there are also structures that assist in the implementation of ICT governance within the institution. It must also ensure that there are appropriate and effective processes to monitor ICT risk and that the system of internal controls is effective in reducing ICT risks to an acceptable level.

Council through the VC and Executive Management must continuously evaluate the use of ICT and set direction and insist on controls. The VC, the Executive Management and delegated structures in the institution must provide Council with the information required in decision-making and the evaluation of the performance of ICT in the institution.

To have effective ICT governance in the organization, the lower levels need to apply the same principles of setting objectives, providing and getting direction, and providing and evaluating performance measures.

As a result, good practices in ICT governance need to be applied throughout the enterprise and especially between the ICT function and the business units.

Quality is conformance to the users' requirements; it is also defined as fit for purpose and it is also about meeting stakeholders' requirements. In order to achieve quality services ICT must always involve the business units to ensure that their business requirements are met by ICT.

To help enable this:

- Executive Management members should play an active role in determining ICT strategy.
- The VC should provide organizational structures to support the implementation of ICT strategy.
- The Director ICT Services must be business-oriented and provide a bridge between ICT and the institution.
- The ICT Director as the delegated ICT Governance champion as per the King IV code which says that the governing body should delegate to management the responsibility to manage IT effectively.
- Executive Management should become involved in the ICT Steering Committee through regular feedback reports.

Effective implementation of ICT Governance

The overall objective of ICT Governance is to understand the issues and the strategic importance of ICT and implement those ICT strategies required to sustain business operations into the future. It is generally expected for ICT to deliver business value and generate acceptable return on investment and move from efficiency and productivity gains toward value creation and business effectiveness. The implementation of effective ICT governance is based on the following critical pillars:

- Leadership, Organisation and Decision Rights
- Flexible and Scalable processes
- Enabling Technology

Leadership, Organisation and Decision rights

Executive Management to ensure:

- That the roles and delegated responsibilities and authority in the organisational units are well defined, documented, measurable and continuously improved.
- Define interfaces in the organization, equitable roles to stakeholders, disclosure and transparency and ensure that workflow spans organisational unit boundaries or silos.

Flexible and Scalable processes

- Processes should be designed and developed which are flexible, scalable and consistently applied.

Enabling Technology

Leveraging tools and technologies that support the major ICT Governance components and will ensure that:

- Processes are supported by information requirements that support ICT imperatives and components.
- That the tools deployed are effective to facilitate governance and decision support.

ICT Governance implementation

Major components which are part of ICT Governance categories include Programme and Project management, Process management, Resource management, Strategic sourcing and Vendor management, and ICT Service management. Executive Management will ensure that there are systems in place to enforce those responsibilities which generally relate to ICT alignment, the management of technology-related business risks and the verification of the value delivered by the use of ICT across the enterprise.

Project/Programme Management (PM)

The Department of ICT Services must develop Project Management procedures which outline the following:

- Phases of the Project;
- Budget and dates;
- Roles and Responsibilities;
- Decision points;

- Monitoring Control;
- Risk Management.

Process Management

To ensure operational excellence, the Department of ICT Services will define, deploy and also automate processes in line with the business requirements. ISO/IEC 15504 will be used to assess the capability of ICT related processes.

There are six capability levels, incorporating nine process attributes.

Table 1: Process Capability Level and Attributes

Level	Description	Attribute(s)
Level 0: Incomplete	The process is not implemented or fails to achieve its process purpose. At this level, there is little or no evidence of any systematic achievement of the process purpose.	
Level 1 Performed	The implemented process achieves its process purpose.	• Process performed
Level 2 Managed	The previously described Performed process is now implemented in a managed fashion (planned, monitored and adjusted) and its work products are appropriately established, controlled and maintained.	• Performance management • Work product management
Level 3: Established	The previously described Managed process is now implemented using a defined process that is capable of achieving its process outcomes.	• Process definition • Process deployment
Level 4: Predictable	The previously described Established process now operates within defined limits to achieve its process outcomes.	• Process measurement • Process control
Level 5: Optimized	The previously described Predictable process is continuously improved to meet relevant current and projected business goals.	• Process innovation • Continuous optimization

Service Management and Delivery

The Department of ICT Services will develop a Service Management and Delivery Plan according to industry best practices which deal with minimizing and avoiding disruptions and assuring the continuity of ICT service. Key principles for ICT service management and delivery excellence include:

- Streamlining service delivery and support processes based on best practices;
- Developing and documenting repeatable processes and procedures;
- Implementing standards and guidelines to perform tasks correctly the first time;
- Performing proactive analysis, prevention and resolution;
- Disaster prevention and recovery;
- Definition of services targets and costs;
- Accurate allocation of recovery costs; and
- Audit, review and improve ICT processes.

Controls

1.1 Performance Management

Executive Management, in collaboration with the ICT function, should develop a performance management plan for ICT investments. The plan should be based on factors such as the organisation's vision and mission, institutional strategies and objectives, financial considerations, quality and effectiveness.

1.2 Asset Management

This deals with ICT resource allocation and utilization, financial and cost management, asset inventory and tracking, configuration management, license management, time and cost reporting, recovery including charge back systems where appropriate. Executive Management should ensure that tools that support asset management are deployed to optimize asset usage across the entire lifecycle from procurement to disposal and retirement.

1.3 Change Management

Changes in operations scope, systems, software, hardware, networks and applications are inevitable. Change management cuts across many ICT Governance components. A change management policy, process and procedure should be developed and implemented which covers evaluation of impact, funding required, approval, tracking and documenting of change from current to a new baseline. Change management tools that manage change across the development and operational boundaries, are process-centric and leverage portfolio

management to prioritize change activities and funding should be considered. The ICT department should develop and implement a Change Management Policy for ICT.

1.4 Management Controls

Regulatory compliance and audit management requirements determines the type and level of management and administrative controls deployed. The Organization should provide a documented audit trail for compliance and elaborate how continuous compliance is to be sustained.

UNiVEN ICT Governance model

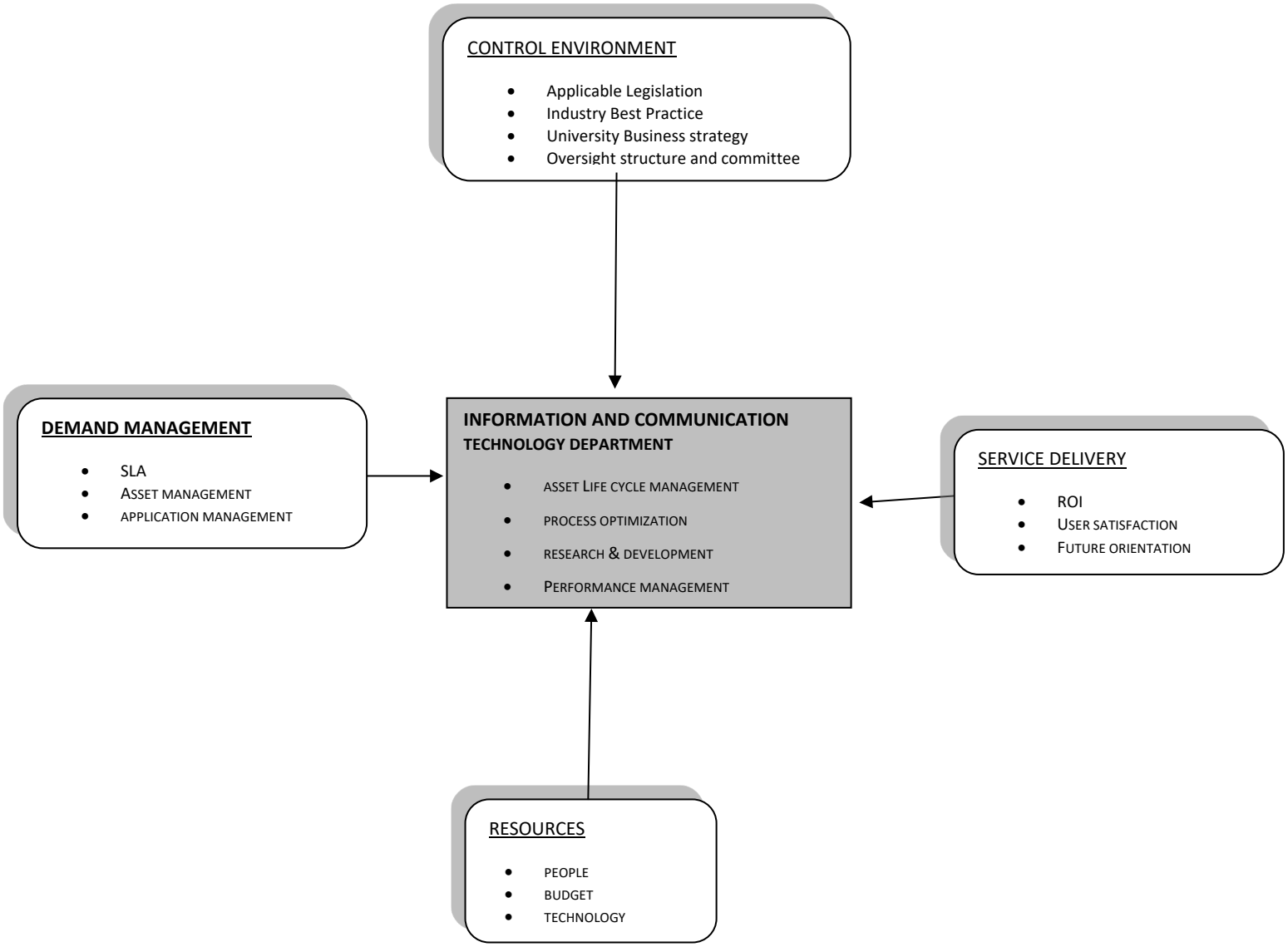


Figure 1: The UNIVEN's ICT Governance Model

UNIVEN ICT governance maturity

ICT Governance maturity assessment is the process of conducting an assessment of the level of compliance with the accepted and approved ICT Governance framework of the UNIVERSITY. Determining the ICT Governance maturity is recommended as it assists in formulating the ICT Governance strategy.

ICT Governance Capability Model

The ICT Governance Institute provides a model in six stages and it is as follows:

Table 2: ICT Governance Capability Levels

There are six capability levels, incorporating nine process attributes.

