INNOVATIVENESS AND MANAGEMENT MODELS IN IMPLEMENTING AND MANAGING DIGITAL LEARNING IN GAUTENG UNIVERSITIES

by

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TABLE OF ABBREVIATIONS

4IR	Fourth Industrial Revolution
AI	Artificial Intelligence
BSC	Balance Score Cards
CIM	Cyclic Innovation Model
CFA	Confirmatory Factor Analysis
EFA	Exploratory Factor Analysis
HRM	Human Resources Management
ICT	Information Communication and Technology
MMF	Management Model Framework
NRC	National Research Council
OBOR	One Belt One Road
ODL	Open Distance Learning
OECD	Organisations for Economic Cooperation Development
OI	Organisational Innovativeness
PMI	Performance Measures Indicators
PPP	Private Public Partnership
R&D	Research and Development
SBL	School of Business Leadership
SME	Small Medium Enterprises
SMU	Sefako Makgatho University
SPSS	Statistics Package Software for Social Sciences
STATSSA	Statistics South Africa
TEL	Technology Enhanced Learning
TQM	Total Quality Management
TRM	Technology Road Mapping
TUT	Tshwane University of Technology
UJ	University of Johannesburg
UNISA	University of South Africa
UP	University of Pretoria
VUT	Vaal University of Technology
WITS	Witwatersrand

DECLARATION

I, **Martin Tsiliso Lerata** with the undersigned signature hereby declare that:

Innovativeness and management models in implementing and managing digital learning in Gauteng Universities thesis I present for the degree of Doctor of Business Leadership at the UNISA School of Business Leadership, is my own work and has not been submitted before by me for the degree, at this or any other educational institution. It is sensible to note that all material sources or quoted that were used in this study from the beginning to the end have been dully acknowledged.

Martin Lerata (05696826)	30 February 2024
	
Full name of candidate, signature and student number	Date

ABSTRACT

Prior research indicates that the use of organisational innovativeness and management models has primarily been observed in firms from developed countries. Research has revealed that this factor contributes to the effectiveness and competitiveness of a business. Preliminary investigations revealed that most organisations in developing nations, such as South Africa, do not adopt these tactics and initiatives. This necessitated the research, which was carried out at six universities in the Gauteng region. The problem that was identified was that these universities do not use organisational innovativeness strategies and management models when they are discharging their core functions, which are teaching and learning, as well as digital learning. The aim of this study is to determine if these universities do have organisational innovativeness strategies and if there are any management models that are being used to ensure that they are efficient and competitive. The researcher aims to ascertain whether these universities have established any indices to gauge their innovativeness. The study would culminate in the development of an innovation framework that these universities could use to measure their level of innovativeness. During preliminary inquiries, it was discovered that the notion of organisational innovativeness is not practiced in these six universities; some use it unintentionally. It is felt that more research should be done to identify whether these notions exist, and if not, they should be added alongside generic management models. It is expected that this will help these universities become more efficient, sustainable, and competitive, as has been demonstrated with organisations in developed countries. The research method that has been used is the quantitative research methodology for collecting and analysing data. Different theories have been used during the process of conducting this research. According to the findings of this study, it was established that, indeed, most of these universities do not have organisational innovative strategies and initiatives that they are using when it comes to digital learning, teaching, and research. Based on the findings, it is recommended that when these universities are developing their strategies, they can use any of the recommended organisational innovativeness initiatives and couple them with recommended generic management models as proposed by Birkinshaw (2017) to improve their efficiency and competitiveness as proposed by previous researchers in developed countries. It is also suggested that they employ the proposed innovation indices to assess their level of innovativeness. Lastly, it's crucial to align the university's

overall strategies, innovation plans, digital learning strategies, and management models.

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KEY WORDS

Organisational innovativeness, management models, digital learning, universities, organisational ambidexterity, innovation

CHAPTER 1 OVERVIEW OF THE STUDY

1.1 Introduction

Many organisations, including universities, have been faced with tough competition since the dawn of democracy in 1994 in South Africa. The reason for this is because they had to compete globally after the lifting of sanctions against South Africa. This has presented them with challenges, including accelerating the path of strategic renewal, creating and engaging in new ways of doing things, and making innovation a shared responsibility, as recommended by Ferreira et al. (2015). They argue that in such a changing environment, only those organisations that demonstrate the capability to innovate will succeed. Hence, it is important to determine if these universities that have been identified have the strategies and frameworks to measure their level of innovation that can assist them to be competitive and move with agility to respond to global needs as recommended by Nandal et al. (2020). Therefore, this study investigated the level of innovativeness of six selected universities in the Gauteng province and whether they had the indices to measure it. It is hoped that this will assist them in being innovative and competitive with those in developed countries and private universities, since they are now competing in the global arena. The universities that form part of the study are: Sefako Makgatho Health Sciences University (SMU), University of Pretoria (UP), University of Johannesburg (UJ), University of Witwatersrand (Wits University), Tshwane University of Technology (TUT), and Vaal University of Technology (TUT). During preliminary investigations, the researcher found that these universities were not using any organisational innovation initiatives. It was also established that some are using organisational innovativeness interventions unknowingly; hence, it is important to conduct this study in order to determine if the above is indeed true and to assist them in developing a framework that they will use to measure their level of innovativeness.

This study also inquired about the existence and use of generic management models, as proposed by Birkinshaw (2012), among these universities. The generic management models referred to are the discovery model, the quest model, the science model, and the planning model. The study further investigated the compatibility of these management models with the organisational innovativeness dimensions proposed by

Wang and Ahmed (2004). The examined models of organisational innovativeness include process innovativeness, product innovativeness, market innovativeness, strategic innovativeness, and behavioural innovativeness.

The level of organisational ambidexterity in these universities was investigated in order to determine if there is a culture of employees being allowed and encouraged to simultaneously exploit existing strategies and operational plans while at the same time exploring new strategies and interventions for doing things as proposed by Olk and West (2020). According to them, this organisational ambidexterity also contributes to organisational innovativeness.

The main aim was to develop an innovation framework or indices that these universities could use to calculate their level of innovativeness. This will be examined in relation to the digital learning interventions these universities must implement to become more competitive, sustainable, and efficient. This is due to the COVID-19 epidemic, which has forced these colleges to implement remote learning policies. This pandemic has changed the world and shown many organisations that there are different ways of doing things in the working environment.

According to Wolf and Floyd (2017), innovation needs strategic planning and extensive business research. Strategic planning ranks among the most widely applied management tools in organisations. As a result, one of the strategic initiatives for universities is to ensure that their strategies are compatible with their organisational innovation models, management models, and digital learning strategies. Therefore, this will form an integral part of the research.

Research conducted prior to this discovered that creation, sustainable improvement, and rebounding can help these universities (Marlen Gabriele Arnold, Alina Vogel & Martin Ulber, 2021). This can help create a formulation for the concept of wild spirits. Schumpeter developed the concept of the entrepreneurial spirit. In his theory called Mark I, Schumpeter argues that a nation's innovation and technological change come from entrepreneurs, or wild spirits. He also held the belief that individuals play a crucial

role in ensuring the success of any organisation and the overall economic growth of a country. In this theory, he suggests that an entrepreneur's primary role is to initiate innovative ventures. This theory is also called innovation theory or dynamic theory. It further explains that entrepreneurs emerge because individuals have certain psychological elements, for example, willpower, self-intuition, and tolerance capacity (Knudson et al., 2004). Therefore, it is crucial to conduct this study to ascertain whether the management and employees of these universities possess the necessary willpower and capacity to transform their institutions, ensuring their competitiveness and efficiency. If management believes that its employees have the capacity to come up with new ideas, it means that they will have to create an environment where employees are encouraged to come up with new ways of doing things instead of following the old order. These universities can also benefit from an accumulated measure of progression as the COVID-19 pandemic in South Africa expands (Drain and Garrett, 2020). This can be done by implementing digital learning interventions that are aligned with their strategies. This will ultimately lead to them being competitive and sustainable. This study will also determine if the current digital learning interventions are embedded in universities' strategies.

This study explained the ground directing focus on the problem statement and the explanation for the study and its body of cognition. A brief literature assessment is furnished, jointly with the inquiry and methodology to be employed. The ethical motivation and boundaries are also examined. A list of citations is provided at the end.

1.2 Background of the research study

Franco and Haase (2017) argue that in many economies, there has been a high demand for high salary increases from labour organisations. This has led to the majority of these organisations passing on the salary increases to their customers. Therefore, many organisations in developed countries have embraced organisational innovation, requiring their employees to perform more tasks with fewer resources to meet their salary demands. This approach has led to a rise in productivity, enabling these organisations to pay their employees higher salaries without raising the prices of their products for customers. With this approach, they managed to stay competitive as a

result of implementing innovation interventions and introducing technological innovation. This has proven that innovation and the use of management models allow organisations to do more with fewer resources. Universities in South Africa are also faced with similar problems. By implementing innovation interventions, universities in South Africa can enhance their efficiency with limited human resources and maintain reasonable salaries without raising the cost of education for students. This has compelled them to innovate and implement digitization, thereby introducing new methods of operation. Innovation can, therefore, be considered a cardinal cause of any university's prosperity and competitiveness, as proven by those organisations in Western countries.

According to a preliminary investigation conducted by the researcher on senior managers, lecturers, and students in some universities and the public press in Gauteng, many of the students owning computers prefer to receive their material online and prefer online teaching and learning as opposed to face-to-face traditional methods, especially after the COVID-19 pandemic. This is a demonstration that digital learning interventions are a new way of doing things as opposed to face-to-face lecturing, as it was done previously in these universities. It follows then that universities must have digital learning strategies and infrastructure to accommodate this, and this is also part of technological innovation and embracing Artificial Intelligence (AI), especially when it comes to teaching and learning. According to Al Sayed and Yang (2017), the One Belt, One Road Initiative (OBOR) impacts countries' technological innovation. Developing OBOR economies can provide solutions to overcapacity problems and create more market opportunities for education and other industries. However, this alone does not suffice to stimulate technological innovation potential. In contrast, forecasted entry into developed OBOR markets on a competitive basis will provide incentives to the SA government to further consolidate its 'entrepreneurial state' role as envisaged by the President. This means that the government must play a critical role in making sure that this technological innovation is embraced, since it has been proven that in developed countries, governments have contributed to this kind of innovation. This is also emphasised by Mazzucato and Semieniuk (2017), who argue that it is the role of every government to play a part in ensuring that institutes of higher learning are innovative. This can be achieved by providing funding and developing innovation strategies for these

universities. Therefore, in order for them to be innovative, the government should ensure that it assists them by providing the necessary infrastructure as well as developing relevant strategies. Management models will be discussed below since they form part of this research, which is based on organisational innovation, management models, and digital learning.

A management model is the selection of successful choices by a firm's governance, detailing how they define objectives, actuate endeavours, organise activities, and apportion resources. There are four generic management models: the discovery model, the science model, the quest model, and the planning model. Experts have described the global implementation of innovation usage and management models as a driving force for credible action plans and competitiveness. Therefore, even these universities should have the ability to select the most appropriate management models for their needs, enabling them to implement credible operational plans that enhance efficiency and competitiveness. Buyukbalci & Boukari (2017) detail innovation as a strategy that can enhance an organisation's competitiveness and sustainability. The aforementioned findings have demonstrated that the implementation and utilisation of specific management models and innovation initiatives will result in organisational efficiency and competitiveness in universities and other organisations. However, preliminary investigations revealed that some of these universities have not been proactive in identifying specific management models and innovation initiatives that would enable them to be innovative. Additionally, they lack innovation indices to gauge their level of innovation, underscoring the importance of conducting this study.

The work environment influences creativity in several ways. Within organisations, creativity is affected by the highest levels of leadership, through the strategies they set, the structures and policies they establish, and the values they communicate. Creativity is affected by all levels of management through managers' everyday practices in dealing with individuals, teams, and their projects. As a result, individual creativity is affected by co-workers' everyday attitudes and behaviours, through dyadic interactions and team dynamics, and this will lead to organisational efficiency and increased productivity and competitiveness (Amabile and Pratt, 2016). Based on this understanding, it is important to determine if there is a culture of creativity in these universities and if it is supported

by management, because this can lead to increased productivity. The next construct that forms part of this research is digital learning, and it is discussed in the next paragraph.

According to Mpungose (2020), although digital learning has come of age in South African higher education, scepticism, caution, and an inadequate reward system for innovative teaching systems have resulted in its slow uptake by academics. Some universities do not realize this idea due to environmental influence, and as a result, they have not been using it in full.

For an organisation, particularly a university, to be successful and competitive, it is essential to ensure that it aligns its digital learning activities and management models with the latest practices. It is also important to ensure that all staff are competent and capable of adapting to the current innovative ideas and to secure the idea that they are equipped to adjust to the 4th Industrial Revolution (4IR). The digital revolution will form part of this paradigm shift, compelling the management of these universities to ensure that they are ready for new innovation initiatives (Xing and Marwala, 2017).

Schwab and Davis (2018) define this concept of 4IR as a new chapter in human development, on par with the first, second, and third Industrial Revolutions. Similarly, it is also driven by the increasing availability and interaction of a set of extraordinary technologies. The 4IR is characterised by a combination of several disruptive technologies that are obscuring the lines between the physical, cybernetic, and biological worlds. The range and quality of this digital revolution and innovation should bring brand-new experiences to universities. In an already uncertain global economy, digital technology is expected to have turbulent impacts on economies, especially on universities that find it hard to keep abreast of the rapid speed of advancement and innovation (Report Department of Trade and Industry, 2018). Therefore, it is important for these universities to embrace the principles of 4IR, and this can be done by making sure that technological innovation and digital learning are part of their strategies.

1.3. Key theories and definitions

The following are the distinctive definitions of substantial terminology associated with this study, which are featured in this section:

Table 1: Terms and concepts definition

Organisational innovativeness	*An organisation 's overall innovative capability of introducing new products and services to the market, or opening up new markets, through combining strategic orientation with innovative behaviours and process" (Wang & Ahmed, 2004)*
Management models	*This refers to the choices made by executives of an organisation s regarding how they define objectives, motivate effort, coordinate activities, and allocate resources; that is to say, the description of how work of management gets done. In this case then, a management model reflects the choices made by managers regarding decisions, systems, procedures, people and organisational structure. Business model which is a conceptual term mainly describing the "what" and "why" of the business operations, a management model helps us to define the "how" part (Birkinshaw, 2012).*
Digital learning	*Digital learning is an innovative way to enhance learning and education. It includes all methods of electronically supported learning and is the use of knowledge that is expedited mostly by electronic means. It is a new innovation that is assisting students and provides greater opportunities for students. It is further defined as occurring when students use electronic technology to simplify the process of learning, which is done by making courses that already exist online (Behera & Purulia, 2013)*

Strategic innovation	*Is an organisation's ability to manage ambitious organisational objectives in order to stretch or leverage resources creatively (Wang & Ahmed,2004)*
Organisational ambidexterity	*Refers to an organisation's ability to manage efficiently the current business demands and at the same time to be (Katou, 2021)*
Socio Technical Theory	*This concept refers to a combination of different types of practices and resources resulting from both the technical system, composed of technology, the physical space and the organisation's efficiency as well as the social system. It also includes people, their physical and psychological characteristics (Sony & Naik, 2020).*
Resource advantage theory	*This is a recognition of the creation of a competitive edge as a function of marketing and identifies the role of branding in creating the capability of an organisation to demonstrate its superior abilities* (Gupta et al., 2016).
Unternehmergeist	*This concept was developed by Schumpeter and when translated to English, it means entrepreneurial spirit. In his theory called Mark I, Schumpeter argues that the innovation and technological change of a nation comes from the entrepreneurs, or wild spirits*
Innovation Index	*Organizational index is a tool that is developed in an organization to measure the level of innovativeness. This is meant to measure the impact of innovation initiatives, identify strengths and weaknesses of innovation and benchmark with other organizations to ensure competitiveness (Birkinshaw, 2020)*

1.4 Problem Statement

University management seeks information about the effectiveness of their institutions and has demonstrated interest in the impact of innovation to maintain their

competitiveness against other universities. The issue is that the management lacks innovation indices to gauge the impact of innovativeness within their universities, and they are also unaware of various innovation interventions and management models that can enhance productivity and efficiency (Timothy et al., 2016).

The contribution of public sector innovation to resolving dynamic challenges in economic, social, and public demand is undeniable. However, in comparison to private sector innovation, there is limited empirical evidence available to help understand public sector innovation performance (Ramli et al., 2016). Based on this, it is critical to continue the research on these universities, which are also categorised as public sector, to see whether they have systems and processes in place to assess their level of innovativeness.

Innovation applications at universities are currently faced with challenges resulting in system inefficiencies, irregularities, and poor organisational effectiveness. These challenges not only derail program delivery and compliance with regulations, but they also increase expenditure. They may also contribute to slowing down the growth of these universities. Given that these universities rely on qualified individuals to implement existing and future innovation initiatives, it becomes crucial to comprehend the effectiveness of these applications. The researcher conducted a study to thoroughly investigate the impact of different management models on innovation application in order to address the infrastructure and service delivery challenges faced by most organisations (Broström et al., 2021).

The researcher has also consulted the proceedings of the European Conference (2017) on innovation and entrepreneurship and has noticed that most of the studies were in the first world (private sector) and little attention had been paid to developing countries such as South Africa. This has intrigued the researcher. During discussions between the researcher and the universities, it was noticed that a need exists for a framework or model that would give guidance to these institutions.

1.5 The aim of the study

The primary goal of this study was to determine the level of innovativeness in these universities and whether they use innovation indices to measure organisational innovation. The study also aimed to identify the obstacles to innovation in these institutions and explore the impact of innovation and management models on digital learning. Also, the study sought to determine the way in which innovation could stimulate universities' strategic planning. This is due to the observation that most universities are having a problem aligning their innovation initiatives with their strategies, especially during this time of the COVID-19 pandemic.

Innovation plays an important role in achieving interoperability across universities. This is possible because innovation is a cognitive attribute that aims to capture domain knowledge. This, in turn, assigns the university the responsibility of explicitly fostering innovation in a generic manner. This eventually provides the basis for agreement within certain management models. Because of this, innovation has become a research topic in many organisations, including the universities identified for this study. The researcher`s interest in this phenomenon has been aroused by similar observations. As a result, the primary focus was on determining whether universities have innovation strategies and whether those strategies are compatible with their management models. The researcher also intended to establish how innovation could contribute to efficient digital learning operations and applications. Finally, the study intended to develop innovation indices that could be used to measure innovativeness.

1. 6 The objectives of the study

This study has the following objectives:

- To determine if these universities have innovation interventions that they are using in order to be innovative.
- To create indices that these universities could use to calculate innovativeness and measure their level of innovativeness.
- To determine the degree of compatibility between management models, innovation indices, and digital learning.

1.7 Research question

This study aims to address the following research questions:

1.7.1 Main Question

a) Do the universities that are part of the study have innovation indices that they use to measure their level of innovativeness?

1.7.2 Sub Questions

a) Which organisational innovativeness (OI) initiatives and management models are being used in the six universities in the Gauteng province of South Africa?
b) Which organisational innovation dimensions and management models will be suitable for specific universities?
c) Which variables are required for calculating levels of innovativeness in order to create a university innovation framework?
d) What is the compatibility between management models, organisational innovativeness, and digital learning that is suitable for these universities?

1.8 Unique contribution of the study

This study played a crucial role in confirming the absence of innovation indices in the universities identified for research. Against the backdrop of the latest developments and paradigm shifts in university discourses, sustainability, and self-preservation, this status quo is a handicap, particularly with regards to the competitive nature of universities in a neoliberal era. Subsequent to that discovery, the universities then benefited directly, as they all had one developed for them. This innovation index was developed using generic management models as recommended by Birkinshaw (2012). It was hybrid in that it also drew on Wang and Ahmed's (2004) recommendations. Additionally, the methodology and the framework were developed using some of the findings from Nandal et al. (2020). It is suggested that organisations use an innovation dashboard with a matrix not exceeding twelve constructs.

The study is made even more valuable and unique by the fact that there has never been extensive organisational innovativeness research that has been conducted in almost all public universities in developing countries. Most of the research has been conducted by

private companies and universities in developed countries. It is therefore envisaged that the outcomes and findings of the study will leverage the competitive urge of the beneficiary universities. This study will also contribute by recommending the use of specific generic management models, which is currently not the case.

1.8.1. Theoretical and practical contribution

Theoretical contribution of this study is that the different concepts have been brought together to form part of the innovation index. These concepts are for example principles of collective wisdom and organisational ambidexterity and how they can contribute to organisational innovativeness in these university, which something that has never been extensively researched previously. This is over and above the framework and also on how to calculate the level of innovativeness in South African universities.

1.8.2. Theoretical and practical implications

The practical implications of these proposed components that forms part of innovation index will have the following implications on these universities:

- Diversity of thought: A diverse group will bring different perspectives, knowledge, and skills, leading to more comprehensive problem-solving within these universities.
- Aggregation of information: The collective pooling of information increases the likelihood of identifying accurate and relevant data.
- Error correction: Group dynamics can help identify and correct individual biases or errors.
- Emergence: New ideas and solutions can arise spontaneously from group interaction.
- Culture change: Inculcate the culture where employees are exploiting the current task the way they have been doing and at the same time being encouraged to explore new ways of doing things.

1.9 Research methodology

Research methodology is a strategy one employs to systematically solve an identified problem. It may be understood as the science of studying how research is done. In the process of conducting the research methodology, the researcher followed various steps that are generally adopted by scholars in this field. In this study, the research

methodology that was used was the quantitative methodology. This is in the form of developing a questionnaire that has questions and statements that aim to address the problem statement, which in this case is to first find out if there are indeed any specific innovation interventions and specific management models that these universities are using when delivering their strategic goals. Secondly, to determine if they have any innovation indices that they are using to measure their level of innovation. These statements that formed part of the questionnaire were validated and tested for reliability, and others were taken from the research that has been conducted by Wang and Ahmed (2004) and Birkinshaw (2012). It is necessary for the researcher to know not only the research methods and techniques but also the methodology as proposed by Kothari (2021).

1.9.1 Research design

Research design refers to an investigation's overarching approach. It is divided into quantitative and qualitative approaches. Between these two came a hybrid approach called mixed methods. The aforementioned represent the fundamental conceptualizations of a research problem. In summary, quantitative research yields numerical data that can be transformed into numerical values. Qualitative research, on the other hand, brings forth non-numerical data. It directs attention to how to gather spoken data rather than measurement. Gathered content is analysed in an informative, subjective, impressionist, or even identification style (Mahajan, 2020).

Mahajan (2020) further argued that quantitative research is a formal, objective, rigorous, deductive approach, and systematic strategies for generating and refining knowledge for problem solving. Quantitative research explains phenomena by collecting numerical, unchanging, detailed data that is analysed using mathematically based methods, in particular statistics, that pose questions of who, what, when, where, how much, how many, and how. It deals in numbers, logic, and an objective stance. It is original research in which the researcher decides what to study, asks specific and narrow questions, collects quantifiable data from participants, analyses these numbers using statistics, and conducts the inquiry in an unbiased, objective manner. Based on the aforementioned arguments, this study used quantitative methodology. This study was conducted using SPSS for data analysis, which was in the form of questionnaires as per quantitative methodology. This was due to the size of the population and sample, which consisted

of six universities in Gauteng province with more than fifty thousand (50 000) full-time and part-time employees. This approach was the one that was suitable and that has been used to complete the research on time. This also assisted in making sure that the data was valid, reliable, objective, and reproducible. Another reason for conducting quantitative research was to enable the researcher to make generalisations, obtain objective measurements, and utilise data to make decisions involving a large number of participants. Therefore, quantitative research design was the perfect approach for this study.

1.9.2. Philosophical stance

A philosophical perspective involves observing and experiencing the world. This is influenced by people's values, beliefs, and preferences. It is a metaphorical position in which people's social and personal attributes are combined. It contributes to a researcher's ability to think critically. The word philosophy is composed of two words: 'philio', which means love, and 'sophia', which means 'knowledge', 'wisdom', or 'truth'. The second word, 'sophia', signifies 'knowledge', 'wisdom', or 'truth'. Therefore, philosophy is a rational inquiry aimed at knowledge acquisition in order to understand reality (Payne, 2015).

Reality may include human behaviour in organisations, institutional policies, systems, and practices, politics, economics, and so forth. The philosopher's job is to give a comprehensive and rational account of the nature of reality in order to reveal the truth about it. To philosophise is to apply scientific procedures to reality and investigate it for the purposes of generating more knowledge and understanding about it (Turyahikayo, 2021). The researcher's philosophical stance entails conducting research and critically analysing the findings. The researcher also seeks to understand reality through participant responses, given that reality encompasses the behaviour of organisations and, in this instance, universities. This study also examined the existence of policies and strategies related to organisational innovation and management models, as described by Turyahikayo (2021). This was done in line with quantitative research methodologies.

1.9.3. Research method – Quantitative

To collect the data, the researcher used a combination of lecturers, senior lecturers, and managers' responses to a questionnaire. This questionnaire was distributed to participants in these six universities using Microsoft 365.This research used quantitative research methodology to collect data, and a questionnaire was used to collect empirical data. The questionnaire used a five-point Likert scale, ranging from 1=strongly disagree, 2=disagree, 3=neither 4= agree; 5=strongly agree.

1.9.4. Research strategy

Extrinsic, aggregate, and view were selected to enable answering the research questions. Evident phenomena and biased significance can provide sufficient knowledge, depending on the specific research questions. The research direction is practical and applicable, incorporating various perspectives to effectively interpret the data. The research project was channelled into two phases.

In the basic phase, data was gathered from questionnaires that were sent to senior managers, managers, and lecturers at Gauteng universities and analysed. The results, once saturated, were interpreted using theories of innovation and governance models in order to detail affiliated issues. In the second phase, a comprehensive literature review was conducted in order to provide an extended theoretic basis that helped alter the second data analysis.

The data was analysed using a quantitative content analysis that used coded themes revealed in the interrogation transcripts and also drew on the theoretical constructs that appeared in the data. The classes that evolved to help define states over repetitive readings were grouped into themes at the end of the analysis. The themes were then reviewed, and key findings were developed, including findings regarding influences and new trends and a theoretical framework conceptualising key factors in innovation adoption.

1.9.5. Research Time Horizon

The 'snapshot' time horizon is what researchers call cross-sectional, while the 'diary' perspective is what they call longitudinal (Hermanowicz, 2016). In this study, the

researchers examined the change in innovation and application of management models in universities over a year. Hence, this study is classified as a longitudinal case study.

1.10 Population of the research study

The population is the complete set of instances from which a sample is taken. In sampling, the term ‘population’ is used in its normal sense. For research to detect comparative levels of innovation at universities in Gauteng, the population from which the researcher would select his sample would be all public universities in Gauteng province.

1.11 Sample size and sampling strategy of the study

Sampling provides a valid alternative to a census when it is impracticable for the student to survey the entire population and because his budget constraints prevent him from surveying the entire population.

1.12 Designing of interview questions

A total of 67 questions was developed based on answering the research question and addressing the objective of the research. In addition to this, 'one subdivision of a questionnaire asked a public set of actual questions.' The questionnaires covered demographics, innovation and innovativeness, digital learning, and management models, as well as key incentives and inhibitors in the use of innovation as suggested by literature. It is also envisaged that categories for analysis will arise as a result of the questionnaire's design. Therefore, the researcher will be able to commence data collection with an initial set of categories derived from the questions covered.

1.13 Ethical consideration and procedures

The rules and regulations available at the UNISA SBL were used, and the questions to be asked as part of a questionnaire were approved by the ethics committee of UNISA and all these universities. The statistics expert assisted in fine-tuning the questions to ensure that they were valid, reliable, and in compliance with statistical principles, as well as to ensure a dependable framework and recommendations. An application for ethical

clearance was submitted to the UNISA Ethics Committee in line with the guidelines and was approved as such. This was after presenting the required proposal and the proposed questionnaire that was to be circulated to participants at these universities. The UNISA Ethic Committee approved the application. After the approval, all six universities also submitted the researcher's questionnaire to their Research Ethics Committees, which was a pre-requisite before they could distribute the questionnaire. It took nearly eight months for all six universities to approve the questionnaire. Following this, they issued approval letters and assisted in the distribution of the questionnaire, which resulted in the participation of 306 participants from all the targeted universities.

1.14 Limitations

The study's limitations are that only 306 employees from these six universities took part. This is because there are more than 5,000 employees in these positions across all six universities. The other limitation is that this study was confined to the universities in Gauteng province and excluded the other 20 universities that exist in South Africa. Lastly, UNISA was also not included in this study because it is a distance learning university and the execution and strategies might be different from those of other universities. If it were to be included, it would be a huge task for this study.

1.15 Summary

This chapter focused on establishing the groundwork for the research, including an introduction and the study's background. The background of the study focused on the understanding that, for any organisation to be effective, it must adopt innovative approaches to problem-solving and benchmark itself against other advanced universities globally. The problem identified in this study is that most South African universities are not implementing innovative interventions and management models, despite some of these universities being aware of their implementation. According to previous research, compatibility between innovativeness and management is still an issue in most organisations, and in order to improve organisational innovativeness, it must be determined which management models are compatible with which innovative interventions (Birkinshaw, 2017).

The problem statement dealt with the identification of the problem to be investigated. In order to carry out research effectively, it is essential for the researcher to possess a well-defined and unambiguous research topic, which has been addressed in the present chapter. This study employed a quantitative research methodology. This was done by developing a questionnaire, which was distributed to the identified participants. The kind of sampling that was used is random sampling in order to ensure that all participants get an equal chance of being chosen. These were all lecturers, senior academics, and support staff managers at six universities in Gauteng province. An analysis of the data was done using SPSS.

The aim of this study has been dealt with, and this study will contribute to the body of knowledge in that it has come up with strategies that will ensure that there is synergy between innovative strategies, management models, and digital learning. The study also developed innovation indices that these universities can use to measure their level of innovativeness and recommend which management models should be deployed in order to ensure that there is organisational and employee efficiency. This will also foster a culture that embraces the principles of the 4th Industrial Revolution, particularly in light of the COVID-19 pandemic, which has prompted many universities to implement remote learning interventions. As part of the research process, the issue of ethics was taken into consideration. Limitations were also identified during the data collection process. Chapter 2 deals with the literature review interventions that were considered when conducting this study. It is about reviewing existing research and building knowledge in the fields of organisational innovativeness and organisational ambidexterity, particularly in South African universities. Chapter 3 is about the research methodology and the roadmap of this study. It outlines the specific steps and techniques that the researcher used to gather, analyse, and interpret data to answer the research question. It provides a structured approach to this research and justifies why quantitative research methodology was used as opposed to qualitative or mixed research methodology. This chapter also addresses how ethical considerations were taken into consideration during data collection, such as informed consent, and how participants who took part will be anonymous.

Chapter 4 is about the presentation and interpretation of findings, which are combined as one and serve to clearly communicate the results of the research. It presents findings in a clear and concise manner, utilising tables and figures to communicate patterns and trends. The findings are interpreted and explained, explaining their significance and how they answer the research questions. This allowed the reader to understand the issues that have been researched and their contribution to the broader knowledge of the field of this study.

Chapter 5 is about Findings Analysis and Recommendations (FAR), which presents the study's findings and recommendations. This is the section where the researcher objectively reports the entire study's results, provides data and evidence from research methods to support the findings, analyses the findings to determine if they are align with the research premise, identifies patterns, and compares them with previous research. Based on the analysis, this chapter concludes with a discussion of the study question and issue. The recommendations are an important part of this chapter, which explores the study's implications and how they might be used to improve practices, policies, and processes in South African universities.

CHAPTER 2 REVIEW OF RELATED LITERATURE

2.1. Introduction

The first chapter served as an introduction to the study. Its objective was to outline how the research would be done. The study's background provided a clear explanation for the motivation behind doing the investigation. The chapter also outlined the study's quantitative approach, which was used for data collection. The impact of this research on the academic community was examined, and it discussed how to collect data using a questionnaire. The research objectives were a key component of Chapter 1, indicating the purpose of this investigation.

This chapter is about a review of related literature. It is based on research terms, themes, and issues raised in the problem statement. This will ensure that the literature that is reviewed relates to the problems that this study is trying to solve. The main purpose of this chapter is to set the study within its wider context and show how it supplements the work that has already been done on this topic. It directly influences research questions. The origin of the concept of organisational innovation and management models, especially the implementation and management of digital learning, and its evolution over time will be critically reviewed.

This chapter discusses the challenges universities face in terms of innovation. Identification of compatible management models that will promote innovativeness is also discussed in this chapter. The chapter delves deeper into the challenges that hinder innovation. The innovation framework and indices were discussed comprehensively. The chapter also includes the proposed solutions to these challenges. The issues of competitiveness, strategic management, and customer attraction were also incorporated into the chapter.

Organisational learning and culture have been cited by previous scholars as one of the contributions universities can make to be innovative, and this is discussed below. The concept of technological innovation plays a significant role in enhancing the innovativeness of these universities. This chapter includes the theoretical framework,

detailing the various theories that guide it. A critical review of the literature is part of this chapter, and a conclusion on the above issues will be provided.

2.2. The concept of e-learning in universities

More recently, Msomi et al. (2016) argued that in order to have an understanding of what e-learning is, one must understand what learning is, as the process starts with learning. They described learning as a process whereby individuals obtain new skills so that they can increase their knowledge and, in the process, improve their performance and productivity. They further argue that the main objective of learning is to improve an employee's performance so that the organisation can meet its strategic goals, be it to maximise profit in the private sector or to improve service delivery in the public sector.

Learning is the process of acquiring new understanding, knowledge, behaviours, skills, values, attitudes, and preferences. It's fundamental to most living things, and it allows us to adapt to our environment and grow throughout our lives. Learning is not a one-time event; it's an ongoing process that happens over time. People learn from experiences, interactions, and deliberate efforts to acquire knowledge. The acquisition of knowledge and skills can involve factual knowledge (like historical dates), procedural knowledge (like riding a bike), or conceptual knowledge, Vega Chica, Luis Ángel Valle Lituma (2023)

Kok (2013) defines e-learning as an innovative way to enhance learning and education. He is also supported by Behera and Purulia (2013) when they state that e-learning includes all methods of electronically supported learning and is the use of knowledge that is expedited mostly by electronic means. E-learning is a new innovation that assists students and provides them with more opportunities. Stoltenkamp (2012) also defines e-learning as occurring when students use electronic technology to simplify the process of learning, which is done by making courses that are already available online. All the above authors agree on two things: that e-learning is innovative and that it is done electronically.

Kattoua et al. (2016) came up with a broader definition of e-learning after the 3rd Industrial Revolution, stating that it is web-based learning as of late. It is the delivery of

education in a flexible and easy way through the use of the internet to support individual learning or organisational performance goals.

Several industrial revolutions occurred at different times in history. These industrial revolutions have resulted in accelerated economic growth and an improved quality of life for people around the world. We are currently at the dawn of 4IR, or Industry 4.0. Industry 4.0 is relatively different from the three revolutions, mainly because of the disruptive nature of the technologies driving it and the potential scale of its impact across many industries. It is characterised by digitization, collaboration, automation, adaptation, and human-machine interaction. In response to this phenomenon, countries across the world, especially emerging industrial economies such as South Africa, intend to capitalise on the 4IR to leapfrog development (Bayode et al., 2019). Universities in South Africa should also embrace the principles of this 4IR in order to ensure that they implement digital learning in its entirety. This will also aid in addressing the pressing issues of massification, infrastructural challenges, and the ongoing COVID-19 pandemic in South Africa, thereby establishing remote learning as the new norm. The manufacturing industry won't be the only sector to experience the effects of 4IR; every other sector is likely to feel its impact. This means that even higher learning institutions in the education sector will have to adapt.

Schwab and Karlen (2019) also support the above argument by emphasising that a holistic and integrated response is required from all stakeholders, including universities, to realise the use of digital learning. Developing countries like South Africa need to develop and implement the 4IR strategies sooner rather than later. History has shown the importance of being an early adopter of new innovations while at the same time avoiding “bleeding-edge” innovations. In order to benefit from this new industrial revolution, governments and regulatory institutions must quickly adapt and respond by providing an enabling environment and policies that will foster sustainable socio-economic development. Based on these arguments, it is imperative that innovation and e-learning strategies be developed and taken care of to ensure that they are integrated into the university's strategies. Hence, one of the reasons for conducting this study.

Kashora et al. (2016) define e-learning as a form of education via the internet, networks, or standalone computers. It includes the network transfer of skills and knowledge (typically over a distance) and refers to the use of electronic applications and processes to learn. E-learning processes may include the following:

● Web-based learning

● Computer-based learning

● Virtual classrooms

● Digital collaboration among many others.

E-learning content is delivered mostly via the internet, intranet, extranet audio or videotape, satellite TV, or CD-ROM. This approach to learning is, therefore, centred on information and communication technologies (ICT). While the origins of e-learning are unknown, online learning is known to have started in the 1980s, as reported by Moore et al. (2010). It probably had its origins in the 1980s. They further maintain that authors and researchers do not provide clear definitions of the terms ‘online learning’, 'eLearning', and ‘web-based learning', and as a result, these terms sometimes tend to be used interchangeably.

Learning is a relatively lasting change in behaviour that is the result of experience. It is the acquisition of information, knowledge, and skills. When you think of learning, it's easy to focus on formal education that takes place during childhood and early adulthood. But learning is an ongoing process that takes place throughout life and isn't confined to the classroom Kendra (2020).

According to the DPSA Report (2015, p. 4), as well as Kuznia and Ellis (2014), e-learning is a form of training that is conducted using information and communication technologies (ICTs) as a tool for learning online. This innovation has enabled access to new educational opportunities that were not available before because it breeds a new way of thinking and improves collaboration and interaction between members of a learning

community (Pamfilie et al., 2014). When looking at the above definitions of e-learning, they all have the following common denominators, as indicated in the table below:

Table 2: Different Authors and their contribution to the definition of digital learning

AUTHOR	ELECTRONIC	INNOVATION	EDUCATION	ICT	KNOWLEDGE	LEARNING
Kok (2013)	X	X	X	X		X
Bahera (2020)	X	X	X		X	X
DPSA (2015)	X		X	X		X
Kattoua et al (2016)	X		X			X
Msomi et al (2016)	X	X	X		X	X
Kashora et al. (2016)	X	X	X	X	X	X

Source (Pamfilie et al., 2014).

As per the above table, it can be concluded that all these scholars agree that e-learning is all about electronic learning, education, and learning. Determining the innovativeness and management models for implementing digital learning in these universities is crucial, as it forms part of the research.

2.3. The concept of organisational innovation in organisations

Despite its prevalence in business and management school curricula, corporate boardrooms strategizing responses to changing industrial and economic conditions, media outlets detailing the latest technological developments, and contemporary popular discourse, innovation remains a nebulous term that defies simple explanation (Tierney and Lanford, 2016).

Within academia, an authoritative explanation of innovation has proven elusive, as individual disciplines conceptualise innovation in markedly dissimilar ways. Sociologists, for example, might define innovation as “the process of introducing new elements into a culture through either discovery or imitation” (Schaefer, 2017).

Researchers from the field of business management may stress different aspects of innovation, asserting that it is the “invention and implementation of a management practice, process, structure, or technique that is new to the state of the art and is

intended to further organisational goals." Innovation provides an organisation with a competitive advantage and can stimulate economic growth. Furthermore, there is a widely held belief that technological innovation forms the foundation of industrialization. The concept of innovation has been widely researched and has been defined by various authors over the years (Birkinshaw et al., 2008).

Drucker (1998) defines innovation as an entrepreneurial tool that is specifically used to capitalise on change for a diverse business or service. The term innovation is a commercial consequence of an “inventions” or a technological advancement; an invention that can be commercialised is an innovation (Bayode et al., 2019).

During the last two to three decades, policymakers have increasingly become concerned about the role of innovation for economic performance and, more recently, for the solution of challenges that arise, such as the climate challenge. The view that policies may have a role in supporting innovation has become widespread, and the term innovation policy has become commonly used (Fagerberg, 2022). In this study, universities in the Gauteng province serve as the contextual field for investigation of the level of innovation, especially when it comes to management models and digital learning. This will ultimately ensure that teaching and learning will produce students who will, in return, contribute to the economic improvements in South Africa.

Tierney and Lanford (2016) argue that higher education, including universities, is faced with global forces that necessitate innovation in research, pedagogies, and organisational structures. They further argue that while others may consider these changes to be a threat to traditional academic life, innovation in research can provide benefits to society in the form of medical and technological breakthroughs, inventions that improve global sustainability, and interdisciplinary ventures that raise the quality of life for millions, particularly in poverty-stricken regions.

Innovative pedagogical methods and modes of delivery are likely required to match the dynamic interplay between workforce development and higher education, especially in developing countries; hence, it is imperative that a theoretical understanding of

innovation is of outmost importance for universities. People have been using the concept of innovation since the late 1880s, when they defined it as something unusual. These concepts of innovation and entrepreneurship are probingly Schumpeter's most distinctive contributions to economics. One of the most common themes in Schumpeter's writing was the role of innovation (new combinations) and entrepreneurship in economic growth. Schumpeter was among the first to lay out a clear concept of innovation; his views on the topic changed over time (Śledzik, 2013). Based on the above, it means this concept of innovation has been around for a long time and has evolved over time because of developments in different economies around the world.

Recently, Buyukbalci and Boukari (2017) came up with another definition and claimed that several definitions of organisational innovativeness have been developed in related literature. Innovativeness is a firm's propensity to introduce and support new ideas, novelty, experimentation, and creative processes that may result in new products, services, or technology. Furthermore, from a broad perspective, innovativeness is also defined as a firm's capacity to engage in innovation, i.e., the introduction of new processes, products, or ideas in the organisation. Innovation is regarded as a strategy that will lead to many organisations improving their competitiveness, making profits, and ensuring sustainability.

Buyukbalci and Boukari (2017) support Wang and Ahmed (2004) by further defining organisational innovativeness as an organisation's overall innovative capability of introducing new products to the market or opening up new markets by combining strategic orientation with innovative behaviour and processes. In light of these definitions, it can be concluded that according to the multidimensional conceptualization of organisational innovativeness, there are five dimensions, and these are:

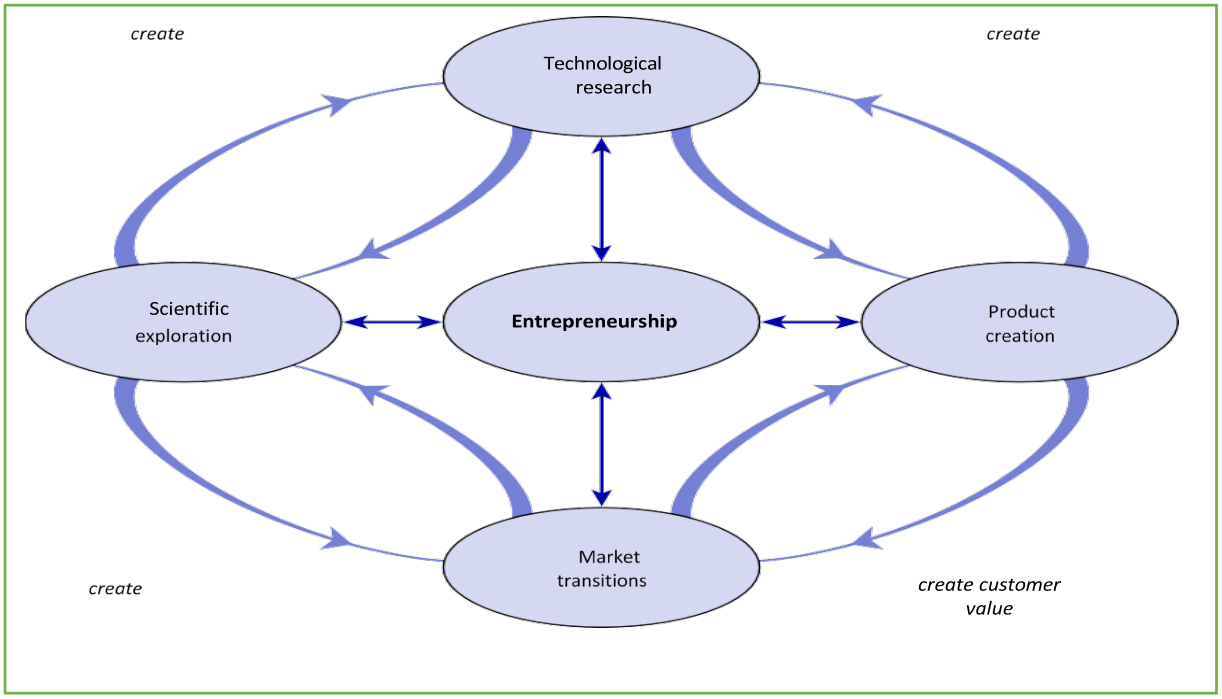
1) Product innovation involves the timely introduction of new products to the market.
2) Market innovativeness refers to new approaches that are put in place to enter the market.

3) Process innovativeness, which means the introduction of new production methods, processes, and management strategies in order to improve production or service.
4) Behavioural innovativeness pertains to the development of organisations and the management of change.
5) Strategic innovation is defined as the identification of gaps, such as a customer segment, a customer need, or a way of producing, delivering, or distributing products and services that are new or existing but neglected or not realised by competitors, and the use of these gaps to grow and become the new mass market. In addition to the above, strategic innovativeness is an organisation's ability to manage ambitious organisational objectives in order to stretch or leverage resources creatively.

Trott (2017) also agrees with the above scholars, especially on the issues of product innovation, technological innovation, scientific innovation, and market innovation, as per the framework in Figure 1 below. Trot developed the 'cyclic innovation model' (CIM) that described different kinds of innovation. There is a cross-disciplinary view of change processes (and their interactions), and this takes place in an open innovation arena. Behavioural sciences and engineering, as well as natural sciences and markets, are brought together in a coherent system of processes with four principal nodes that function as roundabouts. The combination of these changes leads to a wealth of business opportunities. Entrepreneurship plays a central role in making use of those opportunities. The message is that without the drive of entrepreneurs, there is no innovation, and without innovation, there is no new business.

According to Figure 1 below developed by Trott (2017), innovation is the management of all the activities involved in the process of idea generation, technology development, manufacturing and marketing of a new (or improved) product or manufacturing process or equipment. It is also a management process which offers a distinction between an innovation and a product, the latter being the output of innovation.

Figure 1: Trott (2017) different kinds of innovativeness



It is necessary at this point to cross-reference these discussions with the practical realities of managing a business today. The senior vice-president for research and development at 3M, one of the most highly respected and innovative organisations, recently defined innovation as: Creativity, the thinking of novel and appropriate ideas and innovation which refers to the implementation of those ideas within an organisation (Trott, 2017).

Clegg et al. (2015) claim that for the last decades there has been research on organisational innovativeness and most scholars are of the view that for employees in any organisation to be innovative, management must include them in the decision-making process and avoid the top-down communication strategy. Employees are more likely to make efforts to innovate when they feel themselves trusted and empowered.

