APPLYING THE SUBSTITUTION AUGMENTATION MODIFICATION REDEFINITION MODEL TOWARDS ADOPTION OF E-LEARNING USAGE AT WALTER SISULU UNIVERSITY

By

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Declaration of originality

I, Mr Teoflax Anele Mabona with the student number 219246297, hereby declare that this Master's thesis, to be awarded, is my own research and has not previously been sent to any university for review or completion of a postgraduate degree or other credential. Where other people's research has been used (either from a written source, the internet or from some other source), it has been properly acknowledged and cited in compliance with departmental requirements.

…… (Signature)

Teoflax Anele Mabona

Abstract

The adoption of e-learning by universities around the world has grown drastically during this time of the Fourth Industrial Revolution. Most universities implement the full utilisation of e-learning, conducting classes only by using online course delivery. Some universities still prefer a blended learning approach where classes are presented to students using both the traditional way of teaching and online e-learning platforms.

Walter Sisulu University (WSU) is one of those universities that uses blended learning. The university started using this approach in 2009, through a partnership between WSU and the Netherlands for learning and teaching enhancement using e-learning. The adoption and usage of e-learning in universities is a challenge, which some researchers have investigated. This study aimed to apply the Substitution; Augmentation; Modification; Redefinition (SAMR) Model to enhance the adoption of e-learning and its usage at WSU.

To obtain results, a quantitative method using approaches, such as WiseUp logs, WiseUp e-learning usage publications, WSU e-learning documents and literature, was applied. The study, according to the WiseUp logs, found that the e-learning levels at the university were low. Using the WiseUp e-learning usage publications, revealed that the university was still having some challenges regarding the low usage of WiseUp. Some of the students were not aware of the WiseUp platform as they said the system was only shown to them once and never again for continuous training.

Most lecturers' challenge was that the system was time-consuming to upload online content. This study used the WSU e-learning documents to show that the institution employed some initiatives for the adoption and usage of WiseUp, such as the LTD (Learning Teaching Development) department orientating students about WiseUp, just after their registration.

The study 's objective was achieved, which was to apply the Substitution; Augmentation; Modification; Redefinition (SAMR) Model to enhance the adoption and usage of e-learning at WSU. The study applied the Substitution; Augmentation; Modification; Redefinition (SAMR) Model to provide a clear understanding of WSU's position in terms of e-learning adoption and usage. The overall result from the study showed that WSU was based mostly on the first three levels of teaching and learning integration into technology, and in the enhancement level of the Substitution; Augmentation; Modification; Redefinition (SAMR) Model. The researcher noted that much still needed to be done because the usage of the system was still very low but its integration into teaching and learning was positive.

Keywords

E-learning, Technology Adoption, Learning Management System, ICTs, rural university, WiseUp, SAMR Model

Dedication

I firstly dedicate this dissertation to my late brother, Mr Mawabo Sajini Mabona, may his soul rest in peace. My brother did a lot for me, things I can't mention now; he went to heaven very early and I owe him a lot. I so wish he was around to see that I have achieved all that he had planned for me. Lastly, I dedicate this to my two lovely parents Mr William Mabona and Mrs Nosithile Mabona; without them, all of this would not have happened.

Acknowledgement

I want to express my unconditional appreciation to my supervisors, for not getting tired of me from the beginning to the end. My supervisor, Prof Darelle van Greunen, for her patience and guidance, who assisted me all the way since I met her; she was so helpful in this research. I would like to think that she has a way of getting through your mind. To my co-supervisor, Dr Nobert Rangarirai Jere, for his valuable words of wisdom when going to him for clarity. He would make me see the problem in a different understandable view.

Lastly, I want to thank my wife, Mrs Sinazo Makubalo-Mabona, for her support. When I would think of dropping out, she would encourage me and tell me that "I believe in you my husband; don't quit you've gone this far".

Table of Contents

[List of figures]

[List of tables]

[List of Appendices]

[Acronyms and abbreviations]

SAMR: Substitution Augmentation Modification Redefinition

WSU: Walter Sisulu University

UP: University of Pretoria

UJ: University of Johannesburg

NMU: Nelson Mandela University

UNISA: University of South Africa

CHE: Council on Higher Education

LTD: Learning and Teaching Development

LMS: Learning Management Systems

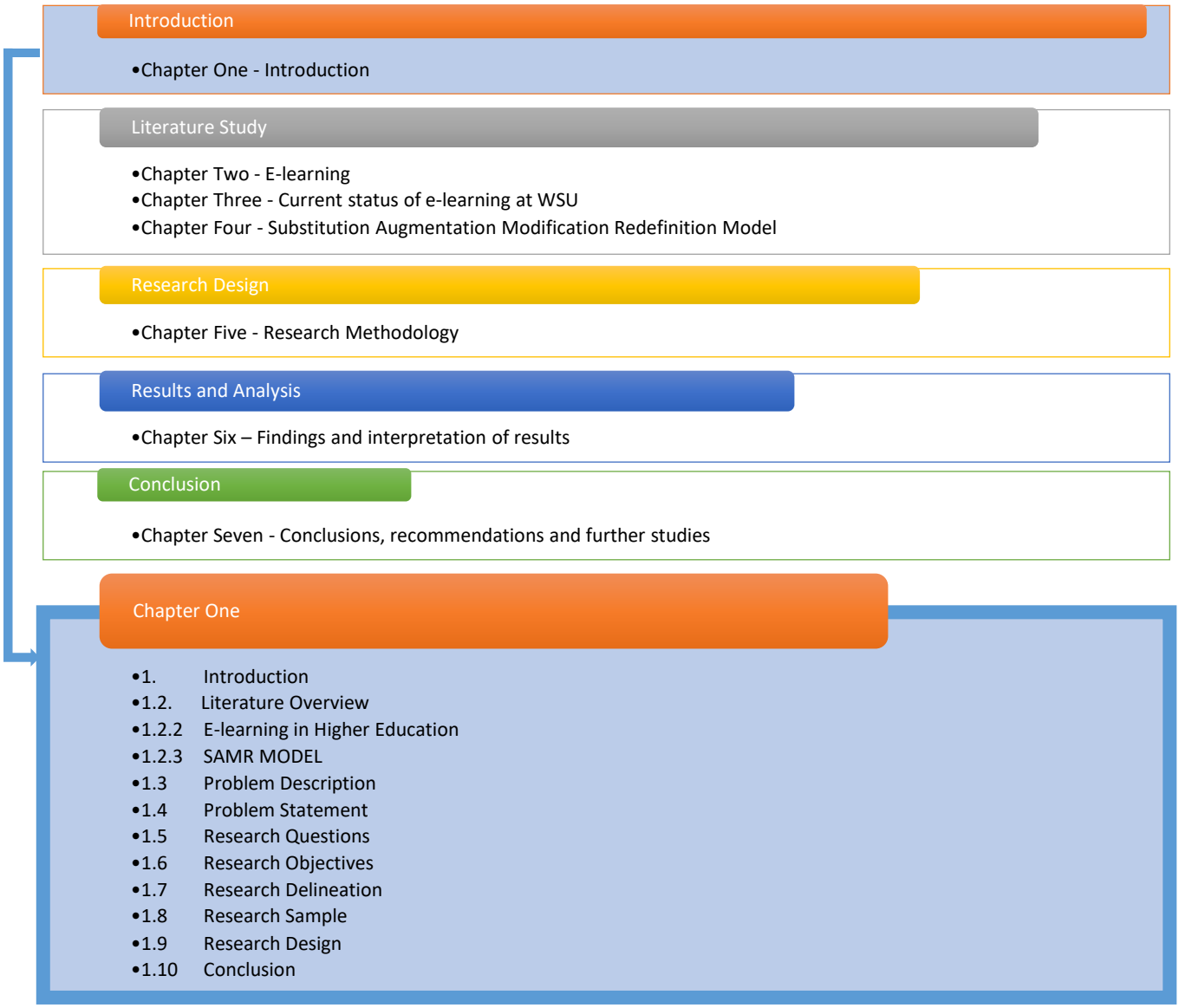
TPACK: Technology Pedagogy and Content Knowledge

TAM: Technology Acceptance Model

ICT: Information Communication Technology

ITU: International Telecommunication Union

Chapter One



1. Introduction

As technology evolves, many ICT solutions have been experimented with and deployed. Within the education sector, Learning Management Systems (LMS) have been organised, but their adoption and usage are still low. With the current technologies used by universities for electronic learning (e-learning), the universities' management expect an increased demand output rate of graduates that are produced as a result of e-learning.

In almost all universities, including rural ones, has gained popularity and has been extended nationwide. Walter Sisulu University (WSU) had to meet huge demands as a result of its merger in 2005 and they implemented a LMS. This demand was from the fact that the University covers a large geographical area and they had to make sure that there is an online supplementing capability of

delivering teaching and learning to WSU students and lecturers. As the university covers a large geographical area of the Eastern Cape, the same qualifications are offered across different campuses. In some cases, due to staff shortages, only one lecturer teaches the same courses at different campuses, which also incurs travelling costs due to movement from one campus to another (WSU, 2016).

By using an LMS, lecturers can upload notes on the system, upload assignments for their students, and the students can log in and download all the uploaded resources, depending on their course. The awareness of an LMS within universities still need to be taken into consideration when e-learning is introduced, meaning there must be a change management and this is supported by (Muuro, Wagacha, Oboko, and Kihoro, 2014). Their study found that not enough had been done when it comes to the instructions for lecturers using the LMS.

In most universities, the level of awareness and usage of the LMS need to be investigated and it is mostly underutilised. According to Coleman and Mtshazi (2017), certain universities were very strict in requiring lecturers to produce research in the time allocated to them. Some lecturers became frustrated when they were expected to learn to use the LMS, as they found the process of course uploading to the e-learning platform time-consuming (Coleman and Mtshazi , 2017).

Jacob-Israel and Moorefield-Lang (2013), argued that with the choice of websites and applications on the web, teachers had a highly reliable source of recommendations for the best current online tools and web applications. Little development has taken place in terms of adopting a model that could assist in enhancing the adoption and usage of e-learning at WSU. This was supported by the fact that most of the studies on e-learning at WSU focused on usage. Some authors, such as Mafuna and Wadesango (2012), focused on the acceptance of the WiseUp LMS, the University's Information Communication Technology (ICT) infrastructure in terms of the LMS accessibility to students, and the awareness of the University's LMS.

Mafuna and Wadesango (2012), emphasised infrastructure when investigating WSU's access to technology. In some cases, questions needed to be considered as proposed by the Substitution Augmentation Modification Redefinition (SARM) Model. These questions are, specifically: How are these technologies and tools being implemented within certain organisations; are these tools being used to their maximum potential; and what impact do these adopted technologies and tools have on teaching and learning?

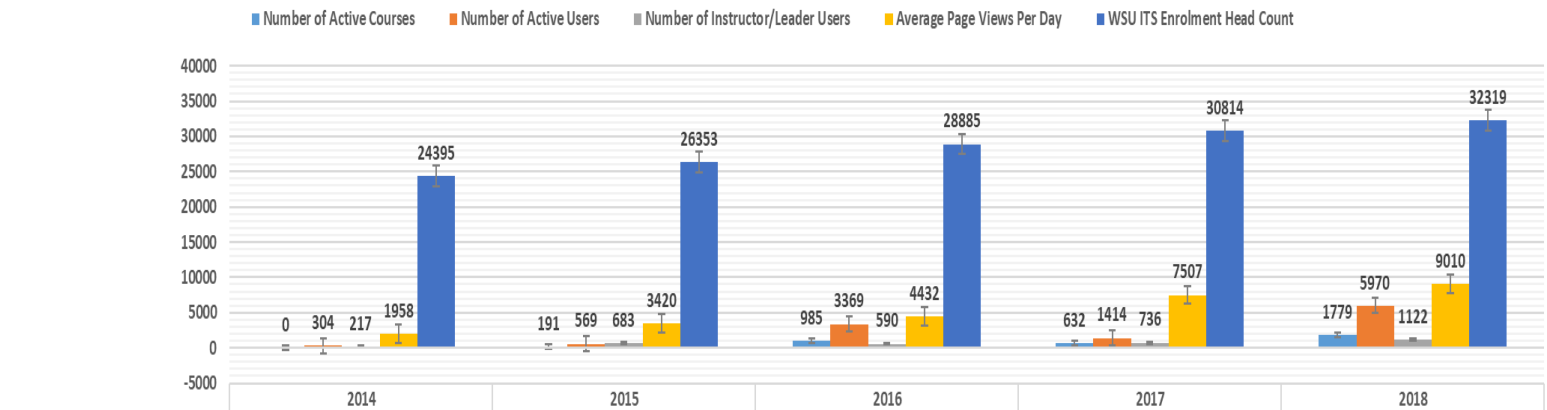
Hamilton, Rosenberg, and Akcaoglu (2016) explained the SAMR Model as one that inspired teachers to move up from the lower to a higher level of learning while using technology for teaching. This, as Puentedura (2013), explained, resulted in enhanced (higher) levels of university learning, as well as the adoption and usage of teaching technology.

Walter Sisulu University is spread over a large number of rural areas in the Eastern Cape and has more than 30 000 enrolled students. Jack (2007), reported that WSU is a result of a merger that occurred on 1 July 2005, following the coming together of Border Technikon, the University of Transkei and the Eastern Cape Technikon. WSU was the last university of all to be merged by the Minister of Education. Shwababa (2014), noted that WSU was initiated, based on the Act no. 101 of 1997 of Higher Education, as a new, comprehensive university.

The institutions that merged to form WSU were not only historically disadvantaged but also geographically far apart. According to WSU (2016), the university's strategic document stated that the institution's Learning and Teaching Development (LTD) department supported academics in terms of monitoring and preparing those students with a lack of writing skills. They also provided career advice where necessary, by using the e-learning management system. The university's LTD implemented Blackboard as its LMS. This LMS was then named WiseUp. WiseUp offers a robust set of tools, functions and features, designed to enhance teaching and learning.

WiseUp could be used as a supplement for the on-campus courses or be the point of access to an online course. On WiseUp, lecturers could submit learning and teaching materials, post and mark assignments online, check on plagiarism in student submissions, place students, interact with students through social network platforms, and track and monitor student performance.

It was LTD's responsibility to train lecturers and students to use WiseUp. WSU, as noted from the data extracted from the WiseUp logs against the ITS student headcount enrolments, experienced extremely low e-learning adoption and usage, as demonstrated in Figure 1. From 2014 to 2018, as determined by the system, the highest usage was 9 010, whereas WSU enrolled 32 716 students in 2018. This showed a low adoption and usage of the LMS (Walter Sisulu University [WSU], 2018). The evidence below demonstrates that the institution still needed to do much, as the annual licence fee of the LMS used by WSU (WSU, 2016) ran a hefty R841 491.90. Therefore, the researcher proposed that the SAMR Model be applied at WSU towards the adoption and usage of e-learning. From 2014, it was clear that no activities took place at all on the system, as the number of active courses was zero.



	2014	2015	2016	2017	2018
Number of Active Courses	0	191	985	632	1779
Number of Active Users	304	569	3369	1414	5970
Number of Instructor/Leader Users	217	683	590	736	1122
Average Page Views Per Day	1958	3420	4432	7507	9010
WSU ITS Enrolment Head Count	24395	26353	28885	30814	32319

Figure 1: WSU Blackboard Trends (Walter Sisulu University [WSU], 2018)

1.2. Literature overview

1.2.2 E-learning in Higher Education

E-learning has been implemented in universities with some benefiting from it. Some universities have collaborated with the use of technology, whereby University A would assist University B for online-related class delivery activities (Calitz, Cilliers, & Greyling, 2006). The use of technology in education benefit both students and lecturers. For this to be accomplished, the relevant infrastructure need to be present between the two ends, for example from one campus to another. This means that network connectivity from Queenstown campus to Buffalo City Campus linking also the other two which are Mthatha and Butterworth Campuses should be present at all times.