Level	Description	Attribute(s)
Level 0: Incomplete	The ICT Governance Framework is not implemented, or it fails to achieve its purpose. At this level, there is little or no evidence of any systematic achievement of the ICT Governance Framework's purpose. There is no senior management oversight of ICT-related activities to ensure that the enterprise's ICT goals are aligned with and add value to the organization and to ensure that ICT-related risks are appropriately managed. The organization has not recognized that there is an issue to be addressed, and hence there is no communication about the issue.	
Level 1 Performed	The implemented ICT Governance Framework achieves its purpose. There is awareness and recognition that more formalized oversight of ICT is required, that it needs to	• ICT Governance performance

	be a shared responsibility and that support of top management is required. Regular governance activities and performance indicators are under development, including ICT planning, delivery and monitoring processes, but rely mostly on the initiative of the ICT management team, with voluntary or co-opted participation from key business stakeholders. Basic measurement and assessment methods have been identified but the processes have not been adopted consistently across the organization. Governance processes and tools have been adopted by individuals within various ICT projects, but there has been no formal training or communication on governance standards and responsibilities.	
Level 2 Managed	The Performed ICTGF is now implemented in a managed fashion (planned, monitored and adjusted) and its work products are appropriately established, controlled and maintained. The need to formalize ICT governance is well understood and accepted. An organizational and process framework has been defined for oversight and management of ICT activities and is being introduced to the full organization as the basis for ICT governance.	• Performance management • Work product management
Level 3: Established	The Managed ICTGF is now implemented using a defined process that is capable of achieving its process outcomes.	• ICTGF definition

	A baseline set of governance and performance indicators have been defined, documented, implemented and tracked, leading to further enterprise-wide improvements. While measurable, procedures are relatively simple, and reflect the formalization of existing practices, and utilization of standardized tools.	• ICTGF deployment
Level 4: Predictable	The established ICTGF now operates within defined limits to achieve its outcomes. ICT governance framework is fully implemented, and its issues are fully understood at all organizational levels, supported by formal training. ICT governance has evolved into an enterprise-wide process and activities are becoming integrated with the enterprise governance process. Enterprise management is working together for the common goal of maximizing ICT value delivery and managing ICT-related risks. There have been regular assessments of ICT capabilities and projects have been completed that have delivered tangible improvements to ICT's performance. Customer relationships are clearly defined based on service definitions and agreements. ICT processes are aligned with the business and with ICT strategy. ICT process improvement measures are well understood and quantifiable. ICT is communicating real results of monitoring and initiating process improvements in the form of a balanced scorecard.	• ICTGF measurement • ICTGF control

Level 5: Optimized	The Predictable ICT Governance Framework is continuously improved to meet relevant current and projected business goals. ICT governance practices have developed into an advanced and forward-looking approach. Training and communication (of governance issues) is supported by leading-edge techniques. Processes have been refined to a level of external best practice, as a result of continuous improvement and maturity modeling comparisons with other organizations. ICT is utilized in an extensive, integrated and optimized manner to automate workflow and provide tools to improve quality and effectiveness. The practice of continuous improvement of ICT capabilities is embedded in the culture and includes regular external benchmarking and independent audits providing positive assurance to management. The implementation of optimized policies has resulted in an organization, people and processes that are quickly adaptable and increases the competitive advantage of the enterprise.	• ICTGF innovation • Continuous optimization

1.1 ICT Governance Capability Level

The ICT governance capability level at University of Venda is at level 1 at this stage. To improve on the current ICT Governance capability level at the University in compliance with King IV, it will have to prove that:

- ICT Governance Framework has been developed, approved and implemented.

- Information Security Management practices are implemented.
- ICT strategy planning forms part of the strategic business planning process.
- Business and Disaster Recovery and Business Continuity plans, policies and procedures are developed and implemented.
- Project Management procedures and practices are adhered to.
- ICT Procure and disposal policies and procedures are developed and implemented.

AUTHORISATION

The information and communication technology Framework mandate its implementation with the following approvals:

Approval:

SIGNED: _____ DATE: _____

APPENDIX I – ICT STEERING COMMITTEE TERMS OF REFERENCES

INFORMATION AND COMMUNICATION TECHNOLOGY STEERING COMMITTEE

TERMS OF REFERENCE AND CODE OF CONDUCT

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GLOSSARY

ICT Steering Committee	Planning and discussion body on delegated matters and, making recommendations about ICT matters Univen wide to EMC and Senate.
Consensus	Agreement by all members present of the Steering Committee
Team leaders	Those nominated by the various stakeholders to be the spokespersonon behalf of the School/Department/Directorate
Areas	Where programmes are presented
Learning Sites	Univen sites of delivery.

INTRODUCTION

Rationale and philosophy of the ICT Steering Committee

The rationale is to create a platform where ideas, comments, suggestionsand proposals on the planning and management of the ICT investment couldbe debated and recommended to EMC and Senate for their consideration. This process will create a culture of inclusiveness and will overcome any divide between the stakeholders. The philosophy is to create unity of vision and ensure that the needs of the institution as a world-class comprehensive University are met.

The following outcomes of the ICT co-operation process in higher education should be used as guidelines, within the scope of the vision and mission of Univen:

- Differentiating Univen through its world-class ICT infrastructure, technology enhanced teaching and learning and ICT support.
- Forging a unique identity and a culture of excellence, quality and compassion for all ICT related initiatives and teaching.
- Establishing a high-quality, motivated ICT staff corps for Univen.
- Striving for the enhanced throughput of students, without sacrificing quality in the process.

Purpose of the ICT Steering Committee

The ICT Steering Committee should lay the foundation and groundwork for ICT technology processes in Univen. It should consider all strategic initiatives and make recommendations to the EMC and Senate on the ICT Integrated Technology Plan and related initiatives.

The following will be the objectives of the ICT Steering Committee:

- Draft the Integrated Technology Plan (ITP) for Univen and submit to EMC and Senate for approval.
- Monitor the ITP and priorities for Univen.
- Make recommendations to EMC and Senate based on contributions to the bottom line and throughput principle.
- Consult with all stakeholders.
- Stay abreast of new and emerging technologies

1.1 TERMS OF REFERENCE

The following are the terms of reference for the ICT Steering Committee

1.2 Composition

The membership of the ICT Steering Committee shall comprise of: The Chair of the ICT Steering Committee will be the DVC Operations.

- The Deputy Chair will be the Director ICT Services
  Other Members:
- Three members from the ICT Department (TechnicalResource)
- Director Library Services
- Director Finance
- Representative for the Registrar Academic
- Two members from CSC/BIS Disciplines
- Director HR
- The Deans of Schools or Representative
- Director Research
- One Member from Internal Audit
- SRA Representative

2.2 Meeting procedures

2.2 The meetings of the ICT Steering Committee will take place at the University of Venda, in Thohoyandou or online through Microsoft Teams.

2.3 Meetings will be conducted according to an agenda as provided by the appointed secretary. Members should confirm with the appointed secretary that they have received the necessary documentation for a meeting **five (5)** working days in advance.

2.3.1 Formal minutes will be taken by the appointed secretariat and circulated to the members **Ten (10)** days after the meeting.

2.3.2 The Chairperson should sign the adopted minutes of the previous meeting.

2.3.3 Recommendations from the stakeholders will be in the form of a report. Thenominated person/s from stakeholders will present their report.

2.3.4 Consensus has to be reached. Disputes will be dealt with in terms of theProcedure as described (see paragraph 3.2).

2.3.5 Specialists may be consulted when advice is needed.

2.3.6 The ICT Steering Committee will meet **four times** per annum.

2.3.7 All deliberations will be conducted according to an agenda as provided by the secretary. Agenda points, with supporting documentation, should beforwarded to the secretary at least **seven (7)** working days before the scheduled meeting.

2.3.8 Additional agenda points will be accepted at the meeting, providing the majority of the members support the proposed point.

2.3 Responsibilities

2.3.1 The ICT Steering Committee will make recommendations to EMC andSenate on:

- The strategic positioning of ICT matters in terms of the IntegratedTechnology Plan.
- The issues investigated and the time frame of each process if new projects.
- Priority areas in each process.
- The cost implications and viability of new ICT programmes/infrastructure.

- Economics of scale, scope and synergies
- Disaster recovery/risk analysis.

2.3.2 The ICT Steering Committee will determine:

- A budget for the implementation of each process.
- The milestones of new ICT processes.
- The critical success factors for each process.

2.4 Reports

2.4.1 The ICT Steering Committee reports to the Risk Committee

2.4.2 The ICT Steering Committee will compile final reports and proposals that have to be submitted to EMC and Senate.

2.4.3 Reports of the ICT Steering Committee have to be approved by the team before it is submitted any further.

2.4.3 Consensus has to be reached. Should there be disagreements; the dispute resolution procedure will be applicable.

2.4.4 The specialised sub-teams have to provide the recommendations in the form of a report.

2.4.5 Consultation with the specialised sub-teams might be necessary to ensure a common understanding before compiling the final report that has to be submitted further.

2.5 Tasks

2.5.1 The report(s) of each specialised sub-team will be discussed forrecommendation to higher bodies.

2.5.2 The ICT Steering Committee will determine a plan of action at theirmeetings.

2.5.3 The ICT Steering Committee may request specialised sub-teams to conducturgent surveys and audits on its behalf.

2.5.4 The ICT Steering Committee Responsibilities:

- To oversee the ongoing development of a University-wide ICT StrategicPlan.
- To monitor the implementation of the ICT Strategic Plan.
- To receive reports on projects in the ICT Department and to agree changesin priorities and resources.
- To monitor and advise on ICT budget and all departments' expenditure onICT
- To monitor the service levels set for the ICT Department and achievementthereof.
- To develop and recommend the University's Computing Policies andStandards.
- To monitor the implementation of such policies and standards throughout theUniversity.
- To continuously review the University-wide computing resource with respectto optimising and protecting its value through redeployment and/or renewal.
- To make recommendations to Executive Management and Senate asappropriate.
- To establish sub-committees and working groups as required
- To consider emerging ICT developments and assess the potential for theirdeployment in the University.

2.6 Term of membership composition of the ICT Steering Committee

2.6.1 The membership composition will remain the same for a period of one year.

2.6.2 If a vacancy occurs, it is the responsibility of that stakeholder grouping to fill it.

2.7 CODE OF CONDUCT

CODE

3.1.1 To adhere to the terms of reference as set out herein.

3.1.2 To ensure that all processes are transparent, communication is effective andthat all stakeholders are involved.

3.1.3 The chairmanship of meetings will be the DVC Operations or his delegate.

3.1.2 The committee comprises a chairperson and ten (10) members, with no limitation on the number of participants; however, **the presence of a chairperson and four (4) members will form a quorum.**

3.1.3 Apologies for absence should be submitted to the appointed secretary at least **twenty-four (24)** hours in advance. If at any meeting there is no quorum in terms of the code of conduct, the meeting must be postponed for three days, all members must receive due notice of the postponement and whoever is present at the follow-up meeting will form a quorum.

3.1.4 The decision-making will be consensus driven. In the case of disagreement, the Dispute Resolution Procedure as outlined herein will be followed.

3.1.5 The members will adhere to the meeting procedures and the chairperson of the day has the authority to guide the process in an orderly fashion. In the case of unbecoming behaviour, the chairperson has the right to bring the meeting to order.