Similarly, Franco and Haase (2017) define organisational innovativeness as innovation involving changes in the routines of firms aiming at improving the efficiency. Innovation is about productivity, profitability, flexibility and creativity of a firm using disembodied

knowledge. Organisational innovation relates to the organisational changes over time, including new business practices and procedures.

There is an agreement that innovation will ultimately lead to an organisation being productive, sustainable and competitive (Lee & Trimi, 2018). According to the researcher interpretation based on the above definition, in general, universities in South Africa and Gauteng province, in particular, are not exception to this. Therefore, it means that for them to be competitive and their employees to be productive, they should be innovative. On the other hand, universities were important for innovation, and that especially in the early phases of innovative processes, the face-to-face exchange of knowledge was essential as supported by Lee and Trimi (2018). Hence, it is imperative to conduct this study in order to determine the level of innovativeness of these universities, and what management models should they adopt for them to be innovative

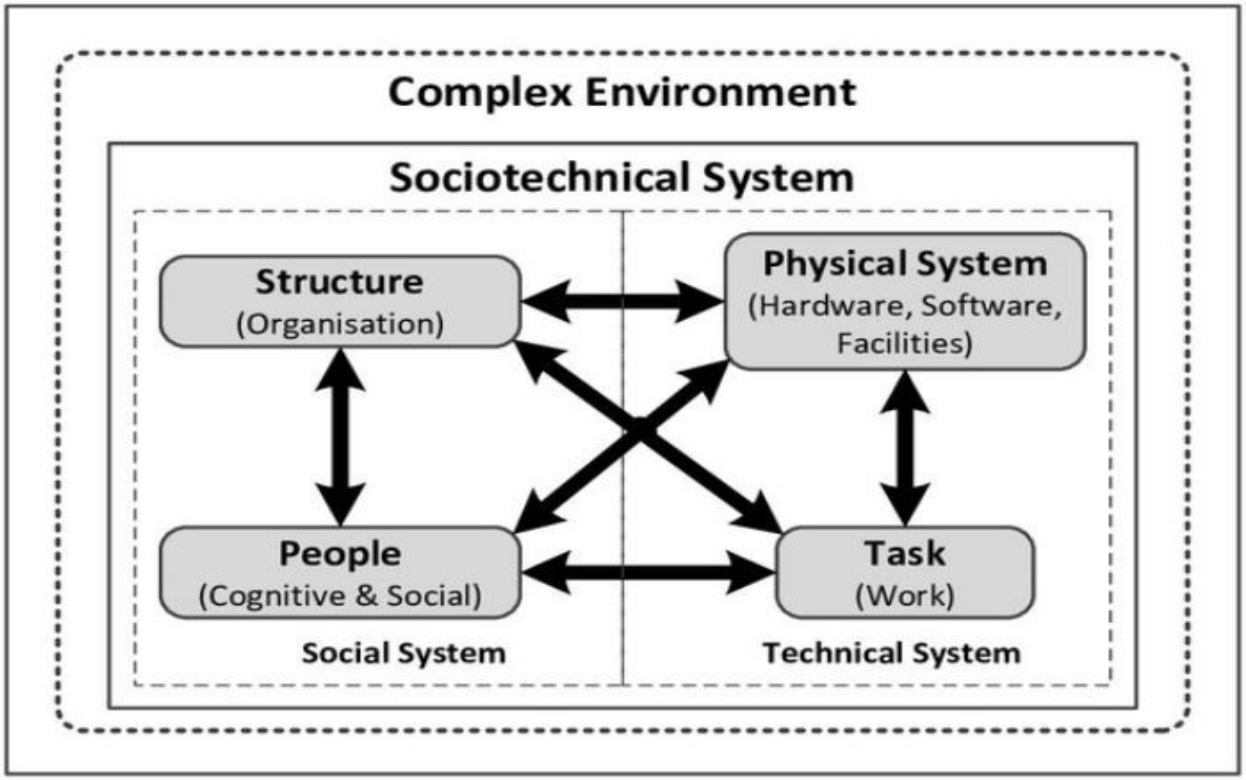
Similarly, Franco and Haase (2020) define organisational innovativeness as innovation involving changes in firms' routines aimed at improving efficiency. Innovation is about a firm's productivity, profitability, flexibility, and creativity when using disembodied knowledge. Organisational innovation refers to changes in an organisation over time, including new business practices and procedures.

There is an agreement that innovation will ultimately lead to an organisation being productive, sustainable, and competitive (Lee and Trimi, 2018). The researcher's interpretation, based on the above definitions, suggests that South African universities, including those under study, are not exceptions to this rule. Therefore, in order for these universities to remain competitive and their employees to be efficient and productive, they must demonstrate innovation. Hence, it is imperative to conduct this study in order to determine the level of innovativeness in these universities and what management models they should use in order to implement their operational plans and achieve their strategic goals, especially when it comes to teaching and learning.

In conclusion, this study will focus on the definition of organisational innovativeness, which includes market, product, behavioural, strategic, and process innovativeness, as defined by Buyukbalci and Boukari (2017), and also supported by Wang and Ahmed (2004).

Franco and Haase (2017) initially explained that organisational innovation is linked to socio-technical theory. This is a combination of different types of practices and resources resulting from both the technical system, which consists of technology, the physical space, the organisation's efficiency, and the social system. This includes people and their physical and psychological characteristics, the social relationships between individuals responsible for performing tasks, and the formal and informal organisational demands in the work situation. Figure 2 illustrates that for any organisation to be innovative, there must be a clear alignment between its structure and the availability of relevant systems. Additionally, there must be competent people who will be able to use those systems in order to achieve the objectives (tasks).

Figure 1: Sociotechnical System Naik (2020)



The above figure is about socio-technical systems theory as proposed by Sony and Naik (2020), which was initially developed by Trist (1978). According to these scholars, socio-technical systems are systems that involve complex interactions between people (the social component), machinery (the technical component), and the environmental components of the socio-technical work system. The social dimension focuses on

people, relationships, organisations, incentives, and performance measures. Therefore, this study used socio-technical theory to focus on these components (structure, systems, people, and tasks), aiming to determine if these elements are present in these universities and whether they align and integrate when developing and implementing their strategies. The reason for this is that organisational innovation aims to create new organisational designs, which involve modifying the internal structure of the organisation and its connections with various external entities, including other firms, government bodies, universities, assistance services, and research laboratories, among others (Franco & Haase, 2017). Preliminary investigations reveal that many of these universities lack staff capable and dedicated to developing innovation, particularly in areas such as strategic, behavioural, and technological innovation.

Franco and Haase (2017) also discovered that several other organisational studies on innovation demonstrate the complexity of the concept. According to the European Commission's 1996 Green Paper on Innovation, this concept is defined as the successful production, assimilation, and exploration of something new. They further assert that innovative organisations embrace various forms of innovation, distinguishing them into three categories: process innovation, product/service innovation, and strategy/business concept innovation. Process innovations, according to them, are about work organisation, new internal procedures, policies, and organisational form. Process innovation, i.e., work organisation, new internal procedures, policies, and strategies, as well as new business models that include new missions, objectives, and strategies, form the definition of organisational innovation.

Recently, as per the Organisation for Economic Cooperation and Development (OECD) (2017) organisational innovation was described as an initiative that includes two broad streams which are:

1. The restructuring of production and efficiency processes involves various strategies, such as business re-engineering, downsizing, flexible working arrangements, outsourcing, greater integration of functional lines, and decentralisation.

2. Human resource management (HRM) practices include performance-based pay, flexible job design and employee involvement, improving employees' skills, and institutional structures affecting labour management relations.
3. Product/service quality-related practices emphasise total quality management (TQM) and improve coordination with customers/suppliers.

Franco and Haase (2017) claim that there are certain types of innovations that are relevant to emerging SMEs and large organisations in developed countries. This research investigates the types of innovations that are relevant to universities in Gauteng province, which contradicts the claims made by Franco and Haase (2017).

Medrano and Olarte-Pascual (2016) described marketing and technological innovation as the kind of innovation that is more relevant to SMEs. Numerous studies on innovation focus on technological innovations, like the ones conducted by Franco and Haase (2020) and Birkinshaw (2020). However, it is currently challenging to limit the discussion of innovation to product and process innovativeness because new ideas can transform any part of any organisation's value chain. As a result, the OECD/Eurostat (2005) definition in the Oslo Manual distinguishes four types of innovation: product, process, organisational, and marketing. This study will look at what types of innovation are most relevant to universities. Based on the data presented above, it is not appropriate to limit the subject of innovation to product and process innovation.

There is a lack of empirical evidence in the literature on the impact of marketing innovativeness. This is noteworthy, even though the effects of marketing innovativeness differ from those of innovations in other areas such as products and processes innovativeness. Furthermore, marketing methods and tools play an important role in industry evolution. Marketing innovation is defined as the implementation of a new marketing method involving significant changes in product design and/or packaging, product placement, product promotion, or pricing (OECD/Eurostat, 2005, p. 49; Medrano & Olarte-Pascual, 2016). Universities should also be involved in marketing innovativeness in order to ensure that they recruit students and are able to conduct teaching and learning on a global scale.

However, there was a significant change to the definition of innovation in the 2005 Oslo Manual. Previously, technological product and process innovativeness were defined as the two types of innovativeness considered in the measurement of innovation. In the third edition of the Oslo Manual 2005 (Gault, 2023), two other types of innovativeness were added at the same level as technological innovation: marketing and organisational innovativeness (Medrano & Olarte-Pascual, 2016).

Three streams of marketing innovation studies are found in the literature on this phenomenon. The first stream discusses the competitive advantages that can be achieved through marketing innovation. The second addresses the relationships between marketing innovations and other innovation types. Finally, the third-stream attempts to understand the characteristics of organisations that adopt marketing innovativeness. This means that every organisation must market its products and services well to grow its customer base and be successful and sustainable (Wang and Ahmed, 2004). This is not only applicable to organisations in the business sector, but it is also relevant to universities since they are also organisations that are responsible for preparing students to be employed in workplaces.

2.4. Management models in organisations

Given that this study focuses on innovativeness and management models in the implementation of digital learning, it is crucial to examine prior research on the application of management models and various types of innovations, as previously discussed, and their interrelationships in fostering organisational innovativeness within these universities. Over and above this, when developing the indices that measure the level of innovativeness, the matrix that will be developed should consist of any of the generic management models as recommended by Birkinshaw (2012) based on the responses that will emanate from the data collected from participants on the questionnaire.

According to Buyukbalci and Boukari (2017), the management model refers to the decisions made by an organisation 's executives regarding how they define objectives, motivate effort, coordinate activities, and allocate resources. In other words, they define how the work of management is done on a daily basis. Management models reflect the

choices made by managers when it comes to decision-making: which systems to put in place, procedures that should be followed, what kind of people are needed, and the kind of organisational structure suitable for an organisation.

A management model aids in defining the operational aspects of the organisation. Among other things, it takes into account factors such as the development of decision-making processes, determining who should authorise what, adhering to uniform standard operating procedures within an organisation, and ensuring all employees are aware of them. Lastly, it also ensures that the organisational structure is aligned with the organisational strategy and the budget of the organisation (Buyukbalci & Boukari, 2017).

There are four generic management models, namely: discovery, quest, science, and planning models, which are discussed below. The discovery model is the one suitable for emerging SMEs or organisations. This model is also suitable for businesses operating in unpredictable and fast-changing environments. It can be applicable to a specific project in a large, well-established organisation. The planning model, on the other hand, is widely adopted in mature industries where work is conducted in a linear manner and where the degree of predictability of market evolution is high. According to the quest model, managers set clear organisational goals and encourage employees to achieve these objectives through a variety of means. In other words, employees are told what to do but not how to do it. The model is useful for established and growing organisations operating in a competitive environment and attempting to distinguish themselves. The science model proposes a combination of formal rules and structures, authority in decision-making, an intrinsic motivation approach, and obliquity in achieving goals. Compared to other forms, this model's application is relatively limited. It is mostly practiced in special engineering project firms (Buyukbalci & Boukari, 2017). Universities also fall under the definition of an organisation; the above is applicable to them. Against this background, this study investigated the management models that the universities selected, which would assist in determining the ones that are compatible with their innovation strategies.

The management model's function is to capture economic value at an early stage. A flourishing management model creates an algorithm that connects technological prospects with economic value realization. The management model unlocks latent economic value from an application, but its common sense stresses the consequent hunt for new, alternate models for different applications later on, an inexplicit psychological attribute unmarked in most discussions (Chesbrough and Rosenbloom, 2002). These two scholars also investigated the intellectual conditions of the concept, offering a practical explanation and showing how an organisation arose by employing an impressive management model to commercialise an application jilted by other organisations. They demonstrate the extended shadowiness that this model casts upon the management of designated spin-offs of organisations. In contrast, the search for an effective management model in unsuccessful ventures was limited.

However, Bodrozic and Adler (2022) argue that the concept of a management model has not received much scholarly attention, and the terminology has been loose. Management models refer to both ‘‘rhetoric’’ and "ideologies", as supported by Barley and Kunda (1992). A management model can also be defined as a distinct body of ideas that offer organisational managers precepts for how best to fulfil their technical and social tasks. The management model often includes multiple management concepts, sometimes competing for pre-eminence, sometimes complementary, but sharing common themes.

They further found out that there are two criteria that are used to differentiate management models from management concepts. Generality management and pervasiveness management are the two criteria that separate management models from concepts. While the former opens up completely new fields of application, the latter is applicable to a wider range of industries than concepts. To avoid an excessively mechanical explanation of this evolutionary process, one should zoom into one or more steps to account for the actors who contribute to the birth and diffusion of new management models. This process unfolds in four interrelated, overlapping, and non-linear phases: (1) various efforts are made to articulate a widespread organisational and management problem; (2) competing management concepts offer innovative solutions;

(3) a management model emerges from among these concepts as a theorised solution; and (4) the management model is diffused.

2.5. Management models suitable for universities and their compatibility to innovation

Texaria-Quitros et al. (2020) posit that total quality management (TQM) is also another type of management model. Total quality management (TQM) is an organisational management approach that prioritises quality, encourages participation from all members, and strives for long-term success by ensuring customer satisfaction and generating benefits for all members of the organisation and society. There is a range of quality management models developed for industries, and they have not been adopted or tested within higher education institutions on a global basis. They developed Table 3 below and argue that it identifies and defines the different management models that have been applied internationally in higher education institutions (HEIs). These management models are explained and defined as per the table below. All of them do contribute to ensuring that there is innovation and organisational effectiveness in universities.

Table 3: Total Quality Management Models (Texeira-Quiros et al., 2022)

Model	Definition
TQM	A comprehensive management approach which requires contribution from all participants in the organisation to work towards long-term benefits for those involved and society as a whole.
EFQM excellence model	Non-prescriptive framework that establishes nine criteria (divided between enablers and results), suitable for any organisation to use to assess progress towards excellence.
Balanced scorecard	Performance/strategic management system which utilises four measurement perspectives: financial, customer, internal process and learning and growth.
Malcolm Baldrige award	Based on a framework of performance excellence which can be used by organisations to improve performance. Seven categories of criteria: leadership, strategic planning, customer and market focus, measurement, analysis, and knowledge management, human resource focus, process management and results.
ISO 9000 series	International standard for generic quality assurance systems is concerned with continuous improvement through preventative action. Elements are customer quality and regulatory requirements as well as

	efforts made to enhance customer satisfaction and achieve continuous improvement.
Business process re-engineering	It is a system to enable redesign of business processes as well as structures to achieve improved performance. It is concerned with change in five components: strategy, processes, technology, organisation and culture.
Servqual	Instrument designed to measure consumer perceptions and expectations regarding quality of service in five dimensions: reliability, tangibles, responsiveness, assurance and empathy and to identify where gaps exist.

Application of the above-mentioned models has yielded a number of benefits for HEIs. In order to achieve these benefits, a number of critical requirements must be met in the implementation of these models. Top-level commitment, customer delivery focus, and medium- or long-term strategic objectives are required. Successful implementation also depends on effective leadership and sufficient levels of financial and human resources. However, a number of core requirements and limitations exist for the successful implementation of these models. The benefits identified are both tangible and intangible. In the first instance, the models are deemed to be relevant within the current competitive higher education environment as they incorporate the perspective of students as customers. They also take into account the perspectives of both internal and external stakeholders (Taroreh et al., 2022).

Aly and Akpovi (2001), as well as Becket and Brookes (2008), posit that improvements have been reported in areas such as customer service, administrative processes, staff and faculty morale, and strategic and budget planning. There is general consensus among these authors that a key benefit of using these models is the requirement for HEIs to adopt a strategic approach to quality measurement and management and to engage in self-assessment against predetermined criteria. Therefore, creating innovation indices is crucial for these universities to gauge their level of innovation.

The quest management model, especially the emergence and collective wisdom principle, was expected to foster behavioural, process, and product innovativeness. There is a relationship between the quest management model and behavioural and product innovativeness; however, there is little or no significant relationship between the

quest management model and process innovativeness. In the case of behavioural innovativeness, the statement was partially supported as the impact of variables was not observed in the expected order. It was suggested that the impact of collective wisdom and emergence is of primary importance, while the results show that the relative order of quest model principles on behavioural innovativeness is collective wisdom, alignment, emergence, and extrinsic motivation. In terms of product innovativeness, extrinsic motivation has a stronger impact than collective wisdom. The study findings also indicate a significant relationship between the science management model and behavioural, product, and process innovativeness (Buyukbalci & Boukari, 2017).

The relationship between management models and innovativeness dimensions needs to be looked at and revealed. By revealing such relationships, important details are believed to be underlined, leading managers to make conscious choices while designing their management models. Only models that foster an innovative culture within the organisation can enable it to align with emerging competitive imperatives. Nevertheless, to come up with concrete and more detailed guidelines on how to design a management model that enables innovativeness, further studies should deal with additional variables such as contextual and organisational lifecycles. More specifically, to determine whether the adoption of or benefiting from certain management model principles in order to facilitate innovation capabilities will depend on factors such as the existence of supporting mechanisms in the institutional context or the age, origin, and composition of the workforce, like variables describing the organisation. In today's post-modern management environment, managers tend to involve people in decision-making processes and decentralise planning in order to make them internalise goals and planned actions rather easily. Such internalisation is especially important as any kind of progress and improvement in organisational processes requires the voluntary contribution of employees at each level (Buyukbalci & Boukari, 2017).

They further argue that the quest management model, especially emergence and collective wisdom principles, was expected to foster behavioural, process, and product innovation. The results indicate a significant relationship among the quest management model, behavioural innovativeness, and product innovativeness, but no significant relationship was found with process innovativeness. They further determined that

important details are believed to be underlined to lead managers to make conscious choices while designing their management models. Only models that align with the innovative culture of the organisation can effectively adapt to the new competitive imperatives. Based on that, it has been found that the effectiveness of traditional management models is somehow limited in the new business environment, which causes an organisational shift towards alternative management principles. However, there is a dearth of scholarly works on the relationship between management models and their impact on organisational innovativeness. It is against this backdrop that this study aims to design innovative indices and a framework for management models and their capacity to promote organisational innovativeness among the selected universities in Gauteng province and thus provide a practical and academic contribution.

Kayley (2017) also introduced another management model that can help an organisation be innovative and meet customer demands. This management model is called just-in-time delivery. Organisations that use this management model drive process innovativeness more effectively.

2.6. Innovation indices and framework of universities

According to Global Innovation Indices (GII) (2018), the Republic of South Africa (RSA) has been ranked the 58th (out of 126 countries) most innovative economy in the world and the most innovative in sub-Saharan Africa. The GII 2018 placed RSA one level below the fellow BRICS member, India, in the 57th position, just above Brazil and Egypt. The GII 2018 also identified 20 countries that are outperforming on innovation relative to their level of development. Among these new entrants who are top achievers from the Sub-Saharan Africa region is South Africa, as well as Colombia, Tunisia, Costa Rica, Serbia, Montenegro, Thailand, Georgia, and Mongolia (Dutta et al., 2018). They conducted research and found out that, according to the Global Innovation Indices (GII), South Africa falls under the 40.4 category.

However, RSA's innovation score was hampered by low foreign direct investment inflows, poor pupil-teacher ratios in secondary schools, and a low rate of tertiary enrolment. RSA was rated at 101 out of 126 in the ease of starting a business metric and also fared badly in the provision of microfinance gross loans.

South Africa still struggles to contribute financially towards business research and development (R&D), more specifically to its public universities. It means that the government must invest more in innovative initiatives, especially in universities. These investments are crucial to spurring breakthrough technologies and innovation interventions (Global Innovation Indices, 2018).

Cornell University INSEAD and WIPO (2018) provide data for South Africa from 2011 to 2018, demonstrating that the country's spending on innovation, particularly technological innovation and research, is inadequate. According to these data, the average value for South Africa during this period was 36.56 points, with a minimum of 35.1 points in 2018 and a maximum of 38.2 points in 2014 as compared to Switzerland at No1 at 67.4. The Global Innovation Indices capture elements of the national economy that enable innovative activities, and these are: (1) institutions; (2) human capital and research; (3) infrastructure; (4) market sophistication; and (5) business sophistication. The three output pillars capture actual evidence of innovation outputs: knowledge and technology, and these are knowledge and technology as well as creative outputs.

2.7. Competitiveness and innovation in universities and SMEs

Arshad and Arshad (2019) ascertain that the quality of education at a given institution is vital, especially in a competitive market where students` decisions to stay or leave the institution are solely dependent on the facilitation processes and quality of education rendered by any of the universities. In support of these claims, Burkett (2003) argues that various universities are deteriorating or failing to provide high-quality education that is accessible and deliverable in a flexible manner. This research indicates that these universities lack competitiveness and innovation. Therefore, in order for them to be competitive, they should be innovative; hence, this study will also be conducted with these six universities in Gauteng province to determine their level of innovativeness that can lead to them being competitive and sustainable.

To ensure survival, intrapreneurship is essential in business today, as the world is changing rapidly. Leading organisations rely more on internal entrepreneurial activity to create higher levels of competitiveness through innovation. The term intrapreneurship refers to a system that allows an employee to act like an entrepreneur within a company

or any organisation. Entrepreneurs are self-motivated, proactive, and action-oriented people who take the initiative to pursue an innovative product or service (Gupta et al., 2016). This argument also applies to universities, as they are organisations, and to remain competitive, they must foster a culture of initiative and motivation among their employees.

They further argue that the resource advantage theory recognises the creation of a competitive edge as a function of marketing and identifies the role of branding in creating an organisation's capability to demonstrate its superior abilities. It has also been noticed and reported in the literature of local organisations that a brand that contributes to the competitiveness of the reseller is able to compete at the local level using innovative marketing initiatives. Managers seeking to enhance their organisation 's competitiveness are actively seeking new strategies in a turbulent environment, while discarding traditional approaches that have proven ineffective. The higher a brand's competitiveness, the greater its ability to adopt innovative marketing initiatives in a competitive marketplace. Also, the greater a brand's ability to adopt innovative marketing initiatives, the higher its competitiveness in a competitive marketplace. Supporting this, Hunt and Morgan (2017) argue that the value of a resource to a firm or organisation is seen in terms of its potential to yield competitive differentiation and/or customer value delivery that enhances performance outcomes. Based on these findings in the private sector, it is also applicable to universities in that, for them to be innovative, they should ensure that their marketing strategies and branding are reviewed from time to time in order to be competitive.

The supporters of this resource advantage theory (RAT) maintain that it is a theoretical framework that explains how firms can achieve and sustain superior financial performance by leveraging their resources and capabilities to gain competitive advantage, comparative advantage, and technological innovation while also engaging in organisational learning. It is recommended that in order for these universities in this study to be financially stable, they should ensure that they use innovation and management models and be able to measure their level of innovativeness. Hence, this study will develop an innovation index that each can use.

While the creation of push and pull in a competitive market benefit both brand and reseller firms, it also requires them to innovatively cooperate with each other. According to the literature, when resellers benefit from the promotional activities performed by a brand, the indigenous knowledge and home-grown relationships of resellers play an important role in building the competency and capability of brand managers to innovatively juggle with the different barriers and shortcomings of the growth markets. Universities, as learning organisations, should also collaborate with each other in order to embrace innovation. The juggling performance of altering and rearranging the actions of the brand based on its standardised policies and the requirements of a local market can result in the discovery of an innovative marketing idea that is very context-specific and facilitates the smooth functioning of the brand in an agile situation. From the point of view of resource advantage theory, these kinds of actions in a competitive market led people to think that the success of juggling depends on the resources needed and the ability to take advantage of the expected incentives from the new marketing idea, according to resource advantage theory (Gupta et al., 2016).

2.8. Impetus to higher levels of performance using innovation

Chen et al. (2019) are of the view that the objectives of universities are to: provide in depth knowledge; seek academic development; educate students; and coordinate national development demands. The core functions of a university are basically teaching, research, and scholarship. Perkins (2018) pointed out that the university has become one of the finest institutions in the modern world. In the United States, it is central to the conduct of our national life. It is our most advanced scholarship and research agency. It is crucial to the transmission of knowledge from one generation to the next, and it is becoming increasingly important in the application of knowledge to modern society's problems. According to Donald (2014), universities should establish performance measure indicators (PMIs) based on these functions to evaluate resource allocation performance. This will ultimately contribute to their innovation and ensure that their strategies are aligned with their organisational innovation initiatives.

Wu et al. (2019) and Chen et al. (2019) further argue that the balanced scorecard (BSC) enables businesses to transform their overall organisational strategy into effective management. The BSC is a performance-measurement system, as proposed by Chen

et al. (2019), a strategic-management system, and a communication tool. Apart from financial measurement, which is the essence of the BSC, it also emphasises the role of the customer, internal processes, innovation, and learning. As a result, it provides a complete range of PMIs to measure the achievement of strategic targets. The BSC has four measurement perspectives, which are:

(1) Financial perspective,

(2) Customer perspective,

(3) Internal process perspective, and

(4) Learning and growth perspective.

Based on the above, performance management is central to measuring the performance of every organisation, and innovation can therefore enhance universities and organisations generally to perform in accordance with set standards and remain competitive.

Maine et al. (2014) conducted research on how innovation transforms industries. In their study, they proposed that a strategic model must assist enterprises in adjusting to ever-shifting marketplace mechanics. It is crucial for organisations to understand their customer base and the dynamics of the market in order to grow their customer base. This is because a larger customer base leads to higher revenue, as it increases sales. This is also applicable to universities, since they must make sure that they increase their student intake. This can be achieved by developing attraction strategies that are credible and ensure that they attract many students. This will ultimately lead to increased revenue for them. The Department of Education will also increase the equitable share that they give to these universities, since the more students they have, the more money they get from the government.

2.9. Challenges facing universities in innovativeness

According to Brooks and Becker (2019), one of the challenges facing universities in developed and underdeveloped countries revolves around a lack of managerial and leadership skills. Furthermore, higher education institutions' bureaucratic structures

(HEIs) reportedly undermine the application of management models and discourage organisational innovation. The models' effectiveness also relies heavily on a team-based approach that challenges the traditional autonomous role of academics. They concluded that further studies should be conducted to determine which management models promote the performance of universities. In particular, future research should investigate the specific causal nexus between TQM and product innovation. In terms of managerial implications, the study clearly identified the fundamental role played by senior leadership in generating new organisational knowledge. Therefore, an empowering and open-minded leadership based on organisational values of sharing and trust represents an indispensable pre-condition for the generation of effective knowledge-creation mechanisms. Therefore, lack of leadership and choosing incorrect management models that are not aligned to the university's strategy is a problem that is facing these universities to innovate.

Hossain (2017) suggests that SMEs face unique challenges for innovation, and these challenges include scarcity of resources, complexity of the scientific field, coordination of the operative functions of the firm, and access to up-to-date scientific excellence. This is also what the majority of senior managers at Gauteng province's universities indicated during the preliminary investigations of this study. The scarcity of resources is reflected in the annual reports of these universities.

Using data from the European car industry, Dodourava and Bevis (2014) found that SMEs have weak ties with other organisations and larger incumbents. SMEs practice open innovation activities extensively, even though they face a number of barriers while trying to apply it. Most SMEs face challenges that are related to organisational and cultural issues to deal with the increased external factors. These challenges include venturing, customer involvement, external networking, research and development (R&D) outsourcing, and external participation. Moreover, SMEs in developing countries face different challenges compared to those in developed countries. Similar challenges are experienced by universities in developing countries such as South Africa, as per the preliminary investigation. Therefore, this study is being conducted to see if universities are facing the same challenges and what should be done in order to overcome them.

De Marco et al. (2016) highlight the following challenges universities face when it comes to innovation:

- Employee resistance to innovation and change is a persistent issue. Sometimes this resistance is caused by a lack of communication within universities, and ultimately, employees will be demotivated, and their morale will be low, affecting productivity and efficiency.
- Organisational structures that are not in line with best human resources practices.
- Individuals and groups who feel threatened about their professional situation, the content of their work, income, prestige, and institutional power are therefore resisting innovation.
- Organisational culture is defined by ‘bureaucratic’ values and tends towards polarisation, that is, the absence of shared values associated with an environment where there is little information and communication between workers and management.
- There's a deficiency in engagement and knowledge regarding the implementation of modifications.

2.10. Interventions addressing innovation challenges of universities

Hossain (2016) suggests that, in developing countries, a government agency using innovation hubs could help SMEs connect, communicate, and collaborate with independent inventors and other parties to jumpstart innovation practices. However, when it comes to universities, the National Research Council (NRC) in South Africa is responsible for assisting them with research and innovation (STATSSA, 2019).

In the same vein, and additively, Wynarczyk (2013) argues that in terms of international competitiveness, SMEs are highly dependent on three key internal components. These are R&D capacity, managerial structure, and competencies, as well as two external factors: open innovation practices and the firm's ability to attract government grants for R&D and technological development. He then argues that universities are not an exception to the aforementioned criteria. Based on the annual reports of these universities and the Department of Higher Education quarterly reports, universities in

South Africa are encouraged to come up with Public Private Partnership (PPP), which is the policy of the government. This can assist universities when it comes to dealing with innovation challenges.

Azeem et al. (2021) suggest that an innovative culture cannot be imposed by top management through internal communications. Instead, an innovative culture emerges from the influence of top management, manifested through the coherence of its collective behaviour. Change from a conservative culture guided towards innovation implies enhancing people's roles by involving them in the definition of strategies and the establishment of goals, by creating a communication system, promoting the permanent improvement of work conditions and the constant evaluation of workers, stimulating creativity, assuming a perspective of medium and/or long-term goals instead of a perspective of short-term ones to obtain immediate profit, and promoting flexible structures that will allow an increase of informality, communication, and the participation of all members of the organisation.

The above leadership approach is lacking in universities, and it is recommended that this approach of collective wisdom be adopted by universities in order to address organisational innovativeness challenges, since it has been proven that this has worked mostly in the private sector (SMEs) in developed countries.

Franco and Haase (2017) postulate that there is a shortage of studies showing the role of inter-organisational partnerships in the implementation of organisational innovation activities within the SME sector. According to their findings, partnerships contribute to organisational innovation and competitiveness. In light of the above, this research also focused on the level of inter-organisational partnership and collaboration between local and international universities, with a particular emphasis on research and innovation issues.

Lee & Trimi (2018) insist that open innovation is not an attractive option, especially for early-stage ventures that may not have adequate capabilities regarding Research and Development (R&D) investment and capital. According to reports, open innovation has

a lot of potential for organisation s. Conversely, Oakey (2013) appears to disagree, arguing that the applicability of open innovation systems is overstated due to the long-term, expensive, and risky nature of research and development (R&D), which also necessitates the necessary protection of outcomes. These scholars further argue that open innovation is still an effective way to invest in R&D. Complementing the Internet with supporting tools such as Web 2.0 is becoming increasingly essential to leverage the internal and external capabilities of many organisations. Some scholars, such as Spithoven et al. (2013), argue that small organisations are more effective than large organisations in using various open innovation practices in parallel. Based on the above research, it can be concluded that even universities need to subscribe to open innovation since this is part of innovation and has proven that it can address the challenges of innovation.

Adding to the voices above, it is Shin et al. (2018) who established that the smallest organisations are still pursuing closed innovation over open innovation. Tranekjer and Sondergaard (2013) further developed this idea by exploring Danish SMEs with the goal of finding the cost associated with various sources of innovation. They found that market and science sources are related to decreased costs, collaboration with suppliers of similar knowledge bases is related to market performance, and collaboration with customers results in lower project costs. However, they discovered that SMEs that closely integrate with suppliers tend to exhibit a lower degree of novelty in new products. They further established that technology scouting is a low-cost but effective option for high-tech SMEs (Parida et al., 2012). SMEs as a whole are increasingly adopting open innovation as part of their business models. Therefore, universities should adopt open innovation in order to do more with less.

According to Eurostat (2016), between 2010 and 2012, more than a quarter (27.5%) of all European enterprises implemented organisational innovation. Therefore, partnerships and organisational innovation are necessary to create more value for firms in the automotive branch. This is also in line with Al Sayed and Yang's (2017) argument. Since there is evidence that partnerships promote organisational innovativeness,

universities are also encouraged to develop partnership strategies, and this study will also determine the level of partnership interventions in these universities.

2.11. Resources and innovation management models applications

According to Chesbrough (2007), in order to innovate, the organisation 's management model administrators must decide which innovation interventions and management models they can use. This study aims to develop innovation indices for these universities to measure their innovativeness and select a suitable management model. Chesbrough (2007) further provided a practical definition of management models and offered a Management Model Framework (MMF) that lightens up the possibilities for management model innovation. MMF sequences achievable management models from elementary (and not very priceless) models to far more innovative (and very priceless) models. Using the MMF, enterprises can measure where their current management model is placed in relation to its possible position and then specify befitting steps for the furtherance of it. This is a persuasive and exemplary model for assessing the feasibility of a new management model design, a model for carrying it out, and a governance plan for decision-making.

Franco and Haase (2017) argue that currently, it is necessary for organisations in the automotive sector to respond quickly to consumers' expectations, meaning agility, flexibility, and business efficiency. In this context, partnerships are considered a form of open innovation in the automotive industry. In this study, the conceptual basis for explaining partnership formation is resource-based theory, which predicts that resources are both the key to an organisation's success and the main limitation to its growth, as supported by Penrose (1959). Therefore, the issues of partnership will be looked at as part of determining the level of innovation.

This consists of analysing an organisation's resource position and looking at strategic options suggested by that analysis (Wernerfelt, 1984). It is important to note that for SMEs to be able to stay competitive, they must have enough resources, which, inter alia, include human and financial resources. This is also applicable to universities; in

order for them to stay competitive, they must also ensure that they have enough financial and human resources, as will also be established in this study.

2.12. The role of state in innovation

In developed countries that possess competitive advantages, the role of the government is to create or identify opportunities for technological breakthroughs. However, for emerging economies, governments are struggling to create innovation opportunities, and this results in a lack of competitiveness (Al Sayed & Yang., 2017).

The above is also supported by Chan and Aldhaban (2019), who argue that the government should be involved in building competitive advantages and exploiting opportunities through managing resources strategically and pushing through a strategic learning cycle. This can be strengthened by making sure that institutions of higher learning are given enough resources in order to be involved in R&D to a large extent. The government can also contribute by ensuring that they encourage the teaching of science, technology, and innovation initiatives at schools and provide bursaries for students involved in this innovation initiative.

For universities to successfully implement innovation, they must do so in accordance with the principles of technological innovation. This will help them be competitive and promote digital learning. The creation of an attitude of openness to knowledge and new solutions among employees is pivotal to this, as it involves listening to their submitted ideas, implementing them, and simultaneously removing obstacles that hinder proposed changes and creative ideas (Matejun, 2016). This is crucial given that most universities conducted their classes in person before the COVID-19 pandemic. Since then, many technological interventions have been developed as a new way of doing work; things like Teams and Online Teaching have become the norm for these universities. According to this development, the government should play a role in encouraging and funding these universities to implement these technological initiatives.

Potter (2019) states that as far back as 2004, there was a key message that was directed to all governments and economic and development agencies in OECD countries, of which South Africa is part. The intention was to encourage domestic firms and research

organisations to participate in global knowledge flows in order to underpin national and regional competitiveness. It further promulgated the idea that universities should be at the forefront of this initiative because they are responsible for producing graduates who must ensure that they come up with innovative ideas that will make SMEs competitive and promote the country's economy.

According to Potter (2019), the rationale for the above position stems from the growing importance of two key drivers of change in contemporary economic development. The first is the shift towards the knowledge economy, in which economic development is strongly influenced by innovation performance, which depends increasingly on the generation, distribution, and exploitation of knowledge. This knowledge should be developed by universities so that it can be shared with students. He strongly believes that networks for knowledge sharing are critical to innovation-led economic development, and while many networks are local, it is also important to exploit global connections. The generation and dissemination of knowledge are at the heart of the university's existence.

Globalization, or the process of increasing interactions between countries through trade, investment, labour flows, and strategic alliances, is the second driver of change in contemporary economic development. This is facilitated by improvements in information and communication technologies (ICT) and political steps towards economic integration. Globalization creates new opportunities, both for exploiting domestic knowledge and tapping into one generated overseas. As a result, globalisation and the shift to the knowledge economy both support innovation and competitiveness in modern economies. This provides a background against which universities and other organisations in every country can flourish and be competitive. This can be realised only when governments contribute to the development of economic policies that will encourage them to be innovative and profitable, and this should start at institutions of higher learning since they are responsible for the dissemination of knowledge and innovation.

In order to develop the idea above further, Potter (2019) maintains that in encouraging different governments to play a role in supporting innovation in organisations and

universities, the above issues should be placed within a broader agenda that stresses the necessity of building strong endogenous innovative capacities before national or regional economies. According to him, this will help to build innovation in universities and other organisations around the world. By developing strong internal innovation capacities, economies can increase their attractiveness to foreign investors. Therefore, the state must play a crucial role in funding universities so they can be innovative, with the aim of making them competitive and sustainable.

Perhaps Higher Education Institutions (HEIs) are no more independent than before; it seems they are accountable to more stakeholders than ever and often accountable in greater detail to the government, but they are certainly more autonomous. In this respect, universities outside the United States are moving closer to the US model. They have greater responsibilities in self-organisation and self-financing, and in some countries, they have more scope to define their mission and chart their strategic course. The evolution of Higher Education Institutions (HEIs) and their executive arms and administrative machinery has been associated with both the growth of government funding and administration, the semi-privatisation of funding, and the growing weight of activities conducted autonomously by the government (Marginson, 2017). This emphasises the role of government even in South Africa; however, other universities have developed third-party revenue strategies where they raise their revenue outside of government funding. To succeed in this, they will have to be innovative.

2.13. Organisational learning and innovativeness in universities

According to Wang et al. (2021), organisations that have a clear process regarding organisational learning can address organisational issues, i.e., organisational change, organisational renewal and transformation, innovation, and competitive and comparative advantage, more quickly and sustain their position in the industry.

Broadly speaking, organisational learning can be defined as the acquisition of new knowledge and abilities. Learning processes are integral to addressing environmental changes. Consequently, an organisation that is high in learning should be able to understand and adapt to any changes in its environment in a superior manner in comparison to organisations that are struggling with learning. Wang and his colleagues

further argue that learning processes are influenced by environmental factors, in that changes in those factors normally determine how much and in which way an organisation will learn and then transform the knowledge. In other words, it is believed that if environmental factors change and are perceived to be high in uncertainty, the organisation will experience more difficulties in understanding and learning from the environment (Akpolat et al., 2014).

Nonetheless, other researchers on this phenomenon have raised concerns about this rather negative view of uncertainty and argued that acceptance of uncertainty and ambiguity could be drivers of innovation (Freel, 2005a). Moreover, innovation could be a means of reducing uncertainty, while at the same time, uncertainty is a necessary condition of innovation. The rationale behind this view is that organisations operating in more uncertain environments are propelled to adapt by pursuing more aggressive strategies such as the development of new products, services, and/or processes; this argument is further advanced by Özsomer (1997). Consequently, in comparison to those organisations that operate in more benign environments, those operating in uncertain environments are said to be more likely to embrace innovation. Because they operate in an uncertain environment, all these universities need innovation strategies and management models to move quickly and compete.

Nevertheless, to this date, it is not evident if only certain sources of perceived environmental uncertainty are likely to trigger organisational innovativeness, such as changes in customer preferences and/or the discovery of new technological advancements (Freel, 2005b), or, in fact, all sources of perceived environmental uncertainty. Certainly, organisations operating in environments that are characterised by fierce price competition are less likely to engage in costly innovation projects (Soliman, 2014). Therefore, uncertainty impacts an organisation 's level of innovation, and universities in South Africa need to innovate to tackle the challenges posed by uncertainty.

There are several theoretical perspectives that are relevant in explaining the intricacies of managerial perception of environmental influences, subsequent decision-making, and the occurrence of learning and the achievement of innovation in the context of complex

organisational systems. In organisations, there is uncertainty and a lack of relevant information about learning and innovation. Inadequate or missing information can lead to various kinds of uncertainty, each with potential follow-on effects. The system theory mentioned earlier provides a theoretical lens through which to consider many possible sources of uncertainty and their effects on an organisation. While system theory helps to explain the systemic nature of environmental influences, it also assists in explaining the organisation as an open and social system itself. Even though the environmental uncertainty perspective has been extensively studied, it was found that its potential to explain issues of learning and innovation in complex and dynamic times has not yet been explored (Akpolat et al., 2014).

The theory yields further clarification for the many relationships between the organisation, managers, and their view of the organisational environment. Yet, further conceptual work is necessary to solve issues related to the definition and assessment of perceived environmental uncertainty. While much of the management literature dismisses perceived environmental uncertainty as a phenomenon with adverse consequences, it suggests that it may well be an important reason for organisations to drive new learning and innovation. It is acknowledged that a positive relationship between perceived environmental uncertainty and learning and innovation can be difficult to establish, yet it can be argued that there is a high degree of interdependency between these concepts and that there are benefits to further exploring the link between perceived environmental uncertainty and organisational learning and innovation (Akpolat et al., 2014).

Beckett (2014) adds another dimension to the discourse on the phenomenon, arguing that operating in a dynamically changing environment is the norm for most organisation s today. External factors, such as trade globalization and the explosion of accessible knowledge, continue to stimulate innovation on a number of fronts. Enterprises and nations invest in stocks of new knowledge through research to seek a competitive advantage, but this is only realised when such knowledge is used in concert with some elements of established knowledge.

One document that significantly contributes to the discourse on the phenomenon under discussion is published by an Australian think-tank group titled “Inside the innovation matrix: exploring the human dimensions” by ABF (2008). Its contribution is the exploration of potential strategic and policy responses to a dynamic business environment. The matrix part referred to the fact that an organisation may be concurrently innovative in a number of ways: developing new technology, adapting existing technology, combining established technologies in novel ways, organising itself differently, or engaging with clients in novel ways (Beckett, 2014).

The human dimension refers to the fact that innovation is essentially a social process. People come up with novel ideas and work together to apply them. People are the agents of organisational learning, and learning may ultimately be embedded in routines that support both efficient day-to-day operations and parallel innovation initiatives. Such routines, along with information and employees' tacit knowledge, collectively represent the corporate memory. This memory includes people and places outside of the organisation. Based on the above, learning and knowledge management do contribute to organisations' capacity to innovate (Beckett, 2014).

2.14. Organisational culture and innovativeness in universities

Aktas et al. (2011) define organisational culture as a behaviour in any organisation where all internal stakeholders share the same values and subscribe to a common vision and mission that has been agreed upon by a collective. These employees also share the same understanding of how the strategic objectives of their organisation would be achieved, and all are committed to working towards that. They also hold the belief that we should view organisational culture as the strategic function of the organisation, treating it as a continuous process that deserves our appreciation.

Zeb et al. (2021) have developed an organisational culture framework built upon a theoretical model called the "Competing Values Framework." The Competing Values Framework (CVF) is one of the most influential and widely used models in organisational culture. Among the six models of organisational culture, researchers discovered that the adhocracy culture is the one most closely associated with innovativeness within an organisation. It is sometimes described as an organisational

culture that is dismissed whenever the organisational tasks are over and reloaded rapidly whenever new tasks emerge. Adhocracy is an organisational culture that gives a lot more opportunity for individuals to develop in their own way, as long as they are consistent with the organisation's goals. Leaders are characterised as people who are driven by innovation and the discovery of new ideas. An organisation's focus is to gain as much opportunity as it can from the external environment. According to this type of culture, individuals will be considered successful and efficient if they can create and develop new ideas and innovations.

In conclusion, they discovered that aligning strategy, politics, and human resource practices with organisational culture can aid an organisation in achieving the desired levels of organisational efficiency, contingent on the stability or variability of the internal and external environment. In other words, if there is organisational efficiency, this is related to organisational innovativeness.

2.15. Implications of organisational strategy in innovation in universities

Executive management plays an integral role in upholding the organisation's philosophy, based around innovation and continuous improvement, and encouraging staff members to be creative when developing new programmes and activities. Programme success is also dependent on strong multi-disciplinary teamwork. The lifestyle and clinical departments are interconnected, with strong communication and cross-team cooperation resulting in high-quality programmes for communities. Strategy is seen as an integral part of the learning process for a learning organisation because it focuses on the organisation's development of core competencies, both in the present and in the future. Many of the scholars who followed agreed with this and argued for a more distributed form of leadership. Goh (1998), for example, synthesised the management practices and policies related to the construct and argued that learning organisations have five building blocks:

1. Clarity and support for the mission and vision.
2. Shared leadership and involvement.
3. A culture that encourages experimentation and the ability to transfer knowledge across organisational boundaries.

4. Teamwork and cooperation These building blocks require two main supporting foundations:
    - An effective organisational design that is aligned with and supports the building blocks.
    - Appropriate employee skills and competencies needed for the tasks and roles described in these strategic building blocks. Like Goh, other scholars subscribing to the strategic perspective have attempted to provide clear definitions of the learning organisation, with many providing building blocks or action imperatives. These strategic building blocks are aimed at providing practical guidance for operationalizing the concept into daily practice. As also argued for by Yand et al. (2014), there is a perceived weakness in this approach, probably because it emphasises the macro level and thus neglects some commonly defined elements of the learning organisation, such as individual learning.

Brunswicker and Van Haverneke (2015) identified five strategies that organisations adopt for searching. These are:

- Minimal searchers,
- Supply-chain searchers,
- Technology-oriented searchers,
- Application-oriented searchers,
- Full-scope searchers. They also identified that each strategy entails a mix of interactions with external sources of innovation, such as (1) customers, (2) suppliers, (3) universities and research organisations, (4) Intellectual Property Rights (IPR) experts, and (5) network partners. They transcend technology road mapping methods (TRMs) and embrace the market pull strategy of integrating technology with products. They also argue that developing an appropriate search strategy is an important step for organisations to pursue innovation. According to them, acquisition and exploitation are crucial for the search strategy.

Strategic management in organisations illustrates the central role of the entrepreneur's vision and intuition, which are more prominent than any formal strategic plans (Klammer

et al., 2017). However, there have been few attempts to understand how entrepreneurs craft their strategies (Miller & Freisen, 1982). Karami (2007) is concerned about the absence of enough strategic thinking in small organisations, as well as whether or not top management in organisations both formulates and implements strategy. Hence, this research will investigate if these universities have strategies and if those strategies are aligned with innovative initiatives and management models.