Mabuyisela & Adams (2017), said poor ICT infrastructure at universities that had implemented e-learning might be a challenge, which could later result in the low usage of e-learning. According to Mupfiga, Mupfiga, and Zhou (2017), if the e-learning infrastructure was up to standard and everything in order, users were likely to adopt and use e-learning as required. Muuro, Wagacha, Oboko, and Kihoro, (2014) argued that collaborative teamwork between stakeholders was required to have a fully operational e-learning university. If the university ensured that the students were provided with multimedia-based content, they would indeed be encouraged to adopt and use e-learning.

Most universities worldwide are using e-learning but some are lagging when it comes to using their e-learning platform to full capacity. Several studies published on e-learning usage are broadly discussed in the literature chapter of this study.

1.2.3 The SAMR Model

Some efforts have investigated the user acceptance of e-learning at universities. Masrom (2007), used a technology acceptance model (TAM) to investigate e-learning as an effective LMS for universities to use. The researcher found that when doing user workshops on LMS, the focus should rather be on how bringing new technology into the university could improve the effectiveness and efficiency of student learning than the technology usage procedures. The researcher concluded that the TAM Model was not descriptive; that is, it did not provide a clear view of the technological flaws within an adopted and used technology and merely evaluated the technology used, while providing predictions on the technology acceptability.

Uys (2007), proposed a Leadership, Academic and Student Ownership and Readiness (LASO) Model as a guiding framework to be used within enterprise-wide technological transformation in higher education. Masrom (2007), pointed out that when using LASO model of technology transformation in the higher education sector, the model mostly focused on the necessity for integration of technological transformation, and the necessity for integrated and coordinated top-down, bottom-up and inside-out strategies was emphasised. When the LASO Model was used, it acknowledged the technological transformation to be complex. However, for LASO to be successful, it needed support from within, from the stakeholders of the system, involving students and also the lecturers to take part in the transformation.

The models mentioned, such as TAM, had been used within higher education to assist in the technological acceptance, and the authors did mention that the model had some challenges in terms of good diagnostics and finding flaws in the used or adopted technology. TAM only evaluated the used technologies and provided predictions on its acceptance. The LASO Model, as mentioned above, acknowledged complexity when performing a technological transformation within an organisation.

For the model to be a success, a true partnership needed to be among the stakeholders, in this case, the students and lecturers. TAM and LASO did not define the levels of technological transformation and enhancement of the used and adopted LMS in the way that the SAMR Model did. The SAMR

Model since then became a good decision-making model for university management in doing interventions related to the usage and enhancement of LMS, when necessary.

Jude, Kajura and Birevu, (2014) defined the SAMR Model as an ICT-structured learning and teaching methodology, using technology as a substitute tool, without making any change to the organisation's current processes. When additional functional improvements occurred, these then became an Augmentation, and the introduction of a significant redesigning of the task was referred to as Modification. The authors further added that if new tasks were added or created, that was then defined as a Redefinition. All the specified tools in the model depended on the user's knowledge of the availability and integration of the tools.

The tools, as for the SAMR Model, are divided into two aspects: namely an **enhancement,** which is made up of Substitution and Augmentation, playing a large role in the teaching and learning process. Additionally, the SAMR Model involves **transformation,** which is the Modification and Redefinition of the teaching and learning processes, by realising and significantly redesigning some of the tasks a system performs. The SAMR Model provides a more detailed framework in assisting how technology can be integrated into education, without missing any developmental stage. This is further demonstrated in figure 2 below.

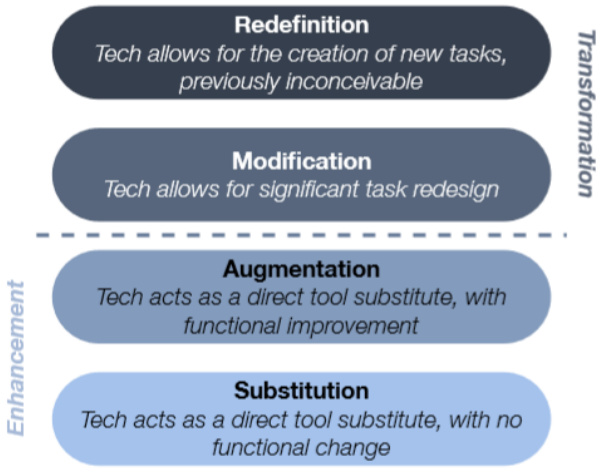


Figure 2: SAMR Model (Puentedura, 2012)

Jude et al. (2014), argued that transformational learning tasks that centred on mobile devices, would go far beyond being a mere substitute for more traditional ways of doing day-to-day activities. The SAMR Model provided a framework that is used in categorising and assessing mobile learning activities. The model was introduced by Dr Ruben Puentedura in 2006, as part of his work with the Maine Learning Technologies Initiative (Puentedura, 2006). The model's intention, as implemented in the United States

(US) at the State of Maine, was to attract lecturers by encouraging them through enhancing the educational quality by using technology.

In the case of Walter Sisulu University, which has adopted the e-learning management system since 2009, clarity on the maturity of the system was lacking in terms of usage in supporting academic performance activities. Therefore, in the current study, the SAMR Model was used to determine the current status of the University's WiseUp platform. The results assisted in providing a baseline of a clear view of the chosen LMS. This would answer some questions, such as what could be done to promote the LMS usage at the university. The results gathered from the research analysis, would recommend enhancements to optimise the system's functioning and use.

1.3 Problem Description

Rural universities, as well as other urban educational organisations in South Africa, are still in the early stages of trying to motivate lecturers and students to adopt the use of e-learning. As noted in the previous sections, since the implementation of WiseUp from 2009, the LMS was not yet fully utilised at WSU as the institution intended. This underutilisation resulted in a loss, as WiseUp averaged more than R500 000 of annual licence fees per year.

According to the 2019 WiseUp access logs, 32716 students were enrolled in the 2018 academic year, as seen in figure 1, and only 5970 active students accessed the system. From 2014 to 2018, the highest number of usage was 9010, whereas WSU enrolled 32716 students in 2018, and this showed the low adoption and usage of the LMS. Moreover, WSU lecturers spent excessive amounts of time travelling from campus to campus to conduct lectures in person to the students, when they could have used the LMS and limited campus travelling to only when necessary.

1.4 Problem Statement

The LMS's use and adoption, according to figure 1, was at a low level at WSU, which created a negative impression of the university. According to Baleni (2011), some challenges at WSU created problems for the lecturers, resulting in them not using WiseUp. The researcher found that some lecturers faced computer illiteracy challenges when navigating the WiseUp platform and ending up not being motivated to use the platform (Baleni ,2011).

In the study, it was revealed that some WSU lecturers had no computers, which would be a large challenge, also resulting in the low usage of the e-learning platform. The low utilisation had also been a challenge for the WSU students as they had poor skills and knowledge of how to use WiseUp. They had only been exposed to the system when they arrived and were trained how to use it, but never how to practically implement it into their daily course activities (Mafuna & Wadesango, 2012).

The above statements led the researcher to conclude with the problem statement for the study below.

The adoption and continued effective usage of e-learning by WSU stakeholders remain significantly low.

In addition to this, the following research questions were proposed:

1.5 Research Questions

The main research question of the study is: How can the SAMR Model be applied to enable e-learning adoption and usage at WSU?

This study aimed to address the following sub research questions:

1. What is the current e-learning usage rate by WSU stakeholders since it was implemented?
2. What are the current challenges experienced by WSU resulting in the low e-learning utilisation?
3. What are the e-learning adoption and usage strategies used at WSU to encourage staff and students?

To address the research questions, the following objectives were proposed.

1.6 Research Objectives

Primary Objective:

The aim of the research is to apply the SAMR Model to enhance e-learning adoption and usage at WSU.

Secondary Objectives

1. To establish the extent of e-learning use by WSU stakeholders;

2. To investigate the current challenges experienced by WSU stakeholders resulting in the low e-learning utilisation; and
3. To evaluate e-learning adoption and usage strategies used at WSU to enhance the usage of e-learning by staff and students.

1.7 Research Delineation

The study focused on Walter Sisulu University's students and staff. To fairly represent the WSU staff and student community on the four campuses, the researcher used a combination of methods, including WiseUp logs, WiseUp e-learning usage publications and WSU e-learning documents.

1.8 Research Sample

The study sample used different methods to identify the participants. The WiseUp logs were chosen to obtain all the active users of the system, which made up the sample of the study. According to the Blackboard Analytical Tool (BbAT) (2019), the number of active students in the system was 1561 and active lecturers, 1300. The study focused on the system's actual logs, which then meant the number of lecturers and students combined made up the sample size, which was 2861.

1.9 Research Design

The researcher identified a quantitative method as suitable to use for the study. This research method assisted to generalise results and measure various views in a chosen sample.

The study followed a method of using the system logs to obtain a thorough reflection of the current usage of WiseUp across different campuses. Current WiseUp e-learning usage publications, including the available e-learning documents, were also involved.

By using this research method, the study was able to develop an initial understanding and sound base for further decision-making. In the research literature review, an online desktop study was considered for quantitative data collection.

The research process is clearly outlined in figure 3 below, where the detailed steps are demonstrated.

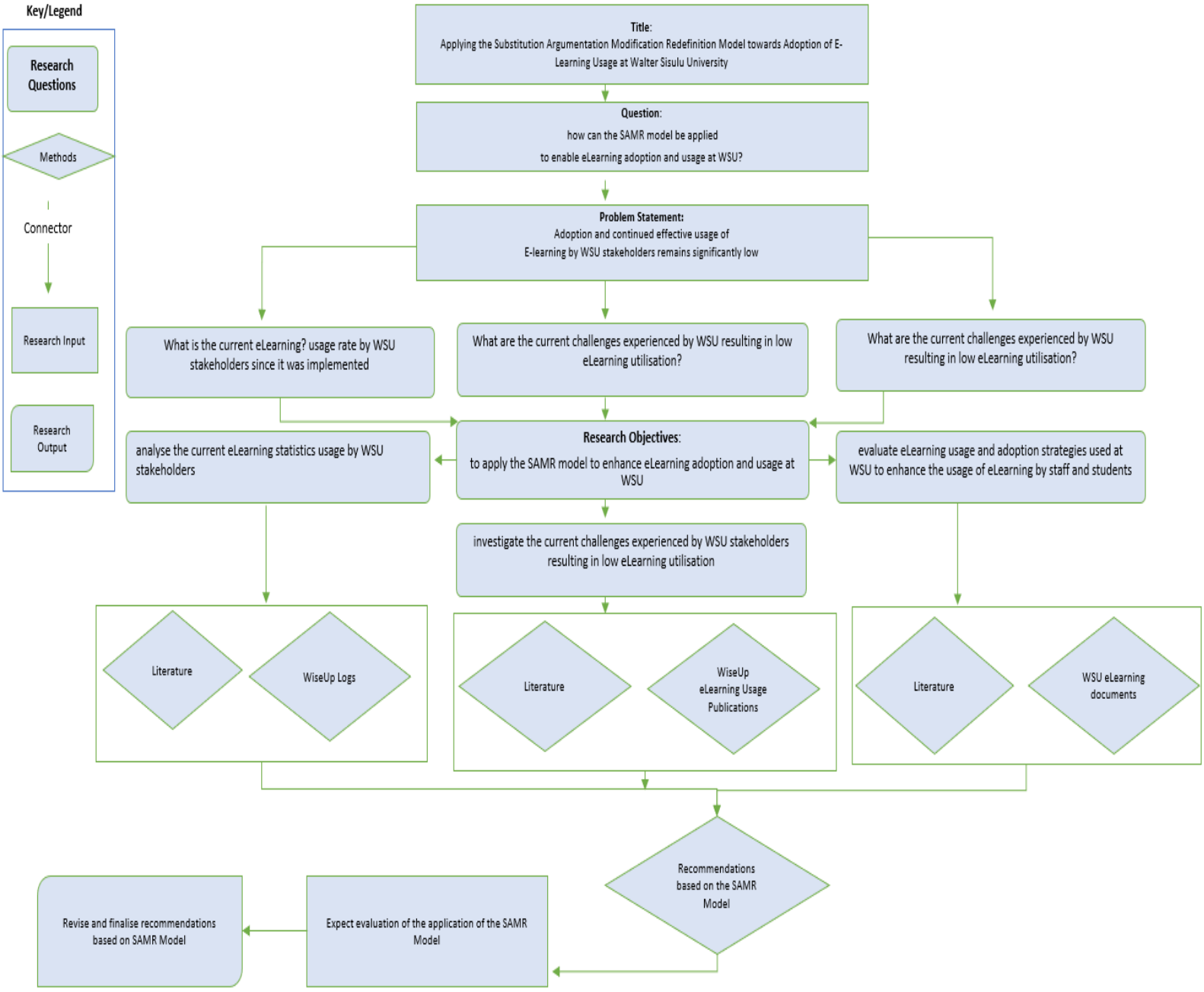


Figure 3: Graphical representation of the research process

- **Research input**: As illustrated in figure 3, the study was initiated by first identifying the research title by selecting a relevant topic with the guidance of the supervisor(s). Upon finding the research title, a research question was identified based on the selected title. In step three, according to figure 3, the researcher then extracted a problem statement that led to the selected topic.
- **Research question:** In this phase, the researcher drew three sub-questions from the research's problem statement, which then led to the research objective. The research

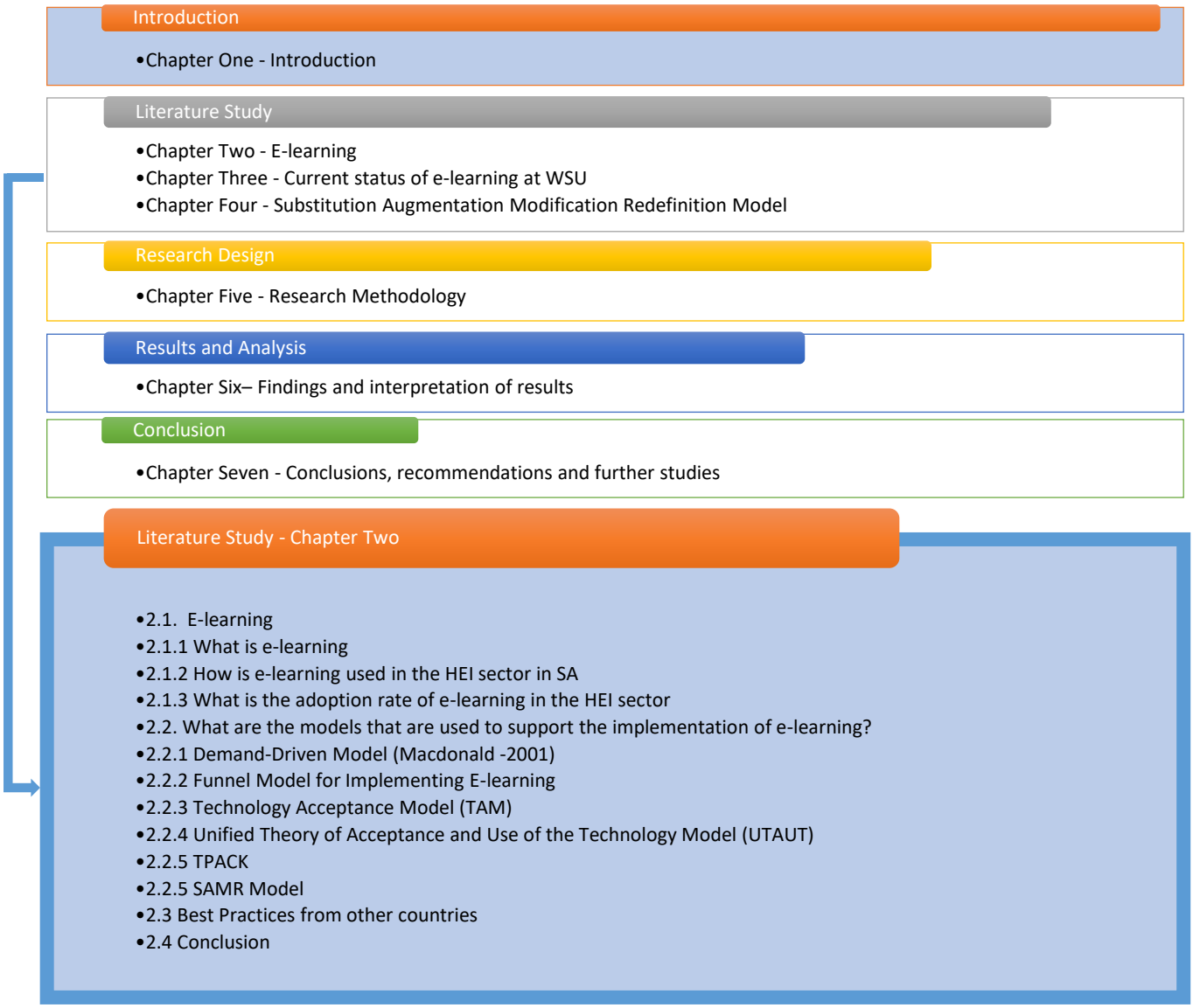
objective was branched into three sub-objectives that were linked back to the research questions, in trying to answer the main research problem statement.