3.1.6 The members will give their full commitment and dedication to the tasks.

3.1.7 A spirit of mutual trust and respect will guide the deliberations and debates.

3.1.8 Tasks and timeframes that have been agreed upon, will be adhered to.

3.2 DISPUTE RESOLUTION PROCEDURE

3.2.1 Decisions made by the ICT Steering Committee will be consensus driven.

3.2.2 Should consensus not be reached, the parties shall go into caucus to reviewtheir positions.

3.2.3 Negotiations will be focused on the interests of Univen as reflected in itsmission and vision.

3.2.4 The parties should then discuss the disputed issues amongst

themselves tocatalyse resolution.

3.2.5 A process of mediation could be entered into, with arbitrators beingappointed by the parties involved, in an effort to resolve the dispute.

3.2.6 Failing to do this, the ICT Steering Committee will refer disputes to EMC fordecision.

3.3 VALUES – University values will guide the members

During deliberation the participants to these two committees should adhere to the values of Univen:

3.3.1 **Professionalism** - depicted in high-quality work delivered on time.

3.3.2 **Trust, transparency** and **honesty,** which are reflected in frequent, comprehensive consultation and feedback.

3.3.3 Frequent, comprehensive, honest and open **communication** on roles, expectations, progress, successes, problems and agreements.

3.3.4 **Equality and fairness** - give all team members an opportunity to participate,air views, perform activities and to have the right to differ.

3.3.5 **Respect** - respect the dignity and diversity of all members and respect thevalue each one can add.

3.3.6 **Recognition** - recognise the efforts and constructive participation of all.

CONCLUSION

The outcome of this ICT Steering Committee, sub-teams and stakeholder involvement should assist Univen to attain its vision. Univen has to build a new and strong ICT administrative, governance and academic capacity.

2025

UNIVEN ICT STRATEGY

2021 - 2025

The Digital Blueprint

My ICT, your path to digital transformation

Table of Contents

1 ICT Strategic Workshop

- The University of Venda ICT Department completed a workshop to develop an ICT strategy that aligns with University strategic goals and priorities.

- The workshop was facilitated by the ICT management team and took place over three days from 23 to 25 November 2020.
- Audit and Risk, Computer Science, AdaptIT as the Univen ERP partner were invited to join the ICT in developing the

Univen ICT 2025 roadmap.

- Diagnostic survey was carried out on a study, and the ICT team assessed the current state of ICT operations at University of Venda. The ICT team determined that although they have implemented number of projects successfully, they currently operate at the Current-State Maturity Level 2 of ICT maturity (Defined/Firefigh ting). The team plans to raise the maturity toTarget Maturity Level 4 (Quantitative/Business Partner) by theend of

the 2025. The team has identified a series of ICT objectives and initiatives, aligned to the University goals, that will allow them to take the university to the next level of digital transformation.

- During the workshop, the team also identified key ICT capabilities and resources required in order to meet and support the University strategic goals.
- The ICT resource plan was formulated, and cross skilling was agreed to share workload while proposed ICT Structure is being approved.

University of Venda 2025 Strategic Goals

Vision

A University leading in engaged scholarship

Mission

The University of Venda proc=duces graduates that are relevant and globally competitive

Thrusts

- Student Centeredness and engaged Scholarship
- Entrepreneurial University
- Governance for outstanding scholarship
- Linkages, Partnership and Internalization

Objectives

- SO1: To enhance student well-being and success
- SO2 : To enhance the curriculum and improve graduateness
- SO3: To strengthen engagement of students, staff, and community stakeholders
- SO4: Enhance teaching and learning support
- SO5: To enhance research outputs for innovation and impact
- SO6: To develop an entrepreneurial culture
- SO7: To ensure financial sustainability
- SO8: To be an anchor institution for effective integrated local andregional development
- SO9: To develop enterprise
- SO10: To promote effective institutional governance and management systems
- SO11: To enhance cooperate identity
- SO12: To improve governance of institutional information systems
- SO13: To strengthen systems and processes for infrastructure development and maintenance.
- SO14: To enhance security in and
- SO15: To strengthen the university's local, regional, and international profile and visibility

ICT Capabilities

ICT Initiatives

ICT Strategy Background

The University of Venda technological environment is strategically important to its academic mission since Information and Communication Technology is an indispensable presence and fundamental enabler of world-class research, educational practices, and the fundamental operations of our integrated university community. The ICT Strategy is an important enabler that directly supports Univen'sstrategic priorities. Univen operates an ICT back-office environment (networks, infrastructure, servers, etc.) that supports a front-office environment, learning and teaching in a fairly standardised practice. The ICT Department conducted a review of 2016 to 2020 ICT Strategic priorities on the 25th November 2020 in order to crafta 2021 to 2025 Univen ICT strategy (hereafter referred to as the 2025 ICT Strategy).

The 2016 ICT Smart Campus Priorities

In the 2016 ICT strategic priorities, the University of Venda embarked on an ambitious 'Smart Campus' project which guided its future Information and Communication Technology roll-out. The network broadband was increased to 10Gbps on campus, because it is clear that a number of our academic and operational processes would be Information and Communications Technology driven for greater efficiency. In 2016, Univen started the provision to all undergraduates, honours and masters students with a Windows tablets loaded withvarious features and software, including Office 365.

The Cloud solution was successfully initiated, new services are being hosted on thecloud and the implementation will continue to evolve and present new challenges and opportunities. The ICT department will continue to adapt its approaches and embrace opportunities and tackle the challenges. The ICT department has made remarkable progress through the replacement of obsolete laptops, obsolete Servers,installation of Video Conferencing, Audio Visual, Teams, VoIP and stabilising the ICT network and these have positively led to an improvement in the ICT user experience.

As per the ICT 2016 Smart Campus priorities, majority of the projects were successfully implemented, therefore, maintenance and upgrade of ICT infrastructureis a high priority and integral to the academic project.

The ICT Department is continuing to improve ICT services and connectivity to meetthe business requirements. The availability of network platforms has drastically improved and upgrades and maintenance of these services is significant.

The 2025 ICT Strategic Vision

The development of ICT Strategy (2025) sets out an overall vision and defines the key ICT strategic objectives, policies and processes for the five-year ICT plan period.It will be used as the blueprint for future ICT department service delivery programmes, while providing a framework to exploit and leverage on existing and emerging technologies and best practices to transform business processes throughsimplification and agility, to achieve digital transformation as set out in the 2025 University of Venda strategic goals.

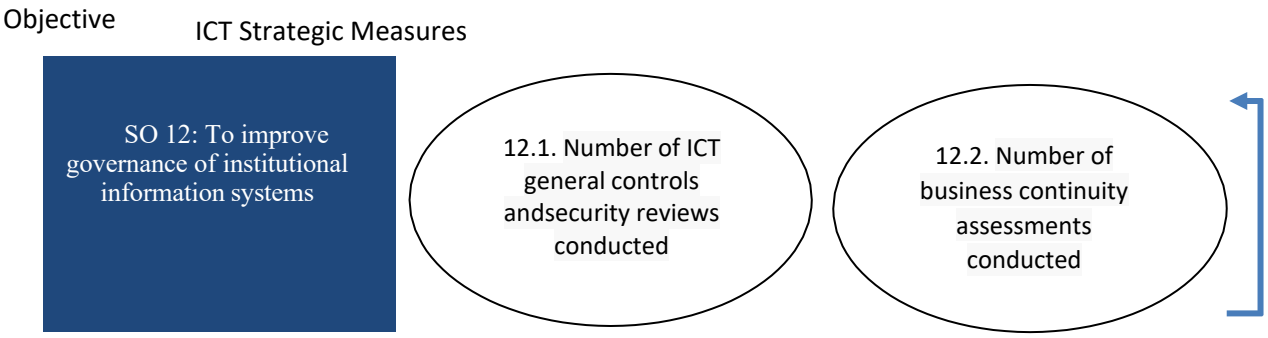
The 2025 ICT Strategy will bring more digital transformation initiatives in deploymentof ICT solutions as technologies continue to evolve. To improve ICT ability to deliverservices and enhance efficiency, Univen will need to leverage on existing and emerging Information and Communication Technologies (mobile solutions, cloud services, social technologies, infrastructure improvement, and Big Data/ Analytics) to support, enable and optimize the teaching and learning, to promote agility and improve business capability to deliver business innovation.

Cyberspace continue to pose threats to our digital transformation programme and create serious security risks if security controls are not managed appropriately. ICTdepartment will implement Cybersecurity framework to protect the integrity of our networks, programs and data from attack, damage or unauthorized access.

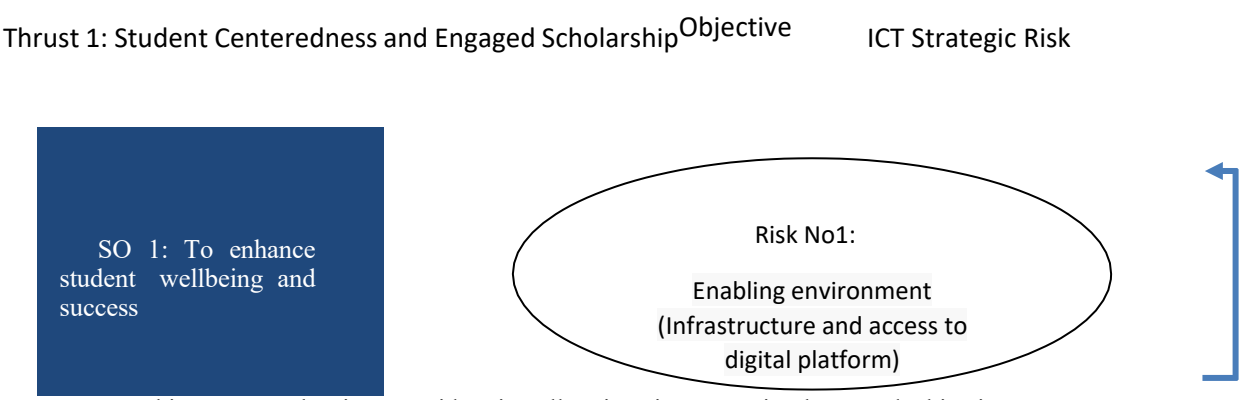
Alignment with the University 2025 Strategy

In developing this 2025 ICT strategy, it was therefore necessary to ensure alignment with the University of Venda 2025 business Strategic Plan approved by the Council. This is observed from the University 2025 Strategic Plan's Strategic Objective number twelve (12) and which addresses ICT directly:

Thrust 12: Governance for outstanding scholarship



The University Management has identified 2025 University Strategic risks and risk number one (1) in the risk register addresses ICT directly:



This strategy takes into consideration all University Strategic Thrust and Objectives, the ICT Department will enable and support all University priorities to enhance the student wellbeing and experience. The 2025 ICT strategy provides a roadmap and shall be the basis of all digital transformation initiatives for the next five years.