2.16. Strategic planning in universities and organisations

According to Sajdak (2017), the changeability of the environment, along with its turbulence and unpredictability, are factors that compel the introduction of new rules of corporate behaviour as well as new concepts that can help organisations respond to the changing problems that they encounter. The challenges of today's organisations primarily concern the need to adapt and identify new sources of competitive advantage. Organisations are faced with the dilemma of reconciling permanent elements of their strategy, such as vision, strategic objectives, and the building of a competitive advantage, with the need to exploit new opportunities and a willingness to constantly implement changes. This situation also applies to universities seeking to tackle current competitive challenges. Succeeding in unstable conditions does not depend on a single factor (effectiveness) anymore but requires the possession of numerous equivalent advantages, namely, the ability to react quickly, innovativeness, operational excellence, close relationships with customers, the ability to attract the best employees, and the ability to create value.

All of these characteristics are critical for an agile organisation, whose fundamental creed is effective adaptability to the changing environment. Strategic agility is defined as strategic involvement in the field of technology entrepreneurship. This has a significant effect on the level of innovativeness of surveyed enterprises, mostly stimulating the scope of implementation of innovations in products and services in organisations (Sajdak, 2017). Since there has been research done in the private sector as mentioned above, it has been proven that strategic planning stimulates innovativeness, and this can be done in these universities.

Similarly, Tuluce and Yurtkur (2019) argued that strategic entrepreneurship literature is one of the few areas of strategic management writing. In this aspect of innovation, Joseph Schumpeter has argued that managers create innovations in the face of competition, thereby generating economic growth and sustainability. The main question in strategic management is how organisations achieve and sustain competitive advantage. This is primarily explored in the work of Schumpeter (1943, 1942), who argues that entrepreneurs are the primary agents of economic growth. Therefore, it means that for every organisation to be competitive, it must have a strategy. Organisational strategies are becoming more and more important for both new and established organisations. Because of increasing environmental dynamics and global competition, organisations, regardless of their age or size, must build more strategies for the purpose of surviving. All of this is because these organisations strive to be innovative in order to survive.

Organisational strategy refers to the pursuit of superior performance by an organisation via simultaneous opportunity-seeking and advantage-seeking activities. Both small and large organisations encounter obstacles as they pursue their organisational strategy. They aim to build on the identification of opportunities for coping with global competition through their own competitive advantages. It is important that organisations around the world make strategic planning part of their core function so that they can address the challenge of unsustainability (Tülücea & Yurtkurb, 2015). They further maintain that no organisation, however successful and big, can continue to hold a place of leadership unless it recognises that modern business operates in a world of galloping change that creates new products, risks, and opportunities.

To be successful, many organisations' management should know where the organisation is going (business model) and how it will get there (management model). This is adequately explicated in Schumpeter’s theory of competitive behaviour in relation to innovation and economic development (Schumpeter, 1934). Below, we outline some of its key tenets.

- Introduction of new products and services, that is to say, one with which clients and consumers are not yet familiar, or of a new quality of products and services.

- The introduction of a new method of production is the one not yet tested by the branch of manufacturing concerned.
- The opening of a new market.
- The conquest of a new source of supply of raw materials or half-manufactured goods.

This theory is related to his study because it speaks to a new way of doing things and also allows employees to think outside the box. This will help these universities become more innovative by adopting new methods, which will ultimately lead to increased competitiveness and efficiency.

2.17. Theoretical framework

This theoretical framework describes the theories and concepts considered relevant in finding solutions to the problem that has been identified. It describes and introduces the theories that explain the rationale for the existence of the research problem. It further informs the statement of the problem, purpose of the study, questions and hypotheses, choice of instrument, and methodology of the study that has been used. In the main, it consists of the following:

- Theoretical practices.
- Constructs.
- Concepts and tenants of a theory (Zarei et al., 2018).

Based on the above definition, the following will form part of the theoretical framework for this study:

2.17.2 Relevant concepts and constructs

The following are some of the main concepts that are of high importance to this study and are under research; they also formed part of the questionnaire, and they are defined by Wang and Ahmed (2004) and Birkinshaw (2012).

Table 4: Relevant concept and construct to the study

Product Innovativeness	*Is referred to as perceived newness, novelty, originality, or uniqueness of products.*
Market Innovativeness	*Is the newness of approaches that organisations adopt to enter and exploit the targeted markets, this means that organisations can enter a market or identify a new market niche and launch products with cutting-edge technological content.*
Process Innovativeness	*Is introduction of new strategies of doing things in an organisation, it also refers to introduction of new management approaches, and new technology that can be used to improve delivery of service product and management processes.*
Behavioural Innovativeness	*It can be present at different levels: individuals, teams and management. Individual innovativeness can be considered as "a normally distributed underlying personality construct, which may be interpreted as a willingness to change" Team innovativeness is the team's adaptability to change Managerial innovativeness demonstrates the management's willingness to change, and commitment to encourage new ways of doing things, as well as the willingness to foster new ideas*
Strategic Innovativeness	*It is the development of new competitive strategies that create value for the organisation. The primary focus of strategic innovativeness to measure an organisation's ability to manage ambitious organisational objectives*
Planning Management Model	*This model is widely adopted in mature organisations where work is conducted in a linear manner and where the degree of predictability of the market evolutions is high.*

Quest Management Model	*Managers in this model set clear organisational goals and encourage employees to reach these objectives through a variety of means. In other words, employees are told what to do but not how to do it. The model is useful for established and growing organisations operating in a competitive arena and thus trying to differentiate themselves.*
Discovery Management Model	*This model is suitable for start-up ventures and small and medium organisations operating in an ambiguous, uncertain, and fast changing environment or for particular units of special projects in large, established organisations.*
Scientific Management Model	*The model is suggesting tight means and loose ends with formal rules and structures and authority in decision making, accompanied by intrinsic motivation approach and obliquity in achieving goals.*

2.18 Informing purpose of the study

The main purpose of this research is to determine the level of innovativeness in the six identified universities in Gauteng province, as well as to find out if they have any indices that they are using to measure their level of innovativeness. If they don't, then create an innovation index that each can use to measure its level of innovativeness.

The other aim was also to determine if they were using specific generic management models (as proposed by Birkinshaw, 2012) when implementing their strategic objectives. Therefore, the focus of this study is on the innovative practices and management models used in the implementation and management of digital learning in Gauteng universities. There are six universities in Gauteng province that were identified for this study. Each of them employs an average of 3,500 employees.

2.18.1 Informing statement of the problem

The problem statement is that during preliminary investigations, it was found out that some of these universities do not have innovation indices that they are using in order to

measure their level of innovativeness, and this study is meant to ascertain that and develop one for them.

2.18.2 Choice of research instrument and research methodology

This research will employ a quantitative methodology, collecting data from these six universities. The SPSS tool will be used to analyse the data and also come up with findings and recommendations.

During preliminary investigations at these universities using their different websites, annual reports, and speaking to relevant people, it was established that they all have an e-learning management system of some kind for certain modules, and others have distance learning programmes. It was also discovered that some have innovation initiatives that they are currently busy with. When it comes to using management models that have been cited by Wang and Ahmed (2004), it is not clear which ones are used in these universities.

The UNISA Google Scholar was used to search the above-related articles using the following key words: customers, innovation indices, innovation application, management models, e-learning, strategies, and planning. This research reviewed a few studies on the definition of the concept of innovation. An exceptional study conducted by Buyukbalci and Boukari (2017) comprehensively examines many categories of innovations, including product, market, process, behavioural, and strategic innovations.

There is agreement among numerous scholars on the four types of management models. These are discovery, quest, science, and planning models, which are regarded as generic by different scholars. In addition to the above, there is another management model called Total Quality Management (TQM). Some authors argue that it is relevant to universities in developed countries in that it has been proven that, if implemented, it can make universities produce and deliver quality training and development interventions. This study determined the management model that is relevant if universities want to become innovative, particularly in managing digital learning.

GII was discussed, and it revealed South Africa`s stance with regard to innovation and the framework for SMEs and different organisations. This is mainly because universities must disseminate knowledge to students who have to qualify as entrepreneurs. Considering this, innovation indices for universities were probed into and compared with those of institutions globally. Gupta et al. (2016) discovered that the higher the competitiveness of a brand, the higher its capability. This became an area of focus for the universities under investigation.

Several challenges, differing from country to country, have been identified by various scholars. Some of these generic challenges include a lack of skills, inadequate resources and credible strategies, insufficient state and government intervention, and issues with knowledge management. In agreement with the above, Zamani et al. (2016) as well as Gulati (2008) argue that the integration of Technology Enhanced Learning (TEL) in different developing nations has proven that there is a potential for e-learning initiatives to improve innovation in the education sector in many countries. However, poverty and a lack of ICT infrastructure are the main obstacles that may have a negative impact.

Furthermore, they divided the obstacles that such countries face into three categories. The first group is called personal challenges. This group includes factors that are associated with internal personal features, characteristics, behavioural habits, and management style. The second group is called attitudinal inhibitors. It encompasses internal variables that are more relevant to the attitudes and perspectives of users regarding e-learning features. The third group is called contextual inhibitors, which are relevant to external variables that comprise the lack of ICT skills and organisational support in the use of e-learning technologies and are cited as obstacles.

Hossain (2016) came up with the suggestion that in developing countries, organisations can be assisted by the establishment of innovation hubs relevant to university ICT departments. This approach will address the innovation-related challenges faced by these organisations. This study will look at what similar initiatives can be established for universities in order to be innovative and competitive. The role of the South African

Institute of Research Council, the National Research Council, and other research agencies will be looked at to determine what meaningful role they can play in increasing the level of innovativeness in these universities in Gauteng and in South Africa in general.

On the other hand, Wynarczyk (2013) suggests that for SMEs to be competitive, they have to focus more on Research and Development (R&D) initiatives. This is also applicable to universities because, for every organisation to be innovative, it has to upscale its research and development initiatives, and previous research will also be looked at in support of this approach.

Franco and Haase (2017) came up with a theory that suggests that for SMEs to be innovative, top-down communication should be discouraged and all employees should be allowed to participate in developing strategies. They call this approach collective wisdom. This study will incorporate this theory to assess its potential applicability to universities in Gauteng.

We looked at the issue of resources and their applications in innovation. According to Chesbrough (2017), when organisations choose a management model, they should choose one that will be compatible with innovation initiatives in order to be efficient and competitive. They recommend that the quest management model and the planning management model are the ones suitable for SMEs and organisations that are in their start-up phases. They also maintain that the Management Model Framework (MMF) should be used in order to determine if the management model is compatible with innovation initiatives or not. Hence, this study will also look at which management model will be suitable for these universities and which innovation initiatives should be used with them in order to promote efficiency.

Franco and Haase (2017) are of the view that the cooperative model should be adopted by SMEs in order for them to be innovative and competitive. The goal is to partner with and compete with other large, similar companies. Essentially, we are establishing a strategic partnership. This study will incorporate the theory of cooperation and collaboration, as it has demonstrated its ability to foster innovation in small and medium-sized enterprises (SMEs) in developed countries. We will investigate this from the

perspective of universities. This implies that we should also examine the cooperation between these universities and those in the global arena to ensure more robust collaboration in innovation.

Since innovativeness has been researched in the private sector in developed countries and was found to assist them in being innovative, technological entrepreneurship forms part of this literature review, and Kozlowski and Matejun (2015) are of the view that this approach can contribute to SMEs being innovative. This approach is one of the fundamental pillars that can contribute to the innovation and sustainability of SMEs. This research will investigate the applicability of this theory to universities in Gauteng province, resulting in new findings and recommendations.

Similarly, Baruk (2018) states that this concept of technological entrepreneurship can contribute to SMEs being innovative. This is because it is a systematic process that has proven to yield positive results in the past. This is based on creating an environment where everyone can generate ideas and come up with problem-solving techniques. The criteria for choosing the best concept should be in place, and monitoring and evaluation of that best concept should be undertaken to determine if it is working or not. If these have been proven to promote innovativeness in SMEs in the private sector, it is imperative to conduct the same research in universities in order to assist them in being competitive and sustainable; hence, this study will also use some of the research methodologies that have been used in the private sector in developed countries in order to ensure that universities are run like the corporate world with the intention of making them sustainable and professional.

Zanella et al. (2019) propose that Schumpeter's innovation theory, which defines innovation as any new policy an entrepreneur implements to lower production costs or boost product demand, and the economic development theory are integral components of this research. The research aims to identify management models and innovation initiatives that can foster innovation in Gauteng universities. The reason for mentioning this theory is because it has been proven that the private sector can make a profit by encouraging employees to achieve more with fewer resources, thereby making a profit. This study will also examine how universities can motivate their employees to exceed

expectations with limited resources, not only to increase profits but also to maintain sustainability and competitiveness. They also argue that strategic management does contribute to organisational innovation. It's important to conduct this study at these universities to determine if their strategies match their innovation strategies (if any) and to develop indices to measure their innovativeness.

2.19. Critical review of literature

When it comes to the definition of innovation, most scholars agree that it originates from Schumpeter's 1880 definition. Despite its evolution over time, the concept remains unchanged. Most of them claim that innovation is focused on products, markets, processes, strategies, and behaviours.

The one that is universal is the one proposed by Wang & Ahmed (2004), since it deals with all the above pillars. There seems to be an agreement among different scholars that innovation will result in organisational efficiency, productivity, flexibility, sustainability, and competitiveness.

On the concept of management models, there seems to be agreement that they are part of management decisions, systems, procedures, people, and organisational structure. However, Bodrozic and Adler (2017) argue that the concept of management models has not received significant scholarly attention. Nevertheless, there is consensus among them that management models prioritise the execution of strategic objectives to guarantee effectiveness and output, which is tantamount to making choices and establishing frameworks for attaining these strategic goals.

As per Buyukbalci and Boukari (2017), the quest and planning management model seemed to be the one that most of the scholars recommend being relevant to SMEs and organisations in developed countries because it has been found out that they will contribute to these organisations being innovative. This study aims to investigate the applicability of these management models to universities in Gauteng province and their potential to foster innovation. It has been proven by many researchers that innovation will ultimately lead to any organisation being competitive, especially if that organisation is using the correct management models. Global and national innovation indices have been developed and used to assess the level of innovation in different countries and in

different organisations. We will use this information to develop indices that these universities can use.

Hossain (2016) agrees with Al Sayed and Yang (2017) that universities in developed countries are facing the same challenges as those in developing countries when it comes to innovation. However, developed countries have overcome some of these challenges and are more advanced in innovation interventions and management models. Underdeveloped countries continue to face significant challenges. Hence, this study will focus on those universities in Gauteng Province, South Africa, since they are in a country that is still developing. There have been solutions that have been proposed previously on how to deal with the challenges facing universities, especially in developed countries. This research will also look at what solutions can be recommended for universities in Gauteng province and South Africa in general.

According to the previous research mentioned earlier in this chapter, the states and governments of other countries have played an important role in assisting organisations when it comes to innovation and the use of management models. When dealing with recommendations, the role that must be played by the South African government will be looked at.

Technological innovation played an affective role, according to the research cited above, and this will be exploited further in this research. Understanding how innovation systems work requires analysing the actors and institutions that contribute to innovation in a particular geographic region, sector, technological area, or level of analysis. Individuals and organisation s operating at multiple scales (e.g., central governments, local authorities, universities) are typically considered actors.

Strategic management and organisational culture have also been cited as one of the main concepts that can contribute to universities in developed countries being innovative, especially when it comes to e-learning (Anadon et al., 2016). This will be looked at during the research process when it comes to universities under investigation.

Hossain (2015) found out that there are several key issues regarding open innovation in SMEs. One of those issues is that there are a limited number of studies in top-notch

journals when it comes to organisational innovativeness. Scholars from the European Union have played a major role in the literature around this subject of organisational innovativeness. Some Asian countries, such as China, South Korea, and Taiwan, have been explored to a considerable extent. Simple statistical analyses are used in most of the studies. Hence, future studies should adopt highly sophisticated analysis techniques. Unlike large firms, support for SMEs from the state and other agencies is crucial. Therefore, policy developments that assist SMEs and universities in fostering open innovation require significant attention in future research. Scholars need to develop a nexus between innovation and entrepreneurship to advise policymakers. Absorptive and disruptive capacities are limitedly and unsystematically practiced by universities and SMEs. However, open innovation requires universities and SMEs to adjust their strategies for absorptive and disruptive capacities. Innovation involves various issues, such as culture and trust. However, these issues remain unexplored in the existing literature. This study will look at open innovation in universities, particularly in underdeveloped countries, and compare it to research conducted in SMEs and other universities around the world.

Janeiro, Proença, and Gonçalves (2014) argue that the current economic environment is driving organisations to become more competitive and innovative. Researchers such as Chesbrough (2003) and Prahalad and Krishnan (2008) show that organisations are accessing global networks in which they are able not only to capitalise on all existing knowledge but also to develop their own innovation activities. Such networks represent new means of adapting to competitive contexts, avoiding high fixed costs, offsetting risks, and expanding the scope of innovative success. Thus, the ability to access these networks becomes a new competitive advantage that is capable of providing long-term strategic competitiveness. Based on the above, it shows that the economic condition within a country plays an important role in making sure that organisations are able to be innovative and competitive.

Chesbrough (2003) describes this new paradigm of open innovation as a way for organisations to collaborate with external innovation sources and develop new products or services. Competitors, suppliers, and customer agencies are some examples of external innovation sources that organisation s can use in the course of their innovation

activities. Therefore, this research will look at what kind of collaboration and partnership interventions these universities have with external stakeholders as part of their community engagement strategies, partnerships, and engagements.

Socio-Technical theory is the one that underpins this study. This is because this research is about organisational innovativeness in the universities in Gauteng province. The aim of these is to determine the level of innovativeness and whether these universities have an index to measure their level of innovativeness. The choice of this is because this system is about human elements of the system, including the people who work in these universities and are part of the organisational structure of them. Moreover, the social technical theory focuses on the organisational culture, where innovativeness plays a crucial role in determining the efficiency of any given organisation. This is also supported by Franco and Haase (2017). Therefore, this constitutes the primary theoretical framework for this study.

2.20. Summary

The researcher has reviewed articles mentioned above dealing specifically with the understanding of the concept of innovation and management models, what management model has been compatible with innovation, what is the role of the state in ensuring that universities are innovative, what is the role of strategic management, and organisational culture in the private sector and universities when it comes to being innovative. In assessing the concept of innovation and the management model, it can be concluded that there is agreement between different scholars' previous articles, as mentioned above. There is also a strong belief that strategic management, the state, and the organisational culture play a critical role in determining whether an organisation is innovative or not. When it comes to which management model is recommended for SMEs, there is agreement that the Quest and Planning model is relevant to SMEs as compared to other management models. This will be looked at extensively when the questionnaire is circulated to participants in these universities to determine which management models can assist these universities in being innovative, sustainable, and competitive.

Other countries do have some innovation indices that have been developed to determine the level of innovation among SMEs and universities; this will form part of this research going forward. Based on the above definitions, the researcher came up with the definition of innovation as a management process in any organisation that seeks to introduce new ways of doing things in order to achieve better and improved outcomes. This can be in the form of new processes, procedures, products, structures, and services.

CHAPTER 3 RESEARCH METHODOLOGY

3.1. Introduction

The previous chapter provided a detailed review of the literature, focusing on the innovation and management models used in the implementation and management of digital learning in Gauteng universities. A theoretical framework was developed for the study in order to uncover the key philosophies, variables, associations, and phenomena guiding the study in the alignment of relevant literature.

This chapter will present various scholars' definitions of research methodology. This chapter will also emphasise the significance of implementing a sound research methodology during the research process. Research design forms part of this chapter and describes the investigation approach that will be followed. We will situate this within the context of broader research paradigms.

The justification for why the quantitative approach was chosen will be discussed. The research design is quantitative, based on the study's goals and objectives. The data collection and different methods that have been used to obtain and analyse the data will also be discussed. The process of population and sampling is further explained in order to highlight the processes followed in identifying the population and how it was sampled. The criteria and strategies that have been used when selecting participants will also be discussed in this chapter. Descriptions of the systems that have been used for collecting and storing data will be explained.

This chapter will demonstrate that data collection was based on probability sampling because the research methodology was quantitative. The approach was systematic, incorporating strict controls to reduce bias and enhance objectivity in the interpretation process. Procedures and instruments used in this research will form part of this chapter, along with their importance and what criteria were used to choose them.

The process of developing questionnaires for participants will be highlighted. This is to clarify what kind of matrix was used to develop those questionnaires. A discussion of how these questions were developed will form part of this chapter.

Based on the above, ethics will be followed, with the intention of ensuring that the findings are trustworthy, valid, and reliable. The limitations of the study will be discussed and, ultimately, a conclusion drawn.

3.2. Different kinds of research methodologies

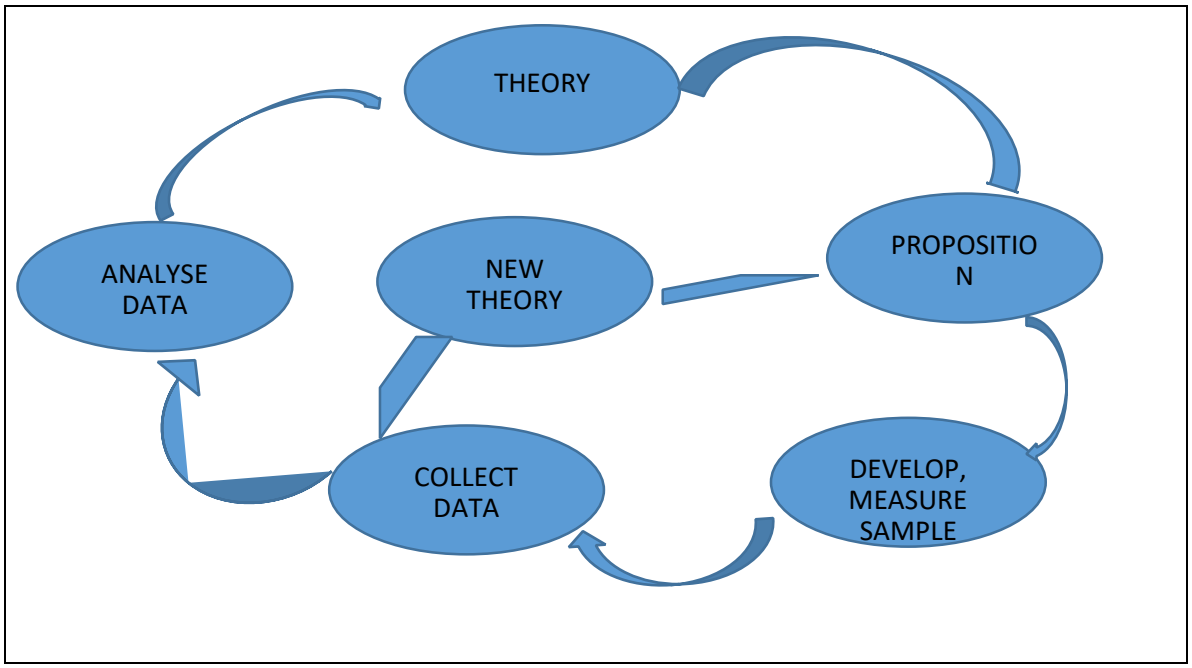
A research problem can be conceptualised in a cardinal way. Simply defined, quantitative research generates numerical data that can be converted into numerical values. Qualitative research, on the other hand, brings forth non-numerical data. It directs attention to how to gather spoken data rather than measurement. Gathered content is analysed in an informative, subjective, impressionist, or even identificationist style. The primary aim of quantitative research focuses more on counting and classifying features and constructing statistical models and figures to explain what is observed (Clark et al., 2008). Based on the aforementioned analogy, quantitative research is an ideal fit for this study.

3.3. Research design

Research design is a strategy or plan that moves from underlying philosophical assumptions to specifying the selection of respondents, the data gathering techniques to be used, and the data analysis to be done (Tichapondwa et al., 2018).

Taylor et al. (2016) define research design as plans and strategies that are developed to seek and discover answers to research questions. According to Šimić et al. (2021), a research design is the plan of action or structure that links the philosophical foundation and the methodological assumption or research approach to its research methods.

Figure 2: Tichapondwa (2013). Illustrate the research design process"



The research design process, as proposed by Tichapondwa (2013), aligns with the process depicted in Figure 3. As per the above figure, the process started with the development and testing of a theory, and a proposition was developed. The population and sample were determined to be six universities located in the Gauteng province, together with a specified group of staff from those universities, as previously mentioned. This cohort consists of lecturers and managers in these universities, as they are responsible for the development and implementation of policies and strategies. Data was then collected from them in the form of a questionnaire that was distributed to participants after getting permission from the ethics committees at these universities. Data analysis was conducted using the SPSS research instrument. A new theory, which in this case is the innovation indices that these universities can use to measure their level of innovation, has been developed, and lastly, it was recommended on which management models they can use with innovativeness dimensions in order for them to be efficient and competitive.

Welman (2018) concurs with the preceding statement and elaborates that the research design must specify the number of groups that should be employed in order to determine which statistical techniques to employ. Whether these groups should be randomly

selected from the populations in question and whether they should be assigned to groups at random. The questionnaire will be sent to them via email using the provided link, and they will respond voluntarily.

We understand research design as a specific combination of decisions within a research process, enabling us to make a specific type of argument by answering the research question. By type of argument, we mean theory improved from our research without any connotations about the argument's direction. In other words, the research design is the implementation plan for the research study by Stefan Hunziker and Michael Blankenagel (2021).

Rashid and Alias (2018) define a research design as "a blueprint for conducting a study with maximum control over factors that may interfere with the validity of the findings." (Frempong) describes a research design as "a plan that describes how, when, and where data are to be collected and analysed." Polit et al. (2001:167) define a research design as "the researcher's overall approach to answering the research question or testing the research hypothesis." This study focuses on the innovativeness and use of management models in Gauteng universities. The research approach is non-experimental, quantitative, and contextual. Data was collected using the above questionnaire.

This research started in 2018 and was completed in 2023. According to preliminary investigations, it was clear that most of these universities do not have indices to measure innovativeness, and they are also not using any of the proposed generic management models in implementing their strategies. It was also found out that others are using some of these concepts unknowingly for survival.

There are currently 26 public universities in South Africa; seven of these are in Gauteng province, as per Statistics South Africa (STATSA) (2017). This research aims to examine the level of innovation at six universities in Gauteng province excluding UNISA, as mentioned in the introduction. The findings will be relevant to all universities in South Africa, given that they are all located in the same country. The reason for excluding

UNISA is because it is purely using open and distance learning (ODL), and for the sake of managing and collecting data, UNISA has many schools and faculties and a huge number of employees, and this will be a mammoth task if it can be included.

The table below depicts the number of universities that were targeted and the participants that are targeted. At this stage, there are no specific schools or departments that are targeted, meaning all senior Academics and Non-Academics will form part of the sample, as well as those who are in management positions.

Table 5: List of Universities taking part in this study.

TABLE OF UNIVERSITIES TARGETED AND NUMBER OF PARTICIPANTS			
NO	**NAME OF UNIVERSITY**	**NUMBER PARTICIPANTS**	**DEPARTMENT /SCHOOL**
1	**UNIVERSITY OF WITWATERSRAND**	**±100**	**ALL**
2	**UNIVERSITY OF JOHANNESBURG**	**±100**	**ALL**
3	**SEFAKO MAKGATHO UNIVERSITY**	**±100**	**ALL**
4	**UNIVERSITY OF PRETORIA**	**±100**	**ALL**
5	**TSHWANE UNIVERSITY OF TECHNOLOGY**	**±100**	**ALL**
6	**VAAL UNIVERSITY OF TECHNOLOGY**	**±100**	**ALL**

The researcher basically implemented the following steps recommended by Tichapondwa (2013): testing the theory, proposing a hypothesis, developing measures, creating a sample, collecting data, analysing the data, and considering the implications of the hypothesis.

3.5. Research approach

The research approach is a plan and procedure that consists of steps from broad assumptions to detailed methods of data collection, analysis, and interpretation. It is,

therefore, based on the nature of the research problem being addressed (Saunders and Bezzina, 2015). Based on this definition and previous chapters, data collection was done using a questionnaire, and it was analysed using different methods like Confirmatory Factor Analysis and deductive approaches. The SPSS tool was also used to analyse the data. There are three research approaches i.e. abductive, inductive and deductive approaches.

Abductive research is a dynamic approach that combines elements of both inductive and deductive reasoning. It starts with an observation or puzzle that doesn't fit existing theories, and then seeks to find the best possible explanation by generating and testing hypotheses. It further involves data collection, analysis, and discover new knowledge or insights. Abductive reasoning serves the purpose of making sense of surprising, ambiguous, or otherwise puzzling phenomena in order to fill the gaps in our beliefs, maintaining or restoring their coherence. This type of reasoning is ubiquitous in both professional contexts such as scientific research, forensic investigation, clinical diagnose, and everyday ones such as natural language understanding, empathy, and theory of mind Żelechowska, et al., (2020).

Żelechowska, et al., (2020) also describe inductive research as a bottom-up approach where the researcher starts with observing a problem and then begin with collecting and analysing data and ultimately develop a new framework. Based on the above this research adopted inductive research approach since it all started with observing and problem, followed by data collection and analysing it, and ultimately came up with a new framework in the form of an index that these universities can use to measure their level of innovativeness. They further define deductive research as a top-down approach where you start with a general theory or hypothesis and then test it by collecting specific data. However, this was not applicable in this research. Both deductive and adductive research approaches are not applicable to this study.

3.6. Research method– Quantitative

All chapters in any thesis are important, but some are more important than others. The research methodology chapter is the most important one because it explains each step

the researcher will follow in order to conduct the research (Pajares, 2007). Based on the above assertion, this chapter is about research methodology, specifically quantitative research approaches. This chapter builds on the research problems and research questions discussed in previous chapters. The research approach that has been chosen is dependent on the research question. To collect the data, the researcher developed a questionnaire and circulate it to lecturers and managers in all six targeted universities around Gauteng province. This study used quantitative research methodology to collect data, and a questionnaire was used to collect empirical data. The research instrument that was used to analyse and collect data was SPSS previously indicated. The questionnaire used a five-point Linkert scale, ranging from 1=strongly disagree, 2= disagree, 3=neither 4= agree 5=strongly agree. This approach was adopted to reduce uninformed responses, as explained previously. A total of more than 60 questions were developed based on answering the research question and addressing the objective of the research. The questionnaire covered demographics, innovation and innovativeness, digital learning, and management models, as well as key incentives and inhibitors in the use of innovation as suggested by literature. It was also to be expected that categories for analysis will emerge from the nature of the questionnaire. Therefore, the researcher was able to commence data collection with an initial set of categories derived from the questions covered. In closing the positivism approach as a research paradigm was adopted as mentioned in the above chapters. The reason being that this approach is based on the idea that reality is objective and can be measured and quantified and put more emphasis to scientific methods when conducting data analysis (SPSS).

3.7. Data analysis

Data analysis was carried out in relation to the research problem. The data was analysed using the responses that have been received from participants after distributing a questionnaire using the SPSS research instrument. The aim was to extract and provide useful information and credible evidence concerning the constructs and factors under study. After data analysis, the researcher developed recommendations.

3.8. Research Paradigm and Philosophy

Kaushik and Walsh (2019) define research paradigms as conceptual and practical "tools" that are used to solve specific research problems. In other words, paradigms function as heuristics in social research. They further explained that each paradigm has a different perspective on the axiology, ontology, epistemology, methodology, and rhetoric of research. Hence, the researcher was mindful of values and ethical considerations when conducting the research, more specifically when developing the questionnaire. In brief, for instance, post-positivism, one of the older approaches to social research, is often associated with quantitative methods and highly formal rhetoric that focuses on precision, generalisability, reliability, and replicability. Post-positivist researchers view inquiry as a series of logically related steps and make claims about knowledge based on objectivity, standardisation, deductive reasoning, and control within the research process.

Introduced by Kuhn (1970), the term paradigm was used to discuss the shared generalisations, beliefs, and values of a community of specialists regarding the nature of reality and knowledge. Paradigms are conceptual and practical "tools" that are used to solve specific research problems. In other words, paradigms function as heuristics in social research. Each paradigm has a different perspective on the axiology, ontology, epistemology, methodology, and rhetoric of research. This research followed the same paradigm.

Haase and Myers (1998) also concur with the above and define a paradigm as a world view of a subject that includes its underlying philosophy and the assumptions inherent in that view. A research philosophy, on the other hand, is a belief about the way in which data should be gathered, analysed, and used. According to them, there are two major research philosophies or paradigms: positivist and anti-positivist. They argue that positivism is a research philosophy that uses numerical data and is associated with quantitative data collection. On the other hand, they also argue that anti-positivist is a research philosophy that uses interviews and is associated with qualitative data collection. However, this study employed positivism instead of anti-positivism, as it is primarily focused on numerical data.

Finally, pragmatism is a paradigm that claims to bridge the gap between the scientific method and structuralist orientation of older approaches, as well as the naturalistic methods and freewheeling orientation of newer approaches (Creswell, 2014). Therefore, this study followed a scientific approach when collecting data.

The term research philosophy refers to a system of beliefs and assumptions about the development of knowledge. Although this sounds rather profound, it is precisely what you are doing when embarking on research: developing knowledge in a particular field. A research philosophy is also a belief about the way in which data should be gathered, analysed, and used. The term epistemology (what is known to be true) as opposed to doxology (what is believed to be true) encompasses the various philosophies of research approaches (Saunders and Townsend, 2018). In this study, data was collected using a questionnaire in order to determine what the truth is (epistemology). It was then analysed using the SPSS tool.

Positivism relates to the importance of what is given in general, with a stricter focus on considering pure data as well as facts without being influenced by the interpretation of human bias (Alharahsheh and Pius, 2020). This study followed a positivist approach because numerical data as well as facts based on the responses were used. The researcher also viewed the targeted universities as real, adopting a perspective similar to that of physical objects as natural phenomena and using only pure data. The interpretation and analysis of the data was done with the intention of achieving the aim and objectives of this research.

3.9. Research strategy

Extrinsic is an aggregate view chosen to enable the research questions to be answered. Evident phenomena and prejudiced significance can provide satisfactory knowledge, depending on the research questions. The direction is applicable practical research, integrating assorted views to help construe the data. The research project was therefore channelled into two phases. In the basic phase, data was gathered from the questionnaires that was given to senior managers and lectures in these universities

and was analysed. The results, once saturated, were interpreted using theories of innovation and management models in order to detail affiliated issues. In the second phase, a comprehensive literature review was conducted that can provide an extended theoretic basis that can help alter the second data analysis.

3.10. Research Time Horizon

The 'snapshot' time horizon is what researchers call cross-sectional, while the 'diary' perspective is called longitudinal (Saunders and Tosey, 2019). In this study, the researcher examined the innovation and application of management models in these targeted universities over a period of one to two years, depending on the responses received. This would therefore be a longitudinal case study.

3.11. Population of the research study

According to Saunders and Tosey (2019), the full set of instances from which a sample is taken is called the population. In sampling, the term 'population' is used in its normal sense. For research to detect comparative levels of innovation at these targeted universities, the population from which the researcher would select his sample would be all six universities in Gauteng province. The six universities were Wits University, Sefako Makgatho Health Sciences University, the University of Johannesburg, Vaal University of Technology, Tshwane University of Technology, and the University of Pretoria. The origins of Wits University lie in the South African School of Mines, which was established in Kimberley in 1896 and transferred to Johannesburg as the Transvaal Technical Institute in 1904, becoming the Transvaal University College in 1906 and renaming the South African School of Mines and Technology four years later. Other departments were added as Johannesburg grew, and in 1920, the name was changed to the University College. Full university status was granted in 1922, incorporating the college as the University of the Witwatersrand, with effect March 1. Seven months later, the inauguration of the university was duly celebrated. Prince Arthur of Connaught, Governor-General of the Union of South Africa, became the university's first Chancellor, and Professor Jan H. Hofmeyer became its first principal (Annual Report Department of Higher Education, 2019).

Sefako Makgatho Health Sciences University was initially called MEDUNSA and was established in 2015. It was later amalgamated with the University of Limpopo, and in 2015, it was disestablished from the University of Limpopo and was called Sefako Makgatho Health Sciences University.

The University of Pretoria was established in 1908, and it still exists under that name. The Tshwane University of Technology was established in January 2004. Vaal University of Technology was established in January 2004. The University of Johannesburg was formed because of the merger between the former Technikon Witwatersrand, Vista University, and Rand Afrikaans University on January 1, 2005.

3.12. Sample size and sampling strategy of the study

According to Skinner and Wakefield (2017), probability proportional to size (PPS) sampling is a method of sampling from a finite population in which a size measure is available for each population unit before sampling and where the probability of selecting a unit is proportional to its size. Its use arises in two particular contexts: (i) multistage sampling and (ii) single-stage sampling of establishments. Unbiased estimation is obtained using the Hansen-Hurvitz estimator in the case of PPS with replacement sampling and the Horvitz-Thompson estimator in the case of probability proportional to size without replacement (PPSWOR) sampling. The estimation of variance is also discussed. According to the previous discussion, this study used the aforementioned approach.

As per Wetshoreck (2020), the Predictive Power Score (PPS) can be applied to numeric and categorical columns, and it is asymmetric. There are many possible ways to calculate a score that satisfies the principles of (PPS). This matrix can be used as an alternative to the correlation matrix to detect and understand linear or nonlinear patterns in data; therefore, this matrix will be part of this research. Sampling provides a valid alternative to a census when it is impracticable for the researcher to survey the entire population and because budget constraints prevent the researcher from surveying the entire population.

Sampling is typically the process of selecting a proportional sample for a study. With the preliminary aim of gathering opinions that are likely to be representative of the whole group, it is thus used to draw from the views of larger groups (Carey and Asbury, 2016). The target population for this study is all six universities in Gauteng province, and the sample size was derived from the lecturers, senior lecturers, managers, and senior managers of these six universities.

Notably, probability sampling techniques are predominantly used in quantitative oriented studies and entail choosing a reasonably small number of units from a population or from specific subgroups (strata) of a population in a random manner where the probability of inclusion for every member of the population is determinable (Winkel et al., 2018). In this study, a random sample of senior management and lectures from these universities was included.

The criteria that the researcher used to choose public universities as opposed to private universities and business schools were the following:

- The majority of the universities are characterised as traditional public universities, and therefore, from the higher sampling, there is a prospect of drawing accurate results and generalizability.
- Lack of funds and time limited the conduct of a study among the entire scope of universities that combine academic and vocationally oriented education.
- The statistics done by the International Education Association of South Africa (IEASA, 2007) portray that traditional (conventional) universities offer bachelor's degrees and have a strong research capacity and high proportions of postgraduate students compared to the others. Therefore, this implicit reality of strong research capacity and higher proportions of students' activities can depict that traditional universities are more involved in practice and engagement within time-intensiveness and technology use for their facilitation and learning processes. This draws together and summarises a set of observations that are seen as important for the study.
- The other issue is that public universities are governed by the same government regulations and also get funding from the government.

- The other reason is because private universities in South Africa are a new phenomenon that started around 1994 after democracy, and most of the business schools are operating autonomously under different management styles.

3.13. Reliability

In quantitative research, reliability refers to the repeatability, replicability, and consistency of the research, that is, the extent to which it can be reproduced. Reliability can be measured internally or externally. Internal reliability is the extent to which data collection, analysis, and interpretation are consistent given the same conditions, while external reliability is the extent to which independent studies can replicate studies in the same or similar conditions (Drost, 2011).

Reliability and validity are empirical research characteristics that date back to early scientific practice. The concept of reliability broadly describes the extent to which results are reproducible, for example, from one test to another or between two judges of behaviour. Whereas reliability describes the degree to which a measure produces the same answer, validity is the degree to which a measure gives the correct answer (McDonald et al., 2019).

Krippendorff (2018) proposed three types of reliability: replicability of results across coders (i.e., IRR), stability or consistency of a single coder's use of codes over time, and accuracy of an established coding scheme compared with others. These definitions highlight the complexity of reliability and the corresponding struggles in social science disciplines to translate and adapt an evolving concept to their own fields. In this study, quixotic reliability was not applicable; instead, the replicability of results across coder types was used. The reason for this was that the researcher employed two different statisticians, both of whom arrived at the same findings.

3.14. Validity

Tichapondwa (2013) argues that in quantitative research there are two types of validity, namely, internal validity and external validity. Internal validity is the extent to which research results can be accurately interpreted, while external validity is the extent to which research results can be generalised to populations and conditions.

Shadish et al. (2019) present four types of validity, the two most discussed of which are internal and external validity. Internal validity refers to whether the observed effects are due to the identified variable(s) and not some other factors, whereas external validity refers to the generalisability of the study's results to other groups, contexts, or time periods. Researchers will want to consider both forms of validity within their research design—considering alternative explanations for what they observe (internal validity) and assessing how current observations may or may not apply to other contexts (external validity). According to the aforementioned definitions, internal validity is the most appropriate for this research as it focuses on the internal variables occurring within these universities. More specifically, participants were asked direct questions to determine if there is organisational innovativeness in their universities, and this has nothing to do with external issues. The way the questions were structured forced them to respond to the situation within their universities.

Researchers will inevitably be concerned with validity when they design, implement, and interpret their study. Broadly speaking, and more in line with the positivist paradigm, validity relates to whether the result or interpretation is correct. Although the concept is most clearly applicable to experiments and quasi-experiments, it is also relevant to other quantitative and qualitative methods (Sovacool et al., 2020). In this study, the researcher looked comprehensively at the issue of validity when interpreting and analysing data using SPSS. It was also found out that cause-and-effect relationships exist because the results stemmed from independent variables within their respective universities and not extraneous factors. Even the constructs that were used as part of a questionnaire were validated and measured the important aspect of the concept of innovativeness and management models.

3.15. Ethical consideration and procedures

The rules and regulations available at UNISA (SBL) were used, and the questions to be asked during the structured questionnaire were approved by the ethics committee. The statistics expert helped to fine-tune the questions to ensure that the correct statistics can be done to ensure a dependable framework and recommendations.

Research often involves a great deal of cooperation and coordination among many different people in different disciplines and institutions. Ethical standards promote the values that are essential to collaborative work, such as trust, accountability, mutual respect, and fairness (Tichapondwa, 2013). Based on the above, this research was conducted in collaboration with different experts in this field of study.

3.16. Limitations

The research is limited by the existence of private universities, business schools, and colleges in Gauteng province. This study will not include private universities, and UNISA will not be included due to the aforementioned reasons.

3.17. Summary

This research used quantitative methodology to collect data and, after that, data analysis was conducted in order to come to a conclusion. This was in the form of a questionnaire that was developed and distributed to the targeted participants at these universities. Prior to the distribution, the researcher ensured that permission from these universities' ethics committees was obtained. Participation in this study was voluntary, and the anonymity of participants was guaranteed.

CHAPTER 4 PRESENTATION AND INTERPRETATION OF THE FINDINGS

4.1 Introduction

The previous chapter dealt with research methodology; it outlines the exact steps taken to conduct the research. This transparency allows researchers to assess the trustworthiness and reliability of their findings. By understanding how the data was collected and analysed, it was determined whether the methods were appropriate and whether any biases might have been introduced. It further explained why the researcher chose specific methods for data collection and analysis. This justification demonstrates that the researcher carefully considered different approaches and selected the most suitable ones for the research question. This chapter will first revisit the research question and the objectives of the study that were mentioned in the previous chapters. This will demonstrate that the study results answered the research question. Secondly, it will describe the questionnaire used for data collection to make sure that there is alignment between the constructs and the study objectives. This will be followed by a description of the demographic characteristics of the participants, which will be presented in tables and graphs. The validity and reliability of the study instrument will be discussed in detail, and this will be followed by the results that answer the objectives of the study. The aspects of validity (construct validity) and reliability (internal consistency and reliability) of the questionnaire will be tested.

This chapter will explain the detailed data analysis used to describe the constructs that help answer the research question. The rationale for how the data were analysed will form part of this chapter. This data analysis process will be based on the research questions, study objectives, problem statement, and conceptual framework mentioned at the beginning. The findings of this study are logically based on the problem, research questions, and design. Narrative data are connected and synthesised through substantive explanatory text, tables, and graphs. This will be followed by discussions and conclusions on data analysis and findings. The next chapter will deal with the conclusion and recommendations.

4.2 Study Objectives and Research question

The purpose of this research was to assess the level of organisational innovation in six universities in Gauteng province. Additionally, the study aimed to determine if these universities currently use any innovation indices to measure their innovativeness. If not, the researcher will develop one for them, following the previous guidelines recommended by researchers who have conducted similar research in the private sector and in developed countries.

The study also wanted to determine if these universities do have generic management models that they are using to assist them in being efficient and competitive, especially when it comes to digital learning. Lastly, to determine if there are any organisational ambidexterity interventions in these universities, check if they exist and if they are aligned with their overall organisational strategies.

The research question revolves around determining what variables are needed to create a framework or indices that universities could use to calculate their level of innovativeness and what the degree of compatibility is between innovation strategies and management models, especially when it comes to digital learning. The main question is: Do these universities currently use an innovation index to measure their level of innovativeness, and if not, are they considering developing one? There are also sub-questions that have been discussed previously regarding management models, digital learning, and compatibility with innovation interventions. All of these questions are about coming up with a solution and making sure that these universities are sustainable, competitive, and efficient.

The following are some of the additional sub-questions that this study wanted to address: How will the innovation indices for each university in Gauteng compare with a national innovation index? Which management model would be best for these universities in Gauteng? What is the level of compatibility between management models, innovation indices, organisational ambidexterity, and digital learning?

4.3 Survey instrument

The main purpose of this study was to determine the level of innovativeness and availability of innovation indices in the six universities in Gauteng Province, South Africa. The questionnaire used for this study was developed using relevant literature and consists of demographic information and three (3) domains: organisational innovativeness, management models, and digital learning. The participants' demographic profile includes their university name, position, year of employment at the university, gender, and age. The questionnaire was developed using the constructs from Wang and Ahmed (2004); other constructs were developed with the assistance of a professional statistician, and they were validated using Exploratory Factor Analysis (EFA) and other statistical protocols. After those constructs were proven to be valid and reliable and a questionnaire was certified and approved by the statistician, it was ready to be circulated. During the process of distributing the questionnaire to participants in different universities, their Ethics Committees wanted to first look at the questionnaire, the research proposal, and other documents in line with their policies. After eight months, approval was granted from all six universities' Ethics Committees for them to distribute the questionnaires using the Microsoft 365 link. The challenges that were experienced were reluctance to grant clearance to distribute the questionnaire, and at some instances, presentations were made in persuading those in these Ethics Committees to grant permission; hence, it took eight months before the permission was granted.