- **Data collection:** The data collection exercise was a high priority, and informed by auxiliary WiseUp logs, WiseUp e-learning usage publications, WSU e-learning documents, the desktop study and a literature review. This process is also demonstrated in figure 3, showing the methods in diamond-shaped phases.
- **Data analysis:** The SAMR Model was used to analyse the findings of the study, recommendations were made, and further studies were recommended.
- **Publication:** The results of the paper would be presented, and peer-reviewed, and once approved, the study would then result in a write-up.

1.10 Conclusion

This chapter provided the background to the study. A brief preliminary literature review was discussed based on e-learning usage publications in Higher Education, as well as an overview of the SAMR Model and the findings from other studies, relating to e-learning. The chapter also briefly shared the statistics of the WiseUp access logs, which assisted the researcher to obtain a clear view of what had been done as yet. The preliminary literature was also incorporated to ascertain whether the study would have any contribution to the body of knowledge already available. This chapter addressed the most relevant sections of the research, namely the problem statement, primary aim and objectives, main research question and sub-research questions, including the research process.

Chapter Two



2.1. E-Learning

2.1.1 What is e-learning

According to Kinuthia and Dagada (2008), e-learning is another way of teaching students and enabling them to learn through technology. The e-learning principle is viewed as an umbrella of its supreme names, such as PC-related learning, web-based learning, online learning and many progressively extravagant words, between the 1980s and 1990s (Kinuthia & Dagada, 2008). The emerged e-learning method is used unknowingly daily, with social media and the World Wide Web. Nichols (2003), explained e-learning as the use of numerous technological tools worldwide, both web or mobile-based, for teaching and learning.

Zoroja, Skok, and Bach (2014) argued that e-learning using technology, played an important role in teaching because it had become part of people's lives. With e-learning in societies, one had exposure

to the many advantages it provided and contributed to some of the traditionally used ways of delivering education to students. Desmond Keegan (2002), further added by saying e-learning acted as a base for most of the international and national institutions in awarding recognised degrees to students who in their studies spent some time using computers for their studies and to submit assignments. Desmond Keegan (2002) further provided a representation of the e-learning process within education in figure 4.

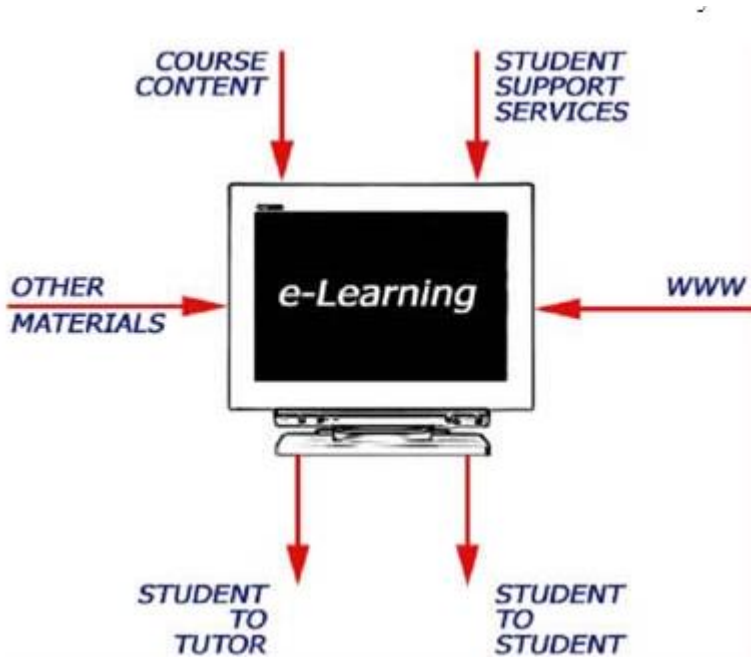


Figure 4: Wired Virtual Learning Environment of today (Desmond Keegan, 2002)

The diagram in figure 4 displays an interactive collaboration to achieve e-learning in the classroom represented by the computer screen, or an example of a student's home, for those doing distance learning. In the diagram, the course content is supplied to the student electronically via the computer screen. The support, in terms of feedback and communication of assignments to students, is also provided electronically. The access to the World Wide Web can be seen as via the electronic channel, assisting with the reading resources found on the web and from other resources, including USB, CD-ROM, audio/video and others. The diagram demonstrates further that communication from one student to another student can be done, using email, chat rooms, and Skype, even if one student is not within the geographical area of another.

When the student submit assignments to the tutor, this was also performed electronically, quizzes were done on the computer and sent via email, whereas the tutor's feedback also could be in the form of an email (Desmond Keegan, 2002). According to Olson, Olson, and Codde (2011), using e-learning, if implemented properly, could improve the value of education provided to students with better quality informational learning strategies and online content. The online joint effort and correspondence that

e-learning provided had the potential to advance the improvement of exceptionally talented students. As we are living in the 21st century in the fourth industrial revolution, students would have basic reasoning, be inventive and have skills for problem solving, and have the option to share and team up with one another (Olson, Olson, and Codde 2011).

According to Fitzpatrick (2012), the use of computers with the internet for interacting between all the continents in the world allowed people to network and engage electronically using the available technologies, and students and lecturers can collaborate as if they were in one place. Education benefits substantially from these technological improvements as they are becoming more inspiring and more socially integrative and collaborative. Fitzpatrick, further added that nevertheless, we might have all these enhanced and good technologies, which enabled us to use e-learning and be more productive in the classroom, but there was still a huge gap to fill on how to have e-learning fully implemented in education.

2.1.2 How is e-learning used in the HEI sector in SA

The University of South Africa (UNISA) embraced the portable innovation and online cloud e-learning years back. The institution in 2004, took a decision to switch from their own e-learning system and started using an open-source integrated system, enrolling more than 200,000 students and named 'myUnisa' (Bagarukayo & Kalema (2015). UNISA adopted Sakai for their e-learning environment, named as myUnisa, which then meant the tools and features within the e-learning platform that UNISA had adopted, depended on the Sakai framework. For students enrolled at UNISA, the e-learning system provided a student number, which the student would later use when submitting assessments and communicating with the administrator or instructors (Poll, 2014).

Bagarukayo and Kalema (2015), argued that when the utilisation of e-learning in South Africa started, the University of Pretoria (UP) was of one of those institutions who began e-learning in 1998, with the WebCT Learning Management System. This was in the wake of having run programmes that were separation-based from 1995, using broadcasting video-conferencing, online courses, and interactive media. Bagarukayo and Kalema (2015), said that at least one component of all the courses offered to students was delivered using WebCT. UP served over 24000 part-time and distance learners and more than 48000 face-to-face, campus-based students. The University started a division, named the Department of Telematic Learning and Education Innovation, with the objective of helping educators in educational planning structure exercises (Bagarukayo & Kalema, 2015).

According to Bagarukayo and Kalema (2015), in 2006, Sakai redid WebCT and the Moodle e-learning system, which was created by OSS Vula for the University of Cape Town. They carried-out an e-learning system, which supported teaching with the aid of distributing announcements and notes; it was used as a transfer medium though and not for construction. The system was presently utilised by an extra 25000 newcomers and teachers of UNISA and North-West University. The courses were planned using e-learning and mock-ups. "There is still an unwillingness to use the system, system usage is not promoted or supported, the computers are in poor working condition, there are no relevant software programmes and no helpful lab instructor"(Bagarukayo & Kalema, 2015,p. 5).

According to Bagarukayo and Kalema (2015), at the Stellenbosch University (SU) and the Cape Peninsula University of Technology (CPUT), a patented e-learning system was used, namely WebCT and its use was just for the learning transfer medium. SU deployed the machine without a session with the relevant stakeholders, which in some instances emerged as a reason for the structures not being completely utilised or maybe not being used at all. The LMS usage was growing substantially at US due to their obligatory intake policy clause. On the other side, CPUT lacked a policy or forum as a framework for the institution to advocate the application and adoption of the e-learning system (Bagarukayo & Kalema, 2015).

According to Bagarukayo and Kalema (2015), in 2010, the University of KwaZulu-Natal (UKZN) started out using the Moodle platform for teaching and studying to assist lecturers to deliver content to students with the use of e-learning. The platform allowed students to download assignments, view announcements, and have forum discussions and other interactive exercises that their lecturers uploaded to the platform. In this organisation, there was no supplementary student support, which then made the system adoption and usage challenging (Bagarukayo & Kalema, 2015).

As reported by Bagarukayo and Kalema, (2015), University of Johannesburg (UJ) used a blended learning approach, meaning it catered for face-to-face and distance learning, using e-learning to deliver teaching to its students. The University enrolled more than 45000 students, which included both face-to-face - full time and part-time students. The university had a bonus as it used a business LMS to supplement direction transport for the campuses, with an additional guide to first years in huge lessons with on-line materials. The lecturers were given a guide in learning improvement, which made the utilisation and adoption of the e-learning gadget smooth and attracted users to the e-learning system (Bagarukayo & Kalema, 2015).

According to Bagarukayo and Kalema (2015), Nelson Mandela University, for e-learning adoption and usage, implemented and used SharePoint 10, which the university applied for content material sharing

and as its record management system. That turned into simply helping the university in having course material online and allowing for collaboration in blended learning environments. Bagarukayo and Kalema (2015), added that this platform had its advantages but it was not flexible enough to support e-learning and its interaction activities were limited. The SharePoint platform was replaced by Moodle, which the Faculty of Education initially used and the whole institution later adopted (Ssekakubo, Suleman, & Marsden, 2011).

In 2008, the University of Fort Hare adopted an e-learning LMS, namely Blackboard, under the Academic Development Centre. The platform was installed in 2009, and immediately the relevant people were trained and the use increased over the years since its beginning. The lecturers were quite comfortable with the LMS as they felt there was efficient communication, easy access to reading materials for students, and instant feedback on assessments (Wright, Cilliers, Van Niekerk, & Seekoe, 2017).

According to Mafuna and Wadesango (2012), Walter Sisulu University started using e-learning in 2009, with the Blackboard platform, which was later renamed WiseUp. The e-learning system started as a result of an investment from the University's funder Nuffic, which realised an excessive failure within the WSU's Faculty of Science and Engineering Technology. The system aimed to supplement the face-to-face studying activities and WSU became a blended learning university. Intended users of the e-learning system were still not all using the platform and some of the students' experience and awareness of WiseUp were very poor, as they were only trained on how to use the system initially and thereafter never used it (Mafuna & Wadesango, 2012).

According to WSU (2018), Walter Sisulu University introduced the use of the Blackboard mobile app, coupled with the collaborative tool, as an additional feature to the upgrade. The main goal of the initiative was to provide a friendly attractive user experience to encourage users to use the Learning Management System. This also was to enable the users to access resources that were uploaded onto the system, anywhere and anytime. The upgrade features encompassed a way in which students then could collaborate with one another and their lecturers and have net meetings additionally. The usage of the digital lecture room was a new means of making formerly traditional teaching and studying activities extra appealing to the students, particularly as there might have been an option to even view the LMS using cellular gadgets.

In some universities, the implementation of having e-learning frameworks in place for usage and the adoption of ICT had been an issue. A report extracted from Education, This, & Foundation (2006), stated that no ICT methodology seemed to be in place regarding the use of e-learning in higher education. This finding was applicable across all types of institutions in South Africa, including the University of the

Witwatersrand and Walter Sisulu University, which results showed that only guidelines were in place on how to access information using the Learning Management System. Nelson Mandela University as per this finding was found to have no ICT-related policy in general. Also, North-West University did not seem to have developed a policy related to e-learning.

2.1.3 What is the adoption rate of e-learning in the HEI sector

In line with the report from L.Czerniewicz,N.Ravjee, N.Mlitwa (2006), it was found that higher education in comparison to preceding years, was spending more on ICT-related infrastructure to overcome poor ICT infrastructure nationally. According to L.Czerniewicz,N.Ravjee, N.Mlitwa (2006), regarding policies that had to guide and assist universities on the use and adoption of e-learning, only a few universities had already put in place ICT strategies as far as in the late 1990s. At the universities of Pretoria and Stellenbosch, such techniques were part of their wide initiatives. Some of the other universities simply had policies and strategies that were part of adoption and usage strategies , in the previous few years. L.Czerniewicz,N.Ravjee, N.Mlitwa (2006), said it was no longer simple to discover any evidence of these kinds of problems that universities experienced, concerning the placement of policies for e-learning. The ICT in those other institutions needed to be investigated further to establish whether the non-existence of implemented policies was of choice.

According to L.Czerniewicz,N.Ravjee, N.Mlitwa (2006), the affected institutions that seemed to be lagging in implementing e-learning policies included the University of Witwatersrand and Walter Sisulu University of Science and Technology. They had policy-related documentation, which was identified as only guidelines on accessing information at one of the WSU delivery sites, which was formerly known as Border Technikon, before the merger and now it was called Potsdam Campus. Nelson Mandela University seemed to not have any preferred IT policy; there was no academic technology and no IT-associated teaching and learning regulations, which could be identified at both UPE and Vista PE. On the other hand, the North-West University (previously the colleges of the North West and Potchefstroom) seemed to no longer have created or inherited educational documentation, preferred IT, or coaching and studying guidelines, from any of its constituent campuses.

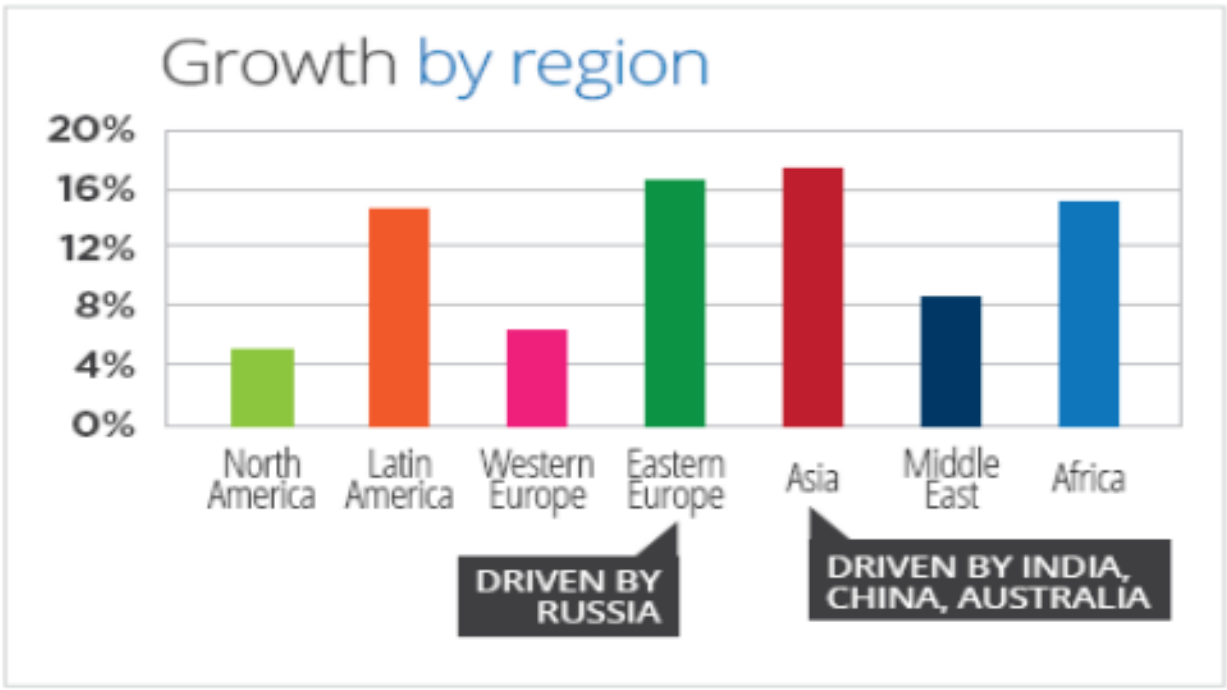


Figure 5: Statistics presenting the 2011-2016 growth rates for the e-Learning market (including LMSs market) by geographical region (Dobre, 2015)

Dobre (2015), said that as a result of their superb fees, the e-learning market turned out to be well worth more than $38.3 billion from 2016, having the lion's cut of 75% from this particular business. The statistics supplied in figure 5 was quoted from a document of Docebo (2014). The graph shows that North America and Western Europe's growth rates were lower than the other regions, meaning that these two regions had reached their fulfilment of implementing e-learning; therefore, the other regions still needed to do more in terms of implementing e-learning.