The ICT Department

Information and Communication Technology Department at the University of Venda operates in an environment that demands significant reliance and robust ICT infrastructure due to distance from bigger cities. The mandate of ICT department is to support Univen business objectives and play the role of a 'change enabler' in the modernization of teaching and learning, business operations and support systems. The ICT department is divided into four units, and the department is restructured to meet the University needs: Network Operations (New: ICT Infrastructure) unit, Systems Operations (New: Business Systems), Support Service (New: ICT Support Service), Telecommunication (New ICT Governance and Security). The Telecommunication Staff will be joining ICT Support Service Unit. (Appendix B & C)

ICT Infrastructure

The ICT Infrastructure unit is responsible for the designing, testing and implementation of routine installations of ICT hardware, including computers/servers, network components and multi-functional devices.

Business Systems

The primary purpose of the Business Systems unit is to meet the needs of Univen through the use of information systems and applications including development, support and maintenance.

ICT Support Service

This unit is responsible for software, Audio Visual, Laboratories, Desktop and Laptop support to all University community

ICT Governance, Security and Compliance

This unit is responsible for defining and setting ICT standards, norms, policies around all ICT operational domains in University in order to maintain best practice, standards and implementation of policies.

Situational Analysis

Internal and external environmental analysis is critical in understanding the conditions within which ICT Department operate. These conditions can either be facilitating or hindering the Department towards excellence performance. Further, such a strategic environmental analysis provides an appreciation of the capabilities of the ICT Department and the external factors that affect it. Therefore, the analysis results in the identification of strengths, weaknesses, opportunities and threats (SWOT), which provide a good indication of what the future strategies will be.

Strengths

- Knowledge, experience, teamwork
- ICT Standardization
- Stable Infrastructure and Platforms
- New Technology Adoption (Innovative- open to new ideas)
- Quality Services
- Collaboration platforms or Technologies

Weaknesses

- Inadequate resources and skills
- Inadequate of critical position on organogram (project management and no enterprise architecture EA))
- Inadequate Office space (server room)
- Insufficient Budget
- 3rd party contracts (Over reliance)
- Lack of succession planning
- Inadequate DRP
- Inadequate policies and procedures (No policy for graduate program)

Opportunities

- Cloud computing, mobility, IoT
- Business Intelligence, data archiving
- Automation, self-service, user training
- Collaboration with 3rd party service providers
- Re-engineer ICT organogram
- Automation and modernization
- Development of young people
- Establishment of ICT Centre
- Improving ICT Security
- Revenue generating services

Threats

- Cyber risk and awareness,
- Attracting skilled resources
- Procurement process, budget constraints
- WAN network availability
- SLA Delivery
- User adoption of systems
- Over reliance of 3rd parties
- Theft and vandalism
- Unrealistic expectation from depts
- Pouching of staff by competitors

The ICT Target State (2025)

To support the business in achieving its 2025 strategic imperatives, ICT has identified key digital transformation initiatives and projects that represent opportunities for growth within university in providing predictable and resilient systems, services, and solutions. The ICT target state is better articulated by first understanding ICT strategy scope, ICT Vision and Mission, ICT Strategic objectives, and ICT Maturity Level (Current and Target State); and all these play important roles in directing, assessing and measuring the ICT performance.

ICT Strategy Scope

Breadth:

The ICT strategy will cover all University Strategic Thrusts andObjectives

Depth:

The depth of coverage for the ICTstrategy will be at the initiative andimplementation level.

Scope

University Coverage:

The ICT strategy will cover all the Faculties, Schools and Departments.

Planning Horizon:

The planning horizon of the ICT strategy will be to the end of 2025 andreviewed annually.

ICT Vision and Mission

Vision

To be a trusted innovative leader in enabling teaching, learning and research

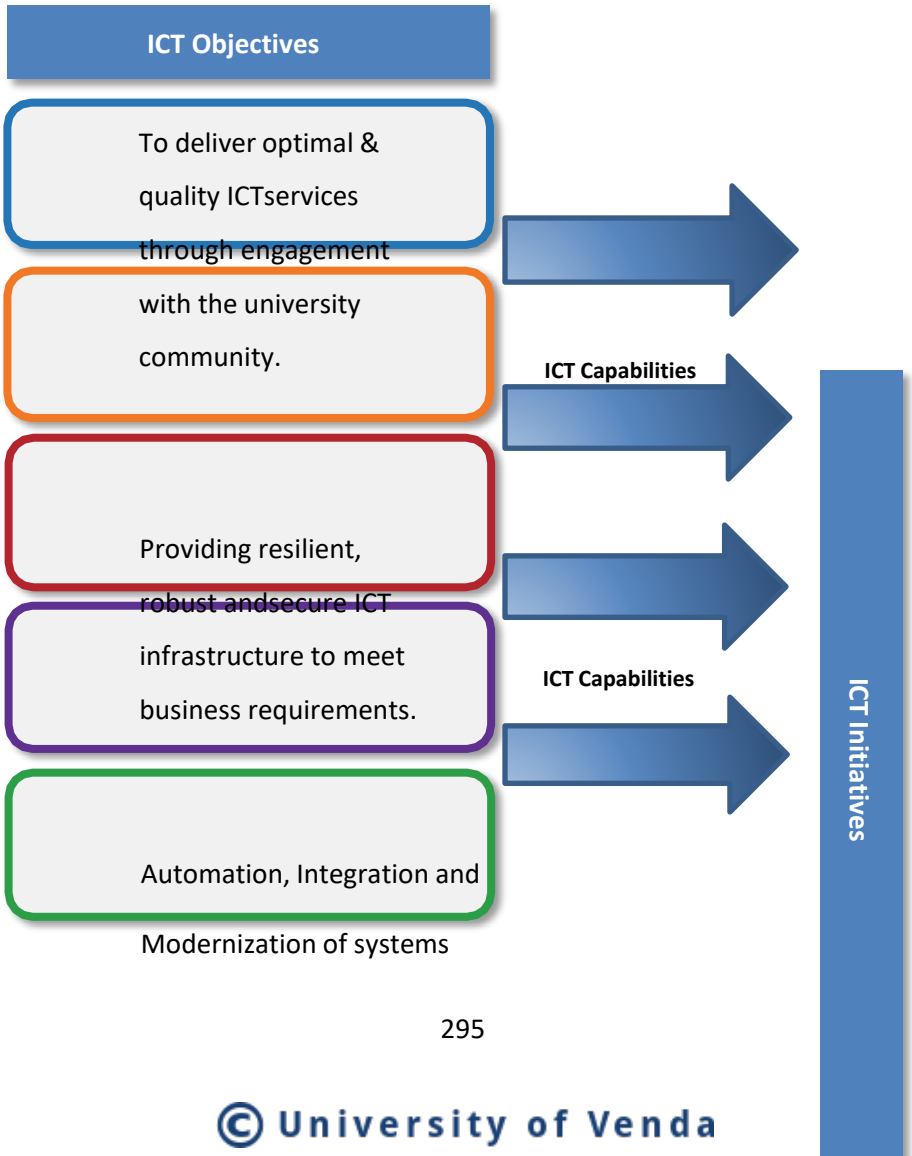
Mission

The ICT Department is committed:

To enhance the quality of university core business through collaborative cutting edgetechnology and

ICT Strategic Objectives

The ICT strategy adopted five strategic objectives that consists of identified projects/initiatives together with associated measurable target and expected outcomes. The ICT strategic objectives are the key issues that Univen needs to address if it is to improve its performance over the plan period. The objectives, which are derived from the business context and situational analysis presented in, drive the strategy and failure to adequately and satisfactorily address the challenges associated with them will adversely affect realization of the ICT strategic objectives.After a comprehensive analysis of the current and future business automation needsat Univen, five strategic objectives were identified for action:



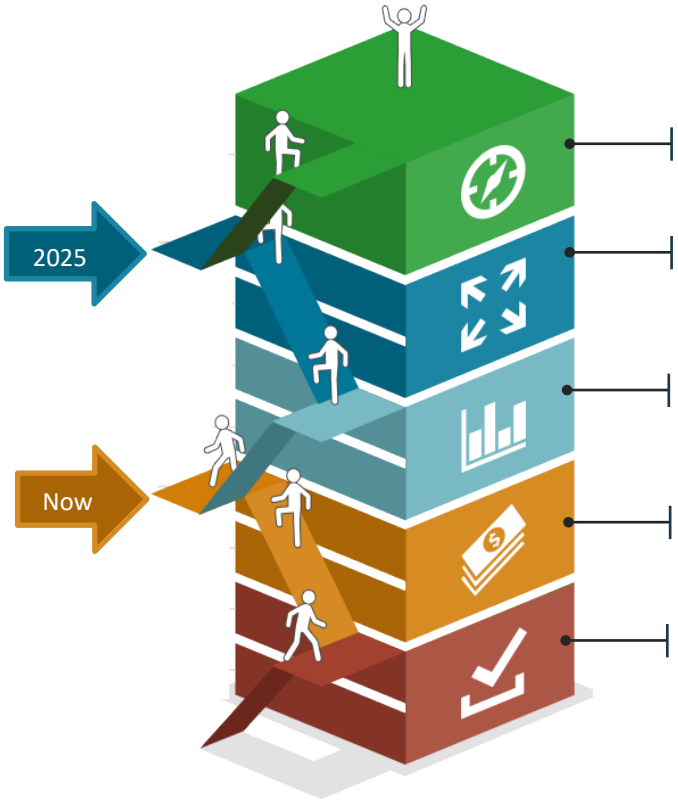
	ICT Capabilities
Improve and promote ICT Governance, Security and Compliance	**ICT Capabilities**
Enhance stakeholder (students& staff) awareness and experience	

These objectives will be treated as governance and be kept in mind at all times when decisions are taken in respect of projects, capital expenditure and resource allocation.

ICT Maturity Level (Current and Target State)

The ICT team currently operates at the level of Managed or Firefighter due to inadequate ICT resources and team is always under pressure to complete required tasks. If the key positions can be created and filled, by the end of the current ICT strategic plan, in 2025, the team would like to move up the maturity ladder to Quantitative or Business Partner.

It is important to note that the ICT department currently has processes and capabilities that operate in the higher levels, but overall functions as a Firefighter.



Optimised, Innovator – Transforms theBusiness

Reliable Technology **Innovation**

Quantitative, Business Partner – Expands the Business

Effective Execution on Business **Projects,** Strategic

Use of **Analytics** and **Customer Technology**

Defined, Trusted Operator – Optimizes the Business

Functional **Business Applications,** and Reliable

Data Quality

Managed, Firefighter – Supports the Business

Reliable **Infrastructure** and ICT **Service Desk**

Initial, Unstable – Struggles to Support

Inability to Provide Reliable Business Services

The self-assessment has offered a perspective on how the department is harmonising its users, processes and resources in order to deliver ICT that is alignedand able to meet the institution's strategic goals.

Expansion of ICT Strategic Objectives

An excellent strategy will deliver expected results if its implementation is good. Various activities ought to be done to ensure successful implementation of this strategy. The detailed ICT Master Plan has been developed (see appendix A). Below are the adopted ICT strategic objectives aligned with ICT projects and initiatives.