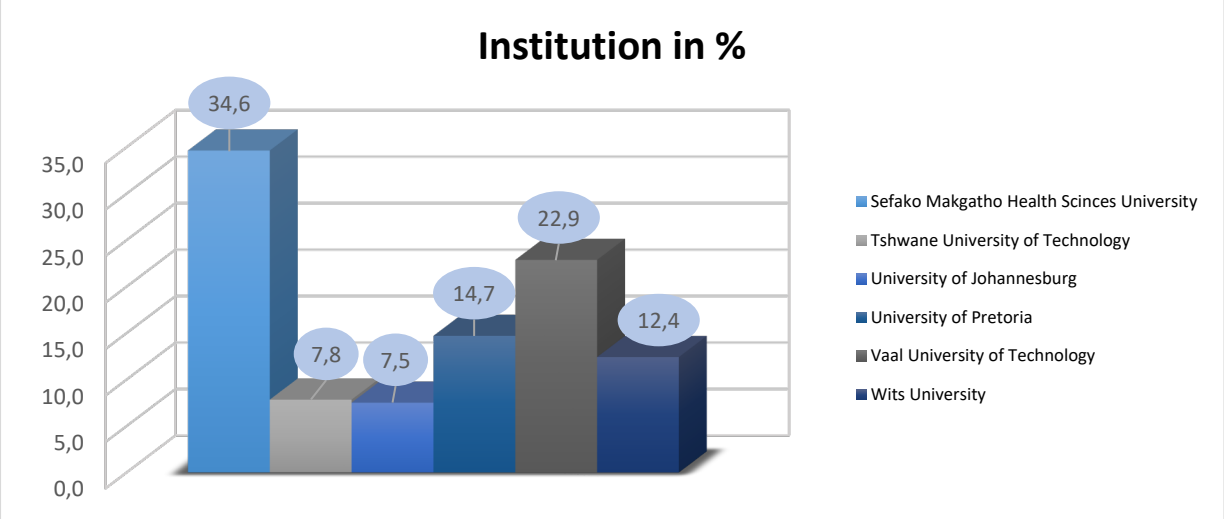
4..4. Demographic statistics

This section is about the profiles of the respondents. These frequency tables are used to explain and describe the demographic profile of the respondents from all six universities. The table includes the name of the university, the years of employment the respondent has been working at the university, their gender, their age group, and the position they are employed at. The sample consisted of 306 respondents. The demographic results are presented below.

Table 6: Name of university and number of participants

	Frequency	Percentage
Sefako Makgatho Health Sciences University	106	34,6
Tshwane University of Technology	24	7,8
University of Johannesburg	23	7,5
University of Pretoria	45	14,7
Vaal University of Technology	70	2,9
Wits University	38	12,4
Total	306	100

Figure 3: Name of universities and percentages

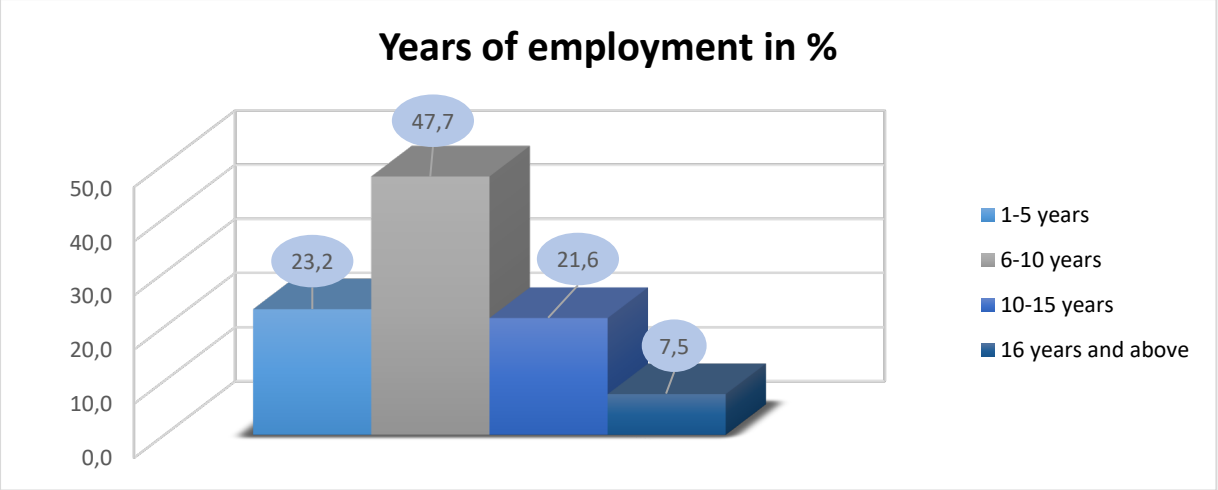


According to the results of the table and the graph above, Sefako Makgatho Health Sciences University (SMU) showed that 34.6% of its employees responded, and this represents the highest number of those who responded. Vaal University of Technology (VUT) came in second with 22.9%, followed by the University of Pretoria (UP) with 14.7%, and Wits University (Wits) with a response rate of 12.4%. Tshwane University of Technology (TUT) stands at 7.8%, and lastly, the University of Johannesburg (UJ) stands at 7.5%.

Table 7: Years of employment in your university

	Frequency	Percentage
1-5 years	71	23,2
6-10 years	146	47,7
10-15 years	66	21,6
16 years and above	23	7,5
Total	306	100

Figure 4: Years of employment in %



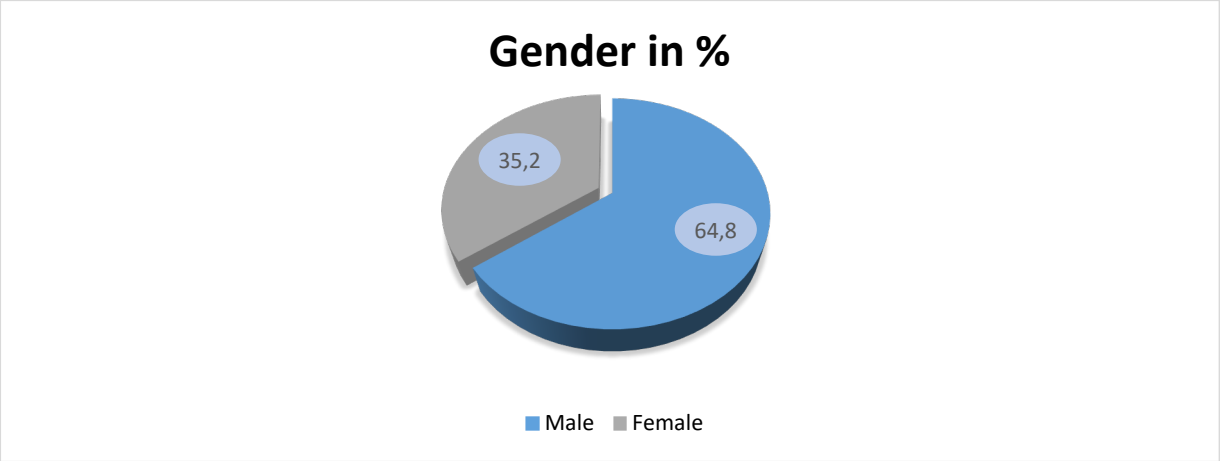
The above table and graph are about the number of years that respondents have spent at their respective universities. Both show that the highest number is 47.7% of respondents who have been working in these universities between 6 and 10 years, followed by 23.2% of those who have been working between 1 and 5 years, 21.6% of those who have been working between 10 and 15 years, and lastly, 7.5% of those with more than 16 years of work experience in their respective universities. Based on these statistics, it can be concluded that a number of respondents have been working in these universities for a very long time, and they are conversant with the existing policies and processes that are in their respective universities. Therefore, their responses can be

regarded as coming from an informed decision and should be regarded as valid and reliable.

Table 8: Gender

	Frequency	Percentage
Male	195	64,8
Female	106	35,2
Total	301	100
Missing	5	
	306	

Figure 5: Gender in %

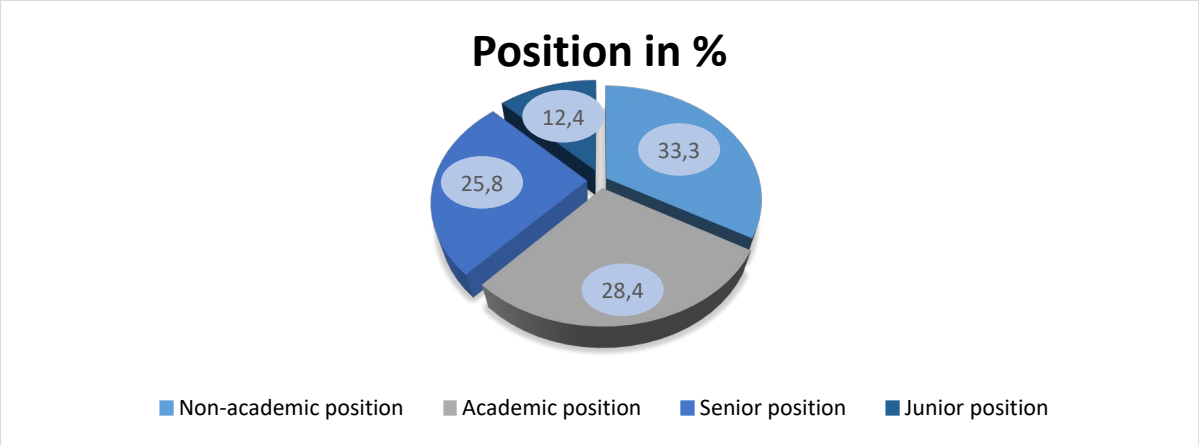


The above table and figure represent the gender of all respondents from all these universities. According to the above, there are 64.8% of males and 35.2% of females. Which means that the number of males is greater than the number of females. This may be due to the fact that there are more males than females in all universities in this province. This is true since it has been attested by Statistics South Africa (STATSSA) in its fourth quarter of the Economically Active Population (EAP) in Gauteng province in 2022.

Table 9: Positions of different participants

	Frequency	Percentage
Non-academic position (Executive Management positions)	102	33,3
Academic position (Executive Management positions)	87	28,4
Non-Academic positions (Senior and Middle Management position)	79	25,8
Academic Positions (Senior and Middle Management Positions)	38	12,4
Total	**306**	**100**

Figure 6: Position in percentages



According to the results presented in the above table and graph, 33.3% of the respondents are from non-academic staff (Executive Management) and 28.4% of the respondents are from academic staff (Executive Management). There are also 25.8% non-academic positions (Senior and Middle Management positions) and 12.4% from Academic Positions (Senior and Middle Management Positions). This demonstrates that the participants represent both senior management and executive management, along with support staff and academic staff, who are primarily responsible for the development and execution of the university's strategy. According to the above statistics, all

employees, both senior management and executive management, participated in this research.

4.5 Statistical data analysis

In this section of statistical data analysis, the process of analysing the collected data was analysed, focusing on using the statistical methods mentioned below to extract knowledge from the data. The following steps were followed during this process:

Define research question or hypothesis: The research question was revisited in order to understand and determine what the study wanted to prove. This was guided by the statistical methods mentioned in this section below.

Plan the study design: an explanation has been provided on how data was collected. In this case, a questionnaire was used and distributed to the targeted population and the sample.

Collect data: The data collection process that was followed was the one using the questionnaire. This questionnaire was made up of constructs and statements that were validated using Exploratory Factor Analysis (EFA) in order to ensure that they were valid.

Descriptive statistics methods were also used in order to summarise the data using measures like mean, median, standard deviation, and frequency tables. This provided a basic understanding of the central tendency, dispersion, and distribution of the collected data.

Choose appropriate statistical tests: The statistical tests that best suit this study were used, like, for example, ANOVA, P-value, etc.

Interpretation of results: The results were interpreted and explained, taking into consideration the research questions and aims of this study.

Communicate findings: The presentation of the statistical data was done in a clear and concise way using tables, graphs, and non-technical explanations.

4.5.1 The questionnaire's various constructs are described.

Table 10 below depicts the different constructs that formed part of the questionnaire.

Table 10: Different Constructs of Questionnaire

Domains	CONSTRUCT	CONSTRUCT	CONSTRUCT	CONSTRUCT	CONSTRUCT
Organisational Innovativeness	Process Innovativeness	Product Innovativeness	Market Innovativeness	Strategic Innovativeness	Behavioural Innovativeness
Management Models	Planning Management Models	Quest Management Models	Science Management Model	Discovery Management Model	
Digital Learning	Digital Learning Strategies	Digital Learning Implementation	Digital Learning Barriers	Staff Competencies Digital Learning	Digital Learning Tools

The domain of organisational innovativeness consists of 20 questions, which are divided into five constructs: product innovativeness; market innovativeness; process innovativeness; behavioural innovativeness and strategic innovativeness. All these four constructs and their definitions are proposed by (Wang and Ahmed, 2004).

Each construct in the domain has four questions and is rated using a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). Product innovativeness is referred to as the perceived newness, novelty, originality, or uniqueness of products or services. This perceived newness encompasses two perspectives: from the client's perspective and the organisation's perspective, it refers to the extent to which a new product or service is viewed as useful or beneficial to some clients. This construct consists of the following questions: IN1, IN2, IN3, IN4.

Market innovativeness is the newness of approaches that organisations adopt to enter and exploit the targeted markets. For some organisations, this means that they can enter a market or identify a new market niche and launch products with cutting-edge technological content. IN5, IN6, IN7, and IN8 formed part of this construct.

Process innovation refers to the use of new strategies when executing organisational strategies. It also refers to the introduction of new management approaches and new technology that can be used to improve the delivery of services, products, and management processes. It is imperative in terms of overall innovative capability that an organisation has the ability to exploit its resources and capabilities and, most

importantly, the ability to recombine and reconfigure its resources and capabilities to meet the requirements of creative service delivery. The following questions formed part of this construct: IN9, IN10, IN11, and IN12.

Table 11: Individual items of organisational innovativeness construct

Product Innovativeness	
IN1	In new product and service introductions, our university is often first to market
IN2	Our new products and services are often perceived as a very novel by customers
IN3	In comparison with our competitors, our university has introduced more innovative products and services during the past five years
IN4	In comparison with our competitors, our university has a lower success rate in new products and services launched
Market Innovativeness	
IN5	Our recent new products and services are only minor changes from our previous products and services
IN6	New products and services in our university often take us up against new competitors
IN7	In comparison with our competitors, our products ' most recent marketing programme is revolutionary in the market
IN8	In new product and service introductions, our university is often at the cutting edge of technology
Process Innovativeness	
IN9	We are constantly improving our business processes
IN10	Our university changes teaching and learning methods at a great a great speed in comparison with our competitors
IN11	During the past five years, our university has developed many new management approaches
IN12	When we cannot solve a problem using conventional method, we improvise on new methods
Behavioral Innovativeness	
IN13	We get a lot of support from managers if we want to try new ways of doing things
IN14	In our university we tolerate individuals who do things in a different way
IN15	We are willing to try new ways of doing things and seek unusual, novel solution
IN16	We encourage people to think and behave in original and novel ways
Strategic Innovativeness	
IN17	Our university R&D/product development resources are not adequate to handle the development need of new products and services
IN18	Key executives of the university are willing to take risks to seize and explore 'chancy' growth opportunities
IN19	Senior executives constantly seek unusual, novel solutions to problems via the use of 'idea men'
IN20	When we see new ways of doing things, we are last of adopting them

The above questionnaire was developed by Wang and Ahmed and was modified to suit the university environment since, from that article, it was used to determine the level of innovativeness of a private firm.

Behavioural innovativeness is demonstrated through individuals, teams, and management, and this enables the formation of an innovative culture and the overall internal receptivity to new ideas and innovation. Behavioural innovation is also a fundamental factor that underpins innovative outcomes. Innovative culture catalyses innovations, while a lack of it acts as a blocker of innovations. The following questions form part of this construct: IN13, IN14, IN15, and IN16.

Strategic innovativeness is referred to as the development of new competitive strategies that create value for the organisation. The primary focus of strategic innovation is to measure an organisation's ability to manage ambitious organisational objectives and identify a mismatch between these ambitions and existing resources to stretch or leverage limited resources creatively. This construct consists of the following questions: IN17, IN18, IN19, and IN20.

Table 12 below details the management models that comprised the second part of the questionnaire. These models are defined as the decisions executives of organisations make about how they define objectives, motivate effort, coordinate activities, and allocate resources. In other words, the definition of how the work of management is done. They must reflect the choices made by managers regarding decisions, systems, procedures, people, and organisational structure. Unlike the business model, which is a conceptual one mainly describing the "what" and "why" of business operations, organisational management models help us define the "how" part (Buyukbalci and Boukari, 2017).

Table 12: Individual items of management models construct

Planning Management Model	
MM1	There is an essence of more stable, predictable and measurable environment in the university in the process of implementing plans.

MM2	There is an incremental innovation and discussions amongst all in the University when it comes to planning.
MM3	Work is conducted in a linear manner in the University since it is at matured stage.
MM4	There is high degree of predictability of the University outcomes when planning.
Quest Management Model	
MM5	Managers set clear organisational goals and encourage employees to reach them.
MM6	Managers encourages employees to reach objectives through a variety of means.
MM7	Employees are told what to do but not how to do it.
MM8	Our university is well established and operating in a competitive environment.
MM9	Managers tend to involve people in decision making process and decentralise planning.
Discovery Management Model	
MM10	There are tight means and loose ends with formal rules, structure, and authority in decision making.
MM11	There is intrinsic motivational approach and obliquity in achieving goals
MM12	There is bureaucratic and formal rules in our university
MM13	There are standardised procedures, but employees are encouraged to seek new ways of delivering outputs.
MM14	Our university is at start-up phase and operating in an ambiguous, uncertain, and fast changing environment
Scientific Management Model	
MM15	Our university is dealing with special projects from time to time.
MM16	Executives are more interested and willing to make innovation in strategic aspects.
MM17	There is a high culture of innovativeness in our university
MM18	I am aware of the University's innovation strategy

The above questions were developed in collaboration with the statistician, and the constructs were taken from an article written by Birkinshaw (2012). According to the writer, the management model has four constructs, as explained in the previous chapters, and these constructs will be validated in this study. The first construct is the

scientific management model, which suggests tight means and loose ends with formal rules, structures, and authority in decision-making, accompanied by an intrinsic motivation approach and obliquity in achieving goals. When compared to other forms, this model's application is rather limited. It consists of questions MM15, MM16, MM17, and MM18.

The discovery management model is the second construct and is suitable for start-up ventures and small and medium organisations operating in an ambiguous, uncertain, and fast-changing environment, as well as for specific units of special projects in large, established organisations. This construct has the following questions: MM10; MM11; MM12; MM13; and MM14.

The third construct is the quest management model. In this model, managers set clear organisational goals and encourage employees to reach these objectives through a variety of means. In other words, employees are told what to do but not how to do it. The model is useful for established and growing organisation s operating in a competitive arena and attempting to differentiate themselves. The questions in this construct include MM5, MM6, MM7, MM8, and MM9.

The last management model is the planning management model, which is widely adopted in mature organisations where work is conducted linearly and where the degree of predictability of market evolution is high. The questions for this construct include MM1, MM2, MM3, and MM4.

Table 13 below is about digital learning and forms the third and last part of the questionnaire. It is meant to find out if these universities have digital learning strategies and whether these strategies are aligned with their overall strategies. This dimension determines if all employees are aware of these strategies and if, indeed, the strategies are implemented accordingly. Each question in each domain was also rated using a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree).

The digital learning construct has several statements, as per Table 13 below. The first one is digital learning strategies, which are meant to determine if all employees are aware of these strategies and if they are indeed implemented accordingly. This construct consists of the questions DL1, DL2, DL3, and DL4. This construct is followed by the implementation of digital learning, which determines the level of implementation of digital learning initiatives in the six universities in Gauteng province. The implementation of digital learning has the following questions: DL5, DL6, DL7, and DL8.

Table 13: Items for Digital Learning construct

Digital Learning Strategies	
DL1	There is E-Learning/digital learning strategies in our university.
DL2	Digital learning strategies are implemented to the fullest within the university.
DL3	University's digital strategy is aligned to our innovation strategy
DL4	All academic staff and student are aware of digital learning strategies
Digital Learning Implementation	
DL5	There is enough collaboration of all teams when it comes to digital learning implementation.
DL6	Our university have digital learning implementation plan
DL7	All academic staff and students are aware of the digital learning implementation plan
DL8	There is specific department dealing with digital learning in our university.
Digital Learning Barriers	
DL9	A risk assessment has been conducted to identify barriers of digital learning in our university
DL10	There are potential barriers experienced by all staff members towards digital learning.
DL11	There is a plan that has been developed to address these barriers
DL12	The plan has been communicated to all stakeholders
Staff Competencies on Digital Learning	
DL13	There are competent and qualified staff dealing with digital learning.
DL14	100% of our students and academics have been taught about using different digital systems
DL15	Break downs of digital systems are attended to promptly
DL16	Our digital systems are always upgraded to be up to date
Digital Learning Tools	
DL17	All student and staff have digital gadgets.
DL18	All students who lived off campus were provided with gadgets for digital learning.
DL19	All Academic staff access to digital learning systems

DL20	All digital learning systems are available remotely

The third construct is barriers to digital learning. This was meant to determine if there are any barriers that these universities are experiencing when implementing digital learning interventions and strategies. This construct consists of questions such as DL9, DL10, DL11, and DL12.

The fourth construct for the digital learning domain is the level of staff competencies in digital learning. This construct is meant to determine the level of competencies and skills of the staff when it comes to the development and implementation of digital learning strategies at these six universities. It includes the following questions: DL13, DL14, DL15, and DL16.

The last construct of digital learning is the digital learning tool, which is meant to determine the availability of digital learning tools and if the staff knows how to utilise these digital learning tools effectively and efficiently. This construct is composed of the following questions: DL17, DL18, DL19, and DL20.

4.6 Constructs validity

For this study to evaluate the construct validity of the three dimensions, exploratory factor analysis (EFA) was used. This was performed to evaluate if the individual items load (or contribute) to the constructs as intended in the questionnaire. Factor analysis is a statistical method used to describe variability among observed variables in terms of fewer unobserved variables called factors (the constructs).

Factor analysis has two types: exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) (Ramli et al., 2016). EFA is used as the first step in the validation process, followed by CFA, which is used as a further step to confirm a factor structure. However, it is important to establish the constructs or factors with EFA before the factors can be confirmed with CFA. In the present study, only the EFA was considered because the study wants to explore the structure of factor loading in the collected data.

The EFA using principal component analysis with orthogonal varimax rotation was used to estimate the factor structure and loadings of the three constructs. The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy (KMO) test and Bartlett's Test of Sphericity were used to confirm that the data collected for this study are appropriate for EFA. The following techniques were used for factor extraction: the Cattell scree plot, the Kaiser criteria of an eigenvalue > 1, and the cumulative percentage of variance. The items with a loading of ≥0.50 were included in their respective factors' loadings.

4.7. Construct reliability analysis

Reliability refers to the consistency of the measurement or the degree to which an instrument measures the same way each time it is used under the same conditions with the same subjects (Todorov et al., 2020). After the validation of the questionnaire, the reliability of the tool was assessed.

The internal consistency of each construct was assessed, discussed, and explicitly tested using a Cronbach alpha coefficient. Constructs can also be referred to as factors, dimensions, or concepts. The threshold for Cronbach's alpha coefficients of greater than 0.7 was considered satisfactory, as proposed by Nunnally (1978).

Reliability is the extent to which the measurement of a phenomenon provides stable and consistent results (Taherdoost, 2016). The reliability analysis was conducted on all the constructs, including their items, to measure the internal consistency. The cut-off value of Cronbach's alpha is 0.7, although 0.6 is sometimes acceptable. The results demonstrate that all the constructs are internally consistent in their measurement because the Cronbach's alpha values are above the required thresholds (0.7), as also supported by Hair et al. (2014).

4.8. Validity and Reliability of Organisational Innovativeness

The Kaiser-Meyer-Olkin provides a measure of the appropriateness of conducting exploratory factor analysis (EFA). The KMO measure of sampling adequacy greater than 0.5 and Bartlett's test of sphericity with a p-value < 0.05 were used to determine the suitability of the data for EFA. The KMO for organisational innovativeness was

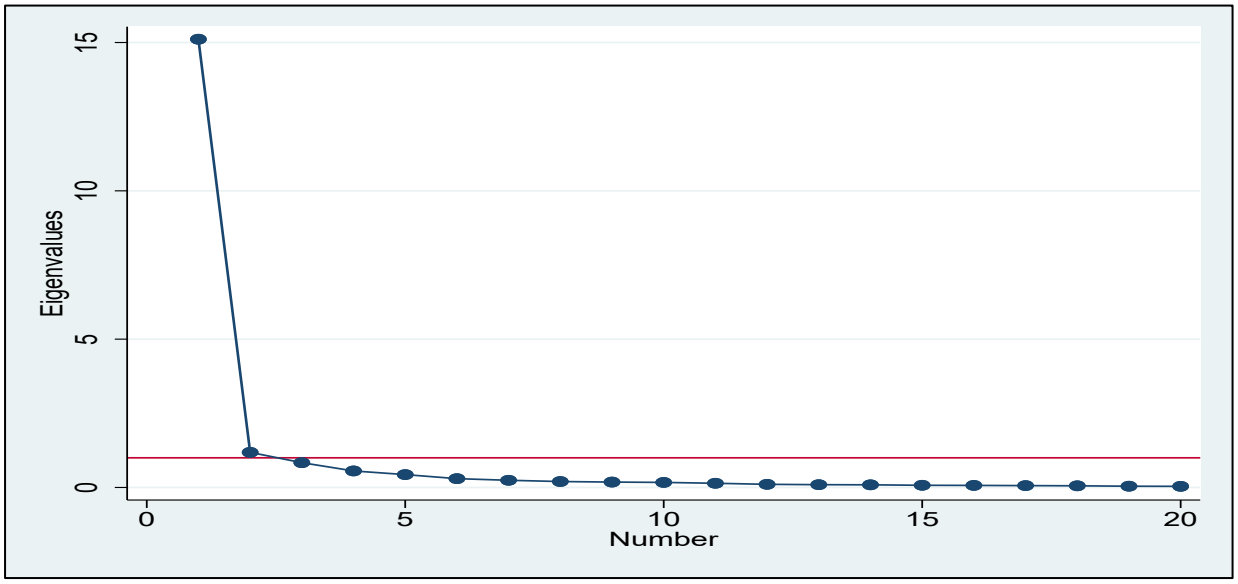
0.964, and Bartlett's test of sphericity had a p-value less than 0.001, which indicates that the EFA was suitable for organisational innovativeness (Table 14).

Table 14: Factor loading of the original items of organisational innovativeness

	F1	F2
% of the variance	**75.6**	**5.9**
Eigenvalues	**15.1**	**1.2**
IN16	0.9211	
IN12	0.9090	
IN15	0.9063	
IN13	0.9012	
IN14	0.8994	
IN7	0.8884	
IN6	0.8790	
IN8	0.8765	
IN11	0.8691	
IN2	0.8689	
IN3	0.8417	
IN1	0.8404	
IN9	0.7654	
IN4	-0.7198	
IN5	0.6824	
IN10	0.6688	
IN19		0.8990
IN18		0.8883
IN20		-0.8365
IN17		-0.7429

The results show that according to the Kaiser criterion, the 20 items of organisational innovativeness are distributed into two-factor loadings with 81.5% of the variance. As depicted in Figure 8, the analysis of the Cattell scree plot for the two factors supports the EFA's result. The items in each factor had a factor loading greater than 0.5.

Figure 7: Cattell scree plot for the organisational innovativeness



The first factor had sixteen (16) items with a factor loading greater than 0.5 and was grouped into four constructs: Product Innovativeness (items 1, 2, 3, 4); Market Innovativeness (items 5, 6, 7, 8); Process Innovativeness (items 9, 10, 11, 12); and Behavioural Innovativeness (items 3, 14, 15, 16). The second factor had four items with a factor loading greater than 0.5 and was labelled "strategic innovativeness."

Table 15: The reliability coefficient for each scale of organisational innovativeness

Constructs	Items	Cronbach Alpha	Skewness
Product Innovativeness	1,2,3,4	0.9412	0.193
Market Innovativeness	5,6,7,8	0.9125	0.350
Process Innovativeness	9,10,11,12	0.9197	-0.001
Behavioural Innovativeness	13,14,15,16	0.9761	0.389
Strategic Innovativeness	17,18,19,20	0.8671	0.683

The findings of the scale reliability coefficient and skewness of the organisational innovativeness construct are shown in Table 15 above. Cronbach's alpha gave values of 0.94, 0.91, 0.92, 0.98, and 0.87 for the domains of product innovativeness, market innovativeness, process innovativeness, behavioural innovativeness, and strategic

innovativeness, respectively. All the above constructs are greater than 0.7, which is in line with good statistical methodologies. According to Gerber et al. (2020), Cronbach's alpha measurement generally falls around 0.7. Here's a breakdown of how it's interpreted:

- 0.9 or higher: Excellent but might indicate redundant questions.
- 0.8–0.9: Very good
- 0.7–0.8: Acceptable (the most common benchmark)
- 0.6–0.7: Needs improvement but may be tolerable depending on the field
- Below 0.6: Low reliability

With the exception of product and market innovativeness, all the scales in the domain of organisational innovativeness were not within the range of 2 in line with the 5-point Linkert scale, which means that they disagree with that construct.

4.9. Validity and reliability of management models

For management models, the KMO was 0.946 and Bartlett's Test of Sphericity was significant ($p<0.001$), indicating that the data is viable to conduct EFA. As illustrated in Figure 9, two factors had eigenvalues greater than one, and the scree plot supports the findings. The percentages explained by each factor were 61.1% for factor 1 and 10.2% for factor 2, as per the table below.

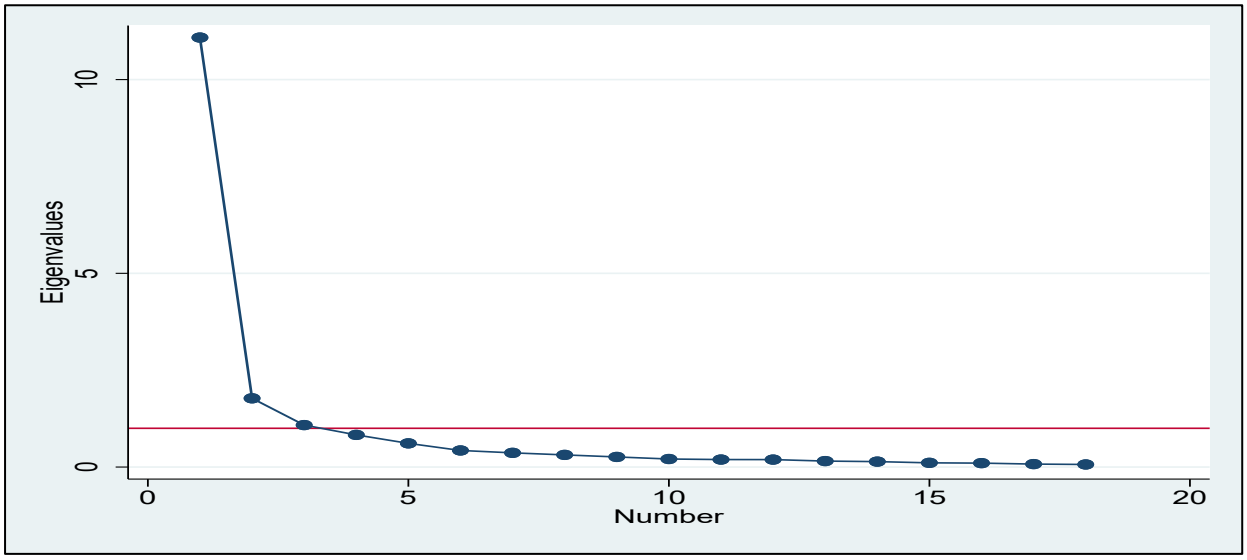
Table 16: Factor loading of the original items of management models

	F1	**F2**
% of the variance	**61.1**	**10.2**
Eigenvalues	**10.9**	**1.8**
MM2	0.9305	
MM18	0.9184	
MM17	0.9164	
MM16	0.9064	
MM11	0.8989	
MM8	0.8939	
MM1	0.8919	
MM3	0.8784	
MM6	0.8657	
MM9	0.7860	

MM13	0.7404	
MM10	0.7229	
MM7	0.6878	
MM14	-0.6449	
MM12		-0.759674
MM5		0.653077
MM4		0.622209
MM15		

Based on the results as per the above table, the first factor had fourteen (14) items with a factor loading greater than 0.5, which was subsequently labelled the “organisational ambidexterity construct." Item MM15 was excluded due to a factor loading of less than 0.5. Three items had a factor loading of greater than 0.5 on the second factor and were labelled “planning management model.

Figure 8: scree plot of management models



Both constructs for management models showed good internal consistency, with a Cronbach alpha of 0.97 for the organisational ambidexterity model and 0.70 for planning management models (Table 17 below).

Table 17: The reliability coefficient for management models

Construct	Items	Cronbach Alpha	Skewness
Organisational ambidexterity	1, 2, 3, 6, 7, 8, 9, 10, 11, 13, 14, 16, 17, 18	0.97	0.3
Planning management models	5, 4, 12	0.70	0.4

4.10. Validity and reliability of digital learning

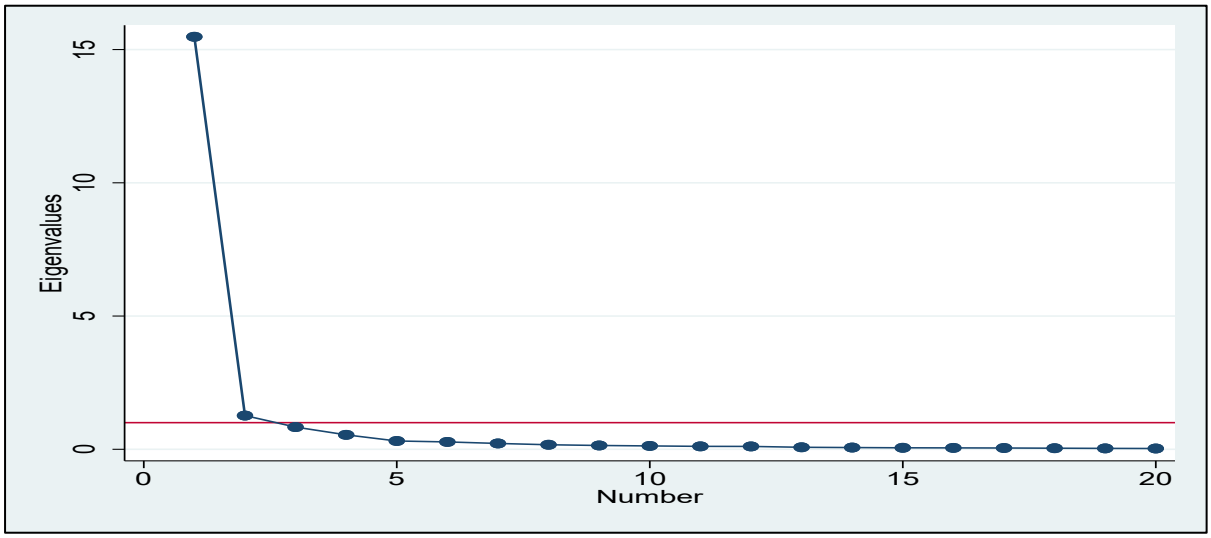
The KMO for digital learning was 0.965, and Bartlett's test of Sphericity had a p-value less than 0.001, which also supports the use of EFA. Two-factor loadings were generated, which accounted for 82.7% of the variance. The KMO for digital learning was 0.965, and Bartlett's test of Sphericity had a p-value less than 0.001, which also supports the use of EFA. Two-factor loadings were generated, which accounted for 82.7% of the variance.

Table 18: Factor loading of the original items of digital learning

	F1	F2
% of the variance	**76.6**	**6.1**
Eigenvalues	**15.3**	**1.2**
DL3	0.92	
DL4	0.89	
DL2	0.92	
DL5	0.99	
DL1	0.98	
DL6	0.96	
DL7	0.96	
DL12	0.87	
DL9	0.85	
DL11	0.83	
DL14	0.82	
DL15	0.82	

DL16	0.78	
DL13	0.55	
DL8	0.95	
DL10	0.86	
DL17		0.93
DL18		0.98
DL20		0.96
DL19		0.93

Figure 9: Cattell scree plot for the Digital Learning



In Figure 10 above, the scree plot for the two factors supports the result of the EFA. All the items in each factor of digital learning had a factor loading greater than 0.5, and factor one was labelled digitization initiatives and strategies, and factor two was labelled digital learning tools.

The scale reliability coefficient for digitization initiatives and strategies was 0.9810, while for digital learning tools it was 0.9762 (Table 19). The two domains of digital learning are within the range of ±2.

Table 19: The reliability coefficient for each scale for digital learning

Construct	Items	Cronbach Alpha	Skewness
Digitization initiatives and strategies	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16	0.9810	0.4437
Digital learning tools	17, 18, 19, 20	0.9762	-0.1611

4.11 Level of organisational innovativeness in the universities

This study's objective was to determine the level of organisational innovativeness and if there are any innovation indices to measure innovation in these six universities. As shown in Table 20, process innovativeness received the highest median score of 11 (9-16), indicating that it is the most commonly used construct of organisational innovativeness.

Product innovativeness 10(10-13) and strategic innovativeness 10(10-12) were the second most frequently used organisational innovativeness, with an equal median score. Market innovativeness construct 8(8-14) and behavioural innovativeness construct 8(8-16) were the least used constructs of organisational innovativeness, with the lowest median score.

Table 20: Summary statistics for Innovativeness responses

	Median (Interquartile Range)	Min	Max
Product	10(10-13)	4	18
Market	8(8-14)	4	20
Process	11(9-16)	4	20
Behavioural	8(8-16)	4	20
Strategic	10(10-12)	4	20

Another objective of this study was to determine whether these universities do have management models that assist them in being efficient and competitive (Table 21). The

study findings revealed that the organisational ambidexterity construct had a median and an interquartile range of 33(30-53), while the planning management model had a median and an interquartile range of 10(10-12).

Table 21: Summary statistics for generic management models

	Median (Interquartile Range)	Min	Max
Organisational Ambidexterity (Discovery, Science, Quest Management Models)	33(30-53)	14	65
Planning Management Model	10(10-12)	3	15

To evaluate whether the organisational ambidexterity interventions are aligned with their overall organisational strategies, the researcher analysed the data according to the university, as shown in **Table 21**. Overall, more than two-thirds of the participants strongly agree with the following statements: (i) managers set clear organisational goals and encourage employees to reach them (80%); (ii) there is a high degree of predictability of university outcomes when planning (81%).

The results also indicated that few of the participants at TUT strongly agreed with the following statements: (i) managers set clear organisational goals and encourage employees to reach them (33%); (ii) there is a high degree of predictability of university outcomes when planning (46%), as compared with other universities.

Interestingly, overall, more than half of the participants strongly disagreed or disagreed with the following statements: (i) There is a high culture of innovativeness in our university (58%); (ii) I am aware of the university's innovation strategy (58%). However, when comparing these statements by universities, nearly all participants from UJ, UP, and WITS strongly agree with the same statements.

The results of the digital learning construct are shown in Table 22 below, with digitization initiatives and strategies found to have a median and interquartile range of 39 (37-64), while the digital learning tools had 12 (11-16).

Table 22: Summary statistics for Digital learning construct

	Items	Median (Interquartile Range)	Min	Max
Digitisation initiatives and strategies	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16	39(37-64)	16	80
Digital learning tools	17, 18, 19, 20	12(11-16)	4	20

The study also evaluated whether employees are aware of these digital learning strategies and whether these digital learning strategies are implemented accordingly and aligned with the university's innovation strategy.

Overall, more than half of the study participants strongly disagree and disagree that there are digital learning strategies at their university (52%); digital learning strategies are implemented to the fullest within the university (56%); the university's digital strategy is aligned with the innovation strategy (57%); and (54%) all academic staff and students are aware of digital learning strategies.

Nearly all participants from UJ, UP, and WITS strongly agree or agree that there are digital learning strategies at their university; digital learning strategies are implemented to the fullest within the university; the university's digital strategy is aligned with the innovation strategy; and all academic staff and students are aware of digital learning strategies as compared to those in SMU, TUT, and VUT.

4.12. Central Tendency Measures

According to Gerber (2022), the central tendency is the statistical measure that represents the single value of the entire distribution or a dataset. Its purpose is to accurately describe all the data within the distribution. In this study, central tendency measures were conducted in order to assess how centred the distribution of the constructs involved in the study is. A five-point Likert scale where the value 1 corresponds to "Strongly Disagree" and the value 5 corresponds to "Strongly Agree" was applied to measure the constructs pertaining to Organisational Innovativeness, Management models, and Digital learning. According to the questionnaire, the mean point on this five-point Likert scale is 2.5 (5/2). Any mean score below 2.5 signifies that respondents either disagree or strongly disagree with the statement measuring those constructs. At the same time, the mean between 2.6 and 3.4 suggests that respondents are neutral, and all those mean scores equal to or above 3.5 suggest that most respondents either agree or strongly agree with the statement measuring that specific construct.

The questionnaire that was circulated to the respondent consisted of three constructs: organisational innovation, Organisational innovativeness, Management models, and Digital learning. And all three had subconstructs that are reflected below.

4.12.1 Responses on organisational innovativeness construct

Table 23 below describes the organisational innovativeness construct. This construct was intended to determine if these universities have overall innovative capabilities for introducing new products and services and also opening new markets through combining strategic orientation with innovative behaviour and processes. It has five sub concepts that form part of the table below:

Table 23: Organisational Innovativeness

CONSTRUCTS	NAME OF UNIVERSITY	Mean	Std. Deviation
	Sefako Makgatho Health Sciences University	2,42	0,408

PRODUCT INNOVATIVENESS	Tshwane University of Technology	2,36	0,410
	University of Johannesburg	3,60	0,351
	University of Pretoria	3,44	0,426
	Vaal University of Technology	2,45	0,308
	Wits University	3,41	0,600
	OVERALL MEAN & STD. DEV.	**2,78**	**0,647**
MARKET INNOVATIVENESS	Sefako Makgatho Health Sciences University	2,17	0,524
	Tshwane University of Technology	1,91	0,471
	University of Johannesburg	3,96	0,359
	University of Pretoria	3,74	0,507
	Vaal University of Technology	2,01	0,533
	Wits University	3,87	0,393
	OVERALL MEAN & STD. DEV.	**2,69**	**0,972**
PROCESS INNOVATIVENESS	Sefako Makgatho Health Sciences University	2,65	0,636
	Tshwane University of Technology	2,00	0,787
	University of Johannesburg	4,07	0,274
	University of Pretoria	3,99	0,518
	Vaal University of Technology	2,39	0,607
	Wits University	4,10	0,600
	OVERALL MEAN & STD. DEV.	**3,02**	**0,973**
BEHAVIOURAL INNOVATIVENESS	Sefako Makgatho Health Sciences University	2,14	0,580
	Tshwane University of Technology	2,13	0,857
	University of Johannesburg	3,98	0,271

	University of Pretoria	3,84	0,647
	Vaal University of Technology	2,11	0,562
	Wits University	4,03	0,410
	OVERALL MEAN & STD. DEV.	**2,76**	**1,037**
STRATEGIC INNOVATIVENESS	Sefako Makgatho Health Sciences University	2,65	0,451
	Tshwane University of Technology	3,09	0,382
	University of Johannesburg	3,02	0,652
	University of Pretoria	2,87	0,379
	Vaal University of Technology	2,75	0,350
	Wits University	2,67	0,240
	OVERALL MEAN & STD. DEV.	**2,77**	**0,433**

The above table is about the construct of organisational innovativeness, which is comprised of the following four sub concepts:

4.12.1.1 Product Innovativeness.

The purpose of this construct was to measure (as part of innovativeness) if these universities' services and products are viewed as useful to their clients and to find out if they are perceived as original and unique. The results indicate that most (M = 3.60) of the respondents who agree with the statements about this construct are from the University of Johannesburg. In addition, as the overall mean score is between 2.5 and 3.4, most respondents are neutral about the statements. Therefore, it can be concluded that the services and products that these universities are offering are not being viewed as useful by their clients and are also not viewed as original.

4.12.1.2 Market Innovativeness

This construct wanted to determine if these universities have new interventions that they exploit in order to be competitive and also to determine if they have been involved in developing cutting-edge technologies in order to enter new markets as part of determining their level of innovativeness. The outcomes as per the above table show

that most (M = 3.96) of the respondents who agree with the statements regarding market innovativeness are again from the University of Johannesburg. Furthermore, the overall mean score of 2.69 indicates that most respondents from all these universities are neutral towards the statements, with their mean score falling between 2.5 and 3.4. Therefore, most of the respondents are in agreement that their universities are not involved in developing cutting-edge technologies, and their level of technological innovation is not up to scratch.

4.12.1.3 Process Innovativeness

The purpose of this construct was to find out if there is a culture within these universities that encourages the development of new strategies for doing things and to also determine if there are new management approaches and new technologies that can be used to improve the service delivery of teaching and learning. The ultimate goal was to ascertain the level of innovative capabilities present within these institutions. Based on the overall mean score results, most respondents are neutral to the statements regarding this construct, since the mean score is between 2.5 and 3.4. Moreover, most of the respondents who agree with the statements are from Wits University, since they are at M = 4.10.

4.12.1.4 Behavioural Innovativeness

The purpose of asking participants about this sub concept was to assess the level of innovation among management, teams, and individuals within their respective universities. Essentially, the goal is to ascertain whether management, teams, and individuals possess a culture of adaptability to change. According to the above table, Wits University has the highest number of respondents (M = 4.03) who express agreement with the statements related to this statement. At the same time, the overall mean score (M = 2.76) reveals that most of the respondents from all six universities combined are neutral to the statements.

4.12.1.5 Strategic innovativeness

This construct wanted to know the level of development of new strategies that can create value for the university. To measure the ability of the university to manage ambitious

strategic objectives, identify mismatches between these ambitions and existing resources in order to stretch or leverage limited resources creatively. The overall mean score (M = 2.77) indicates that most of the respondents are neutral to the statements regarding this construct because the overall mean score is between 2.5 and 3.4.

4.12.1.6 Conclusion on Organisational Innovativeness

Based on the above analysis of the responses received from these universities, it can be concluded that most of the participants are of the view that there is a lack of organisational innovativeness in their respective universities because the average mean on the above five sub concepts (2.77 + 2.76+3.02+2.67+2.78/5= 2.8) is less than <3, meaning that the majority disagree that there is organisational innovativeness in their university.