Nowadays in the 21st century, some universities considered having the Cloud-based LMS, which arose on the specialised market as a matter of course. This was sufficient as the developers came with a way of assisting teaching and learning being on the Cloud, only depending on the availability of the internet and not being concerned about the infrastructure. The only required resources were a computer, tablet, smartphone and internet access and it was also a low-cost solution, as no servers were necessary for the Learning Management System; the e-learning platform was accessible anywhere and anytime (Dobre, 2015).

According to L.Czerniewicz,N.Ravjee, N.Mlitwa (2006), in 2004, only 7.4% of the South African population, 352300, were internet users as per Internet World Stats. What was special in the statement above, is that South Africa, with 7.4 in 100 humans having access, had substantially more internet users than the other countries in Africa, with an average of 1.4 out of 100 people. South Africa, compared to

developed nations, however, had a huge hole to fill, as 55 out of 100 human beings in both the UK (United Kingdom) and the United States had access to the internet, way ahead of Africa. South Africa did, therefore, lag behind advanced nations (all figures ITU, 2003).

According to ITU World Telecommunication (2011), compared to five years ago, in terms of internet access, one-third of 1.8 billion families globally, had internet access. In the developing international locations, it was cited that 25% of homes had a computer system and 20% access to the internet, compared to a few years ago, when only 20% of homes had computer systems and 13% the internet.

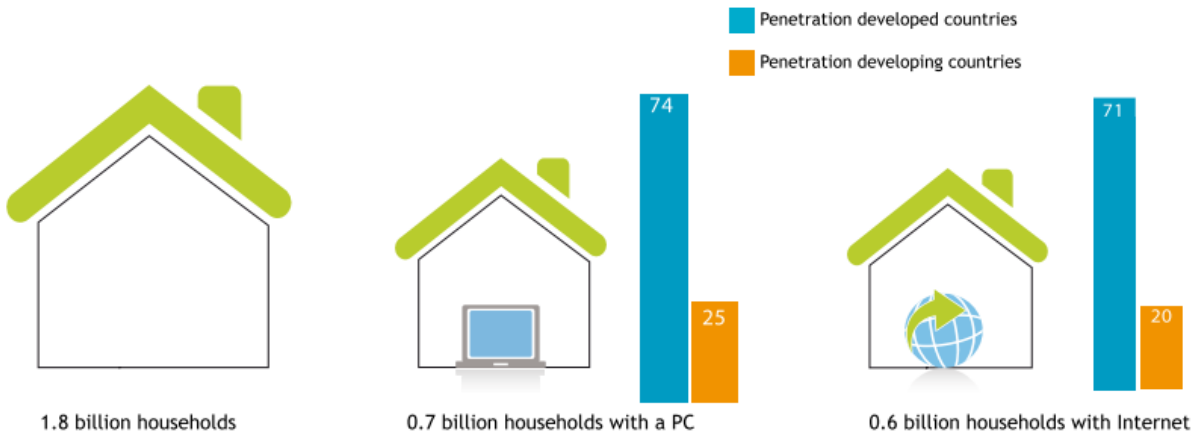


Figure 6: (ITU World Telecommunication, 2011)

Figure 6 demonstrates the long way ahead for developing countries in reaching the level of those already developed countries, but there was positive progress compared to previous years.

In universities worldwide people had ICT infrastructure already enforced; however, they were facing difficulties as to simply accept the usage of e-learning. They were not lacking technology or funding but the faculty's temperament to use the ICT provided to them, was not there (Kinuthia & Dagada, 2008). Mupfiga et al. (2017), said that the use and adoption of e-learning would improve the daily classroom activities that required interaction between teacher and students. When going to or visiting any university campus nowadays one would see that all students had smartphones and laptops and some PCs.

Students were already using the new technologies, surfing the web, updating their devices and downloading online music and playing YouTube videos. Mupfiga et al. (2017), added that this was proof that the mobilised and computerised world was growing in e-learning daily. Therefore, there was a need for people to come up with ways of using the technology out there, which they were actually

underutilising and to apply it in the classroom to have better pass rates and technologically informed graduates.

Jcu and Mills (2011), argued that everyone in the world sensed that it was time to change the educational process to keep up with the trending and rapidly emerging information-based societies. Everybody knew the huge need for knowledge and learning, which had possibly outgrown using the traditional methods of learning and, therefore, the use of e-learning, if adopted, could allow teachers to respond quicker. Jcu and Mills further said there was robust thinking that the academic processes should be modified; if for no alternative reason than to stay in pace with the rising information-based society. The newly advanced world today had e-learning technologies, which enabled collaborative knowledge and provided a richer learning environment, and the acceptance of e-learning had increased.

The adoption and usage of e-learning was an ideal solution that universities would have to start considering because some of the authors did prove that even a grade 10 student could be able to use an e-learning platform and progress much better, than using the old traditional ways. Mlotshwa and Chigona (2018), compared grade 10 pupils, using two different groups, with one group exposed to using Moodle and the other group of learners not have any e-learning platform exposure.

The learners, using Moodle, could perform their work with minimum supervision and be more engaged and encouraged to do their mathematic class exercises on the platform. This group was also able to communicate and collaborate with their peer tutors and were advantaged in such a way that they could receive advice from other learners through the platform. The outcome of the study did prove that technology integration into teaching and learning incorporated an immense potential to reinforce and adopt e-learning (Mlotshwa & Chigona, 2018).

2.2. What are the models that are used to support the implementation of e-learning?

Suryawanshi and Suryawanshi (2015), interpreted e-learning by saying that when one talked of the concept, one had to see it as asynchronous. This means there were no timelines set to go and learn. There was no rush to learn what needed to be learnt and students could take their own time. There was no live interaction with the instructor. The electronically available information was self-help orientated; it could be web-based training or on a DVD. It could also be synchronous, which meant real-time interaction between the instructor and the student, using video-conferencing, Skype or Chat and many more. E-learning provided the opportunity to either use one or both options.

E-learning could also have a global reach, meaning that everything was online and everyone in the world could access the platform. When e-learning was used, costs were reduced; courses could be viewed on

multiple devices and even on smartphones. To achieve the initial intention of having an e-learning environment in an organisation with its benefits already mentioned, issues needed to be considered in assisting the adoption and usage of e-learning. These included the models, which could be put in place for the smooth implementation and integration of e-learning to deliver education to students and for them to study online.

A range of models was accustomed to support the implementation and integration of e-learning, and a variety of studies were conducted to research the most effective models accessible to support the e-learning implementation worldwide. Some of these models that were available and used by universities to implement e-learning, were as follows:

- Demand-Driven Model (MacDonald -2001)
- Funnel Model
- Technology Acceptance Model (TAM)
- Unified Theory of Acceptance and Use of Technology (UTAUT)
- TPAC Model
- SAMR Model

2.2.1 Demand-Driven Model (MacDonald -2001)

The Demand Driven Learning Model (DDLM) was developed in Canada by experts and academics from private and public industries. The model is demonstrated in figure 7 and involved the technology learning management system, services and content. The use of technology acted as a tool to accomplish anticipated learning results in a less valued manner (MacDonald, Stodel, Farres, Breithaupt, & Gabriel, 2001).

Suryawanshi and Suryawanshi (2015), said that this model's main goal was to assist teachers to participate in using technology and technology development in their teaching processes. MacDonald et al. (2001), added that the DDM Model provided a very important clear and precise statement of the very best quality commonplace of web-based learning (WBL). The model was a result of customer demands for the better delivery of content and services, which were expected in every educational environment.

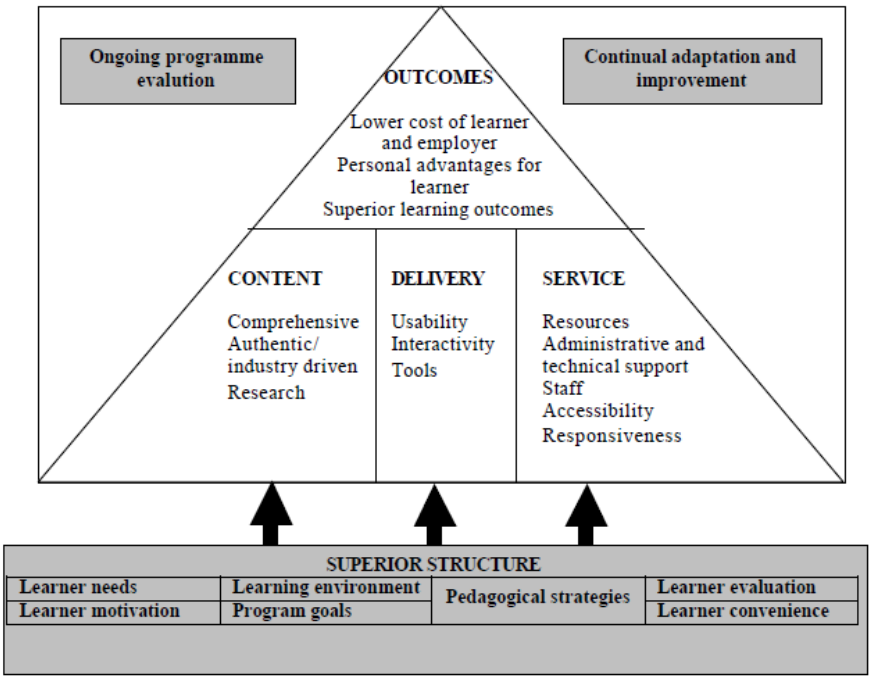


Figure 7: Demand-Driven Model MacDonald et al., (2001)

MacDonald et al. (2001), said the DDM Model was split into completely different sections, namely a high-quality commonplace of superior structure, not to mention three basic client demands, namely delivery, service and content, and learner outcomes, creating up to five parts of the structure as illustrated in figure 7. For the success of the application of the DDLM, these five components had to be properly defined and operationalized by the involved researchers and practitioners. The monitoring and assessing of the model's impact were through continual adaption and improvement, including the ongoing programme evaluation.

MacDonald and Thompson (2005), in their findings, supported the statement that the five components had to be properly defined and in operation and that all the combined components in their study worked best when they were properly defined to implement a quality e-learning course. They added that the secret was to incorporate the particular needs of the learners, through sharing insights into what was required to style the associated delivered e-learning expertise. Their finding added to the present continued growing data of e-learning expertise.

2.2.2 Funnel Model for implementing e-learning

Suryawanshi and Suryawanshi (2015), stated that the Funnel Model could be a smart resolution to contemplate when implementing e-learning in an educational activity. A variety of existing models had been used over time, such as TAM, the theoretical e-learning and educational model. They argued that the other models, as per the previous research, were insufficient because they treated governance, educational style, technology, delivery and curriculum development, as separate and isolated entities.

The Funnel Model was used and applied both synchronously and asynchronously and enhanced all the isolated components of other models into one to implement e-learning; there had not been any models of this kind. This model avoided doing ad-hoc approaches, which resulted in other systems not being used and ending up sabotaging the delivery of good education quality to students.

The authors further said that the Funnel Model should be able to assist universities to adopt and implement efficient and effective e-learning systems, which met users' requirements and expectations. These all could be achieved when all three interconnected components were jointly implemented as recommended by the Funnel-shaped e-learning implementation model, as seen in figure 8. The model was simply designed to resolve the discrepancies found between the curriculum design of e-learning and course delivery to students. The Funnel Model, once implemented for e-learning, catered for programme development combined with the beneficiary's analysis, whereas alternative models, such as theoretic models and TAM, solely focused on usability or technology and did not involve governance and finance.

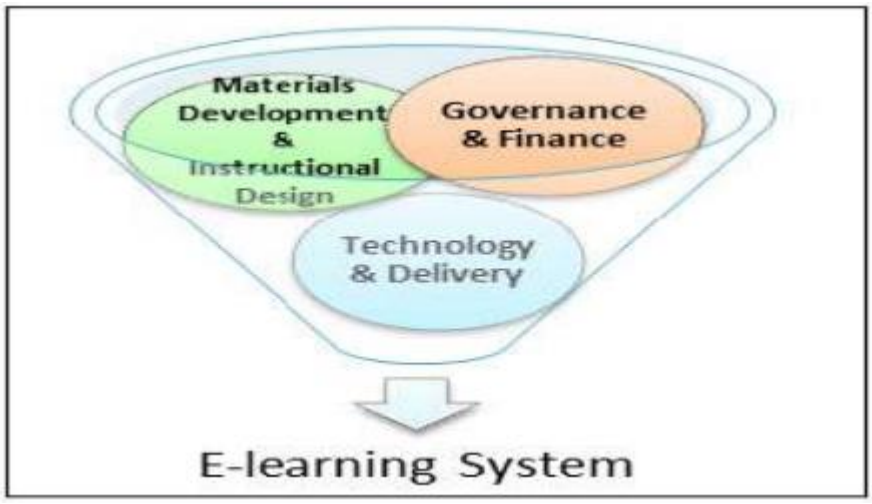


Figure 8: Funnel Model Suryawanshi and Suryawanshi (2015)

As illustrated in the Funnel Model diagram in figure 8, it demonstrated that the model catered for technological availability and ease of use in ensuring that the curriculum design of teaching material matched the technology used. The model also took care of governance and finance, including administration because it was aware that the business continuity for the system used, depended on the institution's management. This component of governance and finance was a critical point of the model because costs were involved when implementing an e-learning system. The need to add more additional components to the system would need to involve governance and finance to have a one hundred per cent fully functional e-learning system.

2.2.3 Technology Acceptance Model (TAM)

This model was popularly known as TAM and had been used by many researchers for the implementation of e-learning.