Provide Optimal and Quality ICT Services

The main role of Univen's ICT Department is to provide ICT services that are Complete, Relevant, Accurate, Timely and Accessible to the university community. Therefore, to deliver quality ICT Services to both staff and students, the ICT Department need to implement the following initiatives:

Objectives	Project/Initiative	2021	2022	2023	2024	2025
1. To deliver optimal & quality ICT services through engagement with the university community	1.1. Connect and migrate UNIVENChemistry and Physics departments workloads to the Centre for High Performance Computing for effective and efficient computational andresearch purpose	Dec	Dec			
	1.2. Implementation of Huawei Academy Project Computingplatform to host and connectequipment to the network fortraining purposes.	Jun				
	1.3. Move Wi-Fi infrastructure to a separate VLAN to enhance identitymanagement and access	Jul				

	control of devices with vulnerabilities.					
	1.4. Implementation of Intune tomanage BYOD	Dec	Dec	Dec		
	1.5. Implementation of FortiGate/FortiWiFi with built-in3G/4G modem to allow WAN connectivity in staff residences	Oct				
	1.6. Deploy external DNS in Azure	Nov				
	1.7. Implement azure on demand security assessment	Dec	Dec	Dec	Dec	

	1.8. Provide continuous systemsSupport	Dec	Dec	Dec	Dec	De c
	1.9. Optimise the use of Service Desk	Dec	Dec			
	1.10. Printing Solution for Students andstaff	Dec	Dec	Dec		
	1.11. Installation of AV facilities in computer laboratories, lecture halls and boardrooms	Dec	Dec	Dec	Dec	Dec
	1.12. Implémentation of the centralise AV monitoring and Audio VisualDatabase		Dec			
	1.13. Replace obsolete computers in thelaboratories	Dec	Dec	Dec	Dec	Dec
	1.14. Optimise the usage of SCCM todeploy software	Dec	Dec	Dec		
	1.15. Procure the System to monitorcomputer laboratories		Nov			
	1.16. Procure Assert tracking system(Mobile Device Management)	Oct				
	1.17. Students laptops to first enteringstudents	Dec	Dec	Dec	Dec	De c
	1.18. Installation of cameras in comp.laboratories	Dec	Dec	Dec	Dec	De

						C
	1.19. Improve Eduroam Federationaccess	Dec				

The ICT Department cannot afford to focus on technology and internal processes without considering the quality of the ICT services and focusing on the relationship with university community. The ICT service management is crucial in ensuring that the ICT Department deliver quality service to the business users. It is a discipline for managing ICT systems and infrastructure focusing on the customer's perspective of ICT's contribution to the business. It deliberately contrasts to technology-centred approaches to ICT management and business interaction.

Providing resilient, robust and secure ICT infrastructure to meet business requirements

The implementation of digital transformation initiatives will require ICT to define strategies and processes on how to mitigate cyber risk to prevent losses caused by data and/or information systems being unavailable, lack of integrity or confidentiality failure. New technology and initiatives, such as Internet of Things (IoT) and Industry

4.0(innovation based on combination of technologies), are leading the evolution of "net" use, introducing new users and increasing the quantity and types of data. The following initiatives have been identified as that will bring robust, resilient and secure ICT infrastructure:

Objectives	Project/Initiative	2021	2022	2023	2024	2025
2. Providing resilient,robust and secureICT infrastructure to meet business requirements.	2.1. Network cabling in residences, laboratories and offices for students and staff to access networkresources	Dec	Dec	Dec	Dec	Dec
	2.2. Install high speed network connectivity on the LAN and toAzure Infrastructure for both students and staff on premise	Dec	Dec	Dec	Dec	Dec
	2.3. Install fast, reliable and secure campus wide wireless access (Highdensity WIFI6, hospitality AP, controllers and devices)	Dec	Dec	Dec	Dec	Dec
	2.4. Migration of Virtual Machine and data from 3PAR to HPE Synergy	Apr				
	2.5. Deploy external DNS in Azure	Dec				
	2.6. Create disaster recovery site in Azure	Dec	Dec	Dec	Dec	Dec

	2.7. Migrate on-premises Workloads to azure	Dec	Dec	Dec		
	2.8. Create a secondary datacentre on premise for business continuity	Dec				
	2.9. Installation of a cooling system	June				
	2.10. Implementation of latest Technology in Azure.	Dec	Dec	Dec	Dec	Dec
	2.11. Migrate Univen website to the cloud/Azure		Oct			
	2.12. Create Cloud/Azure backup and restore	Dec	Dec	Dec	Dec	Dec
	2.13. Ensuring the ERP is deployed with the latest Build	Dec	Dec	Dec	Dec	Dec

Automation, Integration and Modernization of systems

The ICT technology solution strategy provides a guide to direct the evolution and transformation of ICT technology solutions that enable Univen strategy, deliver value, ROI and promote a "single version of the truth". It is a method and organizing principle that aligns functional business objectives and strategies with ICT technology solutions. The technology space rapidly changes, bringing faster processing speeds, greater storage capacity, bigger volumes of data sets, new architectures for information and applications, and advanced software. Examples of

these developments include big data, cloud computing, mobile technology and business intelligence. All these provide different avenues for doing business and require organizations to carefully harness the opportunities provided by such expanding ICT capabilities to create value for teaching and learning. The following deliverables will be actioned to bring digital transformation:

Objectives	Project/Initiative	2021	2022	2023	2024	2025
3. Automation, Integration and Modernization of systems	3.1. Automation of Procurement Processes (Phase 1 & 2)	Dec	Dec	Dec		
	3.2. Smart Thesis (Coveris ResearchInformation System)	Dec	Dec	Dec	Dec	
	3.3. Online purchase of tenderdocument	Dec	Dec	Dec		
	3.4. CELCAT Timetable Integration andSupport	Dec	Dec	Dec	Dec	Dec
	3.5. System Integration (EDRMS, E- learning, MIS, Sierra, ResidenceAllocation)	Dec	Dec	Dec	Dec	Dec
	3.6. Digitization of University Forms	Dec	Dec	Dec	Dec	Dec
	3.7. Law Clinic Admin System	Dec	Dec	Dec		
	3.8. E-procurement process of tenders	Dec	Dec			
	3.9. Automation of part time staff claimsprocess	Oct				
	3.10. Automation of Overtime andRemission of Fees process	Nov				

	3.11. Financial Aid Query Login System		Dec	Dec	Dec	Dec
	3.12. NSFAS Online SubmissionTracking system		Dec	Dec	Dec	Dec
	3.13. Linking of students to funders	Dec	Dec	Dec		

	3.14. Student Debtors Reconciliation Process	May				
	3.15. Acknowledgement of Debt Process	Dec	Dec	Dec	Dec	
	3.16. Credit Balance Request (policy???)	Dec	Dec	Dec		
	3.17. Exam Timetable for lecturers on My Access	Dec	Dec			
	3.18. Mail merging of external examiners address details for sending out letters with exam script. (Support Service?)	Aug				
	3.19. Internet of Things (IoT): Connect laboratory equipment and other devices to the LAN to support Fourth Industrial Revolution	Dec	Dec	Dec	Dec	Dec
	3.20. ICT Processes automation and Self Service (Booking of computer Labs and password resent)	Dec	Dec	Dec		

Improve and promote ICT Governance, Security and Compliance

There is need for the ICT function to adopt ICT best practices of standardization, simplification and automation, as well as Governance, Risk and Compliance (GRC) in order to reduce overall ICT costs, increase business impact, improve quality of service, manage risk, and provide transparency. In this regard, it is imperative to ensure that appropriate organizational and governance structures are in place. The following are strategic initiatives to address areas of improvement, in terms of ICT Governance implementation, as pointed out in the strategic workshop (but not limited to):

Objectives	Project/Initiative	2021	2022	2023	2024	2025
4. Improve and promote ICT Governance ,	4.1. Develop Cybersecurity Framework	Nov				
	4.2. Review current policies andprocedures	Dec	Dec	Dec	Dec	Dec
	4.3. Develop cloud Security Framework		Sep			

Security and Compliance	4.4. Compliance to ICT Laws, Rules, Standards, procedures, Best practices	Dec	Dec	Dec	Dec	Dec
	4.5. Development of DRP	Jun				
	4.6. Enterprise Architecture	Dec	Dec	Dec		
	4.7. Vulnerability Assessment and Remediation	Sep		Sep		SEp
	4.8. Management and monitoring of Audit findings	Dec	Dec	Dec	Dec	Dec
	4.9. Management and monitoring of ICT risks	Dec	Dec	Dec	Dec	Dec
	4.10. Digital Signature Solution	Sep				

Enhance stakeholder (students & staff) awareness and experience

In prioritising the enhancement of the User's experience, the ICT department will focus on staff and students training, change management, and increasing awareness of cybersecurity, major business application and software functionality.

Objectives	Project/Initiative	2021	2022	2023	2024	2025
	5.1. Cybersecurity and ICT Awareness					

5. Enhance		Dec	Dec	Dec	Dec	Dec
stakeholder (student & staff) awareness and experience	5.2. Staff and students training on different ICT systems	Dec	Dec	Dec	Dec	Dec
	5.3. Develop Univen Huawei ICT Academy and train instructors in different fields	Dec	Dec	Dec	Dec	Dec
	5.4. Digital literacy program	Dec	Dec	Dec	Dec	Dec
	5.5. Solicit partnerships with external stakeholders to train students onICT internship programs	Dec	Dec	Dec	Dec	Dec
	5.6. Development of ICTKnowledgebase		Dec	Dec		
	5.7. Appointment of Student Assistants (Preparation for the market)	Dec	Dec	Dec	Dec	Dec

Conclusion

The ICT Department realises that for any strategy to be effective and add true value to the university, this document needs to be a live document, regularly updated (at least once per annum for now) with the latest information and trends. It further needs to be managed as an interactive document, adjusting it (and the strategic planning) regularly to stay aligned with the latest developments in the business (first of all) and the ICT arena (in the business and external).

These strategies will (once approved) then be cascaded down to all subordinate sections into plans, activities and objectives and measurable critical performance areas to ensure successful execution.

The ICT detailed Master Plan and ICT Resource plan has been included as appendixes. This document takes into consideration the current Univen situation, therefore, filling of critical positions, skills transfer and cross function between the units will be highly recommend.