4.12.2. Responses on Management Models Construct

Table 24 below is about responses to the management model construct. This construct was intended to determine if executives in these universities make choices on how they define objectives, motivate effort, coordinate activities, and allocate resources; in other words, to determine how work is done in these universities. In order to determine this, there are four statements that were given to participants, as per the table below:

Table 34: Management models

CONSTRUCTS	NAME OF UNIVERSITY	Mean	Std. Deviation
PLANNING MANAGEMENT MODEL	Sefako Makgatho Health Sciences University	2,55	0,572
	Tshwane University of Technology	2,49	0,735
	University of Johannesburg	4,25	0,420
	University of Pretoria	4,13	0,602
	Vaal University of Technology	2,64	0,534
	Wits University	4,36	0,474
	OVERALL MEAN & STD. DEV.	**3,15**	**0,970**

QUEST MANAGEMENT MODEL	Sefako Makgatho Health Sciences University	2,48	0,573
	Tshwane University of Technology	2,23	0,706
	University of Johannesburg	3,95	0,436
	University of Pretoria	3,92	0,620
	Vaal University of Technology	2,43	0,396
	Wits University	4,03	0,506
	OVERALL MEAN & STD. DEV.	**2,96**	**0,908**
DISCOVERY MANAGEMENT MODEL	Sefako Makgatho Health Sciences University	2,63	0,534
	Tshwane University of Technology	2,88	0,464
	University of Johannesburg	3,42	0,486
	University of Pretoria	3,30	0,324
	Vaal University of Technology	2,72	0,390
	Wits University	3,14	0,316
	OVERALL MEAN & STD. DEV.	**2,89**	**0,526**
SCIENTIFIC MANAGEMENT MODEL	Sefako Makgatho Health Sciences University	2,59	0,604
	Tshwane University of Technology	2,56	0,774
	University of Johannesburg	4,13	0,319
	University of Pretoria	4,02	0,575
	Vaal University of Technology	2,50	0,332
	Wits University	4,26	0,474
	OVERALL MEAN & STD. DEV.	**3,10**	**0,919**

The above table is about the Management model construct. According to this construct, it has the following sub-constructs that are analysed as follows:

4.12.2.1 Planning management model

This sub-concept wanted to determine if the participants from these universities agreed with the statement that they wanted to know if their universities are in a mature stage of growth and if work is conducted in a linear manner where the degree of predictability is high. Based on the results as per the above table, participants from Wits University (M = 4.36) agree with the statement, as do those from the University of Pretoria (M = 4.13) and the University of Pretoria (M = 4.25), who agree that their university is at a mature stage of growth and work is conducted in a linear manner in order to predict the outcomes. However, the overall mean score shows that most of these respondents are neutral to the statements since it is M3.15.

4.12.2.2 Quest management model

According to this sub-construct, the questionnaire aimed to determine whether management in universities sets clear organisational goals and encourages employees to achieve these objectives through a variety of means. In other words, to find out if employees are told what to do but not how to do it. The results show that most (M = 4.03) respondents who agree with the statements regarding this sub-construct are from Wits University. The overall mean score was found to be (M = 2.96); even on this one, most respondents from all universities seem to be neutral since the mean is greater than 2.5.

4.12.2.3 Discovery management model

The purpose of the questions was to ascertain whether the universities are in the start-up phase of their establishment and if they are small to medium universities. Finally, the purpose is to determine if these universities operate in an ambiguous, uncertain, and fast-changing environment, and if there are specific units of special projects within them. The results indicate that most respondents are neutral to statements about this model because the overall mean score (M = 2.89) lies between 2.5 and 3.4.

4.12.2.4 Scientific management model

The purpose of posing these model-related questions to participants was to ascertain whether formal rules, structures, and authority play a crucial role in the decision-making

process at their university. Additionally, these questions aimed to ascertain whether the culture of intrinsic motivation plays a significant role in achieving strategic goals. In summary, this sub-concept wanted to know if the management style is one that believes in the principles of collective wisdom or a top-down management style in these universities. As per the results in the above table, most participants from the University of Johannesburg (M = 4,13), Wits University (M = 4,26), and the and the University of Pretoria (M = 4.02) are mostly in agreement with this statement. Which means that they are saying there is some level of consultation when it comes to decision making in their universities. On the contrary, Vaal University of Technology (M = 2.5), Tshwane University of Technology (M = 2.56), and Sefako Makgatho University (M = 2.59) disagree that there is consultation when it comes to decision-making, which means that there is a top-down management style in these universities.

4.12.2.5 Conclusion on Management Models Construct

Based on the above responses from participants from these universities, it can be concluded that most of them are neutral when it comes to whether their universities have management models in place on how to deliver their strategic objectives since there is an average 3.02 mean (3.10 + 2.89 + 2.96 + 3.15/4 = 3.02). Based on this, it can be concluded that there are no known management models for how to deliver on the strategic objectives.

4.12.3 Responses on Digital Learning Construct

Table 25 describes answers to the digital learning notion. The purpose of this concept was to assess whether these universities have any digital learning practices. It was also designed to establish whether these techniques are being adopted, whether there are indeed impediments to implementing digital learning strategies. Finally, the purpose is to establish whether these colleges employ competent staff with the requisite skills and expertise, and to that end, participants were given five statements, as shown in the table below:

Table 25: Digital Learning

CONSTRUCTS	NAME OF UNIVERSITY	Mean	Std. Deviation
DIGITAL LEARNING STRATEGIES	Sefako Makgatho Health Sciences University	2,27	0,735
	Tshwane University of Technology	2,33	0,698
	University of Johannesburg	4,29	0,456
	University of Pretoria	4,16	0,653
	Vaal University of Technology	2,18	0,506
	Wits University	4,31	0,725
	OVERALL MEAN & STD. DEV.	**2,94**	**1,154**
DIGITAL LEARNING IMPLEMENTATION	Sefako Makgatho Health Sciences University	2,63	0,620
	Tshwane University of Technology	2,52	0,773
	University of Johannesburg	4,21	0,367
	University of Pretoria	4,09	0,664
	Vaal University of Technology	2,50	0,435
	Wits University	4,15	0,467
	OVERALL MEAN & STD. DEV.	**3,11**	**0,940**
DIGITAL LEARNING BARRIERS	Sefako Makgatho Health Sciences University	2,59	0,500
	Tshwane University of Technology	2,58	0,654
	University of Johannesburg	4,13	0,319
	University of Pretoria	3,94	0,598
	Vaal University of Technology	2,45	0,422
	Wits University	3,95	0,464

	OVERALL MEAN & STD. DEV.	**3,04**	**0,850**
STAFF COMPENTENCIES ON DIGITAL LEARNING	Sefako Makgatho Health Sciences University	2,33	0,548
	Tshwane University of Technology	2,51	0,653
	University of Johannesburg	4,13	0,270
	University of Pretoria	4,08	0,553
	Vaal University of Technology	2,26	0,438
	Wits University	4,03	0,511
	OVERALL MEAN & STD. DEV.	**2,93**	**0,977**
DIGITAL LEARNING TOOLS	Sefako Makgatho Health Sciences University	2,87	0,765
	Tshwane University of Technology	2,43	0,919
	University of Johannesburg	4,13	0,310
	University of Pretoria	3,94	0,606
	Vaal University of Technology	2,68	0,594
	Wits University	4,07	0,438
	OVERALL MEAN & STD. DEV.	**3,19**	**0,903**

The above table is about the digital learning construct. According to this construct, it has the following sub-constructs that are analysed as follows:

4.12.3.1 Digital learning strategies

The researcher included this construct in the surveys because he wanted to know the availability of digital learning strategies and systems in various colleges. Also, if they have these strategies, examine whether they are consistent with the university's strategy and innovation strategy. According to the results in the table above, the majority (M =

4.31) of respondents who believe that their university has strategies and processes came from Wits University (M = 4.31), the University of Pretoria (M = 4.16), and the University of Johannesburg. The others do not agree because their average is smaller than (M = 2.5).

4.12.3.2 Implementation of digital learning

The inclusion of this sub-construct was to determine the level of implementation of digital learning in those universities. As per the above table, it is evident that most respondents are neutral (M = 3.11) to the statements about the implementation of digital learning in these universities because the overall mean score is between 2.5 and 3.4. However, those from UP (M4.09), UJ (M=4.21), and Wits (M=4.15) agree that their universities are implementing digital learning strategies. However, those from SMU (M = 2.63) are neutral, TUT (M = 2.52) totally disagrees, and VUT (M = 2.5) also totally disagrees.

4.12.3.3 Digital learning barriers

This sub-construct was meant to determine if there are any barriers that prohibit digital learning at these universities and what those barriers are. According to the results presented in the above table, the majority of respondents (M = 4.13) agree with the statement that there are barriers to the implementation of digital learning. These respondents primarily hail from the University of UJ (M = 4.13), UP (M = 3.94), and Wits (M = 3.95). This is because their average score is higher than 3.5. However, SMU (M = 2.95), TUT (M = 2.58), and VUT (M = 2.45) totally disagree that there are barriers. However, this may be because they initially stated that there are no digital learning strategies in their universities. The overall mean score (M = 3.04) shows that most of the respondents are neutral about the statements.

4.12.3.4. Staff competencies relevant to digital learning

The purpose of asking this question related to this construct was to assess the level of staff competencies and capacity in digital learning within their respective universities. The results indicate that most respondents are neutral (M 2.93) to the statements about this sub-construct since the overall mean score is between 2.5 and 3.4. In addition, UP (M = 4.08), UJ (M = 4.13), and Wits (M = 4.03) are in agreement that their staff members

have competencies. However, SMU (M2.33), TUT (2.51), and VUT (2.26) totally disagree that there is competency and skills from their staff members when it comes to digital learning.

4.12.3.5 Digital learning tools

The purpose of asking these questions on this sub-construct was to find out the level of availability of digital learning tools and, if indeed, whether they are working all the time. Based on the above results, UP (M3.94), UJ (M4.13), and Wits (4.07) agree that there are digital learning tools most of the time. But SMU (M=2.87), TUT (M=2.43), and VUT (M=2.63) are neutral when it comes to this construct, and the reason for this is because their mean is between 2.6 and 3.4. However, the average score for this construct is 3.19, indicating a neutral stance on this particular aspect.

4.12.3.6 Conclusion on Digital Learning Construct

Based on the above responses from participants from these universities, it can be concluded that most of them are neutral when it comes to whether their universities have management models in place on how to deliver their strategic objectives since there is an average 3.02 mean (3.19 + 3.93 + 3.04 + 3.11+2.94= 3.2). Based on this, it can be concluded that there are no digital learning strategies at these universities.

4.13 Presentation as per different constructs

The table below presents the type of statement that formed part of the questionnaire per construct, as well as the responses from participants. This presentation also indicates the frequencies, standard deviation, and percentage per question of those who disagree and agree with that specific question in each construct. The following constructs will be discussed as follows:

4.13.1 Product innovativeness

The results presented in the table below show that most respondents are neutral to the statements on this construct. The study identified four sub-constructs under the category of product innovativeness. On the statement of whether, on the introduction of new services and products, their universities are the first to introduce those services in the market, 50.3% disagree with this statement, and 11.1% totally disagree with this

statement. Which means that in total, 61.4 (50.3 + 11.1) participants disagree to some extent with the statement. Still on this statement, (22.9 + 10.5), which is a total of 33.4, agree to some extent with this statement. When comparing the total of those who disagree and those who do not agree, it means those in disagreement are more than those who agree by 16.9. Another statement is the one that wanted to know if the products and services of these universities are often perceived as very novel by customers, and 50.7% disagree and 8.5 total disagree, which brings the total to 56.2. Therefore, the total number of disagreements is in the majority.

The other statement is to determine if these universities have introduced more innovative products and services during the past five years, and 55.2% of respondents disagree with this statement. The other sub concept is the one that seeks to determine if their universities have a lower success rate when it comes to launching new products and services, and 53.9% agree with this statement, meaning they have a lower rate, which is not good as compared to their competitors. The average mean on this construct and sub concept is 2.78, which means that participants are of the view that there is no product innovation in all these universities.

Table 26: Responses on Product innovativeness construct

In new product and service introductions, our university is often first to market				
	Frequency	**Percentage**	**Mean**	**Std. Deviation**
Strongly Disagree	34	11,1	2,71	1,232
Disagree	154	50,3		
Neutral	16	5,2		
Agree	70	22,9		
Strongly Agree	32	10,5		
Total	306	100		
Our new products and services are often perceived as very novel by customers				
Strongly Disagree	26	8,5	2,74	1,150
Disagree	155	50,7		

Neutral	19	6,2		
Agree	86	28,1		
Strongly Agree	20	6,5		
Total	306	100		
In comparison with our competitors, our university has introduced more innovative products and services during the past five years				
Strongly Disagree	27	8,8	2,64	1,119
Disagree	169	55,2		
Neutral	11	3,6		
Agree	84	27,5		
Strongly Agree	15	4,9		
Total	306	100		
In comparison with our competitors, our university has a lower success rate in new products and services launched				
Strongly Disagree	67	21,9	3,05	1,330
Disagree	47	15,4		
Neutral	12	3,9		
Agree	165	53,9		
Strongly Agree	15	4,9		
Total	306	100		
Mean = 2,78 Std. Deviation = 0,647				

4.13.2 Market Innovativeness

The purpose of this section, as shown in the table below, is to determine how participants from different universities respond to the market innovativeness construct. According to the results, 59.2% of respondents disagree that new products and services are only minor changes from their previous products and services. While only 20.9% of respondents agree with this statement, 29.7% agree that their products are revolutionary in the market compared to their competitors. The other statement asked if the products and services offered by their universities are at the forefront of technology, and 52.6% of respondents disagreed with this assertion. In summary,

when it comes to these four sub concepts, there is an average of 53.3% who do not agree with the statement, and there is a mean of 2.69.

Table 27: Responses on Market innovativeness construct

Our recent new products and services are only minor changes from our previous products and services				
	Frequency	**Percentage**	**Mean**	**Std. Deviation**
Strongly Disagree	17	5,6	2,54	0,937
Disagree	181	59,2		
Neutral	39	12,7		
Agree	64	20,9		
Strongly Agree	5	1,6		
Total	306	100		
New products and services in our university often take us up against new competitors				
Strongly Disagree	21	6,9	2,76	1,101
Disagree	155	50,7		
Neutral	18	5,9		
Agree	100	32,7		
Strongly Agree	12	3,9		
Total	306	100		
In comparison with our competitors, our products 'most recent marketing programme is revolutionary in the market				
Strongly Disagree	24	7,8	2,71	1,094
Disagree	156	51		
Neutral	23	7,5		
Agree	91	29,7		
Strongly Agree	12	3,9		
Total	306	100		

In new product and service introductions, our university is often at the cutting edge of technology				
Strongly Disagree	27	8,8	2,75	1,218
Disagree	161	52,6		
Neutral	9	2,9		
Agree	78	25,5		
Strongly Agree	31	10,1		
Total	306	100		
Mean = 2,69 **Std. Deviation = 0,972**				

4.13.3 Process Innovativeness

As shown in the table below, the results show that 64.1% of the respondents agree that they are constantly improving their business processes at their respective universities. On the same table, the majority of 33.3% of the respondents believe that their universities are teaching and learning methods at a great speed in comparison with their competitors.

On the statement regarding whether in the past five years, their universities have developed many new management approaches, 53.3% of the respondents disagree with this statement. The average mean on the construct of process innovativeness is 3.02, which means that when it comes to the process innovativeness construct, participants are neutral on this construct.

Table 28: Responses on Process Innovativeness Construct

We are constantly improving our business processes				
	Frequency	**Percentage**	**Mean**	**Std. Deviation**
Strongly Disagree	17	5,6	3,46	1,062
Disagree	62	20,3		
Neutral	10	3,3		

Agree	196	64,1		
Strongly Agree	21	6,9		
Total	306	100		
Our university changes teaching and learning methods at a great a great speed in comparison with our competitors				
Strongly Disagree	18	5,9	3,07	1,038
Disagree	77	25,2		
Neutral	102	33,3		
Agree	85	27,8		
Strongly Agree	24	7,8		
Total	306	100		
During the past five years, our university has developed many new management approaches				
Strongly Disagree	20	6,5	2,76	1,132
Disagree	163	53,3		
Neutral	9	2,9		
Agree	97	31,7		
Strongly Agree	17	5,6		
Total	306	100		
When we cannot solve a problem using conventional method, we improvise on new methods				
Strongly Disagree	18	5,9	2,79	1,102
Disagree	159	52		
Neutral	9	2,9		
Agree	109	35,6		
Strongly Agree	11	3,6		
Total	306	100		
Mean = 3,02 **Std. Deviation = 0,973**				

4.13.4 Behavioural Innovativeness

As presented in the table below, the results indicate that there are 52.9% of the respondents who are of the opinion that they do not get a lot of support from their managers if they want to try new ways of doing things. Similarly, only 37.4% of the respondents believe that they are getting support from their managers when they want to try new ways of doing things. The other construct is the one that seeks to determine if in these universities employees who do things differently are tolerated, and only 31% agree and 56.2% disagree with this sub construct. There was another statement that was intended to determine if there is a culture doing things differently in order to find novel solutions. On this one, a huge number of 52.6% do not agree with this statement. The last sub construct is the one that seeks to find out if employees are encouraged to think and behave in original and novel ways, and in the other statement, there is a huge number of 52% who disagree. In conclusion, participants are of the view that there is no behavioural innovativeness in their universities because the average mean is 2.76.

Table 29: Responses on Behavioural Innovativeness Construct

We get a lot of support from managers if we want to try new ways of doing things				
	Frequency	**Percentage**	**Mean**	**Std. Deviation**
Strongly Disagree	18	5,9	2,77	1,112
Disagree	162	52,9		
Neutral	12	3,9		
Agree	99	32,4		
Strongly Agree	15	4,9		
Total	306	100		
In our university we tolerate individuals who do things in a different way				
Strongly Disagree	16	5,2	2,70	1,048
Disagree	172	56,2		
Neutral	15	4,9		
Agree	95	31		

Strongly Agree	8	2,6		
Total	306	100		
We are willing to try new ways of doing things and seek unusual, novel solution				
Strongly Disagree	17	5,6	2,76	1,068
Disagree	161	52,6		
Neutral	15	4,9		
Agree	105	34,3		
Strongly Agree	8	2,6		
Total	306	100		
We encourage people to think and behave in original and novel ways				
Strongly Disagree	14	4,6	2,79	1,065
Disagree	159	52		
Neutral	19	6,2		
Agree	104	34		
Strongly Agree	10	3,3		
Total	306	100		
Mean = 2,76 **Std. Deviation = 1,037**				

4.13.5 Strategic Innovativeness

From the 306 respondents that were surveyed, the results in the table below show that the majority (56.9%) of the respondents agree that their university R&D or product development resources are not adequate to handle the development needs of new products and services. Meanwhile, 55.6% of these respondents disagree that senior executives constantly seek unusual, novel solutions to problems via the use of 'idea men'. On the same statement about strategic innovativeness, 53.3% of the respondents disagree that key executives of their university are willing to take risks to seize and explore 'chancy' growth opportunities. The fourth last sub construct, which is about whether, when they see new ways of doing things, they are the last to adopt them, because this is at 47.4%. Therefore, it can be concluded that they are neutral because the mean is 2.77% average.

Table 30: Responses of Strategic Innovativeness

Our university R&D or product development resources are not adequate to handle the development need of new products and services				
	Frequency	**Percentage**	**Mean**	**Std. Deviation**
Strongly Disagree	65	21,2	3,13	1,339
Disagree	42	13,7		
Neutral	6	2		
Agree	174	56,9		
Strongly Agree	19	6,2		
Total	306	100		
Key executives of the university are willing to take risks to seize and explore 'chancy' growth opportunities				
Strongly Disagree	13	4,2	2,80	1,092
Disagree	163	53,3		
Neutral	20	6,5		
Agree	93	30,4		
Strongly Agree	17	5,6		
Total	306	100		
Senior executives constantly seek unusual, novel solutions to problems via the use of 'idea men'				
Strongly Disagree	13	4,2	2,75	1,068
Disagree	170	55,6		
Neutral	19	6,2		
Agree	90	29,4		
Strongly Agree	14	4,6		
Total	306	100		
When we see new ways of doing things, we are last of adopting them				
Strongly Disagree	67	21,9	2,41	1,198
Disagree	145	47,4		
Neutral	13	4,2		

Agree	64	20,9		
Strongly Agree	17	5,6		
Total	306	100		
Mean = 2,77 **Std. Deviation = 0,433**				

4.13.6 Planning Management Model

The table below shows that 70.3% of respondents agree that there is a high degree of predictability of outcomes when planning at their university. On the other hand, 54.6% of the respondents disagree that work is conducted in a linear manner in their university since it is at a mature stage, and 52.9% of the respondents disagree that there is incremental innovation and discussions amongst all in the university when it comes to planning. Lastly, 48% of the respondents disagree that there is an essence of a more stable, predictable, and measurable environment in their university in the process of implementing plans. In conclusion, the overall results indicate that the respondents are neutral about the statements pertaining to Planning Management Model. There is an average mean of 3.15 on this mean, which means that participants are neutral when it comes to this construct.

Table 31: Responses to Planning Management Model

There is an essence of more stable, predictable and measurable environment in the university in the process of implementing plans				
	Frequency	**Percentage**	**Mean**	**Std. Deviation**
Strongly Disagree	10	3,3	3,01	1,168
Disagree	147	48		
Neutral	10	3,3		
Agree	109	35,6		
Strongly Agree	30	9,8		
Total	306	100		

There is an incremental innovation and discussions amongst all in the University when it comes to planning				
Strongly Disagree	9	2,9	2,90	1,141
Disagree	162	**52,9**		
Neutral	11	3,6		
Agree	98	32		
Strongly Agree	26	8,5		
Total	306	100		
Work is conducted in a linear manner in the University since it is at matured stage				
Strongly Disagree	9	2,9	2,94	1,236
Disagree	167	**54,6**		
Neutral	10	3,3		
Agree	72	23,5		
Strongly Agree	48	15,7		
Total	306	100		
There is high degree of predictability of the University outcomes when planning				
Strongly Disagree	6	2	3,75	0,859
Disagree	35	11,4		
Neutral	19	6,2		
Agree	215	**70,3**		
Strongly Agree	31	10,1		
Total	306	100		
Mean = 3,15 **Std. Deviation = 0,970**				

4.13.7 Quest Management Model

The results presented in the table below show that 69.9% of the respondents agree that managers set clear organisational goals and encourage employees to reach them. However, 52.6. % of the respondents disagree that their managers encourage them to

reach their individuals through a variety of means. On the statement that seeks to determine if they were told what to do but now know how to do it, 64.7% are also in disagreement with that statement. Also, on the issue of whether their university is well established and operates in a competitive environment, 54.6% of respondents do not agree with this statement. The mean for this construct of Quest Management Model is 2.96%, which means that they are not sure.

Table 32 : Response on Quest Management Model

Managers set clear organisational goals and encourage employees to reach them				
	Frequency	**Percentage**	**Mean**	**Std. Deviation**
Strongly Disagree	6	2	3,71	0,899
Disagree	44	14,4		
Neutral	12	3,9		
Agree	214	69,9		
Strongly Agree	30	9,8		
Total	306	100		
Managers encourage employees to reach objectives through a variety of means				
Strongly Disagree	7	2,3	2,91	1,108
Disagree	161	52,6		
Neutral	13	4,2		
Agree	104	34		
Strongly Agree	21	6,9		
Total	306	100		
Employees are told what to do but not how to do it				
Strongly Disagree	10	3,3	2,60	0,997

Disagree	198	64,7		
Neutral	9	2,9		
Agree	81	26,5		
Strongly Agree	8	2,6		
Total	306	100		
Our university is well established and operating in a competitive environment				
Strongly Disagree	12	3,9	2,92	1,237
Disagree	167	54,6		
Neutral	5	1,6		
Agree	78	25,5		
Strongly Agree	44	14,4		
Total	306	100		
Managers tend to involve people in decision making process and decentralise planning				
Strongly Disagree	17	5,6	2,68	1,084
Disagree	178	58,2		
Neutral	10	3,3		
Agree	87	28,4		
Strongly Agree	14	4,6		
Total	306	100		
Mean = 2,96 **Std. Deviation = 0,908**				

4.13.8 Discovery Management Model

According to the results shown in the table below, there are five subconstructs under this construct, and the first one is to find out if there are tight means and loose ends with formal rules, structures, and authority in decision-making in their university, and 48% disagree. On the second one, about whether there is an intrinsic approach and obliquity

in achieving goals in their municipality, 52.3% are also in disagreement with this statement.

Regarding the third statement, which asks whether their university has bureaucratic and formal rules, 48% of respondents disagree. On the fourth one about whether there are standard operating procedures, but employees are encouraged to seek new ways of delivering outputs, 58.5% disagree with this statement.

Lastly, on the statement about whether their university is in the start-up phase and operates in an ambiguous, uncertain, and fast-changing environment, 65.5% agree with this statement. In summary, the overall results show that the respondents are neutral about the statements relating to the Discovery Management Model. There is an average of 2.89 in this construct, which means that participants do not agree that their universities subscribe to the principles of the discovery management model.

Table 33: Responses on Discovery Management Model

There are tight means and loose ends with formal rules, structure, and authority in decision making				
	Frequency	**Percentage**	**Mean**	**Std. Deviation**
Strongly Disagree	11	3,6	2,88	1,075
Disagree	147	48		
Neutral	33	10,8		
Agree	98	32		
Strongly Agree	17	5,6		
Total	306	100		
There is intrinsic motivational approach and obliquity in achieving goals				
Strongly Disagree	10	3,3	2,78	1,016
Disagree	160	52,3		
Neutral	33	10,8		
Agree	94	30,7		
Strongly Agree	9	2,9		
Total	306	100		

There is bureaucratic and formal rules in our University				
Strongly Disagree	20	6,5	2,96	1,264
Disagree	147	48		
Neutral	7	2,3		
Agree	89	29,1		
Strongly Agree	43	14,1		
Total	306	100		
There are standardised procedures, but employees are encouraged to seek new ways of delivering outputs				
Strongly Disagree	20	6,5	2,63	1,070
Disagree	179	58,5		
Neutral	14	4,6		
Agree	80	26,1		
Strongly Agree	13	4,2		
Total	306	100		
Our university is at start-up phase and operating in an ambiguous, uncertain, and fast changing environment				
Strongly Disagree	48	15,7	3,20	1,241
Disagree	53	17,3		
Neutral	7	2,3		
Agree	185	60,5		
Strongly Agree	13	4,2		
Total	306	100		
Mean = 2,89 **Std. Deviation = 0,526**				

4.13.9 Scientific Management Model

The table below shows that 79.7% of the respondents agree that their university is dealing with special projects from time to time. Whereas 53.6% of the respondents disagree with the statement “I am aware of the university’s innovation strategy,” and 52.9% also disagree that there is a high culture of innovativeness in their university. Lastly, 51.3% of the respondents also disagree that executives are more interested in

and willing to innovate in strategic aspects. In conclusion, the overall results indicate that the respondents are neutral about the statements regarding the Scientific Management Model. However, there is an average mean of 3.10 on this construct, which means that participants are neutral when it comes to this model.

Table 34: Responses on Scientific Management Model

Our University is dealing with special projects from time to time				
	Frequency	**Percentage**	**Mean**	**Std. Deviation**
Strongly Disagree	4	1,3	3,89	0,702
Disagree	20	6,5		
Neutral	10	3,3		
Agree	244	79,7		
Strongly Agree	28	9,2		
Total	306	100		
Executives are more interested and willing to make innovation in strategic aspects				
Strongly Disagree	14	4,6	2,86	1,141
Disagree	157	51,3		
Neutral	17	5,6		
Agree	94	30,7		
Strongly Agree	24	7,8		
Total	306	100		
There is a high culture of innovativeness in our university				
Strongly Disagree	18	5,9	2,82	1,181
Disagree	162	52,9		
Neutral	14	4,6		
Agree	82	26,8		

Strongly Agree	30	9,8		
Total	306	100		
I am aware of the university's innovation strategy				
Strongly Disagree	14	4,6	2,83	1,154
Disagree	164	53,6		
Neutral	14	4,6		
Agree	87	28,4		
Strongly Agree	27	8,8		
Total	306	100		
Mean = 3,10 **Std. Deviation = 0,919**				

4.13.10 Digital Learning Strategies

As presented in Table below, the overall results indicate that respondents are mostly neutral to the statement relating to Digital Learning Strategies.

There are 49% of respondents who disagree that there are E-Learning/digital learning strategies at their university. Equally, 52.9% of the respondents also disagree that digital learning strategies are implemented to the fullest within the university, and 52.6% of the respondents also disagree that the university's digital strategy is aligned to their innovation strategy. The results also show that 51.3% of respondents disagree with the statement "All academic staff and student are aware of digital learning strategies." In conclusion, most of the respondents disagree with all the statements because there is an average mean of 2.96.

Table 35: Digital Learning Strategies

There is E-Learning/digital learning strategies in our university				
	Frequency	**Percentage**	**Mean**	**Std. Deviation**
Strongly Disagree	9	2,9	3,10	1,287

Disagree	150	49		
Neutral	11	3,6		
Agree	74	24,2		
Strongly Agree	62	20,3		
Total	306	100		
Digital learning strategies are implemented to the fullest within the university				
Strongly Disagree	10	3,3	2,92	1,209
Disagree	162	52,9		
Neutral	20	6,5		
Agree	70	22,9		
Strongly Agree	44	14,4		
Total	306	100		
University's digital strategy is aligned to our innovation strategy				
Strongly Disagree	12	3,9	2,83	1,134
Disagree	161	52,6		
Neutral	28	9,2		
Agree	76	24,8		
Strongly Agree	29	9,5		
Total	306	100		
All academic staff and student are aware of digital learning strategies				
Strongly Disagree	9	2,9	2,89	1,142
Disagree	157	51,3		
Neutral	31	10,1		
Agree	76	24,8		
Strongly Agree	33	10,8		
Total	306	100		
Mean = 2,94				

Std. Deviation = 1,154

4.13.11 Digital Learning Implementation

The results in Table 36 below show that the majority of the participants (70.6%) agree that there is a specific department dealing with digital learning at their university. On the contrary, the results further indicate that 53.9% of the respondents disagree that there is enough collaboration among all teams when it comes to the implementation of digital learning, and 52.9% of the respondents disagree that their university has a digital learning implementation plan. Lastly, 52.3% of the respondents also disagree that all academic staff have digital learning tools and students are aware of the digital learning implementation plan. Based on the above data, it can be concluded that the respondents are neutral about the statements regarding Digital Learning Implementation.

Table 36: Responses on Digital Learning Implementations

There is enough collaboration of all teams when it comes to digital learning implementation				
	Frequency	**Percentage**	**Mean**	**Std. Deviation**
Strongly Disagree	12	3,9	2,81	1,112
Disagree	165	53,9		
Neutral	20	6,5		
Agree	87	28,4		
Strongly Agree	22	7,2		
Total	306	100		
Our university has digital learning implementation plan				
Strongly Disagree	12	3,9	2,86	1,136
Disagree	162	52,9		
Neutral	14	4,6		
Agree	94	30,7		
Strongly Agree	24	7,8		
Total	306	100		

All academic staff have and students are aware of the digital learning implementation plan				
Strongly Disagree	12	3,9	2,83	1,117
Disagree	160	52,3		
Neutral	25	8,2		
Agree	85	27,8		
Strongly Agree	24	7,8		
Total	306	100		
There is a specific department dealing with digital learning in our university				
Strongly Disagree	8	2,6	3,95	0,848
Disagree	22	7,2		
Neutral	4	1,3		
Agree	216	70,6		
Strongly Agree	56	18,3		
Total	306	100		
Mean = 3,11 **Std. Deviation = 0,940**				

4.13.12 Digital Learning Barriers

As shown in Table 37 below, the results show that 79.4% of respondents agree that there are potential barriers experienced by all staff members towards digital learning. However, 53.9% of the respondents disagree that there is a plan that has been developed to address these barriers, and 53.6% of respondents echo the same sentiments when it comes to the statement about whether a risk assessment has been conducted to identify barriers to digital learning in their university. Additionally, 52.9% of respondents disagree with the statement “The plan has been communicated to all stakeholders." In conclusion, the overall results, like on the other constructs, indicate that the respondents are neutral to the statements pertaining to Digital Learning Barriers.

Table 37: Responses on Digital Learning Barriers

A risk assessment has been conducted to identify barriers of digital learning in our university				
	Frequency	**Percentage**	**Mean**	**Std. Deviation**
Strongly Disagree	12	3,9	2,81	1,106
Disagree	164	53,6		
Neutral	21	6,9		
Agree	88	28,8		
Strongly Agree	21	6,9		
Total	306	100		
There are potential barriers experienced by all staff members towards digital learning				
Strongly Disagree	5	1,6	3,82	0,722
Disagree	22	7,2		
Neutral	16	5,2		
Agree	243	79,4		
Strongly Agree	20	6,5		
Total	306	100		
There is a plan that has been developed to address these barriers				
Strongly Disagree	12	3,9	2,80	1,091
Disagree	165	53,9		
Neutral	18	5,9		
Agree	94	30,7		
Strongly Agree	17	5,6		
Total	306	100		
The plan has been communicated to all stakeholders				

Strongly Disagree	13	4,2	2,74	1,025
Disagree	162	52,9		
Neutral	31	10,1		
Agree	91	29,7		
Strongly Agree	9	2,9		
Total	306	100		
Mean = 3,04: Std. Deviation = 0,850				

4.13.13 Staff Competencies on Digital Learning

As presented in the table below, the results indicate that 41.2% of respondents agree that there are competent and qualified staff dealing with digital learning, while on the contrary, 57.2% of the respondents disagree that digital systems are always upgraded to be up-to-date, and also 55.9% of the respondents do not agree that breakdowns of digital systems are attended to promptly. Lastly, 51.3% of the respondents also share the same sentiment of disagreeing that 100% of our students and academics have been taught how to use different digital systems and gadgets. In conclusion, the overall results indicate that the respondents are neutral about the statements pertaining to Staff Competencies in Digital Learning.

Table 38: Responses on Staff Competencies on Digital Learning

There are competent and qualified staff dealing with digital learning				
	Frequency	**Percentage**	**Mean**	**Std. Deviation**
Strongly Disagree	5	1,6	3,33	0,944
Disagree	51	16,7		
Neutral	124	40,5		
Agree	90	29,4		
Strongly Agree	36	11,8		
Total	306	100		
100% of our students and academics have been taught about using different digital systems				

Strongly Disagree	9	2,9	2,83	1,050
Disagree	157	51,3		
Neutral	30	9,8		
Agree	96	31,4		
Strongly Agree	14	4,6		
Total	306	100		
Break downs of digital systems are attended to promptly				
Strongly Disagree	10	3,3	2,78	1,063
Disagree	171	55,9		
Neutral	15	4,9		
Agree	97	31,7		
Strongly Agree	13	4,2		
Total	306	100		
Our digital systems are always upgraded to be up to date				
Strongly Disagree	10	3,3	2,79	1,105
Disagree	175	57,2		
Neutral	10	3,3		
Agree	91	29,7		
Strongly Agree	20	6,5		
Total	306	100		
Mean = 2,93 **Std. Deviation = 0,977**				

4.13.14 Digital Learning Tools

According to the results in Table 39 below, there is an indication that 40.5% of respondents believe that all academic staff have access to digital learning systems and gadgets. Whereas 41.5% of the respondents are neutral to the statement, “All students and staff have digital gadgets,” and 38.9% of the respondents are also neutral to the statement, “All digital learning systems are available remotely." On the same token, 37.6% of the respondents are neutral to the statement, “All students who lived off campus were provided with gadgets for digital learning." In conclusion, the overall

results indicate that the respondents are neutral about the statements pertaining to Digital Learning Tools.

Table 39: Response to Digital Learning Tools

All student and staff have digital gadgets				
	Frequency	**Percentage**	**Mean**	**Std. Deviation**
Strongly Disagree	11	3,6	3,17	0,923
Disagree	56	18,3		
Neutral	127	41,5		
Agree	93	30,4		
Strongly Agree	19	6,2		
Total	306	100		
All students who lived off campus were provided with gadgets for digital learning				
Strongly Disagree	9	2,9	3,21	0,925
Disagree	59	19,3		
Neutral	115	37,6		
Agree	104	34		
Strongly Agree	19	6,2		
Total	306	100		
All Academic staff access to digital learning systems				
Strongly Disagree	9	2,9	3,22	0,954
Disagree	63	20,6		
Neutral	110	35,9		
Agree	101	33		
Strongly Agree	23	7,5		
Total	306	100		
All digital learning systems are available remotely				

Strongly Disagree	9	2,9	3,16	0,934
Disagree	65	21,2		
Neutral	119	38,9		
Agree	93	30,4		
Strongly Agree	20	6,5		
Total	306	100		
Mean = 3,19 **Std. Deviation = 0,903**				

4.14 Group Differences Analysis

Group differences analysis seeks to examine how independent groups, in this instance, universities, may differ from each other on a variable. This analysis test is useful for examining the efficacy of interventions or treatments. In this study, a one-way between-groups ANOVA was conducted to compare the mean across the six universities under this study. There are three tables of interest: the descriptive table, the ANOVA table, and the post hoc table.

The ANOVA table indicates statistical significance between these universities. The significant difference is determined by the P-value that is expected to be below 0.05, which indicates that there is a mean difference. The post-hoc table should be analysed when the ANOVA shows a significant result. The Post Hoc assesses the mean difference within these universities. The Tukey test was used in this ANOVA.

4.14.1 Relationship between Universities and product innovativeness

The table below depicts the relationship between respondent from all these universities when it comes to product innovativeness. According to this table, the mean is between is between 2.3 and 3.4 for different universities. Sefako Makgatho Health Sciences University (2.4 mean), Vaal University of Technology (2.4 mean), Tshwane University of Technology (2.3 mean), all of these three Universities have a mean less than 3 Mean. Which means that respondents from these Universities do not agree that their products and services are not viewed as useful or beneficial to their clients. However, University of Johannesburg (3.5 mean), University of Pretoria (3.4 mean), Wits University (3.4

mean), which means that these three Universities are neutral when it comes to whether their products and perceived as unique and add value by their customers. In conclusion there is an average mean of 2.7 on this construct which means that they don't agree.

Table 40: Product Innovativeness Descriptive

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
SMU	106	2,4175	,40784	,03961	2,3389	2,4960
VUT	70	2,4536	,30779	,03679	2,3802	2,5270
UJ	23	3,5978	,35145	,07328	3,4458	3,7498
Wits University	38	3,4079	,59961	,09727	3,2108	3,6050
UP	45	3,4444	,42603	,06351	3,3165	3,5724
TUT	24	2,3646	,41032	,08376	2,1913	2,5378
Total	306	2,7843	,64691	,03698	2,7115	2,8571

In statistics, analysis of variance (ANOVA) is a collection of statistical models and their associated procedures in which the observed variance is partitioned into components due to different explanatory variables. ANOVA is a statistical technique for helping to infer whether there are real differences between the means of three or more categories of a variable based on sample data (Gerber et al., 2020). In this study, only one-way ANOVA was considered based on the three independent variables, e.g., organisational innovativeness, management models, and digital learning constructs.

Table 41: Product Innovativeness ANOVA

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	75,759	5	15,152	87,616	0,000
Within Groups	51,880	300	0,173		
Total	127,640	305			

As per the above table, there is a significant difference in mean score across the different universities within product innovativeness (p value = 0.000<0.005).

Table 42: Product Innovativeness Multiple Comparisons

Multiple Comparisons						
Dependent Variable:	PRODINNOV					
Tukey HSD						
(I) University		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Sefako Makgatho Health Sciences University	Vaal University of Technology	-,03612	,06405	,993	-,2198	,1476
	University of Johannesburg	-1.18037*	,09566	,000	-1,4547	-,9060
	Wits University	-.99044*	,07863	,000	-1,2160	-,7649
	University of Pretoria	-1.02699*	,07399	,000	-1,2392	-,8148
	Tshwane University of Technology	,05287	,09401	,993	-,2168	,3225
Vaal University of Technology	Sefako Makgatho Health Sciences University	,03612	,06405	,993	-,1476	,2198
	University of Johannesburg	-1.14425*	,09995	,000	-1,4309	-,8576
	Wits University	-.95432*	,08379	,000	-1,1947	-,7140
	University of Pretoria	-.99087*	,07946	,000	-1,2188	-,7630

	Tshwane University of Technology	,08899	,09837	,945	-,1932	,3711
University of Johannesburg	Sefako Makgatho Health Sciences University	1.18037*	,09566	,000	,9060	1,4547
	Vaal University of Technology	1.14425*	,09995	,000	,8576	1,4309
	Wits University	,18993	,10986	,514	-,1252	,5050
	University of Pretoria	,15338	,10659	,703	-,1523	,4591
	Tshwane University of Technology	1.23324*	,12134	,000	,8852	1,5813
Wits University	Sefako Makgatho Health Sciences University	.99044*	,07863	,000	,7649	1,2160
	Vaal University of Technology	.95432*	,08379	,000	,7140	1,1947
	University of Johannesburg	-,18993	,10986	,514	-,5050	,1252
	University of Pretoria	-,03655	,09162	,999	-,2993	,2262
	Tshwane University of Technology	1.04331*	,10843	,000	,7323	1,3543

University of Pretoria	Sefako Makgatho Health Sciences University	1.02699*	,07399	,000	,8148	1,2392
	Vaal University of Technology	.99087*	,07946	,000	,7630	1,2188
	University of Johannesburg	-,15338	,10659	,703	-,4591	,1523
	Wits University	,03655	,09162	,999	-,2262	,2993
	Tshwane University of Technology	1.07986*	,10511	,000	,7784	1,3813
Tshwane University of Technology	Sefako Makgatho Health Sciences University	-,05287	,09401	,993	-,3225	,2168
	Vaal University of Technology	-,08899	,09837	,945	-,3711	,1932
	University of Johannesburg	-1.23324*	,12134	,000	-1,5813	-,8852
	Wits University	-1.04331*	,10843	,000	-1,3543	-,7323
	University of Pretoria	-1.07986*	,10511	,000	-1,3813	-,7784

The mean difference is significant at the 0.05 level

The post hoc test in the above table demonstrates that when it comes to the product innovativeness construct, the average score of the respondents of the respondents from the University of Johannesburg, Wits University, and the University of Pretoria's

respondents is significantly higher (p = 0.000 < 0.05) than the average score of the respondents from Sefako Makgatho Health Sciences University. This means that the level of agreement regarding product innovativeness differs amongst these institutions.

4.14.2 Relationship between universities and Market Innovativeness

According to the table below, the results indicate that the average mean score of Market innovativeness construct differs across the different universities. The same pattern seems to be happening in SMU (2.1 mean), VUT (2.0 mean), and TUT (1.9 mean), which means that respondents from these three universities do not agree that their universities have new approaches that they adopt in order to enter and exploit targeted markets. Which means that they don't have products that they develop with cutting edge technological content. In contract, Wits University (3.8 mean), UP (3.7 mean), and UJ (3.9 mean) have a mean greater than 3, which means that they agree to a lesser extent that their products and services have made some impressions in the new market. In conclusion, the overall mean is 2.6, which means that there is disagreement that there are new approaches that are adopted in their university in order to exploit new markets.

Table 43: Market Innovativeness Descriptives

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Sefako Makgatho Health Sciences University	106	2,1722	,52368	,05086	2,0713	2,2730
University of Johannesburg	23	3,9565	,35876	,07481	3,8014	4,1117
Vaal University of Technology	70	2,0143	,53312	,06372	1,8872	2,1414
Wits University	38	3,8684	,39309	,06377	3,7392	3,9976
University of Pretoria	45	3,7444	,50702	,07558	3,5921	3,8968

Tshwane University of Technology	24	1,9063	,47096	,09614	1,7074	2,1051
Total	306	2,6912	,97205	,05557	2,5818	2,8005

The table below presents the results of an ANOVA study on market innovation across various universities. According to this table, there is a significant difference in mean scores across these universities since the p value is 0.000 < 0.05, which means it is less than 0,005.

Table 44: Market Innovativeness ANOVA

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	214,824	5	42,965	175,683	,000
Within Groups	73,367	300	,245		
Total	288,191	305			

The table below shows that respondents from the University of Johannesburg, Wits University, and University of Pretoria have significantly higher average mean scores (p = 0.000 < 0.05) than respondents from Sefako Makgatho Health Sciences University, Vaal University of Technology, and Tshwane University of Technology. As a result, there is a high level of disagreement among employees from these different universities regarding this concept of market innovation.

Table 45: Market Innovativeness Multiple Comparison

Multiple Comparisons					
Dependent Variable:	MARKINNOV				
Tukey HSD					
(I) University			Std. Error	Sig.	95% Confidence Interval

		Mean Difference (I-J)			Lower Bound	Upper Bound
Sefako Makgatho Health Sciences University	University of Johannesburg	-1.78435*	,11375	,000	-2,1106	-1,4581
	Vaal University of Technology	,15788	,07616	,304	-,0606	,3763
	Wits University	-1.69625*	,09350	,000	-1,9644	-1,4281
	University of Pretoria	-1.57227*	,08799	,000	-1,8246	-1,3199
	Tshwane University of Technology	,26592	,11179	,167	-,0547	,5866
University of Johannesburg	Sefako Makgatho Health Sciences University	1.78435*	,11375	,000	1,4581	2,1106
	Vaal University of Technology	1.94224*	,11886	,000	1,6013	2,2831
	Wits University	,08810	,13065	,985	-,2866	,4628
	University of Pretoria	,21208	,12676	,551	-,1515	,5756
	Tshwane University of Technology	2.05027*	,14430	,000	1,6364	2,4642
Vaal University of Technology	Sefako Makgatho Health	-,15788	,07616	,304	-,3763	,0606

	Sciences University					
	University of Johannesburg	-1.94224*	,11886	,000	-2,2831	-1,6013
	Wits University	-1.85414*	,09965	,000	-2,1399	-1,5683
	University of Pretoria	-1.73016*	,09449	,000	-2,0012	-1,4591
	Tshwane University of Technology	,10804	,11698	,940	-,2275	,4436
Wits University	Sefako Makgatho Health Sciences University	1.69625*	,09350	,000	1,4281	1,9644
	University of Johannesburg	-,08810	,13065	,985	-,4628	,2866
	Vaal University of Technology	1.85414*	,09965	,000	1,5683	2,1399
	University of Pretoria	,12398	,10895	,865	-,1885	,4365
	Tshwane University of Technology	1.96217*	,12894	,000	1,5923	2,3320
University of Pretoria	Sefako Makgatho Health Sciences University	1.57227*	,08799	,000	1,3199	1,8246
	University of Johannesburg	-,21208	,12676	,551	-,5756	,1515

	Vaal University of Technology	1.73016*	,09449	,000	1,4591	2,0012
	Wits University	-,12398	,10895	,865	-,4365	,1885
	Tshwane University of Technology	1.83819*	,12500	,000	1,4797	2,1967
Tshwane University of Technology	Sefako Makgatho Health Sciences University	-,26592	,11179	,167	-,5866	,0547
	University of Johannesburg	-2.05027*	,14430	,000	-2,4642	-1,6364
	Vaal University of Technology	-,10804	,11698	,940	-,4436	,2275
	Wits University	-1.96217*	,12894	,000	-2,3320	-1,5923
	University of Pretoria	-1.83819*	,12500	,000	-2,1967	-1,4797

. The mean difference is significant at the 0.05 level.