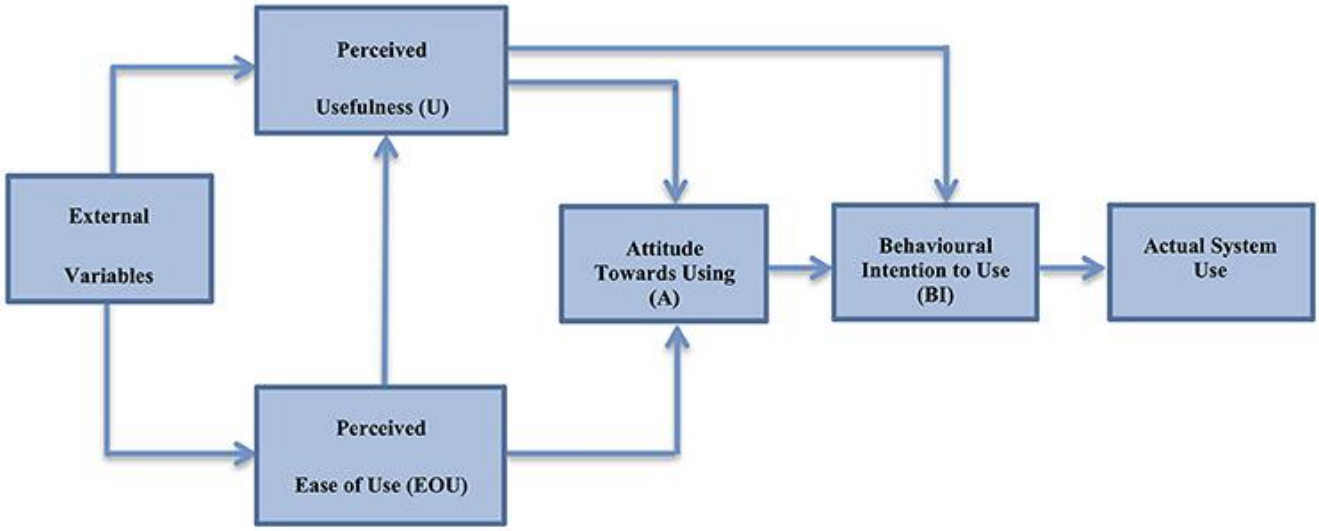


Figure 9: Technology Acceptance Model Adapted from A.A. Davies, (1989)

According to Suryawanshi and Suryawanshi (2015), the TAM Model, developed by Davies in 1985, was based on user requirements. The TAM Model started from having external variables, which might well have been somebody who had used a similar system or similar e-learning platform, that split into two phases of e-learning, namely perceived 'ease of use' and perceived 'usefulness'. At the same time, the perceived 'ease of use' influenced the perceived usefulness of the system, both created either a positive or negative attitude towards using the system. This attitude led to the behavioural intention of using the e-learning system, and lastly, there was the phase of actually using e-learning, 'Actual System Use', depending on the behavioural intention to use. A negative behavioural intention would cause users not to use the system whereas a positive one would. The flow, how TAM was implemented and its features, when implementing e-learning, are demonstrated by the diagram in figure 9.

2.2.4 Unified theory of acceptance and use of technology Model (UTAUT)

According to Suryawanshi and Suryawanshi (2015), the UTAUT Model established by Venkatesh and others in 2003, was a technology acceptance model. The main aim of the model was to describe the user's intention to use the system and the behaviours involved. The model had four key primary determinations, and these were direct determinants of usage intention and behaviour:

- The performance expectancy measures elements, such as enhancements through the employment of the system, positive impacts on performance and utility for the company and workers,
- The effort expectancy measures the ease and importance of use,
- The social influence assists in measuring elements, such as whether it is used by co-workers and checking whether there is any encouragement by management for utilising the system.
- Lastly, a determination, called facilitating conditions is used to measure elements, such as knowledge to operate the system and accessibility of the system.

The UTAUT Model also has four moderators, namely gender, which measures male or female; age, establishing the users' range of age and experience, measuring years of experience using the system and the voluntary system usage. Behaviour intention means access to the system, which measures the intention to use the system. Performance, effort expectancy and social influence, directly affect the intention to use the system, which then influences behaviour. Facilitating conditions have a direct impact on behaviour. Gender affects the determination and performance expectancy, which also influence and are affected by effort expectancy and social influence. Age also has an impact on determination facilitating conditions, social influence, effort expectancy and performance expectancy. Experience influences the facilitating conditions, social influence and effort expectance. Voluntary usage only affects social influence. These elements are all demonstrated in figure 10.

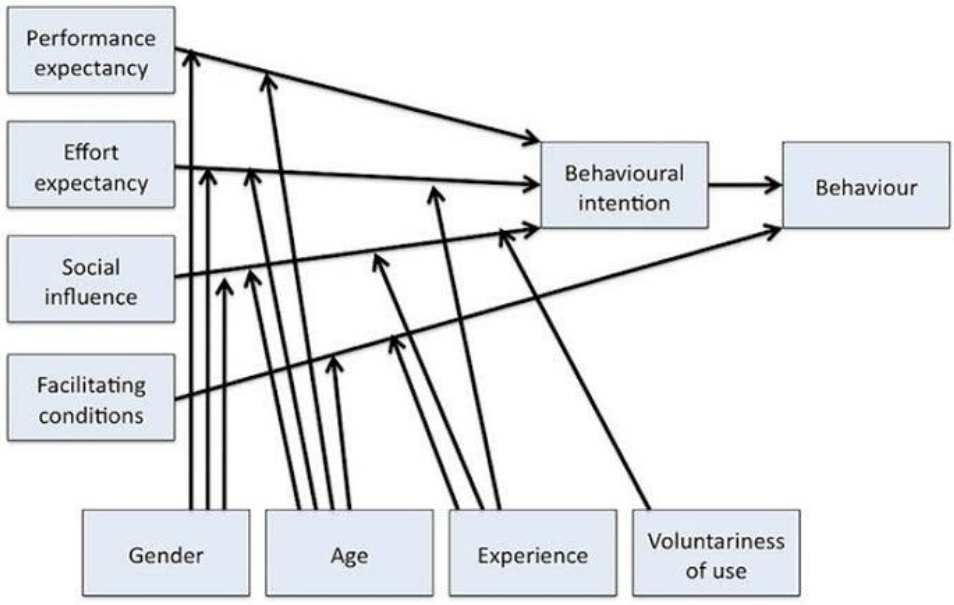


Figure 10The Unified Theory of Acceptance and Use of Technology (UTAUT) Suryawanshi and Suryawanshi (2015)

2.2.5 TPACK

Hilton (2016), Punya Mishra and Matthew Koehler in 2006 developed a model named Technological Pedagogical Content Knowledge (TPACK). The model was designed to incorporate and integrate elements of pedagogical experience, knowledge of content and technical expertise, to assist in the more digital delivery of teaching to students. Before TPAC there was no unifying framework for technology integration. The TPACK Model as demonstrated in figure 11, is circular in shape and has several areas.

First of all, is the knowledge of technology — essentially knowledge of devices, based on technology, such as the iPhone, computer or laptop (TK); then follows the knowledge of pedagogy — the teacher's knowledge of active general teaching methods (PK); and thereafter comes the knowledge of material — the topic one teaches and the skill in the subject (CK). The model intersects on pedagogy and content, ending up having (PCK), technology and pedagogy making (TPK) and the technology and content making (TCK). This whole circular model is shaped with the Technological Pedagogical Content Knowledge (TPACK) lying at its centre.

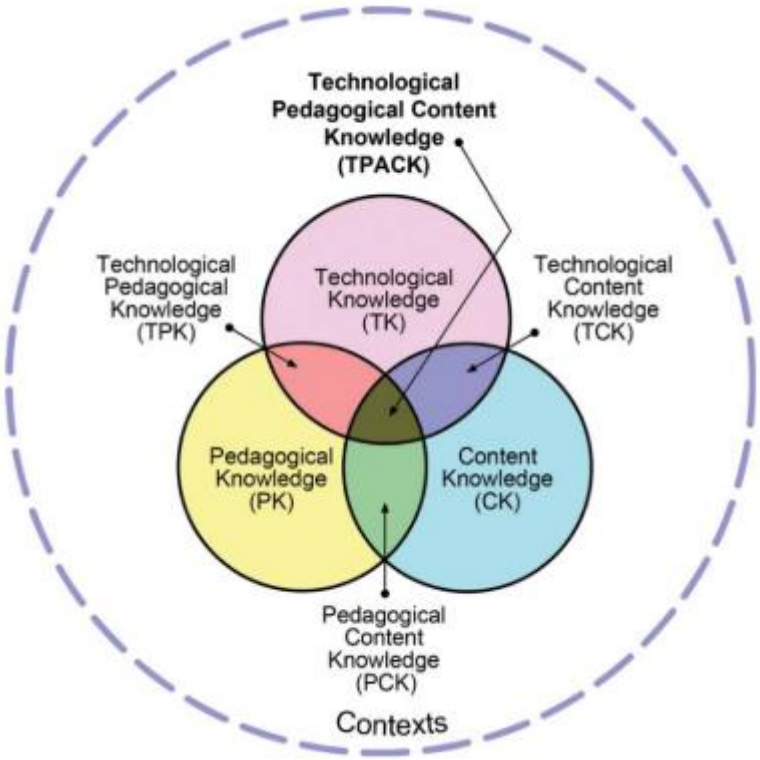


Figure 11: TPACK Hilton (2016)

The model is flexible in terms of allowing each of the three domains shown in figure 11, to work individually and also as a group of components; it emphasises the fact that to have effective technology teaching, learning materials and activities need to be understood and designed, drawing all three components of the model (Hilton, 2016).

2.2.5 SAMR Model

According to Niederhauser and Lindstrom (2018), the SAMR Model, when applied, focused on endorsing the possibilities of technology to transform daily learning; substituting, enhancing, modifying, and redefining the scale, to which teachers used technology, by enhancing and transforming the educational context. The SAMR Model's goal, when used, assisted in transforming the learning and teaching experience to result in good throughput in terms of student pass rates, if the technology was adopted.

The SAMR Model has been applied in most of daily life, by enhancing the way work is done in traditional ways with the use and adaption of technology. Castro (2018), supported the statement by saying electronic user-friendly influential assessment technology had simplified how teachers conducted daily classroom assessments in capturing student's assignments and analysing their results in graphically represented data. As a newly adopted evaluation tool used for surveys and Google Forms quizzes, it could be used to adapt content and daily educational goals and obtain answers from students instantly, as they sent answers using the application. By adding Google Forms, it could be solely aligned and integrated with the technology levels defined in the Substitution, Augmentation, Modification, and Redefinition (SAMR) Model, resulting in the creation of dynamic and customisable formative assessments, in ways never conceptualised.

Castro (2018), further said that despite the enhanced and transformative capabilities that Google Forms brought, not all teachers achieved the four levels of the SAMR Model. The model could be taken as a guiding framework for teachers, who were beginners and advanced and who aspired to use the integration of traditional classroom processes into technology. Castro (2018), added that it should be kept in mind that teachers would have different technology skills. Those teachers, who had adopted and started using the SAMR as a model for integration, should work in the levels that they were good and comfortable in and familiar with, and therefore they never had to force the SAMR integration.

The use of the SAMR Model as an enhancer on the adoption and usage of e-learning was one key that universities should start thinking of. This was supported by Ossiannilsson (2018), saying that for the implementation or enhancement of a good quality e-learning environment, an organisation needed to consider adopting and using the SAMR Model, developed by Puentedura (2006). The SAMR Model provided a clear way of determining the effects that technology had on the daily classroom activities of teaching and learning. The SAMR model, if used and adopted by an organisation, provided indicators in terms of progression in educational technology. It also provided an analysis of "where are we"

questions in the SAMR Model levels used, as users learned to apply the technology in their educational environment. The model was demonstrated in figure 2 of Chapter One. Nakapan (2016), said that the SAMR Model was more like a telescope, allowing teachers to have a deep look at how they could use technology for daily classroom activities. The name SAMR is the result of the four levels discussed below:

- **Substitution** technology works as a simple replacement tool, without any practical shift. This level has to do with the substitution of previously traditional tools that were used in classrooms, such as PowerPoint, projectors when instructing students, instead of writing on the chalkboards, or students writing with computer programmes, such as word processing, instead of in books when taking notes or writing assignments.
- **Augmentation** technology acts as a direct replacement tool, with additional functional improvements. This level relates to instructors being able to do presentations to students using new technologies, such as Skype, which uses video calling, whereby the instructor can share the screen from the other side, even if the teacher is not within the same country. Additionally, at this level students can collaborate and share documents among one another, using the available applications on Google.
- **Modification** technology enables a substantial redesign of tasks; now instructors can create assignments by using Google to redesign certain tasks and have students answering them immediately.
- **Redefinition** technology allows new activities to be created, previously unimaginable; this is the highest level, and students are allowed to perform tasks previously impossible in traditional classrooms, such as filming videos to be submitted as homework and uploading them on social media to request input from the public. If the use of technology is on this level, parents can even go to the school portal and access their children's balances and progress reports (Nakapan, 2016).

Nakapan (2016), said the SAMR Model sometimes when implemented, worked very well when combined with Bloom's Revised Taxonomy because it provided a much clearer view of the daily tasks in the classroom when it comes to technology adoption and its uses, as seen in figure 11. When integrating learning and teaching with technology, two or more models could be used to assist the technology use and adaption in the classroom, as seen in figure 11 (Nakapan, 2016). When using the SAMR model with Bloom's Taxonomy, lecturers often felt scared at first because it seemed complicated when combined. The main goal for lecturers when designing a classroom was to have a simpler combination of the SAMR

Model and the Revised Taxonomy of Bloom's role was to build a simple SAMR ladder coupled with the Revised Taxonomy of Bloom.

When the two models were connected as the process of software convergence progressed from the lower to the upper taxonomy levels, it also moved from the lower to the upper SAMR Model levels. As seen in figure 12, the bottom part of the combined models demonstrated the connection between these two models and further represented the required steps to follow, when undertaking the integration of technology into the classroom's daily activities (Puentedura, 2014).

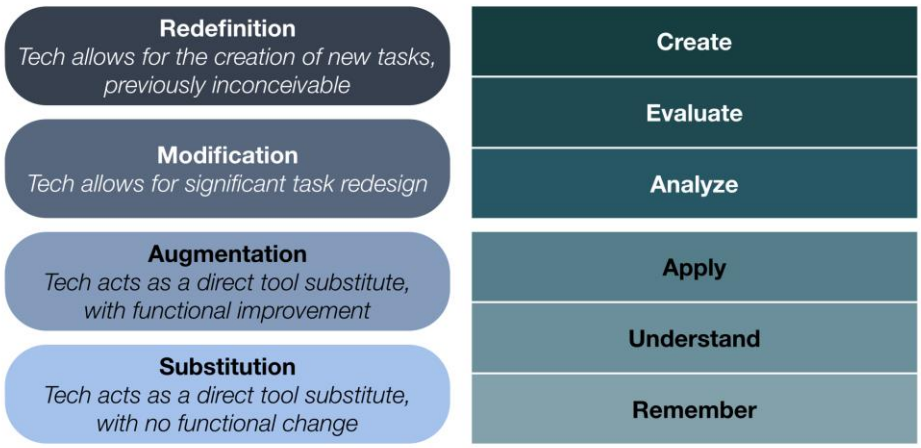


Figure 12: SAMR Model coupled with Bloom's taxonomy (Nakapan, 2016)

Series & Science (2018), confirmed that the SAMR learning model in higher education when used as an integration modelling tool, had been proven to be more effective. The levels within the model were presented in a hierarchical format and the model could be used with Bloom's Taxonomy as they both shared identical levels, as seen in figure 12. When implementing the SAMR Model with its defined four levels, in the first level, Substitution, not much is changed in traditional tools, just small portions of these are altered for teaching and learning activities, for example, from the chalkboard to Microsoft Word. The following level, as per the hierarchy, is Augmentation, where the same is done as in Substitution but with a few additional features to simplify teaching and learning, for example, students save work done from Microsoft Word into OneDrive for lecturers to access and mark.

The Modification level adds more efficient ways that could not be achieved in a traditional teaching environment, for example, students share the work done on their machines, using OneDrive and collaborate with their peers on the work as a group. In the final stage, Redefinition, there are

opportunities for the transformation of the learning and teaching experience and a chance for lecturers and students to redefine the adopted learning system according to their requirements. Students can now set up meetings with their lecturers, using Skype or Microsoft Teams, chat instantly with their lecturers and even share computer screens when doing presentations, even from different geographical areas.

2.3 Best practices from other developing countries

Other countries have shown numerous best practices regarding the implementation and use of e-learning for learning and teaching. According to Olson et al. (2011), by introducing e-learning with Creative Associates International, USAID and the Middle East Partnership Initiative (MEPI), on their project, the Michigan State University, partnered with the University of Algeria, launched a programme to run for three years. The programme was to assist the Algerian secondary education system by addressing its e-learning implementation and integration.

With the collaboration that resulted in the final results of the project, the team managed to connect 28 secondary schools in northern Algeria through this initiative, creating a demonstration project, by linking these schools to counterpart schools in the United States. This was a success, benefiting both teachers and students from using e-learning for their daily class activities, through project activities that involved a long-term ICT integration and e-learning plan (Olson et al., 2011).

According to Olson et al. (2011), the project's objectives that the team accomplished are stated below. The project did not evaluate its impact as this was not its intention.