APPENDIX K – LIST OF PUBLIC UNIVERSITIES IN SOUTH AFRICA

NAME OF UNIVERSITY	WEBSITE
Cape Peninsula University of Technology	https://www.cput.ac.za/
Central University of Technology	https://www.cut.ac.za/
Durban University of Technology	https://www.dut.ac.za/
Mangosuthu University of Technology	https://www.mut.ac.za/
Nelson Mandela University	https://www.mandela.ac.za/
North-West University	https://www.nwu.ac.za/
Rhodes University	https://www.ru.ac.za/
Sefako Makgatho Health Sciences University	https://www.smu.ac.za/
Sol Plaatje University	https://www.spu.ac.za/
Stellenbosch University	https://www.sun.ac.za/
Tshwane University of Technology	https://www.tut.ac.za/
University of Cape Town	https://www.uct.ac.za/
University of Fort Hare	https://www.ufh.ac.za/
University of Johannesburg	https://www.uj.ac.za/
University of KwaZulu-Natal	https://www.ukzn.ac.za/
University of Limpopo	Web : https://www.ul.ac.za/

University of Mpumalanga	https://www.ump.ac.za/
University of Pretoria	https://www.up.ac.za/
University of South Africa	https://www.unisap.ac.za/
University of the Free State	https://www.ufs.ac.za/
University of the Western Cape	https://www.uwc.ac.za/
University of the Witwatersrand	https://www.wits.ac.za/
University of Venda	https://www.univen.ac.za/
Vaal University of Technology	https://www.vut.ac.za/
University of Zululand	https://www.unizulu.ac.za/
Walter Sisulu University	https://www.wsu.ac.za/

Accessed from Universities South Africa

URL: https://www.usaf.ac.za/public-universities-in-south-africa/ Date: 21 March 2021

APPENDIX L – LETTER TO REQUEST EXPERTS TO EVALUATE THE MODEL

Dear _____

EVALUATION OF VIVHO ITG MODEL

This communication serves to request you to evaluate the VIVHO ITG Model. VIVHO is an acronym for **V**ision, **I**ntelligence, **V**alue Adding, **H**olistic view and **O**versight; and ITG is an acronym for IT governance. The Model was developed as part of the PhD studies. The aim of the study was **to conceptualize ITG from a Systems Perspective**. The specific objectives of the study were: (a) To determine the mechanisms of the ITG in HEIs; (b) To identify roles and responsibilities of the identified ITG mechanisms; (c) To establish the determinants of effective integration of ITG in the ICT strategy Development; and (d) To develop an ITG model based on the identified factors and ITG mechanisms.

The Model is to be implemented in HEIs; and it is intended to guide the process of developing and implementation of the ICT Strategy. Therefore, in order to ensure the feasibility and viability of the Model, I kindly request that you evaluate the Model. The model is to be implemented in HEIs.

You may kindly forward **a brief report** in this regard on or before Wednesday, the **15th of September 2021**.

The report should also include the following:

a) Your names

b) Your roles in the IT governance of your organisation/department.

c) Experience in the ICT/IT governance field.

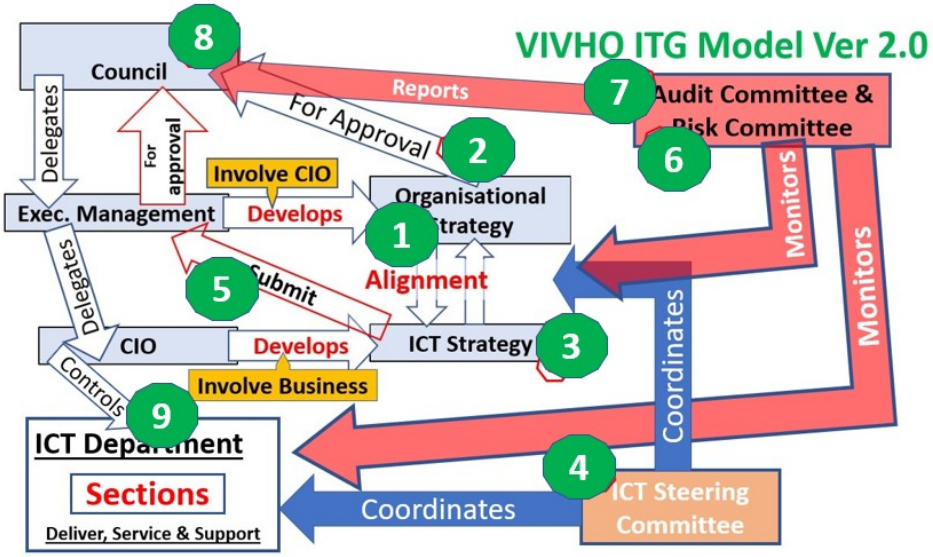
d) IT/IT governance related qualifications

Your contributions in this regard will be highly appreciated.

Kind regards.

Ratshitanga N.T.

Purpose: To guide the development and implementation of an ICT Strategy in a Higher Education Institutions



1. Development of the Organisational strategy (OS)
2. OS approved by Council
3. Development of ICT Strategy – should aligned to the OS
4. Submitted to the ICT Steering Committee – for recommendations
5. Submitted to Exec. Man. Com for the approval to submit to Risk & Audit Com
6. Submit to Risk Com
7. Submit to Audit Com
8. Submit to Council for approval
9. Implementation by Sections within ICT Depart

Designed & presented by: Ratshitanga N.T.

The name was derived from:
Vision, **I**ntelligence, **V**alue Delivery, **H**olistic view & **O**versight

ITG Mechanisms	Main Roles
Council	Strategic Envisioning, i.e. includes approving ICT policies and ICT strategies
Executive Management	Development of organisational Plans
Audit Committee & Risk Committee	Monitoring dev. & implementation of ITG
Chief Information Officer (CIO)	Controls dev. & implementation of ICT Strategy

Determinants of a successful ITG

a) Understanding the complexity of the ITG environment.

b) Local autonomy in relation to decisions taken in different ITG levels.

c) Ensuring that every level is recursively in synergy with the previous ITG level.

ICT Steering Committee	Coordinate's implementation of ICT in HEIs	d) Direct feedback among different ITG mechanisms in HEIs. e) Synergy amongst ITG mechanisms in HEIs. f) Ability of ITG in HEIs to respond to environmental changes or new business requirements.
s in the ICT Department	Implement provisions of the ICT Strategy	

The name of this model is **VIVHO ITG Model**. The name VIVHO was derived from the first letters of the following:

a) **Vision:** Council is responsible for strategic envisioning which amongst others includes setting ICT strategic objectives.

b) **Intelligence:** According to VSM, management is also referred as Intelligence since its main role is to develop plans; and this also concerns adaptability of the organization. The CIO is part of the management. Hence, ICT agility.

c) **Value Delivery:** ICT is implemented in order to deliver value to its intended beneficiaries; and to enable and enhance the performance of the organization. Hence, the reason to ensure its alignment with the organizational activities.

d) **Holistic View:** The application of systems thinking in ITG enables ITG role players to have "holistic view" or "big picture" of the ICT environment. Hence, the need for one to understand the complexity of the overall ICT and ITG environment.

e) **Oversight:** Effective implementation of ICT in HEIs requires the implementation of oversight and monitoring structures. This includes Audit Committee, Risk Committee, Senate and ICT Steering Committee.

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FACULTY OF MANAGEMENT, COMMERCE & LAW

HIGHER DEGREES COMMITTEE

16/09/2021

To NKHUMBULENI TENDANI RATSHITANGA (11564816)
PhD Candidate – Department of Business Information Systems
Faculty of Management, Commerce & Law

Dear Mr. Ratshitanga,

RE: PhD *VIVAL VOCE* (ORAL EXAMINATION) RESULTS
Topic: A Systems Perspective of Information Technology (IT) Governance. A Case of a Higher Education Institution in South Africa

Promoter: PROF NIXON MUGANDA OCHARA
Co-Promoter: PROF. ARMSTRONG KADYAMATIMBA
Department: Business Information Systems

EXTERNAL EXAMINERS:
PROF. TEMBISA NGQONDI
Faculty Of Informatics & Design – Cape Peninsula University of Technology

Dr. SUAMA HAMUNYELA
Faculty of Computing & Informatics – Namibia University of Science & Technology

I refer to your recent PhD *Viva Voce* examination that took place on virtually on MS Teams on the **16th September 2021 from 09:00 – 12:00.** The PhD Viva Voce (Oral Examination) panel were satisfied that

- Were satisfied that the thesis is your work.
- That the thesis makes a make substantial contribution to knowledge and/or provide substantial evidence of original work.
- That you showed satisfactory knowledge and understanding of matters relating to the thesis.
- That you showed a satisfactory knowledge and understanding of background studies to the subject of the Thesis.

From your *viva voce* performance, the oral examination panel recommends that ***the oral defense and examination was acceptable subject to minor corrections and / or amendments being made to the final copies of the thesis to the satisfaction of the supervisors and/or external assessors***. The corrections that need to be taken into account include the following:

- All recommendations from the external examiners' reports.
- Recommendations that were made in the open forum including, but not limited to:
    - How did a systems perspective address the research gaps identified?
    - The need to revise the title to capture what was actually done.
    - Research Methodology comments related to: pilot study – what was removed, and what new variables were added.
    - Generalization of Findings: Given the case study approach adopted, the generalizations as presented may not be appropriate. Address the contribution of the study as a case study.
    - The candidate needs to clarify whether the contribution is a model or a framework.

It is recommended that you address all concerns and recommendations that were made and submit the final thesis to me to confirm these corrections. Confirm these corrections by attaching a rejoinder which should be approved by the promoter. It is possible to make these corrections within a two-week period.

Sincerely,

Prof NM Ochara
Research Professor - FMCL

From: Tembisa Ngqondi
To: Muganda Ochara
Subject: RE: PHD DEFERENCE FOR N.T. RATSHITANGA|16TH SEPTEMBER 2021|09:00 - 12:00
Date: Monday, 06 September 2021 08:34:26
Attachments: image001.png

Dear Prof,

Thank you for extending an invitation for the student N.T. RATSHITANGA defence session. I would have like to be part of the proceedings, but regretfully I will not make it, the proposed date is already booked for another university commitment. You may please go ahead without me, I have closely interrogated the student work and the report I submitted adequately captures my contribution. My report can be used for all the decision you will be taking to judge the student work.