4.14.3 Relationship between universities and Process Innovativeness

According to the table below, there is an average mean score for the process innovativeness construct, and this differs across the different universities. According to SMU (2.6 mean), VUT (2.3 mean), and TUT (2.0 mean), participants do not agree that there is a continuous introduction of new strategies of doing things in their universities. They also don't agree that new management approaches and technology are being introduced in order to deliver the core mandate of their universities. On the contrary, Wits University (4.0 mean), UP (3.9 mean), and UJ (4.0 mean) agree that there is an introduction of new strategies for doing things and also an introduction of new

technologies in these universities. In conclusion, the average mean for all universities is 3.0, which means that they are neutral when it comes to this construct.

Table 46: Process Innovativeness Descriptives

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Sefako Makgatho Health Sciences University	106	2,6462	,63609	,06178	2,5237	2,7687
University of Johannesburg	23	4,0652	,27404	,05714	3,9467	4,1837
Vaal University of Technology	70	2,3857	,60745	,07260	2,2409	2,5306
Wits University	38	4,0987	,59994	,09732	3,9015	4,2959
University of Pretoria	45	3,9944	,51811	,07723	3,8388	4,1501
Tshwane University of Technology	24	2,0000	,78712	,16067	1,6676	2,3324
Total	**306**	**3,0212**	**,97340**	**,05565**	**2,9117**	**3,1307**

The result in the table below shows that there is a significant difference in mean scores across these six different universities within process innovativeness (p value = 0.000 < 0.05).

Table 47: Process Innovativeness ANOVA

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	180,012	5	36,002	99,112	,000
Within Groups	108,975	300	,363		
Total	288,987	305			

According to the table below on the Process Innovativeness construct, respondents from the University of Johannesburg, Wits University, the University of Pretoria, and Tshwane University of Technology scored significantly higher ($p = 0.000 < 0.05$) than the average score of the respondents from Sefako Makgatho Health Sciences University. This implies that the Process Innovativeness of the University of Johannesburg is higher than that of Sefako Makgatho Health Sciences University, followed by that of Wits University and the University of Pretoria. Which means that when it comes to the issue of whether there is an introduction of new strategies and new management approaches in these universities from time to time, it means UJ, Wits, UP, and TUT are introducing these new approaches from time to time when conducting teaching and learning. This also implies that these universities are implementing new technologies to facilitate digital learning. This also means that these universities are using their resources and capabilities in order to meet their strategic objectives. And the other universities are not doing well when it comes to this construct of process innovativeness.

Table 48: Process Innovativeness Multiple Comparisons

Multiple Comparisons						
Dependent Variable:	PROCINNOV					
Tukey HSD						
(I) University		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Sefako Makgatho Health Sciences University	University of Johannesburg	-1.41899*	,13864	,000	-1,8166	-1,0213
	Vaal University of Technology	,26051	,09282	,059	-,0057	,5268
	Wits University	-1.45246*	,11396	,000	-1,7793	-1,1256
	University of Pretoria	-1.34822*	,10723	,000	-1,6558	-1,0406

	Tshwane University of Technology	.64623*	,13624	,000	,2554	1,0370
University of Johannesburg	Sefako Makgatho Health Sciences University	1.41899*	,13864	,000	1,0213	1,8166
	Vaal University of Technology	1.67950*	,14485	,000	1,2640	2,0950
	Wits University	-,03347	,15923	1,000	-,4902	,4232
	University of Pretoria	,07077	,15449	,997	-,3723	,5139
	Tshwane University of Technology	2.06522*	,17587	,000	1,5608	2,5696
Vaal University of Technology	Sefako Makgatho Health Sciences University	-,26051	,09282	,059	-,5268	,0057
	University of Johannesburg	-1.67950*	,14485	,000	-2,0950	-1,2640
	Wits University	-1.71297*	,12144	,000	-2,0613	-1,3646
	University of Pretoria	-1.60873*	,11516	,000	-1,9390	-1,2784
	Tshwane University of Technology	,38571	,14256	,077	-,0232	,7946
Wits University	Sefako Makgatho Health	1.45246*	,11396	,000	1,1256	1,7793

	Sciences University					
	University of Johannesburg	,03347	,15923	1,000	-,4232	,4902
	Vaal University of Technology	1.71297*	,12144	,000	1,3646	2,0613
	University of Pretoria	,10424	,13278	,970	-,2766	,4851
	Tshwane University of Technology	2.09868*	,15715	,000	1,6480	2,5494
University of Pretoria	Sefako Makgatho Health Sciences University	1.34822*	,10723	,000	1,0406	1,6558
	University of Johannesburg	-,07077	,15449	,997	-,5139	,3723
	Vaal University of Technology	1.60873*	,11516	,000	1,2784	1,9390
	Wits University	-,10424	,13278	,970	-,4851	,2766
	Tshwane University of Technology	1.99444*	,15234	,000	1,5575	2,4314
Tshwane University of Technology	Sefako Makgatho Health Sciences University	-.64623*	,13624	,000	-1,0370	-,2554
	University of Johannesburg	-2.06522*	,17587	,000	-2,5696	-1,5608

	Vaal University of Technology	-,38571	,14256	,077	-,7946	,0232
	Wits University	-2.09868*	,15715	,000	-2,5494	-1,6480
	University of Pretoria	-1.99444*	,15234	,000	-2,4314	-1,5575

. The mean difference is significant at the 0.05 level.

4.14.4 Relationship between universities and Behavioural Innovativeness

As indicated in the table below, the results illustrate that the average mean score of Behavioural innovativeness differs across the different universities. According to this table, SMU (2.1 mean), VUT (2.1 mean), and TUT (2.1 mean) all recorded <3, which means that participants in these universities are saying there is no teamwork in their university and there is no appetite to embrace any change and learn how to do things differently. While UP (3.8 mean), UJ (3.9 mean), and Wits (4.0 mean), which means that these three universities' mean > 3, which means that they agree to a certain extent that there is a willingness to work as a team and allowing employees to do things differently, especially at Wits. However, the average mean is 2.7, which is neutral.

Table 49: Behavioural Innovativeness Descriptives

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Sefako Makgatho Health Sciences University	106	2,1439	,58038	,05637	2,0321	2,2556
University of Johannesburg	23	3,9783	,27087	,05648	3,8611	4,0954
Vaal University of Technology	70	2,1071	,56236	,06722	1,9731	2,2412
Wits University	38	4,0263	,41013	,06653	3,8915	4,1611

University of Pretoria	45	3,8444	,64687	,09643	3,6501	4,0388
Tshwane University of Technology	24	2,1250	,85656	,17484	1,7633	2,4867
Total	306	2,7557	1,03710	,05929	2,6391	2,8724

Based on the results of the table below, there is a significant difference in mean scores across the different universities within Behavioural innovativeness (p value= 0.000 < 0.05).

Table 50: Behavioural Innovativeness ANOVA

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	227,739	5	45,548	136,216	,000
Within Groups	100,314	300	,334		
Total	328,052	305			

According to the results below, the post hoc test reports that the results presented for Behavioural innovativeness for respondents from the University of Johannesburg, Wits University, and the University of Pretoria are significantly higher (p = 0.000 < 0.05) than the average score of the respondents from Sefako Makgatho Health Sciences University. Based on this data, it means that the Behavioural innovativeness construct of the University of Johannesburg is higher than that of Sefako Makgatho Health Sciences University, followed by Wits University and the University of Pretoria.

Table 51: Behavioural Innovativeness Multiple Comparisons

Multiple Comparisons		
Dependent Variable:	BEHINNOV	
Tukey HSD		

(I) University		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Sefako Makgatho Health Sciences University	University of Johannesburg	-1.83439*	,13301	,000	-2,2159	-1,4529
	Vaal University of Technology	,03673	,08906	,998	-,2187	,2922
	Wits University	-1.88245*	,10933	,000	-2,1960	-1,5689
	University of Pretoria	-1.70058*	,10288	,000	-1,9957	-1,4055
	Tshwane University of Technology	,01887	,13072	1,000	-,3561	,3938
University of Johannesburg	Sefako Makgatho Health Sciences University	1.83439*	,13301	,000	1,4529	2,2159
	Vaal University of Technology	1.87112*	,13898	,000	1,4725	2,2697
	Wits University	-,04805	,15277	1,000	-,4862	,3901
	University of Pretoria	,13382	,14822	,946	-,2913	,5589
	Tshwane University of Technology	1.85326*	,16873	,000	1,3693	2,3372
Vaal University of Technology	Sefako Makgatho Health	-,03673	,08906	,998	-,2922	,2187

	Sciences University					
	University of Johannesburg	-1.87112*	,13898	,000	-2,2697	-1,4725
	Wits University	-1.91917*	,11652	,000	-2,2534	-1,5850
	University of Pretoria	-1.73730*	,11049	,000	-2,0542	-1,4204
	Tshwane University of Technology	-,01786	,13678	1,000	-,4102	,3745
Wits University	Sefako Makgatho Health Sciences University	1.88245*	,10933	,000	1,5689	2,1960
	University of Johannesburg	,04805	,15277	1,000	-,3901	,4862
	Vaal University of Technology	1.91917*	,11652	,000	1,5850	2,2534
	University of Pretoria	,18187	,12740	,710	-,1835	,5473
	Tshwane University of Technology	1.90132*	,15077	,000	1,4689	2,3338
University of Pretoria	Sefako Makgatho Health Sciences University	1.70058*	,10288	,000	1,4055	1,9957
	University of Johannesburg	-,13382	,14822	,946	-,5589	,2913

	Vaal University of Technology	1.73730*	,11049	,000	1,4204	2,0542
	Wits University	-,18187	,12740	,710	-,5473	,1835
	Tshwane University of Technology	1.71944*	,14616	,000	1,3002	2,1387
Tshwane University of Technology	Sefako Makgatho Health Sciences University	-,01887	,13072	1,000	-,3938	,3561
	University of Johannesburg	-1.85326*	,16873	,000	-2,3372	-1,3693
	Vaal University of Technology	,01786	,13678	1,000	-,3745	,4102
	Wits University	-1.90132*	,15077	,000	-2,3338	-1,4689
	University of Pretoria	-1.71944*	,14616	,000	-2,1387	-1,3002

***The mean difference is significant at the 0.05 level.**

4.14.5 Relationship between universities and Strategic Innovativeness

Based on the results as per the table below, the outcomes indicate that the average mean score of the Innovativeness construct differs across these six different universities. According to the table below, SMU (2.6 mean), VUT (2.7 mean), Wits (2.7 mean), UJ (3.0 mean), UP (2.8 mean), and TUT (3.0 mean). All these universities recorded < 3, meaning that they are neutral when it comes to whether there is the development of new strategies that create value for their universities. Consequently, they also disagree that their universities possess the capacity to effectively handle ambitious strategic goals with restricted resources.

Table 52: Strategic Innovativeness Descriptives

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Sefako Makgatho Health Sciences University	106	2,6486	,45090	,04379	2,5617	2,7354
University of Johannesburg	23	3,0217	,65241	,13604	2,7396	3,3039
Vaal University of Technology	70	2,7536	,34967	,04179	2,6702	2,8369
Wits University	38	2,6711	,24039	,03900	2,5920	2,7501
University of Pretoria	45	2,8667	,37914	,05652	2,7528	2,9806
Tshwane University of Technology	24	3,0938	,38173	,07792	2,9326	3,2549
Total	306	2,7704	,43348	,02478	2,7217	2,8192

According to the results as per the table below, there is a significant difference in mean scores across the different universities within Strategic innovativeness (p value = 0.000 < 0.05).

Table 53: Strategic Innovativeness ANOVA

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6,347	5	1,269	7,473	,000
Within Groups	50,963	300	,170		
Total	57,310	305			

According to the results below (see Table 54), the post hoc test reports that the results presented for Strategic innovativeness construct for respondents that are from Tshwane University of Technology are significantly higher (p= 0.000 < 0.05) than the average score of the respondents from Sefako Makgatho Health Sciences University. This implies that the Strategic innovativeness of Tshwane University of Technology is higher than that of Sefako Makgatho Health Sciences University.

Table 54: Strategic Innovativeness Multiple Comparisons

Multiple Comparisons						
Dependent Variable:	STRATINNOV					
Tukey HSD						
(I) University		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Sefako Makgatho Health Sciences University	University of Johannesburg	-.37315*	,09481	,001	-,6451	-,1012
	Vaal University of Technology	-,10499	,06348	,563	-,2871	,0771
	Wits University	-,02247	,07793	1,000	-,2460	,2011
	University of Pretoria	-.21808*	,07333	,037	-,4284	-,0077
	Tshwane University of Technology	-.44517*	,09317	,000	-,7124	-,1779
University of Johannesburg	Sefako Makgatho Health Sciences University	.37315*	,09481	,001	,1012	,6451

	Vaal University of Technology	,26817	,09906	,077	-,0160	,5523
	Wits University	.35069*	,10889	,018	,0384	,6630
	University of Pretoria	,15507	,10565	,685	-,1479	,4581
	Tshwane University of Technology	-,07201	,12027	,991	-,4170	,2729
Vaal University of Technology	Sefako Makgatho Health Sciences University	,10499	,06348	,563	-,0771	,2871
	University of Johannesburg	-,26817	,09906	,077	-,5523	,0160
	Wits University	,08252	,08305	,920	-,1557	,3207
	University of Pretoria	-,11310	,07875	,705	-,3390	,1128
	Tshwane University of Technology	-.34018*	,09749	,007	-,6198	-,0605
Wits University	Sefako Makgatho Health Sciences University	,02247	,07793	1,000	-,2011	,2460
	University of Johannesburg	-.35069*	,10889	,018	-,6630	-,0384
	Vaal University of Technology	-,08252	,08305	,920	-,3207	,1557

	University of Pretoria	-,19561	,09080	,263	-,4561	,0648
	Tshwane University of Technology	-.42270*	,10746	,001	-,7309	-,1145
University of Pretoria	Sefako Makgatho Health Sciences University	.21808*	,07333	,037	,0077	,4284
	University of Johannesburg	-,15507	,10565	,685	-,4581	,1479
	Vaal University of Technology	,11310	,07875	,705	-,1128	,3390
	Wits University	,19561	,09080	,263	-,0648	,4561
	Tshwane University of Technology	-,22708	,10418	,250	-,5259	,0717
Tshwane University of Technology	Sefako Makgatho Health Sciences University	.44517*	,09317	,000	,1779	,7124
	University of Johannesburg	,07201	,12027	,991	-,2729	,4170
	Vaal University of Technology	.34018*	,09749	,007	,0605	,6198
	Wits University	.42270*	,10746	,001	,1145	,7309
	University of Pretoria	,22708	,10418	,250	-,0717	,5259

***. The mean difference is significant at the 0.05 level.**

4.14.6 Relationship between universities and Planning Management Model

Table 55 below shows the relationship between different universities when it comes to the Planning Management Model construct. According to this table, it shows that Wits University has a high mean of 4.35, UJ recorded a 4.25 mean, and UP is sitting at a 4.1 mean, meaning participants from these three universities agree that their universities are at a mature stage, work is conducted in a linear manner, and the degree of predictability of the outcomes of their strategies is high. While TUT (2.4), SMU (2.5 mean), and TUT (2.4 mean) do not agree that their universities are at mature stages, work is conducted in a linear manner, and there is predictability of outcomes when developing strategies.

Table 55: Planning Management Model Descriptives

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Sefako Makgatho Health Sciences University	106	2,5542	,57218	,05557	2,4441	2,6644
University of Johannesburg	23	4,2500	,41969	,08751	4,0685	4,4315
Vaal University of Technology	70	2,6393	,53439	,06387	2,5119	2,7667
Wits University	38	4,3553	,47445	,07697	4,1993	4,5112
University of Pretoria	45	4,1278	,60213	,08976	3,9469	4,3087
Tshwane University of Technology	24	2,4896	,73529	,15009	2,1791	2,8001
Total	306	3,1511	,97016	,05546	3,0420	3,2603

The results in Table 56 below indicate that there is a significant difference in mean scores across the different universities within the Planning Management Model (p = 0.000 < 0.05).

Table 56: Planning Management Model ANOVA

ANOVA					
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	192,400	5	38,480	121,937	,000
Within Groups	94,672	300	,316		
Total	287,072	305			

The post hoc test in Table 57 below indicates that the Planning Management Model's average score of the participants who are from the University of Johannesburg, Wits University, and the University of Pretoria is significantly higher (p = 0.000 < 0.05) than the average score of respondents from Sefako Makgatho Health Sciences University. Which therefore means that the Planning Management Model of Wits University is higher than that of Sefako Makgatho Health Sciences University, followed by the University of Johannesburg and the University of Pretoria.

Table 57: Planning Management Model Multiple Comparisons

Multiple Comparisons						
Dependent Variable:	PMM					
Tukey HSD						
(I) University		**Mean Difference (I-J)**	**Std. Error**	**Sig**	**95% Confidence Interval**	
					Lower Bound	**Upper Bound**
Sefako Makgatho	University of Johannesburg	-1.69575*	,12922	,000	-2,0664	-1,3251

Health Sciences University	Vaal University of Technology	-,08504	,08652	,923	-,3332	,1631
	Wits University	-1.80102*	,10622	,000	-2,1057	-1,4964
	University of Pretoria	-1.57353*	,09995	,000	-1,8602	-1,2869
	Tshwane University of Technology	,06466	,12699	,996	-,2996	,4289
University of Johannesburg	Sefako Makgatho Health Sciences University	1.69575*	,12922	,000	1,3251	2,0664
	Vaal University of Technology	1.61071*	,13501	,000	1,2235	1,9980
	Wits University	-,10526	,14841	,981	-,5309	,3204
	University of Pretoria	,12222	,14399	,958	-,2908	,5352
	Tshwane University of Technology	1.76042*	,16392	,000	1,2903	2,2306
Vaal University of Technology	Sefako Makgatho Health Sciences University	,08504	,08652	,923	-,1631	,3332
	University of Johannesburg	-1.61071*	,13501	,000	-1,9980	-1,2235
	Wits University	-1.71598*	,11319	,000	-2,0406	-1,3913

	University of Pretoria	-1.48849*	,10734	,000	-1,7964	-1,1806
	Tshwane University of Technology	,14970	,13288	,870	-,2314	,5308
Wits University	Sefako Makgatho Health Sciences University	1.80102*	,10622	,000	1,4964	2,1057
	University of Johannesburg	,10526	,14841	,981	-,3204	,5309
	Vaal University of Technology	1.71598*	,11319	,000	1,3913	2,0406
	University of Pretoria	,22749	,12376	,443	-,1275	,5825
	Tshwane University of Technology	1.86568*	,14647	,000	1,4456	2,2858
University of Pretoria	Sefako Makgatho Health Sciences University	1.57353*	,09995	,000	1,2869	1,8602
	University of Johannesburg	-,12222	,14399	,958	-,5352	,2908
	Vaal University of Technology	1.48849*	,10734	,000	1,1806	1,7964
	Wits University	-,22749	,12376	,443	-,5825	,1275
	Tshwane University of Technology	1.63819*	,14199	,000	1,2309	2,0455

Tshwane University of Technology	Sefako Makgatho Health Sciences University	-,06466	,12699	,996	-,4289	,2996
	University of Johannesburg	-1.76042*	,16392	,000	-2,2306	-1,2903
	Vaal University of Technology	-,14970	,13288	,870	-,5308	,2314
	Wits University	-1.86568*	,14647	,000	-2,2858	-1,4456
	University of Pretoria	-1.63819*	,14199	,000	-2,0455	-1,2309

The mean difference is significant at the 0.05 level.

4.14.7 Relationship between universities and Quest Management Model

As per Table 58 below, the average mean score of Quest Management Model differs across the different universities. Wits University has the highest score (4.03), followed by UP (3.9) and UP (3.9), which means that participants from these three universities agree to a certain extent (<3) that their managers set clear goals and encourage them to reach those objectives through a variety of means. In other words, employees are told what to do but not how to do it. While respondents from TUT stand at (2.2 mean), SMU (2.4 mean), and VUT (2.4 mean), they disagree with the above explanation of the quest management model.

Table 58: Quest Management Model Descriptives

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Sefako Makgatho	106	2,4811	,57290	,05564	2,3708	2,5915

Health Sciences University						
University of Johannesburg	23	3,9478	,43575	,09086	3,7594	4,1363
Vaal University of Technology	70	2,4343	,39559	,04728	2,3400	2,5286
Wits University	38	4,0316	,50623	,08212	3,8652	4,1980
University of Pretoria	45	3,9200	,61997	,09242	3,7337	4,1063
Tshwane University of Technology	24	2,2250	,70603	,14412	1,9269	2,5231
Total	306	2,9647	,90800	,05191	2,8626	3,0668

The outcomes in table 59 below illustrates that there is significant difference of mean scores across the different universities within the quest management model (p= 0.000 < 0.05).

Table 59: Quest Management Model ANOVA

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	164,162	5	32,832	112,831	,000
Within Groups	87,296	300	,291		
Total	251,459	305			

The post hoc test in Table 60 below confirms that the average score of respondents from the University of Johannesburg, Wits University, and University of Pretoria in the Quest Management Model is significantly higher (p = 0.000 < 0.05) than the average score of respondents from Sefako Makgatho Health Sciences University. This indicates that the Quest Management Model of Wits University is higher than that of Sefako

Makgatho Health Sciences University, followed by the University of Pretoria and the University of Johannesburg, respectively.

Table 60 : Quest Management Model Multiple Comparisons

Multiple Comparisons						
Dependent Variable:	QMM					
Tukey HSD						
(I) University		**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
					Lower Bound	**Upper Bound**
Sefako Makgatho Health Sciences University	University of Johannesburg	-1.46669*	,12408	,000	-1,8226	-1,1108
	Vaal University of Technology	,04685	,08308	,993	-,1914	,2851
	Wits University	-1.55045*	,10199	,000	-1,8430	-1,2579
	University of Pretoria	-1.43887*	,09598	,000	-1,7142	-1,1636
	Tshwane University of Technology	,25613	,12194	,290	-,0936	,6059
University of Johannesburg	Sefako Makgatho Health Sciences University	1.46669*	,12408	,000	1,1108	1,8226
	Vaal University of Technology	1.51354*	,12965	,000	1,1417	1,8854
	Wits University	-,08375	,14251	,992	-,4925	,3250

	University of Pretoria	,02783	,13827	1,000	-,3688	,4244
	Tshwane University of Technology	1.72283*	,15740	,000	1,2714	2,1743
Vaal University of Technology	Sefako Makgatho Health Sciences University	-,04685	,08308	,993	-,2851	,1914
	University of Johannesburg	-1.51354*	,12965	,000	-1,8854	-1,1417
	Wits University	-1.59729*	,10869	,000	-1,9091	-1,2855
	University of Pretoria	-1.48571*	,10307	,000	-1,7813	-1,1901
	Tshwane University of Technology	,20929	,12760	,573	-,1567	,5753
Wits University	Sefako Makgatho Health Sciences University	1.55045*	,10199	,000	1,2579	1,8430
	University of Johannesburg	,08375	,14251	,992	-,3250	,4925
	Vaal University of Technology	1.59729*	,10869	,000	1,2855	1,9091
	University of Pretoria	,11158	,11884	,936	-,2293	,4525
	Tshwane University of Technology	1.80658*	,14065	,000	1,4032	2,2100

University of Pretoria	Sefako Makgatho Health Sciences University	1.43887*	,09598	,000	1,1636	1,7142
	University of Johannesburg	-,02783	,13827	1,000	-,4244	,3688
	Vaal University of Technology	1.48571*	,10307	,000	1,1901	1,7813
	Wits University	-,11158	,11884	,936	-,4525	,2293
	Tshwane University of Technology	1.69500*	,13635	,000	1,3039	2,0861
Tshwane University of Technology	Sefako Makgatho Health Sciences University	-,25613	,12194	,290	-,6059	,0936
	University of Johannesburg	-1.72283*	,15740	,000	-2,1743	-1,2714
	Vaal University of Technology	-,20929	,12760	,573	-,5753	,1567
	Wits University	-1.80658*	,14065	,000	-2,2100	-1,4032
	University of Pretoria	-1.69500*	,13635	,000	-2,0861	-1,3039

The mean difference is significant at the 0.05 level.

4.14.8 Relationship between universities and Discovery Management Model

The average score of the Discovery Management Model differs across the different universities, as demonstrated in Table 61 below. SMU (2.6 mean), VUT (2.7 mean), and TUT (2.8 mean) do not agree that their universities are at the start-up level, operating in

an ambiguous, uncertain, changing environment, and dealing with special projects. While UJ (3.4 mean), Wits (3.1 mean), and UP (3.2 mean) are >3, meaning they are neutral when it comes to this construct.

Table 61: Discovery Management Model Descriptives

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Sefako Makgatho Health Sciences University	106	2,6264	,53386	,05185	2,5236	2,7292
University of Johannesburg	23	3,4174	,48585	,10131	3,2073	3,6275
Vaal University of Technology	70	2,7229	,39016	,04663	2,6298	2,8159
Wits University	38	3,1368	,31573	,05122	3,0331	3,2406
University of Pretoria	45	3,2978	,32368	,04825	3,2005	3,3950
Tshwane University of Technology	24	2,8833	,46407	,09473	2,6874	3,0793
Total	306	2,8902	,52601	,03007	2,8310	2,9494

The results in Table 62 below indicate that there is a significant difference in mean scores across the different universities with the discovery management model ($p = 0.000 < 0.05$).

Table 62: Discovery Management Model ANOVA

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	25,517	5	5,103	26,005	,000

Within Groups	58,874	300	,196		
Total	84,391	305			

The post hoc test in table 63 below shows that the discovery management model's average score of respondents that are from the University of Pretoria, the University of Johannesburg, and Wits University is significantly higher ($p = 0.000 < 0.05$) than the average score of respondents from Sefako Makgatho Health Sciences University. This entails that the Discovery Management Model of the University of Johannesburg is higher than that of Sefako Makgatho Health Sciences University, followed by the University of Pretoria and Wits University.

Table 63: Discovery Management Model Multiple Comparisons

Multiple Comparisons						
Dependent Variable:	DMM					
Tukey HSD						
(I) University		**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
					Lower Bound	**Upper Bound**
Sefako Makgatho Health Sciences University	University of Johannesburg	-.79098*	,10190	,000	-1,0833	-,4987
	Vaal University of Technology	-,09644	,06823	,719	-,2921	,0992
	Wits University	-.51043*	,08376	,000	-,7507	-,2702
	University of Pretoria	-.67136*	,07882	,000	-,8974	-,4453
	Tshwane University of Technology	-,25692	,10014	,109	-,5441	,0303

University of Johannesburg	Sefako Makgatho Health Sciences University	.79098*	,10190	,000	,4987	1,0833
	Vaal University of Technology	.69453*	,10647	,000	,3892	,9999
	Wits University	,28055	,11703	,160	-,0551	,6162
	University of Pretoria	,11961	,11355	,899	-,2061	,4453
	Tshwane University of Technology	.53406*	,12926	,001	,1633	,9048
Vaal University of Technology	Sefako Makgatho Health Sciences University	,09644	,06823	,719	-,0992	,2921
	University of Johannesburg	-.69453*	,10647	,000	-,9999	-,3892
	Wits University	-.41398*	,08926	,000	-,6700	-,1580
	University of Pretoria	-.57492*	,08464	,000	-,8177	-,3321
	Tshwane University of Technology	-,16048	,10479	,644	-,4610	,1401
Wits University	Sefako Makgatho Health Sciences University	.51043*	,08376	,000	,2702	,7507

	University of Johannesburg	-,28055	,11703	,160	-,6162	,0551
	Vaal University of Technology	.41398*	,08926	,000	,1580	,6700
	University of Pretoria	-,16094	,09760	,567	-,4409	,1190
	Tshwane University of Technology	,25351	,11550	,243	-,0778	,5848
University of Pretoria	Sefako Makgatho Health Sciences University	.67136*	,07882	,000	,4453	,8974
	University of Johannesburg	-,11961	,11355	,899	-,4453	,2061
	Vaal University of Technology	.57492*	,08464	,000	,3321	,8177
	Wits University	,16094	,09760	,567	-,1190	,4409
	Tshwane University of Technology	.41444*	,11197	,003	,0933	,7356
Tshwane University of Technology	Sefako Makgatho Health Sciences University	,25692	,10014	,109	-,0303	,5441
	University of Johannesburg	-.53406*	,12926	,001	-,9048	-,1633
	Vaal University of Technology	,16048	,10479	,644	-,1401	,4610

	Wits University	-,25351	,11550	,243	-,5848	,0778
	University of Pretoria	-.41444*	,11197	,003	-,7356	-,0933

**** The mean difference is significant at the 0.05 level.***

4.14.9 Relationship between universities and Scientific Management Model

According to table 64 below, the average score of the Scientific Management Model construct differs across universities, with the lowest (2.5) being the one from VUT, SMU (2.5 mean), and TUT (2.5 mean). This means that participants from these universities do not agree that there are tight means and loose ends with formal rules, structures, and authority in decision making. However, Wits is at (4.2 mean), UJ (4.1 mean), and UP (4.0 mean), meaning that they agree that there are tight means and loose ends with formal rules, structures, and authority in decision-making processes in their university since the mean is > 4. Having stated that, the average mean of 3.0, indicating that they are neutral when it comes to this constrict.

Table 64: Scientific Management Model Descriptive

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Sefako Makgatho Health Sciences University	106	2,5896	,60375	,05864	2,4733	2,7059
University of Johannesburg	23	4,1304	,31864	,06644	3,9926	4,2682
Vaal University of Technology	70	2,5000	,33243	,03973	2,4207	2,5793
Wits University	38	4,2566	,47394	,07688	4,1008	4,4124
University of Pretoria	45	4,0167	,57505	,08572	3,8439	4,1894

Tshwane University of Technology	24	2,5625	,77407	,15801	2,2356	2,8894
Total	306	3,0997	,91899	,05254	2,9963	3,2031

The result in Table 65 below shows that there is a significant difference in mean scores across the different universities within the Scientific Management Model ($p = 0.000 < 0.05$).

Table 65: Scientific Management Model ANOVA

ANOVA					
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	172,811	5	34,562	122,309	,000
Within Groups	84,774	300	,283		
Total	257,585	305			

The post hoc test in Table 66 below shows that the Scientific Management Model's average score of the respondents from Wits University, the University of Johannesburg, and the University of Pretoria is significantly higher ($p = 0.000 < 0.05$) than the average score of those from Sefako Makgatho Health Sciences University. This means that the Scientific Management Model of Wits University is slightly higher than that of Sefako Makgatho Health Sciences University, followed by the University of Johannesburg and the University of Pretoria.

Table 66: Scientific Management Model Multiple Comparisons

Multiple Comparisons					
Dependent Variable:	SMM				
Tukey HSD					
(I) University			**Std. Error**	**Sig.**	**95% Confidence Interval**

		Mean Difference (I-J)			Lower Bound	Upper Bound
Sefako Makgatho Health Sciences University	University of Johannesburg	-1.54081*	,12228	,000	-1,8915	-1,1901
	Vaal University of Technology	,08962	,08187	,883	-,1452	,3244
	Wits University	-1.66696*	,10051	,000	-1,9552	-1,3787
	University of Pretoria	-1.42704*	,09458	,000	-1,6983	-1,1558
	Tshwane University of Technology	,02712	,12017	1,000	-,3175	,3718
University of Johannesburg	Sefako Makgatho Health Sciences University	1.54081*	,12228	,000	1,1901	1,8915
	Vaal University of Technology	1.63043*	,12776	,000	1,2640	1,9969
	Wits University	-,12614	,14044	,947	-,5289	,2767
	University of Pretoria	,11377	,13626	,961	-,2770	,5046
	Tshwane University of Technology	1.56793*	,15511	,000	1,1230	2,0128
Vaal University of Technology	Sefako Makgatho Health Sciences University	-,08962	,08187	,883	-,3244	,1452

	University of Johannesburg	-1.63043*	,12776	,000	-1,9969	-1,2640
	Wits University	-1.75658*	,10711	,000	-2,0638	-1,4494
	University of Pretoria	-1.51667*	,10157	,000	-1,8080	-1,2253
	Tshwane University of Technology	-,06250	,12574	,996	-,4232	,2982
Wits University	Sefako Makgatho Health Sciences University	1.66696*	,10051	,000	1,3787	1,9552
	University of Johannesburg	,12614	,14044	,947	-,2767	,5289
	Vaal University of Technology	1.75658*	,10711	,000	1,4494	2,0638
	University of Pretoria	,23991	,11712	,318	-,0960	,5758
	Tshwane University of Technology	1.69408*	,13860	,000	1,2965	2,0916
University of Pretoria	Sefako Makgatho Health Sciences University	1.42704*	,09458	,000	1,1558	1,6983
	University of Johannesburg	-,11377	,13626	,961	-,5046	,2770
	Vaal University of Technology	1.51667*	,10157	,000	1,2253	1,8080

	Wits University	-,23991	,11712	,318	-,5758	,0960
	Tshwane University of Technology	1.45417*	,13436	,000	1,0688	1,8396
Tshwane University of Technology	Sefako Makgatho Health Sciences University	-,02712	,12017	1,000	-,3718	,3175
	University of Johannesburg	-1.56793*	,15511	,000	-2,0128	-1,1230
	Vaal University of Technology	,06250	,12574	,996	-,2982	,4232
	Wits University	-1.69408*	,13860	,000	-2,0916	-1,2965
	University of Pretoria	-1.45417*	,13436	,000	-1,8396	-1,0688

***The mean difference is significant at the 0.05 level.**

4.14.10 Relationship between universities and Digital Learning Strategies

The tables below are about the relationship between universities when it comes to the Digital learning strategies construct. Table 68 below shows that the average score of digital learning strategies differs across the different universities: Wits University (4.3 mean), UJ (4.2 mean), and UP (4.1 mean). This means that there is an agreement from participants that there are digital learning strategies in their universities, that they are aware of them, and that they are being implemented accordingly. On the contrary, SMU (2.2 mean), TUT (2.3 mean), and VUT (2.1 mean) disagree that there are digital learning strategies in their universities, and the average mean for all six universities is 2.9, which means that there is disagreement that these strategies exist and are being implemented.

Table 67: Digital Learning Strategies Descriptives

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Sefako Makgatho Health Sciences University	106	2,2689	,73493	,07138	2,1273	2,4104
University of Johannesburg	23	4,2935	,45635	,09515	4,0961	4,4908
Vaal University of Technology	70	2,1750	,50603	,06048	2,0543	2,2957
Wits University	38	4,3092	,72465	,11755	4,0710	4,5474
University of Pretoria	45	4,1611	,65313	,09736	3,9649	4,3573
Tshwane University of Technology	24	2,3333	,69808	,14250	2,0386	2,6281
Total	306	2,9363	1,15430	,06599	2,8064	3,0661

The results in Table 68 below show ANOVA results between and within groups of participants. It shows that there is a significant difference in mean scores across the different universities within digital learning strategies ($p = 0.000 < 0.05$).

Table 68: Digital Learning Strategies ANOVA

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	278,013	5	55,603	129,943	,000
Within Groups	128,370	300	,428		
Total	406,382	305			

The post hoc test in Table 69 below demonstrates that the Digital Learning Strategies construct's average score of the respondents that are from the University of Johannesburg, Wits University, and the University of Pretoria is significantly higher (p = 0.000 < 0.05) than the average score of respondents from Sefako Makgatho Health Sciences University. This shows that this construct of Wits University is higher than that of Sefako Makgatho Health Sciences University, followed by the University of Johannesburg and the University of Pretoria.

Table 69: Digital Learning Strategies Multiple Comparisons

Multiple Comparisons						
Dependent Variable:	DL					
Tukey HSD						
(I) University		**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**Interval**	
					Lower Bound	**Upper Bound**
Sefako Makgatho Health Sciences University	University of Johannesburg	-2.02461*	,15047	,000	-2,4562	-1,5930
	Vaal University of Technology	,09387	,10075	,938	-,1951	,3828
	Wits University	-2.04034*	,12368	,000	-2,3951	-1,6856
	University of Pretoria	-1.89224*	,11639	,000	-2,2261	-1,5584
	Tshwane University of Technology	-,06447	,14787	,998	-,4886	,3597
University of Johannesburg	Sefako Makgatho Health Sciences University	2.02461*	,15047	,000	1,5930	2,4562

	Vaal University of Technology	2.11848*	,15722	,000	1,6675	2,5694
	Wits University	-,01573	,17281	1,000	-,5114	,4799
	University of Pretoria	,13237	,16767	,969	-,3485	,6133
	Tshwane University of Technology	1.96014*	,19088	,000	1,4127	2,5076
Vaal University of Technology	Sefako Makgatho Health Sciences University	-,09387	,10075	,938	-,3828	,1951
	University of Johannesburg	-2.11848*	,15722	,000	-2,5694	-1,6675
	Wits University	-2.13421*	,13181	,000	-2,5123	-1,7562
	University of Pretoria	-1.98611*	,12499	,000	-2,3446	-1,6276
	Tshwane University of Technology	-,15833	,15473	,910	-,6021	,2855
Wits University	Sefako Makgatho Health Sciences University	2.04034*	,12368	,000	1,6856	2,3951
	University of Johannesburg	,01573	,17281	1,000	-,4799	,5114
	Vaal University of Technology	2.13421*	,13181	,000	1,7562	2,5123

	University of Pretoria	,14810	,14412	,908	-,2653	,5615
	Tshwane University of Technology	1.97588*	,17056	,000	1,4867	2,4651
University of Pretoria	Sefako Makgatho Health Sciences University	1.89224*	,11639	,000	1,5584	2,2261
	University of Johannesburg	-,13237	,16767	,969	-,6133	,3485
	Vaal University of Technology	1.98611*	,12499	,000	1,6276	2,3446
	Wits University	-,14810	,14412	,908	-,5615	,2653
	Tshwane University of Technology	1.82778*	,16534	,000	1,3535	2,3020
Tshwane University of Technology	Sefako Makgatho Health Sciences University	,06447	,14787	,998	-,3597	,4886
	University of Johannesburg	-1.96014*	,19088	,000	-2,5076	-1,4127
	Vaal University of Technology	,15833	,15473	,910	-,2855	,6021
	Wits University	-1.97588*	,17056	,000	-2,4651	-1,4867
	University of Pretoria	-1.82778*	,16534	,000	-2,3020	-1,3535

***. The mean difference is significant at the 0.05 level.**

4.14.11 Relationship between University and Digital Learning Implementation

Table 70 below shows that the average score for digital learning implementation varies across universities. VUT has a low mean of (2.4), SMU also has a mean of (2.6), and TUT has a mean of (2.5), which means that respondents from these universities do not agree that there is enough implementation of digitization in their universities. On the other hand, UJ is at 4.2, UP is at 4.0, and Wits is at 4.1, which means that respondents from these universities agree that digitization is taking place at their university at an acceptable level.

Table 70: Digital Learning Implementation Descriptives

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Sefako Makgatho Health Sciences University	106	2,6250	,62034	,06025	2,5055	2,7445
University of Johannesburg	23	4,2065	,36659	,07644	4,0480	4,3650
Vaal University of Technology	70	2,4964	,43508	,05200	2,3927	2,6002
Wits University	38	4,1513	,46695	,07575	3,9978	4,3048
University of Pretoria	45	4,0944	,66420	,09901	3,8949	4,2940
Tshwane University of Technology	24	2,5208	,77290	,15777	2,1945	2,8472
Total	306	3,1119	,94040	,05376	3,0061	3,2177

The results in Table 71 below show that there is a significant difference in mean scores across these different universities when it comes to Digital Learning Implementation construct ($p = 0.000 < 0.05$).

Table 71: Digital Learning Implementation ANOVA

ANOVA					
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	172,086	5	34,417	105,745	,000
Within Groups	97,643	300	,325		
Total	269,729	305			

The post hoc test in Table 72 below indicates that the Digital Learning Implementation average score of those who responded from the University of Johannesburg, Wits University, and University of Pretoria is significantly higher ($p = 0.000 < 0.05$) than the average score of the respondents from Sefako Makgatho Health Sciences University. This demonstrates that the Digital Learning Implementation of the University of Johannesburg is higher than that of Sefako Makgatho Health Sciences University, followed by Wits University and the University of Pretoria.

Table 72: Digital Learning Implementation Multiple Comparisons

Multiple Comparisons						
Dependent Variable:	DLI					
Tukey HSD						
(I) University		**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
					Lower Bound	**Upper Bound**
Sefako Makgatho Health Sciences University	University of Johannesburg	-1.58152*	,13123	,000	-1,9579	-1,2051
	Vaal University of Technology	,12857	,08786	,688	-,1234	,3806
	Wits University	-1.52632*	,10787	,000	-1,8357	-1,2169

	University of Pretoria	-1.46944*	,10151	,000	-1,7606	-1,1783
	Tshwane University of Technology	,10417	,12897	,966	-,2657	,4741
University of Johannesburg	Sefako Makgatho Health Sciences University	1.58152*	,13123	,000	1,2051	1,9579
	Vaal University of Technology	1.71009*	,13712	,000	1,3168	2,1034
	Wits University	,05521	,15072	,999	-,3771	,4875
	University of Pretoria	,11208	,14623	,973	-,3074	,5315
	Tshwane University of Technology	1.68569*	,16647	,000	1,2082	2,1632
Vaal University of Technology	Sefako Makgatho Health Sciences University	-,12857	,08786	,688	-,3806	,1234
	University of Johannesburg	-1.71009*	,13712	,000	-2,1034	-1,3168
	Wits University	-1.65489*	,11496	,000	-1,9846	-1,3252
	University of Pretoria	-1.59802*	,10901	,000	-1,9107	-1,2854
	Tshwane University of Technology	-,02440	,13495	1,000	-,4115	,3627

Wits University	Sefako Makgatho Health Sciences University	1.52632*	,10787	,000	1,2169	1,8357
	University of Johannesburg	-,05521	,15072	,999	-,4875	,3771
	Vaal University of Technology	1.65489*	,11496	,000	1,3252	1,9846
	University of Pretoria	,05687	,12569	,998	-,3036	,4174
	Tshwane University of Technology	1.63048*	,14875	,000	1,2038	2,0571
University of Pretoria	Sefako Makgatho Health Sciences University	1.46944*	,10151	,000	1,1783	1,7606
	University of Johannesburg	-,11208	,14623	,973	-,5315	,3074
	Vaal University of Technology	1.59802*	,10901	,000	1,2854	1,9107
	Wits University	-,05687	,12569	,998	-,4174	,3036
	Tshwane University of Technology	1.57361*	,14420	,000	1,1600	1,9872
Tshwane University of Technology	Sefako Makgatho Health Sciences University	-,10417	,12897	,966	-,4741	,2657

	University of Johannesburg	-1.68569*	,16647	,000	-2,1632	-1,2082
	Vaal University of Technology	,02440	,13495	1,000	-,3627	,4115
	Wits University	-1.63048*	,14875	,000	-2,0571	-1,2038
	University of Pretoria	-1.57361*	,14420	,000	-1,9872	-1,1600

***. The mean difference is significant at the 0.05 level.**

4.14.12 Relationship between university and Digital Learning Barriers

Table 73 below shows that the average score for the Digital Learning Barriers construct differs across universities. This construct wanted to determine if there has been a risk assessment that has been conducted in their university to find out what the barriers are to implementing digital learning, and they don't agree with that because VUT is at 2.4. mean, TUT is at 2.5 mean, and SMU is at 2.5 mean. While respondents from Wits are at 3.9 mean, UP is at 3.9 mean, and UJ is at 3.9 mean, indicating that they are neutral on this because they are saying they are not sure if these assessments have been conducted. Lastly, there is an average mean of 3.0, which means that they are neutral when it comes to this construct.

Table 73: Digital Learning Barriers Descriptives

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Sefako Makgatho Health Sciences University	106	2,5920	,50039	,04860	2,4956	2,6883
University of Johannesburg	23	4,1304	,31864	,06644	3,9926	4,2682
Vaal University of Technology	70	2,4536	,42198	,05044	2,3530	2,5542

Wits University	38	3,9539	,46446	,07535	3,8013	4,1066
University of Pretoria	45	3,9444	,59803	,08915	3,7648	4,1241
Tshwane University of Technology	24	2,5833	,65386	,13347	2,3072	2,8594
Total	306	3,0433	,85048	,04862	2,9476	3,1390

Table 74 below shows that there is a significant difference in mean scores across the different universities within the Digital Learning Barriers construct (p value = 0.000 < 0.05).

Table 74: Digital Learning Barriers ANOVA

ANOVA					
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	146,251	5	29,250	118,004	,000
Within Groups	74,362	300	,248		
Total	220,614	305			

The post hoc test in table 75 below demonstrates that the Digital Learning Barriers' average scores of the respondents from the University of Johannesburg are significantly higher (p = 0.000 < 0.05) than the average score of the respondents from Sefako Makgatho Health Sciences University, Tshwane University of Technology, and Vaal University of Technology. Likewise, the average score of the respondents from Wits University is significantly higher (p = 0.000 < 0.05) than the average score of the respondents from Sefako Makgatho Health Sciences University, Tshwane University of Technology, and Vaal University of Technology. In conclusion, the results also indicate that the average scores for Digital Learning Barriers of the respondents from the University of Pretoria are significantly higher (p = 0.000 < 0.05) than the average scores of the respondents from Sefako Makgatho Health Sciences University, Tshwane University of Technology, and Vaal University of Technology.

Table 75: Digital Learning Barriers Multiple Comparisons

Multiple Comparisons						
Dependent Variable:	DLB					
Tukey HSD						
(I) University		**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
					Lower Bound	**Lower Bound**
Sefako Makgatho Health Sciences University	University of Johannesburg	-1.53845*	,11452	,000	-1,8669	-1,2100
	Vaal University of Technology	,13841	,07668	,464	-,0815	,3583
	Wits University	-1.36197*	,09414	,000	-1,6320	-1,0920
	University of Pretoria	-1.35246*	,08858	,000	-1,6065	-1,0984
	Tshwane University of Technology	,00865	,11255	1,000	-,3142	,3315
University of Johannesburg	Sefako Makgatho Health Sciences University	1.53845*	,11452	,000	1,2100	1,8669
	Vaal University of Technology	1.67686*	,11966	,000	1,3337	2,0201
	Wits University	,17649	,13153	,761	-,2008	,5537
	University of Pretoria	,18599	,12761	,692	-,1800	,5520

	Tshwane University of Technology	1.54710*	,14528	,000	1,1304	1,9638
Vaal University of Technology	Sefako Makgatho Health Sciences University	-,13841	,07668	,464	-,3583	,0815
	University of Johannesburg	-1.67686*	,11966	,000	-2,0201	-1,3337
	Wits University	-1.50038*	,10032	,000	-1,7881	-1,2126
	University of Pretoria	-1.49087*	,09513	,000	-1,7637	-1,2180
	Tshwane University of Technology	-,12976	,11777	,880	-,4675	,2080
Wits University	Sefako Makgatho Health Sciences University	1.36197*	,09414	,000	1,0920	1,6320
	University of Johannesburg	-,17649	,13153	,761	-,5537	,2008
	Vaal University of Technology	1.50038*	,10032	,000	1,2126	1,7881
	University of Pretoria	,00950	,10969	1,000	-,3051	,3241
	Tshwane University of Technology	1.37061*	,12981	,000	,9983	1,7429
University of Pretoria	Sefako Makgatho Health	1.35246*	,08858	,000	1,0984	1,6065

	Sciences University					
	University of Johannesburg	-,18599	,12761	,692	-,5520	,1800
	Vaal University of Technology	1.49087*	,09513	,000	1,2180	1,7637
	Wits University	-,00950	,10969	1,000	-,3241	,3051
	Tshwane University of Technology	1.36111*	,12584	,000	1,0002	1,7221
Tshwane University of Technology	Sefako Makgatho Health Sciences University	-,00865	,11255	1,000	-,3315	,3142
	University of Johannesburg	-1.54710*	,14528	,000	-1,9638	-1,1304
	Vaal University of Technology	,12976	,11777	,880	-,2080	,4675
	Wits University	-1.37061*	,12981	,000	-1,7429	-,9983
	University of Pretoria	-1.36111*	,12584	,000	-1,7221	-1,0002

The mean difference is significant at the 0.05 level.