Education objectives:

- The level of improvement of the knowledge and skills of the Algerian students was achieved.
- Environments with real-life problems and situations were provided to which students could apply their skills and knowledge.
- An enabling environment was provided through which students could expand on their acquired knowledge to build on existing concepts or construct new concepts in their entirety.
- Students were empowered with the skills needed to enter the workforce of the 21st century and stay self-sufficient people.
- Learners were provided with an engaging shared learning environment online 24/7, through which they could communicate and understand the larger world. The goal was to inspire generations of global citizens deeply rooted in their culture and heritage and for them to open up to and understand international demands, patterns and lifestyles.

- The teachers' level of knowledge and abilities relative to the students' stage was upgraded. Educators were enabled to support the learning process by becoming team leaders and role models for continually better education (Olson et al., 2011).

Social Objectives:

- Providing the Algerians with the resources they could use and capitalising on life-long learning experiences. This context included the following:
    - Access to learning content throughout Algeria and providing access to all educational content for anyone interested in learning or re-learning a skill.
    - Providing the larger Algerian community with professional development and life skills content.
- Helping the distribution of ICT equally to the citizens of Algeria, regardless if they were rich or poor, female or male, urban or rural citizens (Olson et al., 2011).

Economic Objectives:

- The participation of community ICT experts in the development and implementation was accomplished to upgrade their "transferable" knowledge and expertise.
- The application of knowledge and expertise to Algerian member organisations in the areas of training technology, development methods, project management, best practices and indicators/assessments (Olson et al., 2011).

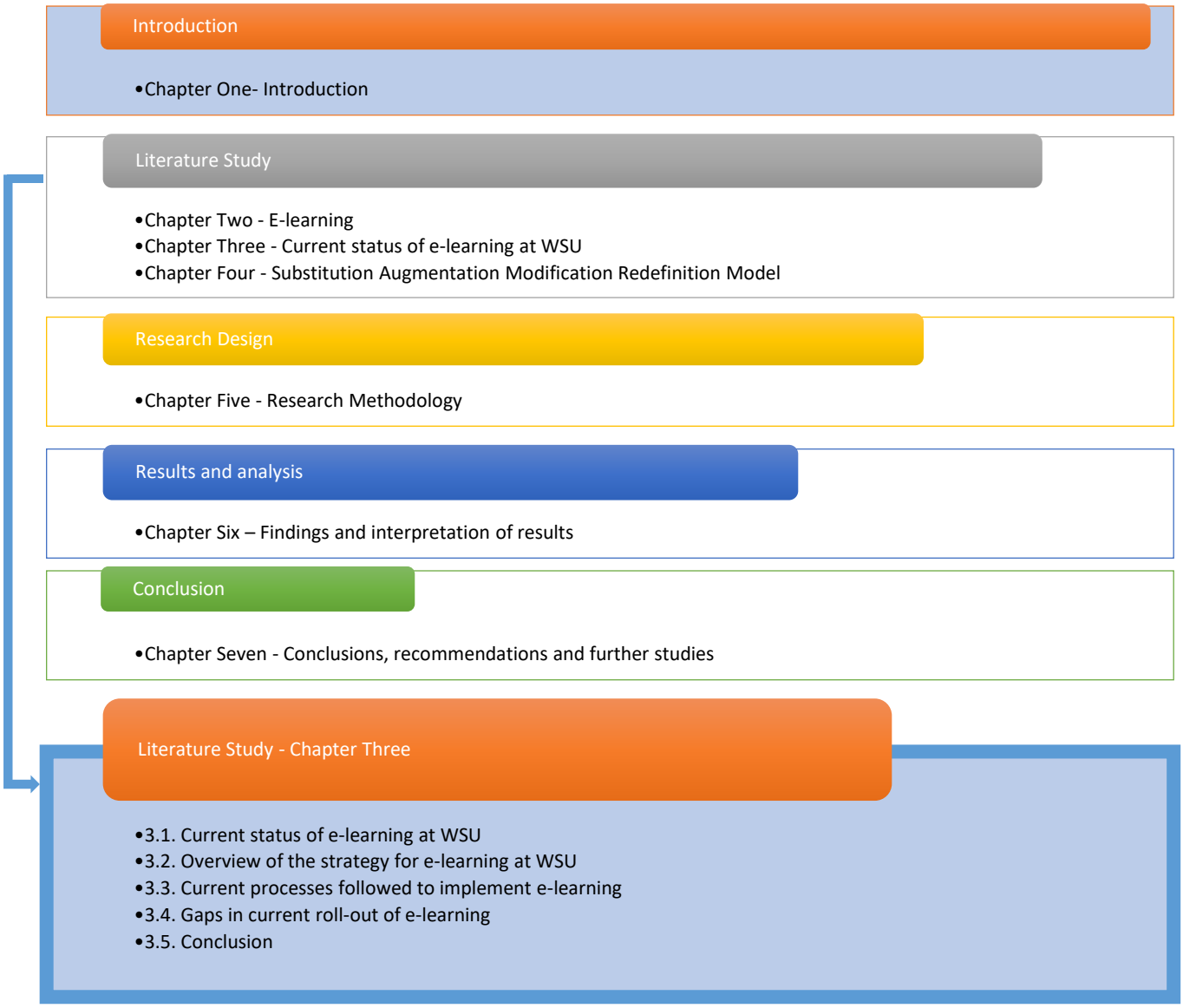
According to Olson et al. (2011), another university participated in a three-year USAID/MEPI-funded programme with the Michigan State University, namely the Lebanese American University in Lebanon. The programme was developed to train Lebanon's in-service teachers on using technology in teaching with a pilot of some 30 participating secondary school teachers. In the three-year project, ICT standards for teachers were developed, which were adopted from the Michigan In-Service Teacher Program and further developed by the MSU College of Education.

Omwenga, Waema, and Wagacha (2005) argued that the implementation of internet infrastructure in most developing countries' universities was rapidly increasing, but for the university to offer online courses off-campus, some limitations should be considered and taken care of. In addition to declining finances, existing infrastructure to support distance learning might not be available or adequate at the time of the implementation of e-learning. Facilities, such as electricity, were also still lacking in most areas, and where these were available, the cost might be expensive.

2.4 Conclusion

This chapter discussed the literature related to the aim of the study, laying down the groundwork. The chapter provided a literature review based on e-learning and sharing what it was about by discussing some of the published studies on e-learning. More detailed literature was discussed on how e-learning had been used in higher education for enhancing teaching and learning. The study presented the adoption rates through published studies. Some of the models that were applied to teaching and learning for technology integration were discussed, followed by published studies on best practices worldwide. The chapter revealed that models could sometimes work best together when combined. Some of the advantages and disadvantages of the models were also explored in this chapter.

Chapter Three



3.1. Current status of e-learning at WSU

According to CHE (2014), Walter Sisulu University had tutors and peer-assisted learners that formed part of the assisting resources for the university' learning and teaching, in addition to usual daily lectures. They usually presented their classes after the scheduled lecture times. The university, in addition to the tutors, provided extended programme students with helpful resources, such as tablets to enhance their learning and teaching, using current technology, allowing them to access the WiseUp (Blackboard) e-learning platform in their comfort zone, 24/7, anywhere. However, the report from CHE, further said that even though the staff and students were given training on using the implemented e-learning platform WiSeUp, the system was not fully utilised. From time to time the WSU's departments did encourage staff and students to attend the free offered courses by the in-housed section department called CLTD, to refresh their computer literacy.

WSU did make use of e-learning because they had the e-learning platform, WiseUp, allowing them to communicate and collaborate with departments and they also used the platform for discussion boards, doing online assessments and uploading reading material. The progress in the use and adoption of WiseUp, however, seemed to be much slower than expected and this might have been caused by external and internal issues, such as access to the e-learning platform or internet, funding and the awareness of the implemented e-learning system (CHE, 2014).

According to the CHE Institutional feedback report (2017), WSU used the Teaching Development Grant to develop lecturing staff members in teaching methodologies, moderation and assessment, and 380 attended unit-based training in 2015. A total of 50 staff members attended the International Computer Drivers Licence; this initiative was one of the ways to enable lecturers to be more computer literate, to use computers and then be encouraged to use the WiseUp e-learning tool to present classes to the students.

According to Dwayi (2011), WSU e-learning was one of the priorities and strategies of the Education Technology and Innovation Unit (ETIU), an institutional coordinating structure. The main mandate of ETIU was to integrate ICTs with educational activities, including advice on how to use technology to support learning and teaching. Mayisela (2014), presented a view of the current status of WSU regarding ICT integration to teaching and learning, saying that the integration of information and communication technology (ICT), and in particular, the WiseUp e-learning platform, into learning and teaching, enhanced the lecturers' teaching practices at WSU.

The study also found that, through e-learning, lecturers were able to upload online materials, communicate with their students, and manage/mark online assessments, to name a few. Students were given the opportunity to interact with online tools, with one another and the lecturer, and to build and maintain understanding. Mayisela (2014), further provided a more detailed view of the status regarding access to the technology infrastructure, saying that as per the study sample, namely 44 WSU lecturers, all responded that there was unlimited connectivity to the internet, as long as one had a computer. The study revealed that 73% of them had access to computers regularly, 20% access to printers, and 80% to photocopying, fax and telephone (Mayisela, 2014).

All the respondents said they did check emails, 80% searched the internet to download reading materials and 33% did searching to enhance their knowledge and teaching skills (Mayisela, 2014). Altogether 73% responded that they did engage classes using Blackboard (WiseUp). No respondent said that they had ever used the video-conferencing platform to communicate and present classes to students (Mayisela, 2014).

According to the report from HEQC (2011), the committee panel had concerns regarding the poor and not up to standard maintenance of WSU's infrastructure to support e-learning. The learners and lecturers complained about difficulties with visual audio web-based equipment and a lack of ICT amenities. Some health and safety regulations were also not compliant in the laboratories that the students used, which was unacceptable.

According to the report from HEQC (2011), the Vice-Chancellor did report that about R405 million was received to improve the WSU facilities and infrastructure, but it seemed to not have been sufficient. The panel did perceive the CLTD's positive endeavours to incorporate instructive innovation into educating and learning exercises, and even more the pilot in the Faculty of Science, Engineering and Technology. The challenge, in any case, remained not exclusively to apply this activity on an even-handed premise in each of the four faculties, but also to move past simply just adopting Blackboard as electronic Learning Management System (LMS). It should be ensured that the utilisation of instructive innovation is inserted into scholastic projects to improve their general quality.

It should be noted that the ICT office knew about these difficulties and was tending to them in its short- and long-term arrangements, coupled with the infrastructure facilities. Its prosperity would rely upon the accessibility of money-related assets, as well as having the option to draw in and keep qualified staff in particular zones. There were still under-maintained and poorly-equipped classrooms, laboratories and libraries, a lack of teaching technology equipment, inadequate ICT platforms and unsatisfactory access to computers for students and teachers (HEQC, 2011).

According to Mgweba (2017), awareness needed to be raised at WSU because although a large percentage, namely 69.2% of the study's respondents, were conscious of WSU's use of e-learning, 12.2% stated that they had not been aware of it and 18.6% were not certain. A little more than half of the participants had e-learning understanding. Mgweba (2017), suggested that this might have been as a result of a lack of awareness of e-learning and the knowledge of how the e-learning platform could benefit both WSU students and staff, as e-learning was best for enhancing the learning and teaching for the 21st century. The WSU unit, named Learning and Teaching Technology (LTD), was responsible for educating students through their lecturers, who sent them to the online training system. Specialists in e-learning would first test whether the students were computer literate, before transferring them to introductory classes in end-user computing.

WSU tried, by all means, to ensure that the students and lecturers used the e-learning platform and provided extended programme students with tablet smart devices. Mavuso, Jere, and Hendrick (2019) supported the statement above saying that at WSU the utilisation of the tablets for collaboration and

accessing online material was at the student's finger-tips anywhere and any-time. It also enabled them to increase their skills in using Morden technological applications for easy access to online learning and teaching material. This initiative by WSU was imperative as this motivated and encouraged many students, most of them from rural backgrounds, about e-learning and also reduced the student dropout rates. Mavuso et al. (2019), noted compelling evidence that both students and lecturers used tablets for educational reasons, which had led to significant changes in the way lecturers teach and train.

According to Dwayi (2011), an e-learning project manager was appointed and would have reported to the Project Management Committee. Three e-learning professionals, a learning material designer, four e-learning managers and a network manager committed to WiseUp management, were also appointed. In December 2010, a total of 411 personal computers were installed around WSU campuses in ten computer labs. In December 2010, at WSU e-learning conferences, two groups of students from the Netherlands had participated, one presenting online learning education seminars. In September 2010, WiseUp had trained 2378 (9.1%) learners. In June 2010, at all campuses, 75 student assistants were trained in WiseUp. A total of 218 (26%) university staff members were trained at the fundamental level of e-learning and 34 at the intermediate level of WiseUp. Altogether 45 staff members presented their e-learning activities during the three Grass Roots events in November 2010.

The Grass Root event and the inaugural e-learning conference acted as two main activities to promote an awareness of e-learning. At Grass Roots, representatives of academic staff, presented their practices to the WSU family, in particular to the institutional leadership (programme coordinators, department heads and school directors). This approach was directed at showing the importance of using technology to support educational activities (Dwayi, 2011).

3.2. Overview of strategy for e-learning at WSU

According to Mayisela (2014), from 2009 to 2011, WSU piloted e-learning through the Nuffic project at the Faculty of Science, Engineering and Technology (School of Engineering and the School of Computing) and three other engineering departments, to improve teaching and learning methodologies and, in turn, enhance student pass rates. Later in the second semester of 2009, three other faculty members were trained and supported in e-learning (Dwayi, 2011). The WSU e-learning Strategy, which had the following four main elements, was delivered as part of the project situation and needs' analysis phase as described above.

The main areas of focus in the strategy included:

- Ensuring that the online learning environment was preserved;

- Having knowledge of the learning environment and the incentives it provided to university stakeholders;
- Training support staff on e-learning; and
- Ensure student engagement in e-learning (Dwayi, 2011).

These elements were then the focus of the study, where strategic outcomes and impacts were assessed as part of the e-learning Implementation Plan 2011, within the system's perspective of change management and the following broad performance targets (Dwayi, 2011).

According to WSU (2016), the drivers for the next three years were:

- Through 2019/20, e-learning would be part of the management strategies around WSU; LTD was known by academic staff and students as the place to go for questions about e-learning
- By 2019/20, there should be a single online location where students could access university content, courses and teaching materials.
- All students and lecturers could make use of WiseUp by 2019/20
- All lecturers used presentation tools (such as PowerPoint) in their classes by 2019/20 and all lecturers used WiseUp as a learning and teaching tool
- In 2019/20 the e-learning methods would be applied to all students
- By 2019, multi-campus teaching was done by WiseUp and interactive smart boards to promote quality education on the various campuses
- Increased constructive learning methodologies in the classrooms
- Effectiveness research on the application of e-learning would be undertaken
- By 2019, at least 50% of the university campus would be wirelessly linked to the virtual learning environment (VLE) for staff and students.

According to WSU (2016), based on the fact that WSU was a contact teaching university, e-learning was used to supplement face-to-face classes and would not replace contact classes. This was commonly referred to as blended education. In 2009, WSU implemented the WiseUp LMS.

From 2011, after the student registration period, all courses would have to be loaded on WiseUp. By 2017, lecturers were expected to make their learner guides, course notes and references to relevant websites and journals, accessible on WiseUp, and at least 50% of them had to perform online student formative evaluations. Online courses would be built according to a cyclical instructional design model as illustrated in figure 13.