Kind Regards

T Ngqondi

From: Muganda Ochara <muganda.ochara@univen.ac.za>
Sent: Monday, September 06, 2021 3:19 AM
To: Tembisa Ngqondi <NGQONDIT@cput.ac.za>
Subject: [EXTERNAL] PHD DEFERENCE FOR N.T. RATSHITANGA|16TH SEPTEMBER 2021|09:00 - 12:00

Good day Prof. Tembisa,
I hope you and your family are safe and healthy? We wish to thank you for undertaking a thorough and positive review for the above PhD candidate. We really appreciate the effort and time that you put in the task. We are now remaining with the examination process of PhD Defence (Viva Voce), during which time, your presence and feedback will be appreciated. We have scheduled to hold the PhD Defence on the **16th of September, 2021 from 09:00 AM to 12:00 AM**. The PhD candidate is allowed 30 minutes to present his work and findings, after which, the examination panel will then be invited to interrogate the candidate. The external examiner is given the first priority in this process. We are therefore requesting your presence in the PhD Defence for the above candidate. However, we are now operating under difficult circumstance and if you are unable to attend, we understand. If this is the case and you will not be able to make it, kindly respond by indicating that you will not be changing the verdict of your external examination report for Mr. N.T. Ratshitanga to allow us to proceed with the PhD defence on the above date.
Kind regards,

Prof. Nixon Muganda Ochara, PhD
Research Professor
Faculty of Management, Commerce & Law
University of Venda, Private Bag x 5050, Thohoyandou, 0950
Limpopo Province, South Africa
Cell: +27 81 4938478/+27 721704 560 Tel: +27 15 962 8532
E-mail: muganda.ochara@univen.ac.za
Skype: Nixon.Ochara

REJOINDER OF CORRECTIONS ADDRESSED ON THE RESEARCH THESIS FOLLOWING THE PHD DEFENCE -

TITLE: A SYSTEMS PERSPECTIVE OF INFORMATION TECHNOLOGY (IT) GOVERNANCE: A CASE OF A HIGHER EDUCATION INSTITUTION IN SOUTH AFRICA

Prepared by: N.T. Ratshitanga

Student No.: 11564816

Corrections Recommended during the PhD Viva Voce examination	
How did a systems perspective address the research gaps identified?	• Addressed in the last paragraph of **Section 3.7.(c)** – **Page 54 and Section 8.5.4 in page 190.**
The need to revise the title to capture what was actually done.	This was addressed – hence - "A CASE OF A HIGHER EDUCATION INSTITUTION IN SOUTH AFRICA" -Even though is not mentioning name of the University of Venda – but it shows that it is not generalizing.
Research Methodology comments related to: pilot study – what was removed, and what new variables were added. This was addressed in **Section 4.6.4**.	• This was addressed in **page 91 Section 4.6.4** by including the following sentences – "**Hence, the engagement with the Director: ICT Services, enabled the researcher to developed sub-questions for each and every main question. He also provided guidance in terms of ensuring that questions are related to a particular ITG structure.**"
Generalization of Findings: Given the case study approach adopted, the generalizations as presented may not be appropriate. Address the contribution of the study as a case study. First paragraph of **Section 7.5** – **Page 175**	• **Section 7.5 – Critiquing the VIVHO ITG Model – Page 175.** There are differences in opinions as to whether findings from a single case study can be generalized. One school of thought consider it inappropriate to generalize case study findings to an entire population (Jingyao et al., 2021; Tsang, 2014a; Wikfeldt, 2016; Yin, 2012); while another school of thought suggests that findings from case studies can be generalized to an entire population (Copestake , 2021; Walsham, 1995; Wikfeldt, 2016; Yin, 2012). For instance from the latter school of thought, they suggest that findings from a case study can be generalized, particularly to support development of theory for cases in similar contexts as the case study under focus (Walsham, 1995; Wikfeldt, 2016; Yin, 2012). This study aligns to the second school of thought that support generalization of findings in theory development. Thus, The VIVHO ITG Model has been developed from the findings of the ITG case study conducted in a HEI, and the results from its evaluation confirmed that the model can be applied to other HEIs. Wikfeldt (2016) further provided the following analogy, the conclusion that "All swans are white" is not suitable to case research as it can be proven to be not true. However, what can be said: "since this case study shows that this swan is white, other cases of swans are likely to be white as well." Therefore, based on this analogy provided by Wikfeldt and Yin, there could be other HEIs where the VIVHO ITG Model could be found to be relevant and suitable. Hence, the HEIs referred to in this section are those where the VIVHO ITG Model could be found to be relevant and suitable. This is in line with Tsang (2014b) who mentioned that for theoretical generalization, the scope of a developed theory is determined by the populations and settings that the theory can be applied to explain the phenomenon concerned.
The candidate needs to clarify whether the contribution is a model or a framework.	• It is a research model. Hence – the following sections: ○ **Section 1.4.(d) – Research Objectives** and **Section 1.5 (d) - Research Question.** ○ **Section 7.3 – Development of the Model in Page 171**

Ratshitanga NT **Date: 30 September 2021**

Prof. N.M. Ochara **Date: 30 September 2021**

BRIEF REPORT ON HOW EXAMINER'S CONCERNS/RECOMMENDATIONS WERE ADDRESSED

Prepared by: N.T. Ratshitanga

Student No.: 11564816

Examiner: Prof. TG Ngqondi

Examiner's Concern(s)/Recommendations	**Researcher's Action(s) to Address the Area of Concern**
The use of document observation in the then **Section 4.5.2** which is now **Section 4.5.1**. The examiner's concern was that, in the then **Section 4.5.2**, I indicated that I did not use observation is not true since I also peruse documents This implies that I used document observation.	Document observation acknowledges by: • including these sentences in the last paragraph of **Section 4.5.1** - "**However, in this study the researcher also collected data through document observation. As highlighted in Section 4.2. the researcher perused ITG documents which included the ICT Governance Framework, …**" • including the following sentence, "**Document observation – perusing ITG documents**" in **Figure 4.1**, **page 69** under subheading **Qualitative Data Collection**.
Reference to the Interview question protocol The examiner's concern was that I should refer to the questions that addressed a particular research question in the interview question protocol. This was in the then **Section 4.5.3** which is now **Section 4.5.2**.	This was addressed by including the following sentences in the 1st paragraph of **Section 4.5.2** in **page 72** – "**The guiding questions were designed in a manner which addresses the research questions. Questions 3.1 to 3.10 focused on establishing the ITG mechanism and their roles in HEI. Hence the data collected addressed the following research questions: What are the mechanisms of ITG in HEIs? and What are the roles and responsibilities of the identified ITG mechanisms in HEIs? Data gathered data through responses to Questions 2(a) to 2(g), Questions 4(a) to 4(f) and Questions 5(a) to 5(e) addressed the following research question: What are the determinants of effective integration of ITG in the ICT strategy Development?**"
The examiner wanted me to indicate the changes that were made to the interview guide as a result of piloting the tool. This was in the then **Section 4.5.5** which is now **Section 4.5.4**.	This was addressed in **page 75 Section 4.5.4** by including the following sentences – "**Hence, the engagement with the Director: ICT Services, enabled the researcher to developed sub-questions for each and every main question. He also provided guidance in terms of ensuring that questions are related to a particular ITG structures**."
The examiner recommended the removal of **Table 4.3 -** Profiles of the Respondents. The Table was in **Page 78** and continued until **Page 80.** The reason mentioned was that there are similar tables in Chapter 5 and 6.	The table was removed.
The examiner recommended that the VIVHO ITG Model in **Figure 7.3** in **Page 133** should be evaluated against other ITG models or frameworks.	This was addressed in **Section 7.5 - CRITIQUING THE VIVHO ITG MODEL** in **Page 134**. The VIVHO ITG Model was evaluated against COBIT 2019 IT Governance Framework which provide best practices for implementing ITG. Hence, the introduction of **Section 7.5**. starts as follows: "**The VIVHO ITG Model was evaluated against the governance and management objectives in COBIT 2019 IT Governance Framework. COBIT 2019 is one of the ITG best practices developed by ISACA (ISACA, 2018a). It has five governance objectives grouped in Evaluate, Direct and Monitor domain (EDM). See Figure 7.4. Therefore, the implementation of VIVHO ITG Model contributes in attaining EDM01. This requires organisations to ensure the establishment and maintenance of a governance framework. …** "

	The researcher also included **Figure 7. 4: COBIT 2019 Governance and Management Objectives (Source: ISACA, 2018a)** for reference purposes. The last paragraph in **Page 135** also included the following sentences which are also evaluating the Model against COBIT 2019. -"**This also talks to COBIT 2019 that mentions that management plans, builds, runs and monitors ICT activities, in alignment with the direction set by the governance body, to achieve organisational objectives (ISACA, 2018a). In line with the Deliver, Service and Support (DSS) domain in COBIT 2019, the Model also shows that the sections within the Department of ICT Services delivers ICT services in line with ICT strategy**." The VIVHO ITG Model was also evaluated against the provisions of King IV. In the middle of the 3rd paragraph in **Page 135** the following sentences were included, "**This also talks to the provisions of King IV that requires the governing body, in this case, Council to govern ICT in a way that supports and enables the organisational objectives (Ramalho, 2016). …**" In **Page 135**, the VIVHO ITG Model was also evaluated against the provisions of COBIT 5. Hence, the paragraph that starts with "**The Model in Figure 7.3 also talks to the aspects related to goal cascade concept which is recommend by COBIT 5 which is one of the ICT governance frameworks, (COBIT 5 Task Force, 2012). In this case, organisational goals should be cascaded down to ICT strategic goals; and ICT strategic goals should in turn be cascaded down into ICT operational objectives. This talks to the synergy principle. Hence, in this Model, Council delegates the executive management …**"

Examiner: Dr. SLN Hamunyela	
Examiner's Concern(s)/Recommendations	**Researcher's Action(s) to Address the Area of Concern**
System's perspective idea should be alluded to in Chapter 1. State why it is substantial to take a system's perspective approach.	This was address by including a new paragraph (1st) in **Section 1.6** in **Page 7**. The included paragraph starts with "**The point of departure with regard to the justification of the study should be to reflect on the benefits of applying systems perspective in the governance of ICT in HEIs. The developed model will enable its implementers to develop systems thinking skills as this will help them to gain significant interest as an all-inclusive approach of ITG. It will enable ITG role players to look at several ICT concepts and practical tools** …"
Consistency of Font types and sizes in Figures and Tables.	This was addressed. Font types and size of figures and tables as Arial and 9 respectively.
Acronyms of VSM and RCE should be introduced only once.	This was addressed. The Viable Systems Model acronym was introduced once in **Page 2** in the following sentence, "**Huygh & De Haes (2019) revealed that Peppard (2005) was the first one to link ITG with Beer's Viable System Model (VSM) which is a ground cybernetics (Beer, 1979; Beer, 1984; Huygh & De Haes, 2019)**".

	The acronym for Resource Constrained Environment was introduced once in the page 76 in the following sentence - "**The study was conducted in one of the twenty-six (26) universities which was selected because it is one of the historically disadvantaged institutions; and it is also a Resource Constrained Environment (RCE) in the sense that it is characterised by significant scarcity of resources."**
Sections should not start with figures or tables. E.g. Section 2.3.	This was also addressed. Initially **Figure 2. 1: Overview of ITG** was in **Page 15** above the 1st paragraph of **Section 2.3**. Now, the Figure 2.1 has been moved to **Page 16** and it is below the 2nd paragraph of **Section 2.3**. This was the only issue regarding sections should not start with figures or tables.
A justification on why VSM was chosen.	This was addressed by including the following paragraph in **Section 3.7 (c)** – **Page 45** – "**However, the justification with respect to the adoption of VSM in this study is alluded in brief in the overview of viable systems model which is the next section. Most importantly, VSM is a well-established framework compared to other models and it is capable of enabling organizations to survive and thrive in complex operating environments; since it can be used either to design a feasible system or to diagnose weaknesses in an existing system (Hildbrand & Bodhanya, 2015; Lowe et al., 2020). Hence, it was the view of the researcher that the implementation of VSM in ITG will also contribute in ensuring its viability in HEIs. This will in turn contribute in closing the ITG gaps as mentioned in Section 2.6.**"
How systems theory will close the ITG gaps	This was also addressed by including the following paragraph in **Section 3.7 (c)** – **Page 45** – "Hence, it was the view of the researcher that the implementation of VSM in ITG will also contribute in ensuring its viability in HEIs. **This will, in turn, contribute in closing the ITG gaps as mentioned in Section 2.6**."
Avoiding short paragraphs – Section 4.5.1	This was also addressed. **Section 4.5.1** was collapsed. It is now a paragraph under Section 4.5. However, some I left them as they are since collapsing them might also affect the logic of the matter which they intend to convey.
Improving Figure 4.1.	This was addressed. The lines and shaped were adjusted properly. The alignment of lines looks better.
Kumar 2014 oversubscribed in the then **Section 4.5.2** which now **Section 4.5.1**.	This was also resolved. A portion of paragraph 4.5.1 (a)(i) that contains the following - "**The unstructured interview is very (Kumar, 2014). The unstructured interview could also assist in this study; …"** was removed and replaced by the following sentence - "**They are also considered … he/she wants if it is in line with the objectives of the study (Adhabi & Anozie, 2017)**." The removal of the following paragraphs also contributed in resolving the issue.