4.14.13 Relationship between universities and Competency of Staff Digital Learning

Table 76 below demonstrates that the average score of Staff Competencies in Digital Learning varies across the different universities. Even on this construct, VUT is at 2.26 mean, and SMU is at 2.3 mean and 2.5 mean. This means that respondents from these universities do not agree that they have competent and qualified staff that can deal with

the implementation of digital learning in these universities. On the other hand, UJ stands at 4.1, UP stands at 4.0, and Wits is at 4.0, indicating that they agree that there is competent staff dealing with digital learning in their universities. The average mean of these universities is 2.9, which means that they are neutral when it comes to this.

Table 76: Staff Competency on Digital Learning Descriptive

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Sefako Makgatho Health Sciences University	106	2,3302	,54832	,05326	2,2246	2,4358
University of Johannesburg	23	4,1304	,27041	,05638	4,0135	4,2474
Vaal University of Technology	70	2,2643	,43797	,05235	2,1599	2,3687
Wits University	38	4,0329	,51060	,08283	3,8651	4,2007
University of Pretoria	45	4,0778	,55346	,08250	3,9115	4,2441
Tshwane University of Technology	24	2,5104	,65308	,13331	2,2346	2,7862
Total	306	2,9330	,97741	,05587	2,8231	3,0430

The results shown in the table below (see Table 77) illustrate that there is a significant difference in mean scores across the different universities within the Staff Competencies on Digital Learning construct (p value = 0.000 < 0.05).

Table 77: Staff Competencies on Digital Learning ANOVA

ANOVA					
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**

Between Groups	212,030	5	42,406	160,331	,000
Within Groups	79,347	300	,264		
Total	291,377	305			

The post hoc test in table 78 below indicates that the average scores for Staff Competencies on Digital Learning of the respondents from the University of Johannesburg, the University of Pretoria, and Wits University are significantly higher ($p = 0.000 < 0.05$) than the average score of the respondents from Tshwane University of Technology, Sefako Makgatho Health Sciences University, and Vaal University of Technology.

Table 78: Competencies on Digital Learning Multiple Comparisons

Multiple Comparisons						
Dependent Variable:	SCDL					
Tukey HSD						
(I) University		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Sefako Makgatho Health Sciences University	University of Johannesburg	-1.80025*	,11830	,000	-2,1396	-1,4609
	Vaal University of Technology	,06590	,07921	,961	-,1613	,2931
	Wits University	-1.70271*	,09724	,000	-1,9816	-1,4238
	University of Pretoria	-1.74759*	,09150	,000	-2,0100	-1,4851
	Tshwane University of Technology	-,18023	,11626	,632	-,5137	,1532

University of Johannesburg	Sefako Makgatho Health Sciences University	1.80025*	,11830	,000	1,4609	2,1396
	Vaal University of Technology	1.86615*	,12360	,000	1,5116	2,2207
	Wits University	,09754	,13587	,980	-,2922	,4872
	University of Pretoria	,05266	,13182	,999	-,3254	,4308
	Tshwane University of Technology	1.62002*	,15007	,000	1,1896	2,0504
Vaal University of Technology	Sefako Makgatho Health Sciences University	-,06590	,07921	,961	-,2931	,1613
	University of Johannesburg	-1.86615*	,12360	,000	-2,2207	-1,5116
	Wits University	-1.76861*	,10363	,000	-2,0658	-1,4714
	University of Pretoria	-1.81349*	,09826	,000	-2,0953	-1,5316
	Tshwane University of Technology	-,24613	,12165	,332	-,5951	,1028
Wits University	Sefako Makgatho Health Sciences University	1.70271*	,09724	,000	1,4238	1,9816

	University of Johannesburg	-,09754	,13587	,980	-,4872	,2922
	Vaal University of Technology	1.76861*	,10363	,000	1,4714	2,0658
	University of Pretoria	-,04488	,11330	,999	-,3699	,2801
	Tshwane University of Technology	1.52248*	,13409	,000	1,1379	1,9071
University of Pretoria	Sefako Makgatho Health Sciences University	1.74759*	,09150	,000	1,4851	2,0100
	University of Johannesburg	-,05266	,13182	,999	-,4308	,3254
	Vaal University of Technology	1.81349*	,09826	,000	1,5316	2,0953
	Wits University	,04488	,11330	,999	-,2801	,3699
	Tshwane University of Technology	1.56736*	,12999	,000	1,1945	1,9402
Tshwane University of Technology	Sefako Makgatho Health Sciences University	,18023	,11626	,632	-,1532	,5137
	University of Johannesburg	-1.62002*	,15007	,000	-2,0504	-1,1896
	Vaal University of Technology	,24613	,12165	,332	-,1028	,5951

	Wits University	-1.52248*	,13409	,000	-1,9071	-1,1379
	University of Pretoria	-1.56736*	,12999	,000	-1,9402	-1,1945

The mean difference is significant at the 0.05 level.

4.14.14 Relationship between university and Digital Learning Tools

Table 79 below depicts that the average score of Digital Learning Tools differs across the different Universities. Even in this construct, the same results persist: SMU is at a 2.8 mean, TUT is at a 2.4 mean, and VUT is at a 2.6 mean. This means that respondents from these universities do not agree that there are enough digital learning tools and gadgets in their workplace. However, when it comes to Wits (4.0 mean), UP (3.9 mean), and UJ (4.1), there seems to be an agreement that they have digital learning tools in their workplace, even though they do not totally agree. The average mean for this construct is 3.9, indicating a neutral stance towards agreement, as it approaches a 4 mean.

Table 79: Digital Learning Tools Descriptives

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Sefako Makgatho Health Sciences University	106	2,8656	,76468	,07427	2,7183	3,0128
University of Johannesburg	23	4,1304	,30960	,06456	3,9966	4,2643
Vaal University of Technology	70	2,6821	,59424	,07102	2,5405	2,8238
Wits University	38	4,0658	,43761	,07099	3,9220	4,2096
University of Pretoria	45	3,9389	,60574	,09030	3,7569	4,1209

Tshwane University of Technology	24	2,4271	,91924	,18764	2,0389	2,8152
Total	306	3,1912	,90253	,05159	3,0897	3,2927

The results shown in Table 80 below illustrate that there is a significant difference in mean scores across these six universities when it comes to Digital Learning Tools (p value = 0.000 < 0.05).

Table 80: Digital Learning Tools ANOVA

ANOVA					
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	117,906	5	23,581	54,195	,000
Within Groups	130,536	300	,435		
Total	248,441	305			

The post hoc test in Table 81 below shows that when it comes to the Digital Learning Tools construct of digital learning tools, there are high average scores among the respondents from the University of Johannesburg, Wits University, and University of Pretoria (p = 0.000 < 0.05) as compared to the low average score of the respondents from Sefako Makgatho Health Sciences University. Furthermore, the average score of respondents from Sefako Makgatho Health Sciences University is significantly higher (p = 0.041 < 0.05) than that of respondents from Tshwane University of Technology. This suggests that the University of Johannesburg has the highest number of digital learning tools compared to Sefako Makgatho Health Sciences University, which is then followed by Wits University and the University of Pretoria.

The results also demonstrate that the Digital Learning Tools' average scores of the respondents from the University of Johannesburg are significantly higher (p = 0.000 <

0.05) than the average scores of the respondents from Vaal University of Technology and Tshwane University of Technology.

Moreover, the Digital Learning Tools' average scores of the respondents from Wits University and the University of Pretoria are significantly higher (p = 0.000 < 0.05) than the average scores of the respondents from Vaal University of Technology and Tshwane University of Technology.

Table 81: Digital Learning Tools Multiple Comparisons

Multiple Comparisons						
Dependent Variable:	DLT					
Tukey HSD						
(I) University		**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
					Lower Bound	**Upper Bound**
Sefako Makgatho Health Sciences University	University of Johannesburg	-1.26487*	,15173	,000	-1,7001	-,8297
	Vaal University of Technology	,18342	,10159	,464	-,1080	,4748
	Wits University	-1.20022*	,12472	,000	-1,5580	-,8425
	University of Pretoria	-1.07332*	,11736	,000	-1,4099	-,7367
	Tshwane University of Technology	.43848*	,14911	,041	,0108	,8662
University of Johannesburg	Sefako Makgatho Health Sciences University	1.26487*	,15173	,000	,8297	1,7001

	Vaal University of Technology	1.44829*	,15854	,000	,9936	1,9030
	Wits University	,06465	,17427	,999	-,4352	,5645
	University of Pretoria	,19155	,16908	,867	-,2934	,6765
	Tshwane University of Technology	1.70335*	,19248	,000	1,1513	2,2554
Vaal University of Technology	Sefako Makgatho Health Sciences University	-,18342	,10159	,464	-,4748	,1080
	University of Johannesburg	-1.44829*	,15854	,000	-1,9030	-,9936
	Wits University	-1.38365*	,13292	,000	-1,7649	-1,0024
	University of Pretoria	-1.25675*	,12604	,000	-1,6182	-,8952
	Tshwane University of Technology	,25506	,15603	,576	-,1925	,7026
Wits University	Sefako Makgatho Health Sciences University	1.20022*	,12472	,000	,8425	1,5580
	University of Johannesburg	-,06465	,17427	,999	-,5645	,4352
	Vaal University of Technology	1.38365*	,13292	,000	1,0024	1,7649

	University of Pretoria	,12690	,14533	,953	-,2899	,5437
	Tshwane University of Technology	1.63871*	,17199	,000	1,1454	2,1320
University of Pretoria	Sefako Makgatho Health Sciences University	1.07332*	,11736	,000	,7367	1,4099
	University of Johannesburg	-,19155	,16908	,867	-,6765	,2934
	Vaal University of Technology	1.25675*	,12604	,000	,8952	1,6182
	Wits University	-,12690	,14533	,953	-,5437	,2899
	Tshwane University of Technology	1.51181*	,16673	,000	1,0336	1,9900
Tshwane University of Technology	Sefako Makgatho Health Sciences University	-.43848*	,14911	,041	-,8662	-,0108
	University of Johannesburg	-1.70335*	,19248	,000	-2,2554	-1,1513
	Vaal University of Technology	-,25506	,15603	,576	-,7026	,1925
	Wits University	-1.63871*	,17199	,000	-2,1320	-1,1454
	University of Pretoria	-1.51181*	,16673	,000	-1,9900	-1,0336

The mean difference is significant at the 0.05 level.

4.14.15 Questionnaire for the study

The table below is about the questionnaire that was used and distributed to the participants at these six universities as part of collecting data.

Table 82: Questionnaires

SECTION A: Demographic profile						
Kindly fill the information below by ticking the appropriate option in the small box.						
Name of University: _____						
Position: [1] Non-academic position: [2] Academic position: [3] Senior position: [4] Junior position						
Years of employment in your university: [1]1-5 years: [2] 6-10 years: [3] 10-15 years: [4] 16 years and above						
Gender: [1] Male: [2] Female						
Age group: [1] 25-45 years: [2] 46-56 years: [3] 57-67 years: [4] 68 years and above						
	SECTION B: Innovativeness					
	Based on the five-point Likert scale, kindly indicate to what extent do you agree or disagree with the following statements.					
Codes	**Statements**	**Strongly disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
	Product Innovativeness *is referred to as perceived newness, novelty, originality, or uniqueness of products. This perceived newness encompasses two perspectives: from the clients' perspective and the organisation's perspective, it basically refers to the extent to which a new product is viewed as useful or beneficial to some clients)*					
IN01	In new product and service introductions, our university is often first to market	1	2	3	4	5
IN02	Our new products and services are often perceived as very novel by customers	1	2	3	4	5
IN05	In comparison with our competitors, our university has introduced more innovative products and services during the past five years	1	2	3	4	5

IN07	In comparison with our competitors, our university has a lower success rate in new products and services launched	1	2	3	4	5
	Market innovativeness is the newness of approaches that organisations adopt to enter and exploit the targeted market. For some organisations, this means that they can enter a market or identify a new market niche and launch products with cutting-edge technological content.)					
IN03	Our recent new products and services are only minor changes from our previous products and services	1	2	3	4	5
IN04	New products and services in our university often take us up against new competitors	1	2	3	4	5
IN08	In comparison with our competitors, our products most recent marketing programme is revolutionary in the market	1	2	3	4	5
IN10	In new product and service introductions, our university is often at the cutting edge of technology	1	2	3	4	5
	Product innovativeness refers to introduction of new strategies of doing things in an organisation, it also refers to introduction of new management approaches, and new technology that can be used to improve delivery of service product and management processes. It is imperative in overall innovative capability, in that an organisation's ability to exploit their resources and capabilities, and most importantly, the ability to recombine and reconfigure its resources and capabilities to meet the requirement of creative service delivery.)					
IN16	We are constantly improving our business processes	1	2	3	4	5
IN17	Our university changes teaching and learning methods at a great a great speed in comparison with our competitors	1	2	3	4	5
IN19	During the past five years, our university has developed many new management approaches	1	2	3	4	5

IN 29	When we cannot solve a problem using conventional method, we improvise on new methods	1	2	3	4	5
	Behavioural Innovativeness *can be present at different levels: individuals, teams and management. Individual innovativeness can be considered as "a normally distributed underlying personality construct, which may be interpreted as a willingness to change" Team innovativeness is the team's adaptability to change Managerial innovativeness demonstrates the management's willingness to change, and commitment to encourage new ways of doing things, as well as the willingness to foster new ideas*)					
IN20	We get a lot of support from managers if we want to try new ways of doing things	1	2	3	4	5
IN 25	In our university we tolerate individuals who do things in a different way	1	2	3	4	5
IN 26	We are willing to try new ways of doing things and seek unusual, novel solution	1	2	3	4	5
IN 27	We encourage people to think and behave in original and novel ways	1	2	3	4	5
	Strategic Innovativeness is the development of new competitive strategies that create value for the organisation. The primary focus of strategic innovativeness to measure an organisation's ability to manage ambitious organisational objectives and identify a mismatch of these ambitions and existing resources in order to stretch or leverage limited resources creatively.					
IN14	Our university R&D or product development resources are not adequate to handle the development need of new products and services	1	2	3	4	5
IN22	Key executives of the university are willing to take risks to seize and explore 'chancy' growth opportunities	1	2	3	4	5

IN 24	Senior executives constantly seek unusual, novel solutions to problems via the use of 'idea men'	1	2	3	4	5
IN 28	When we see new ways of doing things, we are last of adopting them	1	2	3	4	5
	SECTION C: MANAGEMENT MODELS					
	Based on the five-point Likert scale, kindly indicate to what extent do you agree or disagree with the following statements.					
Codes	**Statements**	**Strongly disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
	Organisational ambidexterity is the ability to manage an organisation in an efficient way, while at the same time adapting to the emerging changes in the environment. It is also when employees can innovate in order to both responds to and drives change, thus pro-actively shaping the future. It is further an ability to pursue both explorative as well as exploitative innovations. From a resource-based view this ability is considered valuable, rare and costly to imitate capability. Therefore, organisational ambidexterity can be a source of competitive advantage					
MM1	There is an essence of more stable, predictable and measurable environment in the university in the process of implementing plans.	1	2	3	4	5
MM2	There is an incremental innovation and discussions amongst all in the University when it comes to planning.	1	2	3	4	5
MM3	Work is conducted in a linear manner in the University since it is at matured stage.	1	2	3	4	5
MM6	Managers encourages employees to reach objectives through a variety of means.	1	2	3	4	5
MM7	Employees are told what to do but not how to do it.	1	2	3	4	5
MM8	Our university is well established and operating in a competitive environment.	1	2	3	4	5
MM9	Managers tend to involve people in decision making process and decentralise planning.	1	2	3	4	5

MM10	There are tight means and loose ends with formal rules, structure, and authority in decision making.	1	2	3	4	5
MM11	There is intrinsic motivational approach and obliquity in achieving goals	1	2	3	4	5
MM13	There are standardised procedures, but employees are encouraged to seek new ways of delivering outputs.	1	2	3	4	5
MM14	Our university is at start-up phase and operating in an ambiguous, uncertain, and fast changing environment	1	2	3	4	5
MM16	Executives are more interested and willing to make innovation in strategic aspects.	1	2	3	4	5
MM17	There is a high culture of innovativeness in our university	1	2	3	4	5
MM18	I am aware of the University's innovation strategy	1	2	3	4	5
	Management Models are defined as the choices made by executives of an organisations regarding how they define objectives, motivates effort, coordinate activities, and allocate resources. In other words, the definition of how work of management gets done. Thereby, a management model reflects the choices made by managers regarding decisions, systems, procedures, people and organisational structure. Unlike the business model which is a conceptual one mainly describing the "what" and "why" of the business operations, a management model helps us to define the "how" part.					
MM5	Managers set clear organisational goals and encourage employees to reach them.	1	2	3	4	5
MM4	There is high degree of predictability of the University outcomes when planning.	1	2	3	4	5
MM12	There is bureaucratic and formal rules in our University	1	2	3	4	5
	SECTION E: DIGITAL LEARNING					
	Based on the five-point Likert scale, kindly indicate to what extent do you agree or disagree with the following statements.					

Codes	Statements	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
	Digitalization Initiatives and Strategies ***is the use of digital technologies to change a business model and provide value-producing opportunities. This also involves the different approaches a business can use to effect change within its organisational structure or processes. Changes can take place within the overall structure of an organisation or within certain parts depending on the desired goal for the business.***					
DL1	There is E-Learning/digital learning strategies in our university.	1	2	3	4	5
DL2	Digital learning strategies are implemented to the fullest within the university.	1	2	3	4	5
DL3	University's digital strategy is aligned to our innovation strategy	1	2	3	4	5
DL4	All academic staff and student are aware of digital learning strategies	1	2	3	4	5
DL5	There is enough collaboration of all teams when it comes to digital learning implementation.	1	2	3	4	5
DL6	Our university have digital learning implementation plan	1	2	3	4	5
DL7	All academic staff and students are aware of the digital learning implementation plan	1	2	3	4	5

DL9	A risk assessment has been conducted to identify barriers of digital learning in our university	1	2	3	4	5
DL11	There is a plan that has been developed to address these barriers	1	2	3	4	5
DL12	The plan has been communicated to all stakeholders	1	2	3	4	5
DL13	There are competent and qualified staff dealing with digital learning.	1	2	3	4	5
DL14	100% of our students and academics have been taught about using different digital systems	1	2	3	4	5
DL15	Break downs of digital systems are attended to promptly	1	2	3	4	5
DL16	Our digital systems are always upgraded to be up to date	1	2	3	4	5
	DIGITAL LEARNING TOOLS					
DL17	All student and staff have digital gadgets.	1	2	3	4	5
DL18	All students who lived off campus were provided with gadgets for digital learning.	1	2	3	4	5
DL19	All Academic staff access to digital learning systems	1	2	3	4	5
DL20	All digital learning systems are available remotely	1	2	3	4	5

4.16 Conclusion on the results

This chapter presents the results and findings from the questionnaire that was distributed to six universities in Gauteng province. The purpose of the research was to determine if these universities have innovation indices that they can use to measure their efficiency and effectiveness when implementing their strategies. The study also aimed to ascertain whether these universities employ specific management models in

the implementation of various strategies and programmes, and whether their innovation strategies align with the university's overall strategy.

Three hundred and six (306) participants responded to the survey, which had 67 questions. This questionnaire had three scales (organisational innovativeness, management models, and digital learning). All these scales had nine constructs. The results were dealt with, and the findings formed part of this chapter. According to the above tables and graphs, it has been proven that all the constructs that were used are reliable and valid. The results also show that, in general, all these universities don’t have innovative strategies and initiatives that they can use in order to be efficient and competitive. As a result, in the absence of organisational innovativeness, which has been proven to be an organisation’s capability of introducing new products and services to the market and also opening new markets through combining strategic orientation with innovative behaviour and process, these universities will be less competitive and efficient than those in first world countries.

There is also a general agreement, as per the respondent, that these universities don’t have any specific management models that they are using when implementing their operational plans and strategies. The culture of allowing people to exploit the current task while at the same time exploring new ways of doing things is not encouraged in these universities. This can be attributed to the fact that these are public universities. Most of them are run like government institutions with a lot of red tape, and authority is not decentralised. The other thing is that all these universities are funded by the Department of Higher Education, and most of the time this department develops regulations that all these universities must comply with.

It can also be mentioned that, when it comes to digitization, most of the participants in these universities are of the view that it is not up-to-date, which means that there are no adequate digital teaching and learning interventions and strategies, and also that there is a lack of digital tools and competent staff that can deal with the development and implementation of digital learning. This is also caused by a lack of financial resources since most of these technological innovations need to be procured with huge

amounts of money. There is also a shortage of skills when it comes to people with good ICT skills in the South, as per the DHET report (2022).

Lastly, according to the responses, all these universities do not have any innovation indices to measure their level of innovativeness. It is imperative to also indicate that Wits University, the University of Pretoria, and the University of Johannesburg have slightly different responses from their participants. Most of the participants do not totally disagree about most of the issues. It can be concluded that there is some level of innovativeness and use of management models, even though they are not aware of them.

When it comes to digital learning, all of them don't have a tool that they can use to measure their innovativeness, and they are not aware of which management models they can use in order to discharge their mandates. The reason for this is because these are the universities that have been in existence, have financial capabilities, are able to generate third-stream revenue, and do not entirely depend on government grants.

CHAPTER 5 FINDINGS ANALYSIS AND RECOMMENDATIONS

5.1. Introduction

The preceding chapter addressed the findings derived from the survey conducted for this study. The questionnaire utilised in this study was designed to align with the stated aims and objectives, which are to assess the degree of organisational innovativeness among the six universities located in Gauteng Province, South Africa, to determine whether these universities possess innovation indices to assess their level of innovativeness and if they have implemented innovation initiatives, to determine if these tactics are congruent with the universities' overarching strategy. In addition, it is important to ascertain whether the company employs any generic management methods to achieve its strategic objectives, thereby enhancing its competitiveness and efficiency.

This chapter will further deal with the summary of the study, where the overview of the entire study will be discussed. This will begin with the restatement of the research problem, the research question, the design of the study, the type of data collected, and the key findings relative to the research questions. A brief statement regarding the contents of the literature that has been reviewed. Important elements from the research methodology reflecting the population from which the sample was drawn and the data collection methods that were used will be discussed.

The review of the findings will be deliberated and will be followed by the recommendations derived from the study based on the empirical evidence. It is crucial to mention that this chapter will include the proposed innovation indices, which these universities can use to assess their level of innovation, based on the recommendations made. The limitations of the research will also be expressed. This will then be followed by a conclusion that will deal with the results of this study and be compared with the results of other studies.

5.2. Summary of the study

The main goal of this study was to determine the level of innovation in these six universities using organisational innovativeness constructs proposed by Wang and

Ahmed (2004). Also, to determine if these universities have innovation indices that they are using to measure their level of innovativeness and to determine what obstructs innovation in these institutions and how innovation and the use of management models affect digital learning. Further to find out if these universities are using management models as proposed by Buyukbalci and Boukari (2017), in the process of being innovative with the ultimate goal of them being competitive and efficient when delivering their core function which is teaching, learning and conducting research.

Lastly, to learn more about the way in which innovation could be built into these universities' strategic planning, since during preliminary investigations it was evident that most of these universities are having a problem when it comes to organisational innovativeness and aligning their innovation initiatives and interventions with their strategies. Based on these objectives, a questionnaire was developed based on previous literature, especially using management model constructs and innovativeness constructs. This questionnaire was developed with the assistance of statisticians, who assisted in making sure that those constructs were validated and reliable. Others were taken from Wang and Ahmed (2004) and from Birkinshaw (2012).

5.2.1. Restatement of research problem

All six universities, like any other organisation, aspire to be effective and efficient in order to become competitive. The problem is that they do not know which organisational innovativeness models to adopt in order to achieve organisational efficiency. They also lack innovation indices to measure their innovation. This prompted the researcher to conduct this study, particularly in a developing country like South Africa, with the hope that it would assist these universities in becoming more competitive and efficient.

The other problem is that most of these universities do not have recommended management models that they are using when discharging their functions. The management model of an organisation is about making choices on four main dimensions: defining objectives, motivating effort, coordinating activities, and allocating resources, as proposed by Birkinshaw & Goddard (2009) and Birkinshaw (2017).

This is also supported by Buyukbalci and Boukari (2017), who argue that if an organisation does not identify a specific management model that will be suitable for their organisation, there is a possibility of them not achieving their strategic goals and being competitive and efficient.

The other problem is that during preliminary investigations, it was found out that in most universities, there is no culture of organisational ambidexterity. This is the culture where management allows employees to exploit their current functions while at the same time encouraging them to explore new ways of doing things (Olk, 2020). The problem with this is the red tape and some of the regulations that are commissioned by the Department of Higher Education.

Lastly, there is no alignment between all these management models and digital learning strategies, and some universities don't have any digital learning strategies at all. Therefore, in the absence of any strategies, it will not be possible for these universities to be competitive and efficient as proposed by Saputra et al. (2022).

5.2.2. Restatement of research question

The research questions of this study were mentioned in Chapter 1, and they were as follows:

A. **What variables are needed to create a framework that these universities could use in order to calculate their level of innovativeness?**

   To answer this question, Process Innovativeness, Product Innovativeness, Market Innovativeness, Strategic innovativeness, and Behavioural Innovativeness were identified as the variables that these universities could use in order to measure their level of innovativeness as proposed by Wang and Ahmed (2004). Other variables are indicated in Table 86 in this chapter.

B. **Do these universities have innovation strategies and also management models that they are using that can assist them to be efficient and competitive?**

   According to the responses from participants, it was discovered that all of these universities do not have innovation strategies or any management models that

they are using in order to perform their core functions. The generic management models that were used as variables are the discovery management model, the quest management model, the planning management model, and the and the science management model, as proposed by Buyukbalci and Boukari (2017).

C. **What is the degree of compatibility between organisational innovativeness initiatives and management models in these universities?**

According to the responses received from participants in these universities, they do not agree that there are specific management models that exist in these universities. They further stated that these management models have never been developed and followed when discharging their core functions. Therefore, it means there is no compatibility between these two concepts because of the non-existence of these management models.

D. **Do these universities have innovation indices that can assist them to measure their level of innovativeness?**

According to the responses from participants at all six universities, no university has innovation indices that they can use to measure their level of innovativeness.

E. **Do these universities innovation initiatives and management models align to the digital learning strategies?**

Because of the non-existence of the strategies on innovativeness and management models, there is no alignment between these strategies and digital learning strategies. Even though some universities have digital learning strategies, they are not aligned with the overall strategies of these universities.

5.2.3. Restatement of research design

As mentioned previously, research design is a strategy or a plan that moves from underlying philosophical assumptions to specifying the selection of respondents, the data gathering techniques to be used, and the data analysis to be done (Tichapondwa, 2013). The research design for this study is a strategy for answering the research question that has been developed in Chapter 1 and empirical data that was collected and analysed in Chapter 4. This is based on the fact that 67 questions were circulated to participants in six universities, and 306 participants responded to those questions.

The research objectives were also developed as part of the research design. In Gauteng province, the population consists of universities. The sample size included senior and executive management from both academic and non-academic staff at these universities. The data collection method, as previously explained, consists of a questionnaire that was circulated to these targeted groups. Finally, data analysis was done using different methods of analysing data.

5.3. Key findings relative to research questions and results

The following are the findings of this study research:

5.3.1. Organisational innovativeness

There were five constructs that formed part of the organisational innovativeness concept, and their findings will be discussed below. The meaning of organisational innovativeness is the ability of an organisation's overall innovative capability to introduce new products to the market and open new markets through combining strategic orientation with innovative behaviour and processes (Buyukbalci and Boukari, 2017). According to the responses from the participants in three universities (Sefako Makgatho Health Sciences University, Vaal University of Technology, and Tshwane University of Technology), there are no strategies when it comes to organisational innovativeness. Although these universities are implementing some innovative initiatives, they lack proper documentation in the form of strategies and institutional plans. This means that the way these universities are conducting their business is based on the already-existing plans and curricula that have been predetermined by the guidelines of different institutions of higher learning. As for them coming up with new ways of doing things when it comes to teaching, learning, and research, they follow the traditional methods and don't have new ways of doing things. Therefore, it can be concluded that organisational innovativeness doesn't exist in these universities. The reason for this could be that the South African government merged and restructured these universities in 2005 following the 1994 new dispensation.

Regarding the responses from the other three universities (Wits University, University of Pretoria, and University of Johannesburg), the participants agree (4 Linkert Scale)

that these universities exhibit some level of organisational innovation, although they do not entirely agree. It must be stated that there is no university that totally agrees that there are innovative strategies and initiatives. Based on this analogy, it can be concluded that the concept of organisational innovativeness does not exist in these universities. This means that if these universities need to be competitive and their employees are efficient, they need to develop organisational innovativeness strategies. It has also been discovered that there is no culture of organisational ambidexterity. This can be done by creating an environment that allows employees to explore new ways of doing things when it comes to introducing new products and services while at the same time exploiting their daily tasks.

5.3.1.1. Market innovativeness construct

Regarding this construct of the introduction of new approaches in the market, all six of these universities disagree that their universities are developing cutting-edge technological products that are new and unique in the learning and teaching fraternity. The reason for this is because the mean was less than 2, as per the above table. It therefore means that all six universities are not introducing new products and services into the market, and this must be looked at if these universities want to be competitive and efficient.

5.3.1.2. Process innovativeness construct

Participants at the University of Pretoria, Wits University, and the University of Johannesburg do agree that their universities do introduce new strategies for doing things from time to time. They also agree that there are new management approaches and new technology that can be used to improve service delivery. However, they do not totally agree that these are new approaches. This is because most of the so called new approaches have been introduced in developed countries before they can come to South Africa (Olk, 2022).

5.3.1.3. Behavioural innovativeness construct

This behavioural innovativeness construct is about an individual's willingness to change, their adaptability to change, and the willingness of management to change. All six universities are of the view that there is no willingness from these individuals, teams,

and management to change. This means these universities must come up with change management strategies that will inculcate a culture of change in them. They will need to develop organisational innovativeness and change management strategies that are aligned to their desired university's culture and also create a culture that allows employees to explore new ways of doing things while at the same time exploiting new ways of doing things if they would like to be competitive and innovative, as proposed by Olk (2020).

5.3.1.4. Strategic innovativeness construct

This construct is meant to determine if these universities are developing new competitive strategies that can create value for them. Also, to determine if they have strategic innovativeness that measures their ability to manage ambitious organisational objectives, It was found out that only University of Pretoria, Wits, and UJ participants agree that their universities do have these strategies and initiatives. However, they do not totally agree that these universities have innovative strategies. As a result, in order to be fully competitive and efficient, they still have to do more when it comes to strategic innovation. As for SMU, VUT, and TUT, all the respondents indicated that they don't agree that their universities comply with strategic innovativeness as proposed by Wang and Ahmed (2004). The reason might be because the previous three universities have been in existence for a very long time, have financial muscles, and don't depend on government funding. While these three have recently been established and do not have strong third-stream revenue initiatives.

5.3.1.5. Product innovativeness construct

On this construct, which was meant to determine if these universities are developing products and services that are perceived as new, original, and unique by their clients, again, those universities that have been in existence for a long time agree that some of their products are perceived as unique by their clients. However, they do not totally agree that their universities develop new products and services that are perceived as unique by their clients. Hence, all of the universities are not appearing in the top 100 world rankings as recommended by the US News International Report (2022).

5.3.2. Management models

According to Birkinshaw (2020), the management model can be summarised as choices made by executives on how the work of management gets done. They also help employees define how work should be done. According to the responses, all university scores were under 3. Meaning they do not know if their universities are aware of the management models they are using when they are doing their business of teaching and learning. Most of them were not even aware of the generic management models that were mentioned in the questionnaire: the discovery management model, the planning management model, the scientific management model, and the quest management model.

5.3.2.1. Scientific management model

On this model, which was meant to determine if there are tight means and loose ends with formal rules and structures when it comes to decision-making, the average mean is 3.10, as per the previous table. Therefore, the majority of participants disagree that their universities comply with or implement these constructs.

5.3.2.2. Planning management model

This construct is described as the model that is widely used and adopted in mature industries where work is conducted in a linear manner and where the degree of predictability of market evolutions is high (Birkinshaw, 2012). According to the responses from UP, UJ, and Wits respondents, they agree that their universities subscribe to the principles of this model. This could be because they have been around for more than 50 years and have financial resources. While SMU, TUT, and VUT responses indicated that their universities do not have planning management model initiatives, the reason for this might be the fact that these are new universities that came into being after the amalgamation of universities in 2005, and they are not at a mature stage and rely solely on government grants. They lack the capacity to develop credible systems and processes that subscribe to these management models.

5.3.2.3 Quest management model

The quest management model aimed to determine whether managers at these universities set clear organisational goals and encourage employees to achieve these objectives through a variety of means. In other words, employees are told what to do but not how to do it. On this construct, the average mean for these universities is 2.96,

which therefore means that all of them do not agree that universities do set clear goals and do not encourage their employees to reach those goals through a variety of means.

5.3.2.4 Discovery management model

The purpose of this management model was to determine if these universities are classified as start-up organisations operating in an ambiguous, uncertain, and fast-changing environment, and the responses from all participants disagreed since the mean was also 2.89. This means that they do not agree that their universities operate in an ambiguous and fast-changing environment.

5.3.3. Digitisation strategies and initiatives

Digitisation strategies and initiatives was one of the scales that was used in a questionnaire, and it was intended to find out if these universities have strategies, systems, and initiatives that have been developed in order to change the business model and provide value-producing opportunities as proposed by Drain and Garrett (2020). All the responses of participants from three universities indicated that their universities (Sefako Makgatho Health Sciences University, Vaal University of Technology, and Tshwane University of Technology) do not have digital learning strategies. The reason for these is that their score was below 3, meaning that they do not agree that digital learning strategies have been developed. Therefore, it means that in the absence of digital learning strategies that are aligned with the overall university's strategy, these universities will not be competitive and efficient. Going forward, they must develop these digital learning strategies that are aligned with their overall university's strategies in order to be innovative.

5.3.3.1. Digital learning tools construct

On this construct, the questionnaire was intended to find out if these universities do have the tools that can be used in order to implement digital learning. According to the response, it was found out that there are certain tools like laptops, Teams, Zoom, etc. However, in all these universities, the problem was that most of the time these tools were not functioning properly, and the other problem was the unavailability of data. The other three universities (University of Johannesburg, Wits University, and University of Pretoria) indicated that they do have digital learning tools since the score was 4. However, all universities do not totally agree that digital learning tools are available and

functioning. The reason for this is that not all employees and students have laptops. Especially when classes have to be conducted virtually.

5.3.3.2 Implementation of digitisation

When it comes to the implementation of digitization in these universities, it has been found out that at TUT, SMU, and VUT, there is a lack of implementation when it comes to digitization; there is no 100% implementation, and there are no clear digitization implementation plans. However, most respondents are unaware of the existence of a reliable digitisation implementation plan for UP, Wits, and UJ. Nevertheless, they did not express disagreement, indicating that there is observable execution of digitisation. Nevertheless, it may be inferred that despite the absence of formal plans, the implementation of digitisation does occur.

5.3.3.3 Digital learning barrier

All these universities have barriers that contribute to digital learning, as explained in the previous chapter. By developing the innovation indices, it will assist them in being able to measure if they have systems, processes, and people that will ensure that digitization is up-to-date and can enable them to be competitive.

5.3.3.4 Staff digital learning competencies

It can be concluded that in all these universities, there are not enough skilled employees as compared to those of universities in developed countries. Therefore, it means that these universities must embark on a process of continuous training and development when it comes to ICT. All employees must be trained in order to ensure that they have skills and competencies that will allow them to do their normal work when it comes to digitization and, at the same time, be allowed to explore new innovative ways that will enable them to learn digitally.

5.4. Brief statement regarding the contents of literature reviewed

Buyukbalci and Boukari (2017) argue that in a post-modern management environment, managers tend to involve their employees in the decision-making process. This has proven that when these employees feel trusted and empowered, they are more likely to make efforts to innovate. These universities can achieve this by implementing a quest management model, which not only encourages employees to participate in decision-making bodies but also empowers them to devise their own methods for carrying out

specific functions. The management of these universities must be able to decentralise power so that middle management can take decisions instead of waiting for the executives to give approval. In most of these universities, executives are the only ones who must make decisions. This kind of behaviour has caused some projects not to be implemented in time since, most of the time, these executives are locked in endless meetings. Also following this line of argument are Ellonen et al. (2018), who suggest that different types of trust contribute to the emergence of organisational innovativeness. Therefore, these quest management models should be adopted in order to make sure that these universities are innovative.

Wang and Ahmed (2004) posit that the advantage of using comprehensive organisational innovativeness constructs over a construct of a certain dimension of innovation can be demonstrated in three aspects. Firstly, organisational innovativeness is represented through certain traits such as newness, novelty, etc. and can be easily quantified in terms of to what degree or extent that organisations are innovative, rather than simply dividing them as either innovative or not. Secondly, organisational innovativeness, as a trait, can be constructed to cover various key aspects of innovation. It is more likely to build up a multidimensional measurement, which is more reliable for measuring overall innovativeness than examining the innovative nature of an organisation through one or two aspects of innovation. Finally, organisational innovativeness measures the capabilities of an organisation and indicates the propensity of the organisation to introduce new products to the market or open up new markets. They further emphasise that measuring overall innovativeness is not only about measuring new products developed or new market opportunities but also prescribes the underlying elements of innovation outcomes, i.e., behavioural innovativeness, process innovativeness, and strategic innovative orientation.

These points about management models and organisational innovativeness were based on research that looked at competitiveness and efficiency for private companies in developed countries. As a result, we can say that even universities in South Africa should be able to figure out which management models will work best for their operations

and which organisational innovativeness constructs will work best with which management models. This will lead to competitiveness and efficiency.

5.5. The review of the findings and recommendations

The following findings will be reviewed as per the previous chapter:

5.5.1. Demographic Characteristics

There were six universities that were part of this study. A total of three hundred and six (306) participants participated in this study. This consists of academic and non-academic staff from the targeted cohort. And they have different number of years in each university; this is a demonstration of how long they have been working in those universities, and this also demonstrates that they have institutional memory.

5.5.2. Organisational Innovativeness

The findings on organisational innovativeness reveal that the majority of participants from all six universities strongly dispute the existence of this concept within their respective institutions. This means that all four constructs of organisational innovativeness don't exist in these universities; hence, they are not efficient and competitive, especially when compared with other universities in line with the Global Rankings conducted by Times Higher Ranking (2022).

However, it should be noted that for UP, Wits, and UJ, there are certain participants who believe that these universities exhibit some degree of organisational innovativeness practices, while they do not fully agree, and others are uncertain due to their mean score of 3. One possible explanation for this could be the long-standing presence of these universities, along with their utilisation of an additional source of income outside government funding. Consequently, these colleges possess the capability to recruit proficient personnel, particularly those from industrialised nations. However, SMU, TUT, and VUT strongly refute the existence of organisational innovation practices in their universities. One possible explanation is that these universities are relatively new, having been established after the merging of universities in 2005. Additionally, they may lack the financial resources to attract and retain experts, relying primarily on government

funding. The subsequent are the components of organisational innovativeness, along by their corresponding discoveries:

5.5.2.1. Product Innovativeness

This construct had a median of 10 (10–13), meaning that the participants do not agree that this type of innovativeness exists in their university.

5.5.2.2. Process Innovativeness

According to the responses, this construct had a median of 10 (10–13), which means that the participants do not agree that process innovativeness exists in these universities.

5.5.2.3. Market Innovativeness

This construct had a median of 8 (8–14), which means that the participants do not agree that this kind of innovativeness is used in these universities.

5.5.2.4. Behavioural Innovativeness

This construct had a median of 8 (8–16), meaning the participants do not agree that it is frequently used in their universities.

5.5.2.5. Strategic Innovativeness

This construct also has a median of 10 (10–12), which means that not all agree that there is strategic innovativeness in these universities.

5.5.3. Management Models

The management model has four constructs, which are the planning management model, the discovery management model, the science management model, and the quest management model. However, the Discovery, Science, and Quest Management models did not load during data analysis. It was then agreed that this must be grouped together with just one intervention, which is called organisational ambidexterity. The reason for this is that all three of these constructs share the same specifications and concepts, and there are common denominators between all four of them. Therefore, for

the purpose of analysing the management model scale (Discovery, Science, and Quest Management Model), it will fall under the organisational ambidexterity construct. Based on the above explanation, the following will be explained below:

5.5.3.1. Organisational Ambidexterity (Combination of 3 others)

This management model construct had a median and interquartile range of 33 (30–53). This means that participants agree that organisational ambidexterity exists at these universities. More than two-thirds of participants agree with this construct. However, when it comes to TUT, few participants agree with this construct, meaning that according to them, it doesn't exist. Furthermore, according to the overall responses from SMU, UP, VUT Wits, and UJ, they agree that when it comes to planning, there are clear goals that are set and communicated to all employees. Over and above this, there is a culture of encouraging employees to exploit their current functions and, at the same time, explore new ways of doing things. Employees are motivated to modify the current standard operating procedure as long as it enhances efficiency and yields desired outcomes.

5.5.3.2. Planning Management Model

More than two-thirds also agree with this construct, meaning there is some kind of planning on an annual basis, and employees are aware of planning strategies and are aligned with the university's strategy.

5.5.4. Digitisation Initiatives and Strategies

When it comes to digitization in SMU, TUT, and VUT, most of the participants do not agree that their universities have digital learning strategies that are aligned to their overall university's strategy. The reason for this is the same as the above: financial affordability and because they are new.

However, there is some consensus that some tactics have been created at universities that have been there for a long time, such as UP, Wits, and UJ. Overall, 57% strongly disagree with digitisation at these six universities. This could be true, according to Moonsamy and Naidoo (2022).

5.5.4.1. Digital Learning Tools

All six universities agree that there are digital learning tools, especially those from UP, Wits, and UJ. The reason for this is because these universities are at an advanced stage when it comes to technological innovation, as per STATSA (2021). SMU outperforms VUT and TUT due to the aforementioned factors, despite the acknowledgement that resources such as computers and Teams are available. However, none of the six universities concur that all personnel and students have received adequate instruction on how to effectively and efficiently exploit them. There must be comprehensive skills development strategies that must be developed in order to equip all the users to use these tools.

5.6. Limitations

The limitations of this study are that most of the employees who responded were those with less than five years of experience working at those universities. This means that they might not have been conversant with what is happening at these universities. Or alternatively, they were not inducted very well when they were first employed as part of onboarding.

The other limitation that was observed during the research process is that only less than 10% of the responses came from senior management, who might have been aware of some of the things that middle management was not aware of. This might be because senior management in most universities is overwhelmed with many responsibilities because of a lack of workplace planning and financial resources. There were only 306 people who participated in this research, and all these universities have more than 4500 employees in the target categories. Had most of them responded, maybe the results would have been different.

The questionnaire included four distinct management models as part of its structure. However, when data analysis was done, some of these constructs (i.e., the quest management model, the science management model, and the discovery management model) could not load, and as a result, these constructs were abandoned and only one construct was developed. This construct is organisational ambidexterity. The reason for

this is that most of the questions were related to the definition of these constructs, as explained previously.

5.7. Recommendations

Based on the above findings, the following is recommended as per the following constructs:

5.7.1. Organisational innovativeness

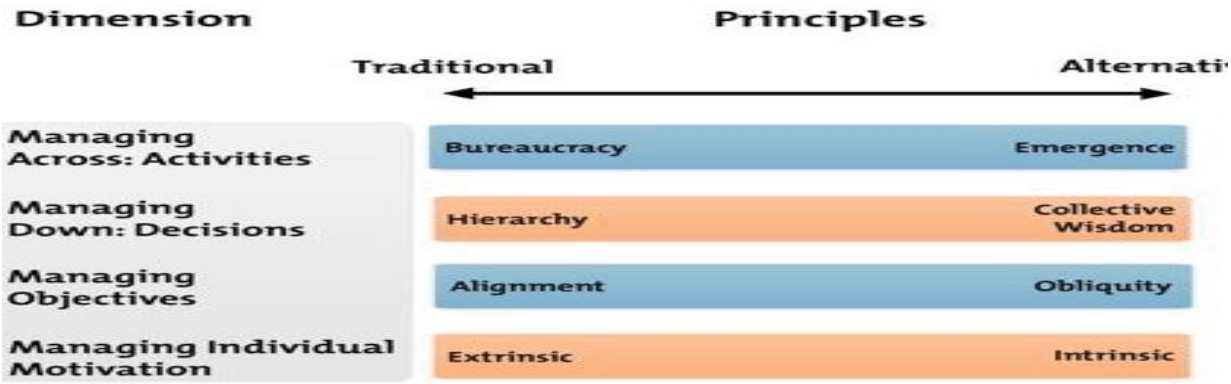
According to Wang and Ahmed (2004), organisational innovativeness measures the capabilities of an organisation and indicates the propensity of the organisation to introduce new products to the market or open up new markets. Measuring overall innovativeness is not only about measuring new products developed or new market opportunities but also prescribes the underlying elements of innovation outcomes, i.e., behavioural innovativeness, process innovativeness, and strategic innovative orientation. Based on the findings of this study, this concept is not implemented in its entirety in all these universities. Hence, it is recommended that, in order for them to be capable of introducing new products (new curriculums and teaching methods), they make sure that they develop and implement innovative strategies in order to be efficient and competitive. These innovative strategies should also be aligned with the university's overall strategy in order to be competitive with other universities in developed countries. Based on the responses and preliminary investigations, it has been found out that these universities are not using any of the above innovative constructs, hence they are not competitive. Therefore, it is recommended that they adopt any of these constructs and choose the ones that will ensure that there is organisational efficiency and employees' satisfaction, which will lead to increased productivity.

In order for universities to be innovative, the Department of Higher Education in South Africa should allow universities to operate like corporate worlds by removing the red tape while still complying with corporate governance principles as recommended by King IV (South African Institute of Chartered Accountants, 2016). This will allow these institutions to be independent and efficient, as supported by Olk (2020).