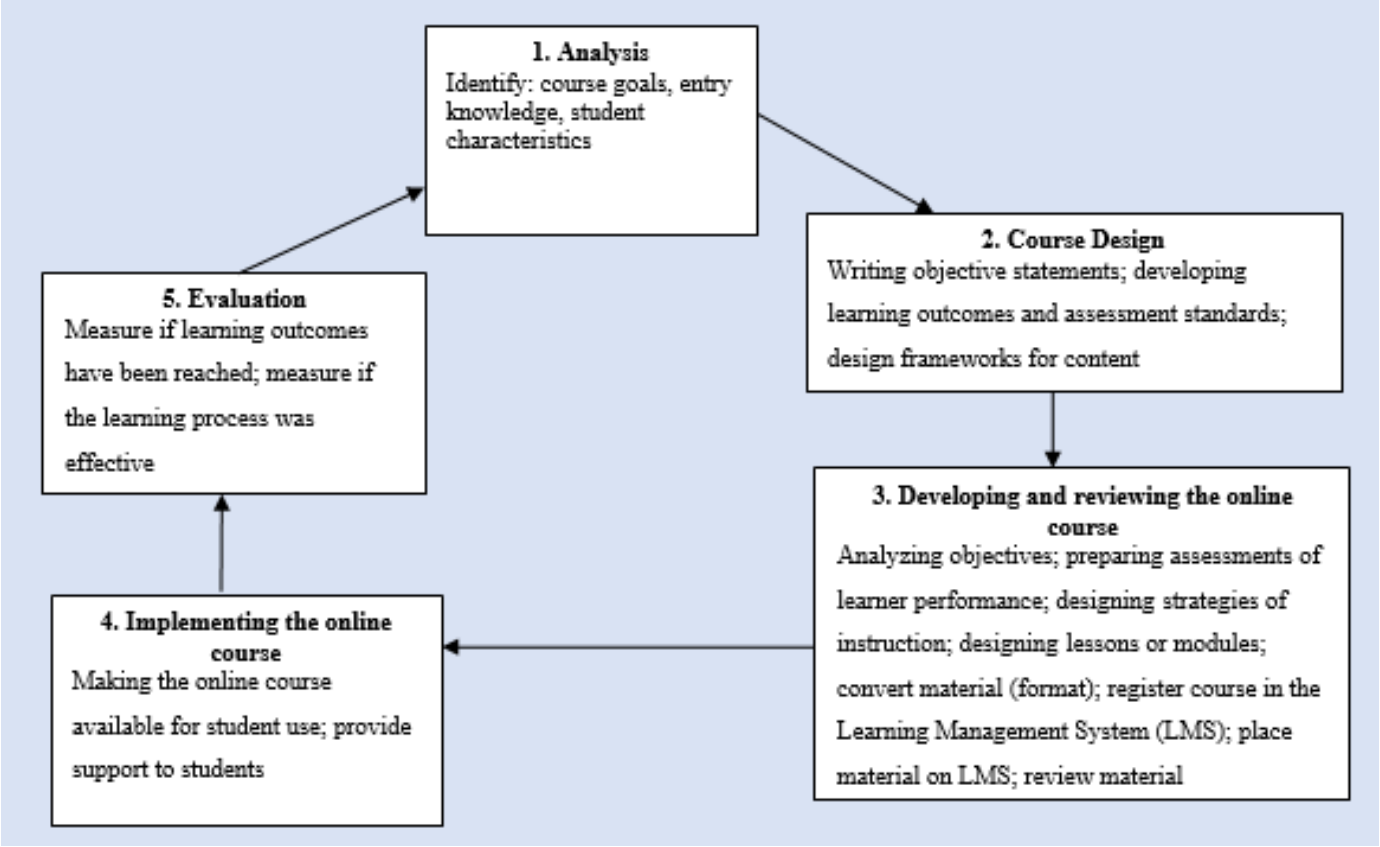


Figure 13:Instructional Design Model (WSU, 2016)

1. Analysis: the teacher will identify the course objectives while planning for the lesson. Students' previous information and characteristics/profile will be listed.
2. Course design: The student's guide should describe the programme's overall objectives. The goals, learning outcomes and performance expectations for each subject, will be outlined in the online course. The evaluation is often directly related to the chosen performance of the programme or subject being assessed, to decide if the participants had achieved what was expected of them.
3. Developing and reviewing the online course: The lecturers must load the contents to the LMS. This process includes the assessment of expectations, the preparation of student performance evaluations, the creation of teaching plans, the design of lessons or tutorials, the translation of

content (format), the recording of classes in the LMS, the presentation of material on the LMS, and the evaluation of material.

4. Implementation of the online course: The course will be made available for use to the general public and support will be provided to students.
5. Evaluation: E-learning output is then measured for all modules at the end of each semester.

According to WSU (2016), although this method of instructional design might seem sequential, it was important to note the need for formative assessment of each development stage. It was also essential for each course developer to ensure that learning results, teaching strategies and student evaluation were constructively aligned.

3.3. Current processes followed to implement e-learning

According to Mayisela (2014), in implementing e-learning at WSU, a number of processes had been followed. The department, which housed the Education Technology and Innovation Unit (ETIU), was in charge of championing the e-learning implementation side, by offering training to lecturers and assist students on how to use and be excellent in using e-learning.

According to Mayisela (2014), the following were some of the initiatives to encourage the use of e-learning and were done for the implementation of WiseUp:

- The CLTD website portal was remodelled in 2009 and continuing changes were taking place to keep up with emerging technology trends;
- WSU stakeholders were continuously updated on CLTD trends; CLTD operations were promoted using brochures and the WSU main website was used to publish articles on new developments;
- Five grassroots activities and three e-learning conferences took place, at which professional lecturers discussed best practices in e-learning and exchanged information and experience with international participants;
- Lecturers were trained on the basic and intermediate levels of e-learning;
- Continued assistance for lecturers with e-learning practitioners during their mentoring sessions (Mayisela, 2014);

Table 1 represents several tools available in WSU's e-learning systems and how the university used them for teaching and learning activities to take place.

Table 1: ***Commonly used WiseUp tools at WSU (Mayisela, 2014);***

WiseUp Tools	Use
E-mail, blogs, journals,	For the communication between discussion forums
Announcements	Used for creating and exchanging relevant knowledge for students
Assignment	Build assignments that students submit online and offline
Assessment tools (built-in and Respondus)	Create online assessments and quizzes that students attempt to do online, and the marks are immediately changed at the Grade Centre.
Survey	Build teaching appraisal questionnaires. At the end of the semester, students attempt this and Quality Control Officers evaluate the data from the SPSS.
Safe assign	Built-in tool for plagiarism enforcement

According to the CHE Institutional feedback report (2017), WSU was very proud of the Centre of Learning and Teaching Development's work. This was confirmed by interviews gathered from different staff groups. The creation of the CLTD to support educational growth was a very good decision because the centre was effective in designing and implementing structures, systems and processes for academic staff development.

WSU's library system provided several walk-in-walk-out (WIWO) labs, which were accessible 24 hours a day. The Umtata Campus had a 486-seat internet laboratory and reading facilities, and Butterworth, a new 500-seat library. It was stated that all the library buildings provided accessible spaces for experiments through Wi-Fi access, but their success was only a starting point and much needed to continue to achieve in this regard (CHE, 2017).

WSU used the process of blended learning in support of teaching and learning, whereby the WiseUp e-learning system was used as a supplement to the university's traditional teaching processes; the system was deployed for the whole university's use but not to substitute the current processes. According to Febriani and Abdullah (2018), blended learning was a mixture of active classroom learning and online e-learning in formal education. Similarly, the definition from WSU (2016), said that blended learning applied to the combination of different environments for learning and teaching. It included combining face-to-face learning and teaching with the world of digital learning and teaching. Figure 14 demonstrates blended learning in a graphical form, whereby e-learning joins the classroom training activities and blended learning are situated where they join.

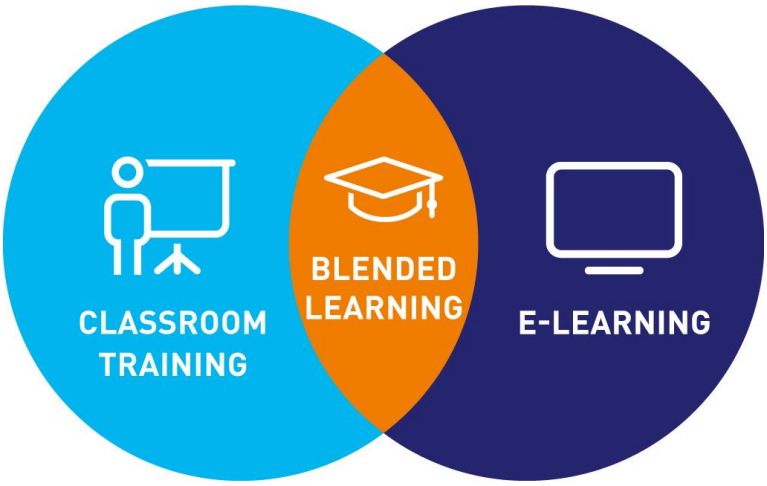


Figure 14: Blended Learning Approach

Several projects assisted the processes of e-learning implementation at WSU. According to Calitz et al. (2006), in recent years, TELKOM, the South African telecommunications service provider, developed Centres of Excellence (COE) between academic departments of historically disadvantaged and advantaged universities. Nelson Mandela University's (NMU) Department of Computer Science and Information Systems (CS&IS), formally known as the University of Port Elizabeth (UPE) collaborated with the Computer Science department at the WSU Mthatha Campus, formerly known as Unitra (University of Transkei).

Due to a shortage of Computer Science academic staff at WSU, NMU's CS&IS department was asked to present computer science courses to WSU Computer Science (CS) students in Umtata. Systems Analysis and Software Engineering III were some of the courses that needed assistance from the NMU lecturers. The courses were delivered in a mixed-mode, using video-conferencing services, the internet, and a full-day semester face-to-face classes. This was indeed a successful blended learning approach. As seen in figure 15, NMU is located in Port Elizabeth and WSU in Umtata, about 485 km apart and with a driving time of five hours and 48 minutes between the two locations (Calitz et al., 2006).

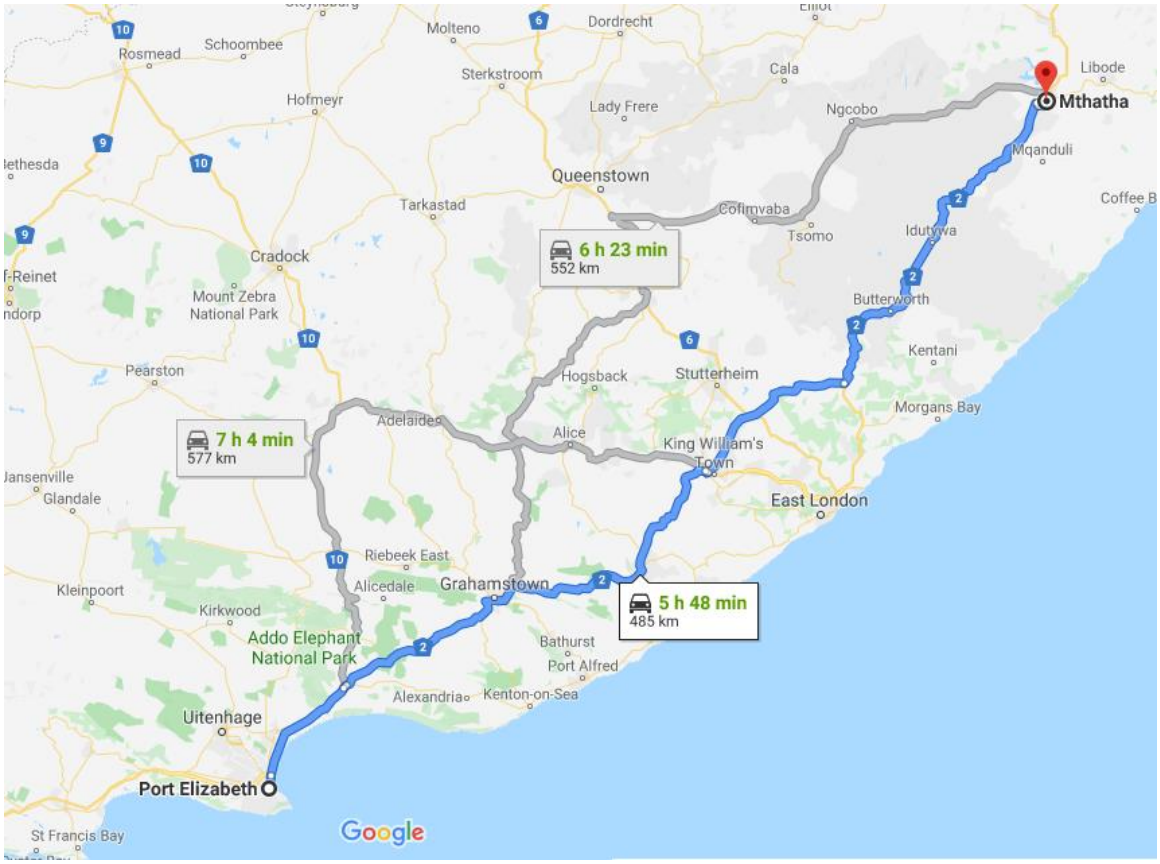


Figure 15: UPE situated in Port Elizabeth and UNITRA in Umtata

3.4. Gaps in current roll-out of e-learning

Several gaps were found when it came to the roll-out of e-learning, according to the CHE Institutional feedback report, (2017). Whereas WSU made good progress over the past three years, as stated in the final report, there was room for improvement in a number of areas of learning and teaching environments. It was recommended that strategies and long-term strategic plans were implemented to ensure that the University not only caught up with its educational facilities and connections but also kept up with the possibilities that would be open, once these facilities and systems were in place. This meant some policies or models had to guide the use and adoption of these systems.

According to Mafuna and Wadesango (2012), there was still a gap at WSU in terms of a few issues to be considered for the full utilisation of WiseUp, such as the complete allocation of resources, skilled personnel and ICT infrastructure to assist in the adoption and usage. Access to students had to be on a 24/7-basis, using WIFI-hotspots on campus, in the residences, and at student accommodation, as there was progress in the implementation, but not yet complete. A lack of awareness and encouragement from the university's side regarding students and lecturers, caused some students among the respondents, to never use WiseUp practically, ever since they were trained to do so. There was also a

fear of being exposed to other learners, as having a disadvantaged background and in the first year not having any experience in using a computer.

Kigundu (2014), argued that the University needed to intervene to resolve the current challenges because most first-year students would have the minimum or no computer knowledge. This became a problem because the CLTD department would have to intervene and assist these students. Should they have arrived with good computer skills, they would not have to waste time and resources to attend basic computer skills courses.

According to WSU (2016), there were some gaps in the implementation of the e-learning platform to its full potential, as there was no link between the two systems and, therefore, ITS student data were imported manually to the LMS. The ETIU and ICT systems were exploring the possibilities of developing an integrated system to automatically add student data to the respective courses on the LMS when they applied for these courses. Key data for this activity was the student number, first name, last name, email address and courses, for which the student was registered.

Integration of the key system to the e-learning system was not isolated (marks from quizzes, online assignments, tasks, etc.). The Examinations Department had to manually capture the marks stored on WiseUp. These key systems pending integration were WiseUp and ITS (Integrated Tertiary Software), which was an ERP system at WSU. When this would be implemented, the Examinations Officers would be allowed to just draw marks from the integrated system. This would reduce human errors by supplying personalised class lists for tests to lecturers, who could then also recognise at-risk students who needed assistance. This computer system would help to map and control student marks in one central location (WSU, 2016).

According to Bagarukayo and Kalema (2015), South African learners, in general, typically faced challenges that included diverse backgrounds, languages and race; they were split between resources and had infrastructure deficits, access issues, lack of skilled educators, job loss myths for administrators and difficulties for teachers in creating content. It was difficult to implement teaching strategies and it was challenging to gain insight into learners' challenges, especially in large classrooms. The academic problems involved a mixed approach, such as integrated learning, which was revolutionary in solving social and cultural diversity concerns, the previous learning experience of students, increased demand for training and increasing learning needs.