	Paragraph which was **Page 71** that starts with – "**Barker (1980) and Kumar (2014) provide an overview of the limitations and problems that …**". Paragraph which was **Page 71** that starts with – "**Observation can happen in natural setting, i.e. where the observer is observing without interfering …**".
Generalizability of the findings given the number of participants – who are coming from one institution out of 26 institutions. The title to reflect single institution.	This was resolved by removing "**S**" from the word "**INSTITUTIONS**" in the title. "A Systems Perspective of Information Technology (IT) Governance. A CASE OF A HIGHER EDUCATION **INSTITUTIONS** IN SOUTH AFRICA" The title after "S" was removed. "A Systems Perspective of Information Technology (IT) Governance. A CASE OF A HIGHER EDUCATION **INSTITUTION** IN SOUTH AFRICA"
Addressing the aspect related to resource constraint or scarce IT resources in Chapter 2 or Chapter 3.	This was addressed in the **1st paragraph** of **Section 2.3.2 - Value Creation and Delivery**, **Page 18.** It was addressed by including "…**and this also talks to organisations with scarce IT resources (Dawson et al., 2016)** in the sentence that starts with "**ITG contributes in helping IT and the business to create a partnership …**" This was also addressed in the last line of the **1st paragraph** of **Section 4.8 - Sampling**, **Page 76.** It was addressed by including **"… as resource constraint is also the primary cause of the delay of most projects (Chaudhary & DakshinaMurthy, 2019)." In a sentence that starts with "This is a major challenge for administrators of the institutions (Michael, 1996) …**"
Lack of efforts or not consulting other HEI has led to the use of theoretical and snowball sampling. Revealing poor data collection process.	The recommendations highlighted in this regard are noted with great appreciation. More especially because they will help me to improve with regard to data collection process in future studies. However, there are also benefits that snowball and theoretical sampling brought to the study. • Snowball sampling afforded the researcher to identify and reach ITG role players whom he wouldn't have reached if not because of being referred to them by other participants. • Theoretical sampling afforded the researcher to get the views from the person who have been a director for more than twenty-five years. Currently, the person is a Chief Information Officer in one of the HEIs. Hence, it enabled the researcher to get information from the expert.

Ratshitanga NT **Date: 06 September 2021**

Prof. NM Ochara **Date: 06 September 2021**

Full Name	User Action	Timestamp
Muganda Ochara	Joined	9/17/2021, 8:16:52 AM
Armstrong Kadyamatimba	Joined	9/17/2021, 8:40:04 AM
Wiza Munyeka	Joined	9/17/2021, 8:41:13 AM
Lonias Ndlovu	Joined	9/17/2021, 8:46:33 AM
Gift Dafuleya	Joined	9/17/2021, 8:47:51 AM
Nkhangweleni Khohomela	Joined	9/17/2021, 8:49:23 AM
Barwa Kanyane	Joined	9/17/2021, 8:50:08 AM
Donald Tutani	Joined	9/17/2021, 8:50:20 AM
Maduvhahafani Thanyani	Joined	9/17/2021, 8:50:47 AM
Maduvhahafani Thanyani	Left	9/17/2021, 8:54:36 AM
Maduvhahafani Thanyani	Joined	9/17/2021, 9:19:36 AM
Maduvhahafani Thanyani	Left	9/17/2021, 9:20:45 AM
Ephraim Mahole	Joined	9/17/2021, 8:50:48 AM
Hlanganipai Ngirande	Joined	9/17/2021, 8:51:27 AM
Nghamula Nkuna	Joined	9/17/2021, 8:51:33 AM
Nghamula Nkuna	Left	9/17/2021, 8:51:35 AM
Nghamula Nkuna	Joined	9/17/2021, 9:00:41 AM
Khathutshelo Khashane	Joined	9/17/2021, 8:51:51 AM
Khathutshelo Khashane	Left	9/17/2021, 8:51:53 AM
Khathutshelo Khashane	Joined	9/17/2021, 8:55:11 AM
Uwizeyimana, Dominique	Joined	9/17/2021, 8:51:58 AM
Jabulani Gumbo	Joined	9/17/2021, 8:52:25 AM
Mutshutshu Nekhavhambe	Joined	9/17/2021, 8:52:48 AM
Tabea Mokhele	Joined	9/17/2021, 8:53:21 AM
Tabea Mokhele	Left	9/17/2021, 8:55:28 AM
Tabea Mokhele	Joined	9/17/2021, 9:14:15 AM
Thabo Shiba Maseakwala	Joined	9/17/2021, 8:54:37 AM
Sunday Babalola	Joined	9/17/2021, 8:54:49 AM
Joyce Sethu	Joined	9/17/2021, 8:55:49 AM
Joyce Sethu	Left	9/17/2021, 9:11:01 AM
Emmanuel Oseifuah	Joined	9/17/2021, 8:56:35 AM
Emmanuel Oseifuah	Left	9/17/2021, 9:00:25 AM
Emmanuel Oseifuah	Joined	9/17/2021, 9:00:51 AM
Shonisani SE. Ramashia	Joined	9/17/2021, 8:57:03 AM
Dr. Hamunyela, L. Suama (INT)	Joined	9/17/2021, 8:58:20 AM
Marota Aphane	Joined	9/17/2021, 8:59:07 AM
Francis Mungofa MF. Manzira	Joined	9/17/2021, 8:59:07 AM
Innocent Tshikovhi	Joined	9/17/2021, 8:59:10 AM
Innocent Tshikovhi	Left	9/17/2021, 9:01:25 AM
Osca Matsilele	Joined	9/17/2021, 8:59:12 AM
Ayodeji Obadire (Guest)	Joined	9/17/2021, 8:59:12 AM
Norman Chiliya	Joined	9/17/2021, 8:59:14 AM
Vhutshilo Macheque	Joined	9/17/2021, 8:59:26 AM
Pholosho Masilane	Joined	9/17/2021, 9:00:39 AM
Solomon Madzvamuse	Joined	9/17/2021, 9:01:27 AM
Tshimangadzo Tshivhilinge	Joined	9/17/2021, 9:01:38 AM
Nkhumbuleni Ratshitanga	Joined	9/17/2021, 9:01:41 AM
Nkhumbuleni Ratshitanga	Left	9/17/2021, 9:15:18 AM
Nkhumbuleni Ratshitanga	Joined	9/17/2021, 9:21:17 AM

Nkhumbuleni Ratshitanga Left 9/17/2021, 9:28:52 AM
Sanah Matloga Joined 9/17/2021, 9:01:49 AM
Vutivi Mkhomolo Joined 9/17/2021, 9:01:53 AM
Vutivi Mkhomolo Left 9/17/2021, 9:07:15 AM
Vusani Moyo Joined 9/17/2021, 9:01:53 AM
Jaco Vermaak Joined 9/17/2021, 9:02:25 AM
Eliiot Ramafhidza Joined 9/17/2021, 9:03:43 AM
Eliiot Ramafhidza Left 9/17/2021, 9:04:24 AM
Eliiot Ramafhidza Joined 9/17/2021, 9:05:56 AM
Freddy Munzhelele Joined 9/17/2021, 9:04:14 AM
Magdeline Segooa Joined 9/17/2021, 9:04:18 AM
Nonkululeko Swelankomo Joined 9/17/2021, 9:04:45 AM
Nonkululeko Swelankomo Left 9/17/2021, 9:05:04 AM
Aleina Mutazu (Guest) Joined 9/17/2021, 9:06:11 AM
Harry Munzhedzi Joined 9/17/2021, 9:07:59 AM
Ally Mahlaule Joined 9/17/2021, 9:10:02 AM
Tharien van der Walt Joined 9/17/2021, 9:11:04 AM
Tharien van der Walt Left 9/17/2021, 9:36:43 AM
Mpho Magwalivha Joined 9/17/2021, 9:11:11 AM
Bono Nethathe Joined 9/17/2021, 9:12:39 AM
Bono Nethathe Left 9/17/2021, 9:16:33 AM
Bono Nethathe Joined 9/17/2021, 9:16:45 AM
Bono Nethathe Left 9/17/2021, 9:25:40 AM
john (Guest) Joined 9/17/2021, 9:15:13 AM
Chiedza Simbo Joined 9/17/2021, 9:17:18 AM
Chiedza Simbo Left 9/17/2021, 9:40:07 AM
Chiedza Simbo Joined 9/17/2021, 9:42:23 AM
Hangwani Ratshitanga (Guest) Joined 9/17/2021, 9:17:35 AM
Hangwani Ratshitanga (Guest) Left 9/17/2021, 9:31:21 AM
HANGWANI RATSHITANGA (Guest) Joined 9/17/2021, 9:20:28 AM
HANGWANI RATSHITANGA (Guest) Left 9/17/2021, 9:34:58 AM
Langanani Mbedzi Joined 9/17/2021, 9:21:07 AM
Douglas Mailula Joined 9/17/2021, 9:21:35 AM
Emmanuel Sikitime Joined 9/17/2021, 9:28:13 AM
Emmanuel Sikitime Left 9/17/2021, 9:31:53 AM
Dr Erasmus Mathebula (Guest) Joined 9/17/2021, 9:29:29 AM
Dr Erasmus Mathebula (Guest) Left 9/17/2021, 9:32:32 AM
HANGWANI RATSHITANGA (Guest) Joined 9/17/2021, 9:37:29 AM
TSHILIDZI (Guest) Joined 9/17/2021, 9:42:57 AM
Mkateko Nkuna Joined 9/17/2021, 9:43:03 AM
Brain Khoza Joined 9/17/2021, 9:43:05 AM
Rofhiwa Khashane Joined 9/17/2021, 9:43:13 AM
Tondani Nethengwe Joined 9/17/2021, 9:43:30 AM
Vusani Netshirando Joined 9/17/2021, 9:43:38 AM