5.7.2. Management models

Birkinshaw (2012) defines management models of an organisation as a predefined process that guides decision-making on four main dimensions: defining objectives, motivating effort, coordinating activities, and allocating resources. Based on this definition and the previous ones mentioned earlier, it is recommended that these universities adopt any of the proposed generic management models since this will enable them to be competitive and efficient, as per this study and previous research. Preferably, they should adopt a quest management model coupled with behavioural management models. The reason for this is that universities, by their nature, are driven by their employees. Therefore, in order for employees to be efficient and productive, they need to be involved in the process of developing strategies, since they are the ones who are going to implement them. Most successful organisations worldwide have proven that collective wisdom increases productivity and efficiency since employees feel more enthusiastic if they implement strategies that they played a role in their development. This is also supported by Buyukbalci and Boukari (2017).

Figure 10: The four dimensions of management model (Birkinshaw, 2012)



As per Figure 11 above, which is proposed by Birkinshaw (2012), in order for these universities to be competitive and efficient, it is recommended that they adopt any of the four generic management models (quest, discovery, planning, and science management model). This will allow them to move away from the traditional way of management to a new way of doing things that puts more emphasis on embracing the principle of collective wisdom as compared to bureaucracy, which has been proven to slow organisational development. This will also allow management at these universities to know what kind of policies to develop in order to improve efficiency.

5.7.3. Digitization initiatives and strategies

Bayode et al. (2019) described this as the use of digital technologies to change a business model and provide value-producing opportunities. This also involves the different approaches a business can use to effect change within its organisational structure or processes. Changes can take place within the overall structure of an organisation or within certain parts, depending on the desired goal for the business.

According to the responses from all six universities, it has been proven that digital learning strategies do not exist. In cases where some digitization's interventions exist, they are not aligned to their universities' strategies. It is therefore recommended that, in order for universities to be efficient, they should start by developing their five-year digital learning strategies. This should be aligned with the broader university strategies and also be aligned with a specific management model. It is recommended that during the initial planning of how many students are going to be enrolled, digital learning interventions should also form part of the planning and be procured at a reasonable cost.

5.8. Measuring organisational innovativeness

Creating a system for the measurement of innovation (innovation activities) must be done in a certain way, not by using random metrics and measures. The system is created for each organisation separately, in accordance with strategic objectives. However, many measurement systems are similar or even the same for organisations in certain industry sectors, as proposed by Borocki et al. (2013). The same is applicable to institutions of higher learning, especially public universities, because all these universities business models are about teaching, learning, and conducting research. Based on the above findings from the literature, the same proposed system will be applicable to these six universities under this study.

They further posit that in measuring organisational innovativeness, some authors suggest two main approaches: subject and object based on innovation counts. The subject approach is based on firms. On the basis of a written questionnaire, firms are asked to provide quantitative and qualitative answers about their innovative activities. This is the same procedure that was followed in this study, where these universities

were given a questionnaire with the intention of finding out, among others, if they do have systems and strategies to measure their level of innovativeness.

Based on the responses that have been given, some innovation indices will be developed based on their responses. This framework will consist of constructs that will be referred to as Key Organisational Innovativeness Measurement Indicators (KOIMI) that have been proposed by Wang and Ahmed (2004). These constructs define organisational innovativeness, as shown in the table below:

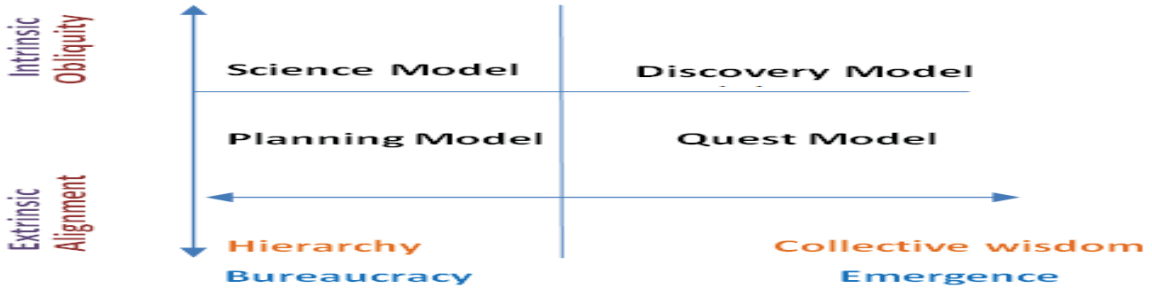
Table 82: Key Organisational Innovativeness Measurement Indicators (KOIMI)

Author	Product	Market	Process	Behaviour	Strategic
Schumpeter (1934)	x	x	x		
Miller & Friesen (1983)	x		x	x	x
Capon et al. (1992)		x			x
Avlonitis et al. (1994)	x		x	x	x
Subramanian & Nilakanta (1996)			x		
Hurley & Hult (1998)				x	
Rainey (1999)				x	x
Lyon et al. (2000)	x		x		
North & Smallbone (2000)	x	x	x	x	

Source Birkinshaw (2017)

The above five key indicators will form part of the innovation index framework. The other four key constructs will also form part of the proposed innovation indices as proposed by Birkinshaw (2017), as per figure 12 below:

Figure 11: Key Organisational Innovativeness Measurement Indicators



The above four constructs are generic management models that have been used in determining the relationship between them and organisational innovativeness, as recommended by Buyukbalci and Boukari (2017). The reason for choosing the above is because they formed part of the questionnaire that was circulated to participants. Therefore, we will use them to measure the level of innovativeness in these universities, and they will also be included in the proposed innovation indices. The reason for this is because of previous literature (Borocki et al., 2013), where they posit that measuring organisational innovativeness should be done in the form of surveys and questionnaires.

According to Gamal (2011), there are different frameworks that can be used to measure organisational innovativeness in any organisations. The following are some of the examples of these frameworks:

- **Diamond model** – Tidd, Bessant, and Pavit; area of assessment: strategy, process, organisation, linkages of organisation with other relevant stakeholders, and learning. Management/audit tool: IMP3rove.
- **Innovation fuel** – The funnel illustrates how innovation goals, innovation actions, innovation teams, and innovation results interact with each other to create change in any organisation. It consists of nine elements: strategic thinking, portfolio management and metrics, research, ideation, insight, targeting, innovation development, market development, and selling.
- **Innovation value chain** – IVC (Hansen and Birkinshaw innovation value chain, 2007). The model view presents innovation as a sequential, three-phase process that involves idea generation, idea development, and the diffusion of developed concepts. Management/audit tool: NESTA; Borocki, Orcik, and Cvijic, Chapter VIII, 155.
- **OSLO Manual** Innovation Measurement Framework: OECD and the European Commission (Eurostat). The framework provided in the manual represents an integration of insights from various firm-based theories of innovation with those of approaches that view innovation as a system. Management/audit tools: INNOCERT, INNOBIZ, and innovation radar.

The proposed innovation indices for this study will use the Diamond model as proposed by Gamall (2011). The reason for this is because it deals with assessing the strategy, process, organisation, linkages of the organisation with other relevant stakeholders, and learning. All of these Key Measurement Indicators (KMI) formed part of the questionnaire that was circulated to all participants. These Key Measurement indicators have been taken from Wang and Ahmed (2004) and Birkinshaw (2012). Therefore, it is important to use these KMIs in these innovation indices because they also refer to the Diamond model pillars, which are strategy, processes, organisation, and learning within these universities. All of these Key Measurement Indicators (KMI) formed part of the questionnaire that was circulated to all participants. These Key Measurement Indicators have been taken from Wang and Ahmed (2004) and Birkinshaw (2012). Therefore, it is important to use these KMIs in these innovation indices because they also refer to the Diamond model pillars, which are strategy, processes, organisation, and learning within these universities.

Table 83 below shows how these universities can develop their innovation indices, which will ensure that they can measure their level of innovativeness. It consists of organisational innovativeness which has five constructs: product innovativeness, process innovativeness, market innovativeness, strategic innovativeness, and behavioural innovativeness. Each of these constructs has a Key Measurement Indicator (KMI). These five constructs have been taken from Wang and Ahmed (2004). The number of KMIs does not make any difference and will depend on what universities want to measure regarding a specific construct since they are calculated using percentages. Tables 83, 84, and 85 should be used as guidelines for these universities to calculate their level of innovativeness. For example, in table 83, if all 10 KMI under the Product Innovativeness constructs have been achieved, it means a university will be allocated a score of 5, as will be explained in detail below.

Table 83: Organisational Innovativeness Key Measurement Indicators (KMI)

NO	PRODUCT INNOVATIVENESS KMI
1	To be the first in introducing number of identified new products in the market.
2	To be the first in introducing number of identified new services in the market

3	Our new products to be perceived as very novel by customers
4	Our new services to be perceived as very novel by customers
5	In comparison with our competitors, our university has a high success rate in new products launched
6	In comparison with our competitors, our university has a high success rate in new services launched
7	Delivering our products at a less cost as compared to our competitors
8	Delivering our services at a less cost as compared to our competitors
9	Developing credible innovation measurement in order to be efficient and sustainable
10	Creating and inculcating the culture of innovativeness within our organisation
NO	**MARKET INNOVATIVENESS KMI**
1	Developing competitive marketing strategies of our services
2	Developing competitive marketing strategies of our products
3	Ensure that there is an achievement of 100% of our marketing targets
4	Encourage aggressive marketing culture within our university
5	Create an environment of developing Blue Oceans Strategies over Competitive Marketing Strategies
6	Ensure that our market innovative strategies are aligned to product innovative strategies
7	Ensure that we conduct extensive continuous research on marketing in order to know what is needed in the markets
8	Introduction of marketing programmes that will enable our university to get return on investment and be able to calculate that accordingly.
9	Encourage our employees to exploiting the current marketing strategies while at the same time exploring new markets.
10	Ensure that we allocate reasonable human and financial resources into marketing our services and products
NO	**PROCESS INNOVATIVENESS KMI**
1	Ensure that we introduce new strategies when it comes to our processes annually.
2	Ensure that there are continuous introductions of new management approaches
3	Continuous introduction of new technologies (Automation) that can be used to improve delivery of services and management processes
4	Ensure that we continually change teaching and learning methods at a great speed (Agility) as compared to our competitors
5	Our university changes teaching and learning methods at a great a great speed in comparison with our competitors
6	Ensure that when we cannot solve a problem using conventional methods, we improvise on new methods

7	Ensure that we develop detections tools that will ensure that we identify structural processes challenges at an early stage in order to come up with corrective measures.
8	Ensure that our university has an ability to recombine and reconfigure its resources and capabilities to meet the requirement of creative production and service delivery (teaching and learning)
NO	**BEHAVIOURAL INNOVATIVENESS KMI**
1	Ensure that our university encourages sustained behavioural change of the organisation towards innovativeness, that is behavioural commitment.
2	Management should provide full support to employees when they want to try new behaviours or ways of doing things.
3	Employees should be encouraged to think in new and novel way
4	Employees should be told what to do and not how to do it. This will encourage them to come up with new ways of doing things
5	Management should inculcate the culture of Collective Wisdom in order to accommodate the inputs from as many employees as possible.
6	Team work should form one of the pillars when doing things in our university
7	Change management should be encouraged and enforced at individual, team and organisational level.
8	Develop change management strategies to be adopted and approved by all
9	Development of change management methodologies and survey that will measure if change is happening and what pace.
10	Ensure that all stake holders will adapt to change as speedily as possible without too much damage to the University
NO	**STRATEGIC INNOVATIVENESS KMI**
1	Our university should identify gaps in the Higher and learning environment and position itself and goes after those identified gaps.
2	To develop competitive strategic objectives that creates value for the University and be able to measure the value created
3	The university should be able to measure its ability to manage ambitious organisational objectives and identify a mismatch of these ambitions and existing resources in order to stretch or leverage limited resources creatively.
4	Be able to identify obstacle at the beginning and during implementation in order to ensure successful executive if its strategic goals.
5	Executives should be encouraged to take calculated risk and explore chancy growth opportunities
6	The university should have an ability to identify external opportunities in a timely fashion and match external opportunities with internal capabilities in order to deliver innovative products and explore new markets or market sectors.
7	Universities should ensure that its Organisational Strategy is aligned to all other strategies.

Table 84 below is about the guidelines that are supposed to measure the use of management models that these universities can use in order to ensure that they are

innovative. It is also recommended that they use these guidelines to choose which management model they can use with specific organisational innovativeness constructs. This table consists of four constructs (Planning, Discover, Science, and Quest Management Model) as proposed by Birkinshaw (2012). If a university decides to implement the Planning Management model as a framework for their operations, it entails defining all the Key Performance Indicators (KPIs) aligned with that model. At the conclusion of the fiscal year, if the university successfully attains 100% of the KPIs, they can assign themselves a score of 5. If their achievement is below 30%, they can assign themselves a score of 2, which will be discussed in detail later.

Table 84: Management Models Key Measurement Indicators (KMI)

NO	PLANNING MANAGEMENT MODEL KMI
1	There is an essence of more stable, predictable and measurable environment in the university in the process of implementing plans.
2	There is an incremental innovation and discussions amongst all in the University when it comes to planning.
3	Work is conducted in a linear manner in the university since it is at matured stage.
4	There is high degree of predictability of the university outcomes when planning.
NO	**QUEST MANAGEMENT MODEL KMI**
1	Managers to set clear organisational goals and encourage employees to reach them.
2	Managers encourages employees to reach objectives through a variety of means.
3	Employees should be told what to do but not how to do it.
4	Our university is well established and operating in a competitive environment.
5	Managers should involve people in decision making process and decentralise planning.
NO	**DISCOVERY MANAGEMENT MODEL KMI**
1	There should be tight means and loose ends with formal rules, structure, and authority in decision making.
2	There is intrinsic motivational approach and obliquity in achieving goals
3	There is bureaucratic and formal rules in our University

4	There are standardised procedures, but employees are encouraged to seek new ways of delivering outputs.
5	Our university is at start-up phase and operating in an ambiguous, uncertain, and fast changing environment
NO	**SCIENTIFIC MANAGEMENT MODEL KMI**
1	Our university is using a management model that is suggesting tight means and loose ends with formal rules and structures and authority in decision making
2	The university management model that encourages intrinsic motivation approach and obliquity in achieving set goals
3	Our university is dealing with special projects from time to time
4	Executives are more interested and willing to make innovation in strategic aspects.
5	There is a high culture of innovativeness in our university

Table 85 below is about the guidelines that are supposed to measure the level of digitisation and the use of innovation in these universities. It is also recommended that they use this guideline to develop digital learning strategies they can use with a specific organisational innovativeness construct. This table consists of four constructs: digital learning strategies, level of digital implementation, digital learning tools, and digital learning barriers and competencies of staff pertaining to digital learning. This implies that each university will assess their level of innovation in digitization using one of these Key Measurement Indicators (KMI). Once they have achieved a completion rate of 100%, they are eligible to allocate themselves a rating of 5. If their achievement is below 30%, they can assign themselves a score of 2, which will be discussed in detail later.

Table 85: Digital Learning Interventions Key Measurement Indicators (KMI)

NO	DIGITAL LEARNING STRATEGIES KMI
1	Development of Digital Learning Strategy for our University
2	Digital Learning Strategy to be aligned to University Strategy
3	Ensure that Digital Learning are implemented fully
4	Ensure that during development of Strategy there is an inclusive approach and buy in from all stakeholders
	MEAN: DIGITAL LEARNING IMPLEMENTATION KMI

1	University to develop clear and simple implementation plan
2	Ensure that the implementation plan include monitoring and evaluation
3	Develop Annual Performance Plan that are known by all
4	Ensure that the implementation plan is aligned to the budget
5	The implementation plan must have monitoring and evaluation interventions
	MEAN: DIGITAL LEARNING BARRIERS KMI
1	Conduct risk assessment to identify possible barriers
2	Once identified, develop a plan on how to address those barriers
3	Identify future possible barriers by looking at internal and external factors
4	Develop monitoring and evaluation in order to track progress
5	Allocate human and financial resources to address all digital learning barriers
	MEAN: STAFF COMPETENCIES KMI
1	Conduct skill audit in order to identify the skills and competencies gaps
2	Develop clear plan on how to address the identified skills gaps
3	Get funding in order to ensure that training does take place
4	After conducting training determine if there is improvement
5	Conduct continuous assessment and research in the markets
	DIGITAL LEARNING TOOLS KMI
1	Conduct a due diligence of all related digital learning tools and gadgets
2	Development of ICT Governance Framework related to Digital Learning
3	Development of an Asset Register for all Digital Learning Tools
4	Development of Procurement Plan for Digital Learning Tools
5	Ensure that the Procurement Plan is aligned to budget and have time frames
6	Development of maintenance schedule of all tools

Table 86 below is about the proposed innovation indices that these universities can use to measure their level of innovativeness. It consists of the five constructs of organisational innovativeness as proposed by Wang and Ahmed (2004): process, product, market, strategic, and behavioural innovativeness. These constructs are the

ones that were used as a questionnaire to determine the level of innovativeness at these six universities. The other constructs that are mentioned below are the ones that were defined by Buyukbalci and Boukari (2017); they were also used in a questionnaire to determine what kind of management models were used in these universities.

In order to calculate the level of organisational innovativeness, every construct must be given a weighted percentage based on what that construct will contribute towards achieving the strategic objectives of that university, and these weightings should be out of 100%. This is in line with the proposal by Nandal et al. (2020), where they argued that measuring organisational innovativeness should echo the nature of the industry and the market, the organisation's goals and strategies, its capabilities and weaknesses, and its move towards innovation, among other factors. They further maintain that the innovation indices should focus on key success factors critical to an organisation's routine and/or customer contentment. The table also consists of management model constructs, and the same methodology should be used as explained above. The questionnaire prepared as proposed by Birkinshaw (2017) included the management models as well as a new component, which is organisational ambidexterity. This is consistent with the majority of the three management models that were previously described.

The last construct is digital learning strategies, which were also used in developing the questionnaires to determine if these universities have digital learning strategies that are aligned to their overall strategies. It is recommended that all of these constructs be used in order to measure the level of organisational innovativeness in these universities. The following is the process that should be followed in calculating the level of innovativeness using this innovation index:

1. **Step One:**
   The university must develop its Innovation Indices using the different Key Measuring Constructs (KMC) mentioned in Table 86 below (Organisational Innovativeness, Management Models, and Digital Learning).
2. **Step Two:**
   Develop the table that consists of Key Measuring Indicators (KMI) as per Tables 83, 84, and 85 above.

3. **Step Three:**

   Develop a framework that consists of rating scales for different Key Measuring Constructs (KMC) as per Table 86 below.

4. **Step Four:**

   After developing all these tables, proceed to Table 86 and enter the weighting. This refers to the duration required for the university to comply with and implement a specific Key Measuring Construct, as well as the relative importance of that construct, expressed as a percentage out of 100%. This percentage will be calculated out of 100%, and when all these percentages are added, they should add up to 100%.

5. **Step Five:**

   Subsequently, refer to Table 87, which contains grading scales, to assess the extent to which the university has accomplished its goals, as elucidated in the aforementioned table. For instance, if the university scored 5 on Product Innovativeness, it should be marked in column 5 of table 86, indicating a 100% achievement in that aspect. This will be applied to every Key Performance Indicator (KPI) where the score will be derived based on Table 87. This should be universally applicable to all the constructs, contingent upon the number of constructs the institution has selected for that specific year.

6. **Step Six:**

   To get the average rating of a certain construct, you need to divide the percentage weighting by 100% and then multiply it by the rating scale, using Table 86 as a reference. This task must be completed in all the structures.

7. **Step Seven:**

   Subsequently, you aggregate the collective average weighting, ensuring that the sum does not exceed 5 and is to be interpreted according to Table 87. The suggested formula should be employed for calculating the average weighting:

Weighting Divide by 100% X Rating (1-5) = Average weighting: Add all to get Final Score which should not be greater than 5

Table 86: Universities Proposed Innovation Indices (Framework)

NO	ORGANISATIONAL INNOVATIVENESS: KEY MEASURING CONSTRUCT (KMC) DESCREPTION		LEVEL OF COMPLIENCE					
		Weighting	1: Non-Complience: 5:Full Compliance					
		%	1	2	3	4	5	Average
1	Product Innovativeness Is perceived newness, novelty, originality, or uniqueness of products and services. It encompasses two perspectives: The clients' perspective and the organisation's perspective, it basically refers to the extent to which a new product or service is viewed as useful or beneficial to some clients	10%						
2	Market Innovativeness Is the newness of approaches that organisations adopt to enter and exploit the targeted market. For some organisations, this means that they can enter a market or identify a new market niche and launch products with cutting-edge technological content.	10%						
3	Process Innovativeness Is introduction of new strategies of doing things in an organisation, introduction of new management approaches, and new technology that can be used to improve delivery of services/products and management processes.	10%						
4	Behavioural Innovativeness It is applicable to Individual, Teams and Management. It refers to adaptability to change, willingness to change, and commitment to encourage new ways of doing things, as well as the willingness to foster new ideas	10%						
5	Strategic Innovativeness It is the development of new competitive strategies that create value for the organisation. The primary focus of strategic innovativeness is to measure an organisation's ability to manage ambitious organisational objectives and identify a mismatch of these ambitions and existing resources in order to stretch or leverage limited resources creatively.	10%						

6	**Organisational Ambidexterity** Is the ability to manage an organisation in an efficient way, while at the same time adapting to the emerging changes in the environment. It is also when employees exploit the current functions and at the same time explore new ways of doing things.	10%						
7	**Quest Management Model** Managers in this model set clear organisational goals and encourage employees to reach these objectives through a variety of means. In other words, employees are told what to do but not how to do it. The model is useful for established and growing organisations operating in a competitive arena and thus trying to differentiate themselves.	5%						
8	**Discovery Management Model** This model is suitable for start-up ventures and small and medium organisations operating in an ambiguous, uncertain, and fast changing environment or for particular units of special projects in large, established organisations.	10%						
9	**Science Management Model** The model is suggesting tight means and loose ends with formal rules and structures and authority in decision making, accompanied by intrinsic motivation approach and obliquity in achieving goals. The application of this model is rather limited when compared to other forms.	5%						
10	**Planning Management Model** Is widely adopted in mature organisations where work is conducted in a linear manner and where the degree of predictability of the market evolutions is high.	5%						
11	**Digital learning strategies and initiatives** Are the frameworks and plans on how to utilise digital learning tools effectively and efficiently	10%						
12	**Strategic Alignment** Ensure that there are effective processes of planning and implementing practices that will ensure an organisation's strategies support its general objectives. A strategically aligned business comprises operations, methods	5%						

	and prescribed practices that work in unison to achieve long-term company goals. In a strategically aligned organisation, all departments, projects, decisions and functions contribute to the fulfilment of the organisation's mission, vision and objectives.							
13	**Total 100%**	**100%**						

Table 87 below outlines the rating scale required to calculate the Key Measuring Constructs mentioned in Table 86, which can be used interchangeably with Tables 83, 84, and 85. According to this table, there is a rating score of 1 (bad) = 0% achievement on a specific construct. Then 2 (poor) = 1-30% achievements on a specific construct. 3 (fair) = 31%–50% achievements on specific constructs. 4 (good) = 51%–79% achievement of constructs. 5 (excellent) = 80%–100% achievement of the construct.

Table 87: Rating scales to calculate innovativeness.

RATING	DESCREPTION	%
1 (Bad)	**Met none of the objectives as per the construct**	**=0%**
2 (Poor)	**Met some of the objectives as per the Construct**	**= 1%-30%**
3 (Fair)	**Met half of the objectives as per the construct**	**= 31%-50%**
4 (Good)	**Met more than half of the objectives as per the construct**	**= 51%-79%**
5 (Excellent)	**Met all the objectives as per the construct**	**= 80%-100%**

According to Nandal et al. (2020), as the business environment has become more sensible, managing innovation functions has become more important for continued existence. Measuring innovation is essential for efficient management. However, as many organisations have uncovered, measuring innovation is a very taxing task. They discovered that innovation is a concept that is impalpable, vibrant, and difficult to define, making it challenging to measure. Given the breadth of innovation actions, relying solely on one or a few metrics is insufficient and can lead to ambiguity. Therefore, based on

these findings, they recommended that any innovation index should be all-inclusive, measuring compound activities and characteristics based on the strategic goals of the organisation for that particular year. Hence, this study recommended the use of those different constructs that have been validated and are reliable.

They further suggested that organisations must use an innovation dashboard, including a set of about eight to twelve metrics. The console should include three categories of metrics: inputs, processes, and outputs. Of course, there is no benchmark set of metrics fitting for all organisations; rather, the metrics should imitate the scenery of the industry and the market, the organisation's goals and strategies, and its move towards innovation, among other factors. It is a vital yet challenging assignment that deserves consideration. Hence, in this research, it was decided to use the four generic management models, five organisational innovativeness dimensions, and five digital learning interventions because they look holistically at all the principles that will ensure that there is efficiency and competitiveness in these universities.

5.9 Final Recommendations

The primary aims of this study were to ascertain whether these universities employ any innovation indices to gauge their level of innovativeness. If they lack such a framework, it is advisable to create one for them based on established criteria utilised in the private sector. However, in order to ascertain this, it was necessary to first evaluate whether these colleges possess innovation plans or not. This was accomplished by employing the organisational innovativeness models that were suggested and verified by Wang and Ahmed (2004) and were included in a questionnaire. The other objective was to ascertain whether these universities possess management models that have been established to effectively implement their strategies. The management models included in the questionnaire were sourced from Birkinshaw (2017). Finally, we need to assess whether these universities have implemented digital learning techniques and if these tactics are in line with any management paradigms. Therefore, the focus of the research is on the concept of innovativeness and the application of management strategies in the implementation of digital learning. The data revealed that none of these universities had implemented any management models or innovative techniques to achieve their strategic objectives.

Based on these findings, the above innovation index has been developed, and it is recommended that it be used by these universities to measure their level of organisational innovativeness. It has been proven that any organisation that has developed these initiatives will be efficient and competitive.

It is advisable that individuals at different stages should employ specific management tactics while making decisions and delivering digital learning. For instance, in order to foster innovation, the University of Pretoria, Wits University, and the University of Johannesburg should adopt the Quest Management model, incorporating Behavioural innovativeness. Given that TUT, SMU, and VUT are not as advanced and mature in their development as other well-established organisations, it is advisable for them to adopt the science management model along with Market innovativeness, Behavioural Innovativeness, Product innovativeness, and Process innovativeness. This management model has been proven to be suitable for such organisations.

During the investigation, the researchers sought advice from several specialists in the field of organisational innovativeness and management paradigms. Their input has been used into this study. Karasch et al. (2020) argue that peer review can enhance the quality of reporting, clarity of presentation, and transparency, leading to better understanding and potential utilisation by clinicians and scientists. Thorough examination can determine if research adheres to proper ethical norms, regulatory clearances, compliance, and fair inclusion of both genders. In addition, they contend that peer review should assess the suitability of authorship and have the ability to identify instances of duplicate publication, fabrication, falsification, plagiarism, and other forms of misconduct. Peer review is the cornerstone of the scholarly publication system as it rigorously evaluates an author's work by other professionals in the same field. Another reason is that it motivates researchers to generate high-calibre research that will propel the discipline forward. Therefore, the researcher interacted with many specialists who were engaged in comparable research, despite the fact that the majority of them were conducting it within the private sector. However, it is anticipated that this will aid our universities in managing these institutions in a manner similar to how the corporate sector manages their organisations. Maximising productivity with limited resources.

Public universities must have the ability to compete with the newly established private universities in South Africa.

5.10. Conclusion

Based on the findings of this study, it can be inferred that none of the universities in Gauteng province possess a technique to assess their level of innovativeness. Furthermore, they lack any innovation projects that they have formulated to enhance their competitiveness. In addition, they lack specialised management methods to effectively accomplish their strategic objectives. In addition, the research revealed that they lack digital learning methodologies to foster innovation in the context of digitisation. These discoveries have led to the development of an innovation index and framework. This index and framework are based on many organisational components that may be used to assess the level of innovativeness. Additionally, a methodology has been established to aid in the development and calculation of innovativeness.

Nandal et al. (2020) discovered that in response to a more discerning business environment, the effective management of innovation operations has become increasingly crucial for the ongoing survival of organisations. Quantifying innovation is vital for effective administration. Nevertheless, numerous businesses have discovered that assessing innovation is an enormous and all-encompassing undertaking. They contend that innovation is an intangible, dynamic, and elusive idea that is challenging to describe and hence difficult to quantify. Due to the wide range of innovative activities, depending simply on one or a few measures is inadequate and can result in uncertainty. It is crucial that measurement encompasses all aspects, including complex actions and features. Therefore, this study has produced the aforementioned innovation indexes and recommends their implementation by these universities. Nevertheless, it is imperative to note that every institution must ensure that its Key Organisational Innovativeness Measurement Indicators (KOIMI) align with their strategic objectives, procedures, and managerial frameworks. This will align with the Diamond Model (IMP3rove).

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APPENDIX

1. Cover Information and Consent Letter

COVER INFORMATION AND CONSENT FOR AN ONLINE SURVEY

TITLE OF RESEARCH PROJECT: ***Innovativeness and management models in implementing and managing digital learning in Gauteng Province Universities***

We kindly invite you to participate in a research study by completing this 10minute online questionnaire. Participation is *voluntary*, and you may decide at any time to stop with completing the questionnaire. To ensure privacy and confidentiality of the information that you submit, we will not collect personal information, your email address or IP number.

This research is conducted as part of my studies towards a PhD in Leadership at UNISA (Supervisor is *Professor Sam Lubbe*). My contact details *Martin Lerata* are on *0721153865* if there are any questions and clarification required.

The study seeks to explore the level of organisational innovativeness and the use of different management models at Universities in Gauteng. We believe the research will assist our employees since it has been proven that the use of certain management models together with various innovations can improve performance, and also increase productivity. The study will ultimately assist employees to improve the existing ways of doing things, while also exploring new ways of doing things (i.e. organisational ambidexterity).

All employees on Post Level 1- Post Level 7 (Top, Senior and Middle Management Employees), are invited to participate, as this cohort is involved in strategic planning and processes of the University.

The questionnaire uses a 5- point Likert Scale:

1= Strongly Disagree; 2= Disagree; 3= Neutral; 4= Agree; 5= Strongly Agree.

There are no benefits to participants, but the research will provide possible interventions that may assist employees with opportunities to be innovative and motivated, which will lead to improved productivity and satisfaction in the work place.

There are no risks to taking part in this survey. Data collected will be analysed through applying different interventions.

The study will be conducted according to ethical guidelines and principles of the Declaration of Helsinki (2013) and guided by the Department of Health Ethics in Health Research: Principles, Processes and Structures, 2nd Edition (2015). The study has received approval from the Sefako Makgatho University Research Ethics Committee, that may be contacted at (012) 521 5617 should there be any concerns regarding the conduct of the study, or any complaint.

'*By completing this online questionnaire, I agree to participate in this study. I have read and understood all the above information provided, and know that once the survey is submitted, I will no longer be able to withdraw since responses cannot be linked back to me. I participate*

knowing that my answers will remain confidential, and that my identity will not be revealed. I am also aware that the information from this survey may be used for research publication and presentation.'

If you are willing to continue with this 10-minute survey, please click on the link below and at the end press submit:

LINK TO SURVEY

Thank you in advance for your kind participation in this survey

ir J

2. UNISA Ethical Clearance Letter

UNISA Ethic Approval

Afrwun, PO 0003 South Aft
Cnr Janadel and Alexandra Avenues, Midrand, 1685, Tel: +27 11 652 0000, Fax: +27 11 652 0299
E-mail: sbl@unisa.ac.za Website: www.unisa.ac.za/sbl

SCHOOL OF BUSINESS LEADERSHIP
RESEARCH ETHICS REVIEW COMMITTEE (GSBL CRERC)

19 October 2021

2021 SBL DBL
031 FA
Name of applicant: Mr MT
Lerata student#: 05696828

Dear Mr Lerata

The application was reviewed in compliance with the Unisa Policy on Research Ethics by the SBL Research Ethics Review Committee on the 14/10/2021.

The proposed research may now commence with the proviso that:

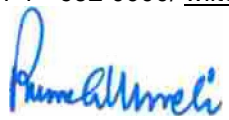
a) The researcher will ensure that the research project adheres to the relevant guidelines set out in the Unisa Covid-19 position statement on research ethics attached
b) The researcher/s will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
c) Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should be communicated in writing to the SBL Research Ethics Review Committee.
d) An amended application could be requested if there are substantial changes from the existing proposal, especially if those changes affect any of the study-related risks for the research participants.
e) The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study.

Decision: Ethics Approval

Student: Mr MT Lerata, (martin.lerata@smu.ac.za , 072 1 153 865)
Supervisor: Prof S Lubbe, (Sam.lubbe@gmail.com , 083 679 3834)
Project Title: Innovativeness and management models in implementing and managing digital learning in Gauteng universities.
Qualification: Doctor of Business Leadership (DBL)
Expiry Date: September 2023
Thank you for applying for research ethics clearance, SBL Research Ethics Review Committee reviewed your application in compliance with the Unisa Policy on Research Ethics.
Outcome of the SBL Research Committee: Approval is granted for the duration of the Project

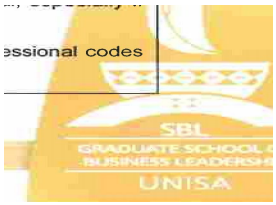
Kind regards,BWZ/twa
Prof N Mlitwa

Chairperson: SBL Research Ethics Committee
01 1 - 652 0000/ wiltonb fi unisaac.za



Prof P Msweli
Executive Dean: Graduate School of Business Leadership

011- 652 02561mswelp@unisa.ac.za



3. Letter from Statistician

27 November 2020

CONFIDENTIALITY AGREEMENT

TO WHOM IT MAY CONCERN

This letter serves to confirm my assistance of the research undertaken by Martin Lerata of the Graduate School of Business Leadership (SBL), currently registered for the Doctoral degree in Business Leadership (DBL) at the University of South Africa. The title of the study is:

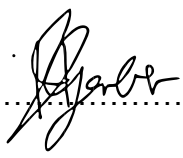
"***INNOVATIVENESS AND MANAGEMENT MODELS IN IMPLEMENTATION AND MANAGING OF DIGITAL LEARNING IN GAUTENG UNIVERSITIES***". As a statistician, I the undersigned hereby agree as required for ethical clearance purpose to ensuring the confidentiality to all data and case participants information made available to me resulting from the study, whether during the study or after conclusion of the study.

Kindly contact me should you need to verify the contents of this letter, should it be required.

Hennie Gerber
Statistician

hjgerber@gmail.com

083 229 9993



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4. **Request Letter to conduct Research**

UNISA | college of graduate studies

REQUEST TO CONDUCT RESEARCH AT TUT (YOUR FACULTY/DEPARTMENT)

Dear HoD/Dean

My name is Martin Tsiliso Lerata and I am currently a part time student with UNISA School of Business Leadership (SBL) doing PhD in Business Leadership.

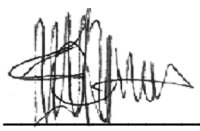
My research topic is ***Innovativeness and management models in implementing and managing digital learning in Gauteng Universities***

The aim of this research is to determine if Universities in GP are having innovation index, and if not, develop a framework that will assist them to be develop one. To further determine if Universities have any management models and if those management models are compatible with which innovation initiatives. Lastly to check if Universities has innovation strategies and if they are aligned to the overall University strategy.

My Supervisor is Professor Sam Lubbe and we hope that this research will assist Universities in SA to determine upfront which innovation model they can use that will correspond with a specific management model especially in making sure that digital learning becomes reality. My data collection involves a questionnaire that has been already approved by UNISA Research Ethics Committee, and it will only take 15 minutes to complete. I have been advised by the TUT Ethics research committee that my research has been provisionally been approved subject to different faculties or departments agreeing that their teams will participate in this voluntary research, and they will remain anonymous. It is therefore against the above background that I would like to humbly request permission to please conduct my research in your faculty/department targeting Lecturers, Managers and any other senior staff members.

I hope and pray that my request will be accepted.

Kind Regards



MARTIN LERATA

5. Permission Letter TUT

Tshwane University of Technology
We empower people

Research Ethics Committee

The TUT Research Ethics Committee is a registered Institutional Review Board (IRB 00005968) with the US Office for Human Research Protections (IORG# 0004997) (Expires 14 Jan 2023). Also, it has Federal Wide Assurance for the Protection of Human Subjects for International Institutions (FWA 00011501). In South Africa it is registered with the National Health Research Ethics Council (REC160509-21).

March 9, 2021

REC Ref #: REC/2022/02/001
Lerata MT
Name:
Student #: 5696828, UNISA
Ms MT Lerata
C/o Prof S Lubbe
UNISA School Of Business Leadership University of South Africa.

Dear Ms Lerata,

J **Decision: Gatekeeper Permission – Referred Back for Clarification and Revisions**

Name: Lerata MT
Project title: *Innovativeness and management models in implementing and managing of digital learning in Gauteng universities.*
Qualification: Doctorate in Business Leadership
Supervisor: Prof S Lubbe

Thank you for submitting the project documents for review by the Research Ethics Committee (REC), Tshwane University of Technology (TUT). In reviewing the documents, the comments and notes below are tabled for your consideration, attention and/or notification:

- University of South Africa (UNISA), Ethics Letter

 The REC took note of the ethical clearance granted by the UNISA School of Business Leadership Research Ethics Review Committee (GSBL CRERC). (Ethical Clearance Number: 2021_SBL_DBL_031_FA; dated October19, 2021).

- Permission Letters

TUT, E-mail Distribution. Note that external researchers (i.e., researchers not directly affiliated with TUT) must formally seek permission from Dr Dhaya Naidoo (TUT Chief Information Officer and Executive Director: Institutional Effectiveness and Technology, E-mail: NaidooD@tut.ac.za) to access contact details of the targeted TUT stakeholders from the TUT Management Information System (MIS) and to release the requested details to the external researcher. The researcher can then manage the dissemination of the questionnaires to the targeted stakeholders. Also note that it is a strict requirement to fully anonymise and deidentify the stakeholder e-mails in all project activities, including the research outputs. In other words, no identifying variables (e.g. staff E-mail addresses, names, positions) may be revealed, and it should not be possible for anyone to identify any stakeholders from the published project data and project results.
Head of Departments. Note that written permission from the selected TUT Heads of Department is required to collect research data from the participants. A copy of the permission letter should be submitted at your earliest convenience to the REC for notification and archiving purposes.

• Proposal

Proposal. The proposal is too long to review and most information is repeating. Also problem statement should be concise.
Proposal. Chapter 1 to 3 is provided. The REC need the proposal not the chapters.
Selection of Research Site. The proposal makes no mention of the *Tshwane University of Technology (TUT)* as potential research site. As such, it is unclear why this application was submitted to the TUT REC. Also other research sites are not indicated in the proposal.
Sampling Strategies. The proposal provides no indication of the relevant *sampling strategies*, *sample recruitment strategies* and *data collection strategies* for the various research participant groups. The important ethics principles in this regard are the following: fair selection procedure and voluntary participation without any form of subtle coercion.
Data Analysis. Data analysis was not included in the proposal.
Validity and Reliability. This information is not included in the proposal.
Ethical Consideration. How consent will be obtained should be included in this section.

• Participant Information Sheet

 Anonymity and Confidentiality. This section does not indicate how the participants' *anonymity* will be protected during the data collection.

• **Survey Questionnaire**

 Section 3.4. Questionnaire survey attaining saturation is not correct.

• Memo of Revisions

 Kindly submit a Memo that outlines the clarifications and/or revised documents in which each of the required revisions are clearly indicated together with the action/s taken to address it. The Memo must include clear references to specific sections and relevant page numbers linked to each revision.

• National Lockdown and COVID-19 guidelines

 Please take note of and adhere to the guidelines stipulated in the document included with the feedback letter entitled, "Implications of alert levels for researchers and postgraduate students during the COVID19 pandemic."

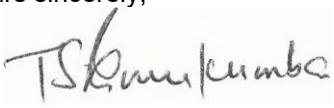
The Research Ethics Committee, Tshwane University of Technology, reviewed the project documents at its meeting on February 22, 2022. The project has been **referred back for clarification and**

revisions. . The clarifications and revised documents must be submitted to the Ethics Administration Officer, Ms Monicca Itsueni (REC@tut.ac.za), for consideration at the next REC meeting.

Expiry date for current ethics review: The **current ethics review** is valid until **31 August 2022**. Failure to submit the clarifications and/or revised project document/s by the expiry date will mean that all subsequent submissions related to the project will be regarded as a new application for full ethics review.

Data collection: Data collection activities as indicated in the proposal may **not** commence until **final approval** has been granted by the TUT REC.

Yours sincerely,



Prof TS Ramukumba
Chairperson: Research Ethics Committee
[TUTRef#2022=02=001=LerataMT]

Tshwane University of Technology
We empower people

Faculty of Information and Communication Technology
Office of the Executive Dean

7 April 2022

Dear Mr M Lerata

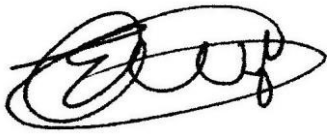
APPROVAL TO CONDUCT RESEARCH AT TUT

The Office of the Executive Dean hereby grants you permission to conduct your research within the faculty as indicated in your application, provided that you obtain:

Gatekeeper permission from the TUT Research Ethics Committee.
Written permission from Dr Dhaya Naidoo (TUT Chief Information Officer and Executive Director: Institutional Effectiveness and Technology, E-mail: NaidooD@tut.ac.za) to access contact details of the targeted TUT stakeholders, as indicated by the letter from the TUT Research Ethics Committee, dated 9 March 2022.
Written permission from the selected TUT Heads of Department to collect research data from the participants in their respective departments, as indicated by the letter from TUT Research Ethics Committee, dated 9 March 2022.

You may approach staff and students solely for research purposes on the topic *Innovativeness and management models in implementing and managing of digital learning in Gauteng* universities and any publications that may emanate thereof.

Wishing you everything of the best with your studies.



Kind regards

DR EA VAN WYK EXECTIVE DEAN: FACULTY OF ICT

We empower people

Tel. 0861 102 422, Tel. (012) 382-9280/9689 Fax (012) 382-9146,
www.tut.ac.za., Private Bag X680, Pretoria 0001

6. Approval Letter UP

2022-02-23

Mr MT Lerata
Graduate School of Business Leadership
University of South Africa

Email: martin.lerata@smu.ac.za

Dear Mr Lerata

APPROVAL OF RESEARCH STUDY

The UP Survey Coordinating Committee has granted approval for the research study titled "Innovativeness and management models in implementing and managing digital learning in Gauteng Universities". The proposed research study has to strictly adhere to the associated study protocol, as well as the UP Survey Policy and the Ethics Committee of the Faculty of Humanities instructions.

Please liaise with the Market Research Office in the Department of Institutional Planning (carlien.nell@up.ac.za) to officially register the study and to finalise the survey regulations, procedures and the fieldwork dates. In order to register the study, the Market Research Office has to receive the formal ethical approval letter from the Faculty of Humanities. A final electronic copy of the research outcomes must be submitted to the Survey Coordinating Committee as soon as possible after the completion of the study.

Kind regards

Prof CMA Nicholson REGISTRAR CHAIRPERSON: SURVEY COORDINATING COMMITTEE

VAAL UNIVERSITY
OF TECHNOLOGY

Research Directorate
Central Research Ethics Committee

Vanderbijlpark Campus
Andries Potgieter Blvd
Vanderbijlpark, 1900, South Africa
Private Bag X021
Vanderbijlpark, 1911, South Africa
www.vut.ac.za

+27(0)16 950 7773
+27(0)16 950 9779
deborahn@vut.ac.za

GATEKEEPER'S LETTER

OFFICE OF THE REGISTRAR

1 March 2022

Dear Mr Martin Tsiliso Lerata,

Ethics Reference Number: FRECMS-23022022-105

PROJECT TITLE: *Innovativeness and management models in implementing and managing digital learning in Gauteng Universities*

RESEARCHER / PRINCIPLE INVESTIGATOR: RESEARCHER: Mr MT Lerata
SUPERVISOR: Prof S Lubbe
APPLYING INSTITUTION: University of South Africa
DIVISION: Faculty of Economic
QUALFICATION: Doctor of Business Leadership

I am pleased to inform you that your application has been scrutinized by our structures and has been successful. You may proceed with your research on our campus.

Please note that, in all correspondence both with the university and participants you are required:

1 To make use of the Research Ethics Clearance Number, and
2 To remain strictly within the parameters of the application that you made to us (and which has been approved).

We wish you well with your research.

Sincerely,

23/03/2022

Dr D Mokoena (REGISTRAR)

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

OFFICE OF THE DEPUTY REGISTRAR

31 May 2022

Martin Lerata
Student Number (05696828)
Doctor of Business Leadership UNISA

TO WHOM IT MAY CONCERN

"Innovativeness and management models in implementing and managing digital learning in Gauteng Universities."

This letter serves to confirm that the above project has received permission to be conducted on University premises, and/or involving staff and/or students of the University as research participants. In undertaking this research, you agree to abide by all University regulations for conducting research on campus and to respect participants' rights to withdraw from participation at any time.

If you are conducting research on certain student cohorts, year groups or courses within specific Schools and within the teaching term, permission must be sought from Heads of School or individual academics.

Ethical clearance has been obtained. (Protocol number: 2021_SBL_DBL_031_FA)

Research Expiration: (September 2023)

Nicoleen Potgieter
University Deputy Registrar

SEFAKO MAKGATHO
HEALTH SCIENCES UNIVERSITY

Office of the Vice-Chancellor

TEMPLATE GRANTING OF INSTITUTIONAL PERMISSION FOR RESEARCH

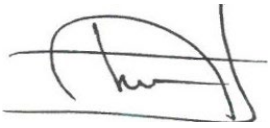
Dear Mr Martin Lerata

l, Professor Peter Mbati, Vice Chancellor of Sefako Makgatho Health Science University grant permission to collect data at this institution for your research project titled Innovativeness and management models in implementation and managing of digital learning in Gauteng Universities

I grant this permission as the authorized person to do so in this institution and am aware of the following,

1. The study is conducted as a UNISA researcher for your Doctor of Business Leadership (DBL) qualification and remains the property of UNISA
2. You {can use}, {not use} the name of the university in your research project
3. All data and information collected will be solely in the procession of the researcher
4. I will {require}, {not require} feedback of the research.
5. The research may be published in the public domain under the supervision of the supervisor

I wish the best and success in this research



PROF PETER MBATI
VICE-CHANCELLOR
Date: 10 June 2020

13 April 2022

Martin Lerata
University of South Africa (UNISA)

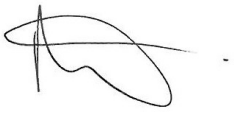
Dear Martin Lerata

PERMISSION TO CONDUCT RESEARCH AT THE UNIVERSITY OF JOHANNESBURG

The request for the project titled *Innovativeness and management models in implementing and managing digital learning in Gauteng Universities* refers. Permission is granted to conduct this study at the University of Johannesburg (UJ).

Please note that the granting of permission does not make it mandatory for UJ students and/or staff to participate in the study. As the reseacher/applicant, you will need to engage with potential participants to obtain their consent to participate in the study.

Sincerely



Dr Ndivhuwo Luruli
Acting Executive Director: Research and Innovation
Email: nmluruli@uj.ac.za