According to Mavuso et al. (2019), WSU introduced students' use of tablets for teaching and learning purposes, as of 2016. Nearly 1000 WSU students gained from a multi-million Rand tablet programme,

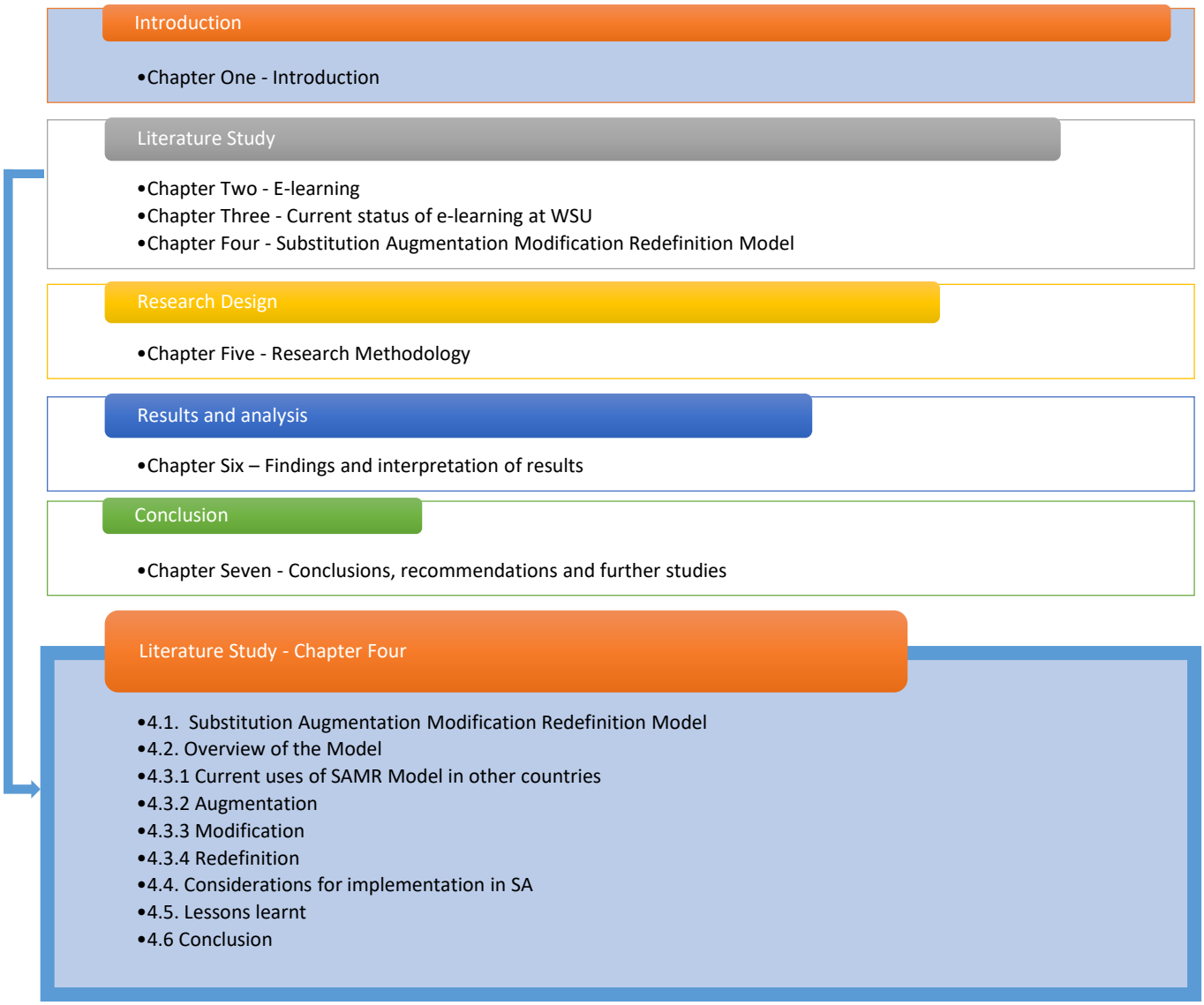
designed to improve teaching and learning in the expanded curriculum of universities. There was, however, still gaps in controlling the content of the tablets that the students were allowed to view. The introduction of the gadgets became a major challenge at times because some students tended to use social media during classes instead of paying attention to the lectures. Monitoring or some kind of penalties should be in place to control this student behaviour in the classroom (Mavuso et al., 2019)

3.5 Conclusion

This chapter discussed the most critical sections, which provided a clear view of the current status quo at WSU. The researcher discussed into detail the current status of e-learning usage, strategies in place for e-learning adoption and usage, the processes that were followed when implementing e-learning and also the gaps found, when implementing e-learning at WSU. This led the researcher towards the answering of the sub-research questions in Chapter One.

It should be noted that WSU had been exploring ways of showing appreciation for the use of e-learning and this was supported by the fact that the university was once involved in a collaborative project with one of the universities in the Eastern Cape (Calitz et al., 2006).

Chapter Four



4.1. Substitution Augmentation Modification Redefinition Model

4.2. Overview of the model

According to Hamilton et al. (2016), the SAMR Model motivated teaching and learning to move from a lower level of technology adoption and usage to a higher one. This was according to Puentedura who came up with the model. The ladder started from Transformation, which was made up of Substitution and Augmentation and went up to an Enhancement stage, which incorporated Modification and Redefinition at the very top level of the model.

The SAMR Model is about assisting the integration of technology into teaching and learning, helping universities in the adoption and use of e-learning; this, in turn, can assist universities to map themselves according to the levels that form part of the SAMR Model, namely Substitution, Augmentation, Modification and Redefinition.

According to Aldosemani (2019), the integration of technology was an important skill that teachers needed to develop to deepen the learning of students and support the achievement of educational goals. It could be challenging to select the best technology tool; however, teachers faced more difficulty integrating technology effectively into their lecture halls. It was ineffective to provide once-off workshops because this was based on the idea that the only challenge facing teachers, was the lack of knowledge of effective educational practices.

According to Frydenberg and Andone (2018), SAMR (Substitution, Augmentation, Modification, Redefinition) was a framework, which evaluated the technology adoption in the context of education and it provided guidance to project developers to assess student learning through the evolution of technology. Jati (2018), explained a well-known SAMR Model, (Substitution, Augmentation, Modification, Redetermination) that represented the connections between teachers' preparation and the advancement of technology, change of teaching and use of technology. Teachers that used technology to teach should start at the lower substitution levels (Puentedura, 2011). At this point, paper and pen were substituted by technology.

Caukin and Trail (2019), said as digital tools and devices were universal, technology was a part of everyday life. As schools began to expand technology in the classroom, it was essential for teachers to consider when, how and why technology fitted into a lesson. In short, substitution occurred when technology acted as a simple substitution, without any functional change in the task; Augmentation was a substitution and also an improvement in the task function; modification entailed a significant technological redesign of the task, and redefinition would be when technology was used to create new tasks, which were not possible without including the technology. It was possible to compare the SAMR model with a ladder, with both the lowest level substitution and the top-level redefinition. When using the software as a Substitute or an Augmentation, it was considered to enhance the learning experience, while at the point of modification or redefinition, it was viewed as a transformation of the learning experience (Caukin and Trail, 2019).

According to Jude et al. (2014), the approach for the pedagogical incorporation of ICTs could be called the technique that used various Information and Communications Technologies (ICTs) in teaching and learning. The ICT use could be carried out in various ways and through several tools, such as the internet, telephone, radio, video-conferencing, CD/DVD, web 2.0 technologies and many more. For the integration of teaching into ICT, the SAMR Framework could be used, explaining the use of technology as an ICT driven pedagogy: a direct replacement unchanged tool (Substitute), direct tool substitute for functional changes (Augmentation), a tool for a major redesign (Modification) or a previously

unconceived tool for new tasks (Redefinition). Each degree of the integration and availability of software obviously depended on user awareness.

Caukin and Trail (2019), said when looking at the levels of the SAMR Model, they could be seen in contrast with the levels of Bloom's Taxonomy. Figure 16 demonstrates the alignment of the two models (SAMR and Bloom's Taxonomy) when used together, which are based on Puentedura' study (2014). Moving upwards the complexity increases.

Substitution and Augmentation in the SAMR Model corresponded with Remember, Understand, and Apply, in Bloom's Taxonomy and Modification and Redefinition aligned with Analyse, Evaluate, and Create (Caukin & Trail, 2019).

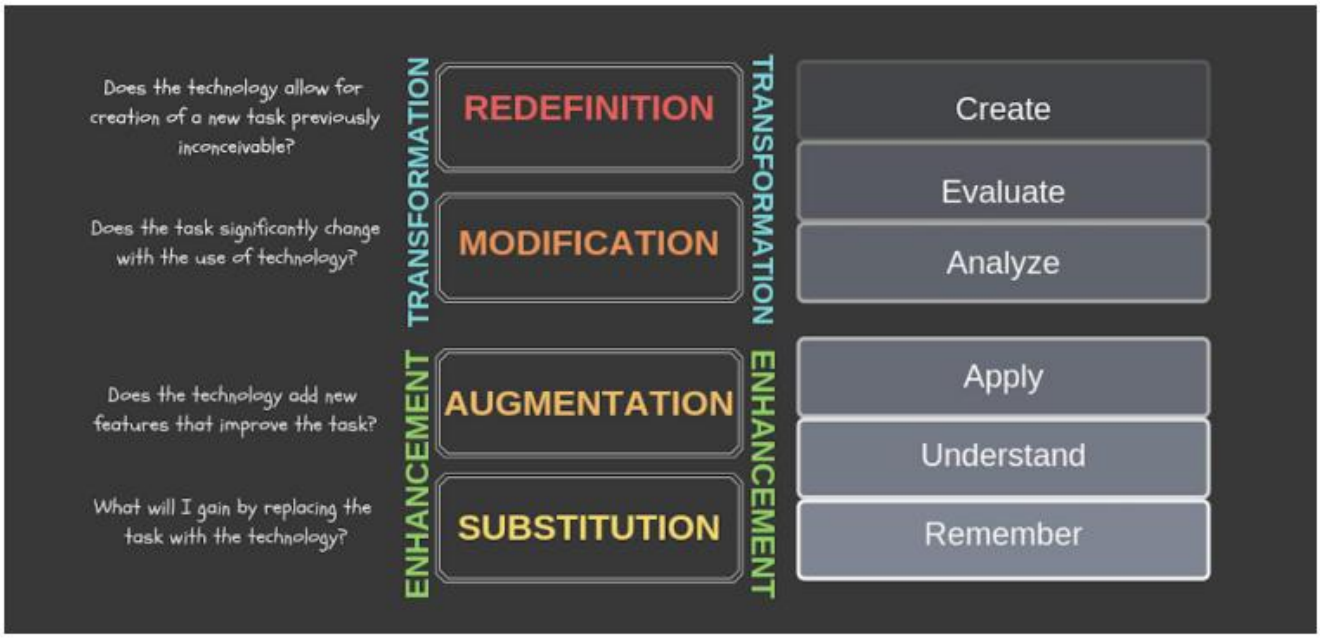


Figure 16: SAMR Model aligned with Bloom's Taxonomy (Caukin & Trail, 2019)

Aldosemani (2019), explained the SAMR Model as one that acted as a guide for educators to continually develop their curriculum through innovation and, most specifically, their teaching and learning methods in the classroom.

4.3. Current uses of the SAMR Model in other countries

In countries, other than South Africa, a number of universities have implemented e-learning through the SAMR Model. The model comprised four levels from the bottom, namely Substitution (whereby users would ask themselves what they would gain by substituting tasks with technology), Augmentation (whether the implemented features that were added, improved the current tasks). The two levels of Substitution and Augmentation, when combined, formed Enhancement. Going further up the model

was Modification (whether the current task that the users applied had a significant change), and lastly, Redefinition (whether the new technology would allow for new tasks that were never possible previously) (Caukin & Trail, 2019).

According to the study by Castro (2018), all four SAMR Model application requirements could be met by Google Forms quizzes. In the creation of Google Forms quizzes by utilizing the SAMR Model, teachers could include medical material, build raw logic-related questioning, refine and modify content and provide students with synchronous input and knowledge to promote self-regulation learning. Learners could also connect and exchange Google Form assessments internationally, targeting students and teachers in areas that were never traditionally conceptualised. Given the improved and revolutionary Google Forms quizzes, not all teachers met all the SAMR requirements.

SAMR could be described as a reference or mediation model for both novice and experienced teachers, who wanted to use more technology in classes. In fact, not all teachers had equal technical competences, which had to be taken into consideration. Teachers who used to incorporate learning and teaching into technology would operate in the familiar and comfortable settings they had established before the SAMR integration. Given the numerous instructional solutions to SAMR integration, the Google Forms questionnaire helped educators from the outset and with professional technologies, to execute SAMR Model benchmarks as a powerful formative assessment tool (Castro, 2018).

Aldosemani (2019), conducted a study to evaluate In-service teachers' perceptions of a professional development plan, using the SAMR Model. The authors emphasised the fact that the integration of technology was an essential competency that teachers had to develop to improve and promote learning to achieve educational goals. Choosing the best technology could be challenging but teachers faced greater difficulty in incorporating technology efficiently into their classrooms.

According to Aldosemani's (2019) study, the programme focused on the SAMR Model substitution level to explore teachers' views on substituting traditional classroom teaching approaches with web applications, to add technical flexibility and turn their education into a learner-centric approach. This model influenced the behaviour, self-productivity and know-how of teachers for technical transformation and generally graded the teaching experience as optimistic and informative.

Dowling and Chell (2014), in their study, used the SAMR Model and agreed that digital technology literacy and the 21st century's critical reasoning and issue-solving skills, teamwork and connectivity, public awareness and technology literacy, had become increasingly relevant. Teachers were now

discovering that technologies could be used to improve such capabilities in students. Nonetheless, new models needed to be used to do this successful, models such as SAMR, which was developed by Puentedura (2006). The iPad programme was launched at the Federal Institutions in the UAE (United Arab Emirates). In this study, the writers used the iPad applications as part of this initiative in trying to find out how they fitted into the SAMR Model.

Dowling and Chell (2014), found that the most teachers' previous use of laptops in the classroom at the Sharjah Higher Colleges of Technology and their prior knowledge of the development of classroom activities using technology, had definitely helped the change from enhancement to transformation as shown in the SAMR Model in figure 16. The encouragement of teachers and their willingness to consider technology along with professional development led by teachers also contributed to the successful application of technology through iPads. A professional IT and educational technology team also made employees feel safe in the knowledge that solutions to problems they faced in the implementation and use of technology in the classroom, would be swift.

The commitment and passion of technology champions in learning new and creative ideas and cascading them to colleagues did not only inspire many but contributed to an extremely rapid transformation through the SAMR Model's four technical stages. Much more needed to be done and many other applications explored, but teamwork and an improved methodology led SHC's teaching staff to accomplish something in just one semester, which Puntedura (2011), said could take up to three years (Dowling & Chell, 2014).

Fabian and Maclean (2014), in their study of assessing the use of tablet devices in learning and teaching activities in the Further Education sector, used the SAMR Model for their analysis. A 15-tablet bank was purchased and prepared for use in the school. Officials were alerted to the future behaviours and uses of tablet devices. The study operation was conducted by three departments: the Language School, Social and Vocational Studies and the Hairdressing Department.

Fabian and Maclean (2014), found in the student engagement during their study that practitioners indicated that students enjoyed using the tablets, irrespective of the context of this SAMR Model in the technology incorporation. In one scenario, the practitioner indicated on the LearnEnglish app that students were exploring the programme for up to 45 minutes and testing different activities before eventually disengaging and searching for further guidance. Whereas the students' excitement was due to the innovation of the system, the modification of the normal course approach would bring benefits, such as better engagement in the learning process, and a possibility to carry out tasks that traditional methods could not have done (Fabian & Maclean, 2014).

Frydenberg and Andone (2018), evaluated the SAMR (Substitution, Augmentation, Modification, Redefinition) TalkTech project as a pedagogy to enhance student learning about Augmented Reality and develop the students' technical skills. The study also addressed the SAMR Model as applied in the TalkTech project and its implementation to build learning initiatives for the transformation of education in Information Systems.

Frydenberg and Andone (2018), through their SAMR Model study, said the TalkTech 2016 project offered students the opportunity to integrate and embrace new technology, while they collaboratively built and shared new knowledge. Instead of writing a conventionally written report (Substitution), they strengthened their learning by sharing their research on ThingLink and used internet communication resources to achieve international online and mobile collaboration (Augmentation). By creating original multimedia content (Modification) and integrating it into new AR experiences (Redefinition), they transformed their learning. The SAMR Model and its application in the TalkTech project was generalised when it came to creating learning programmes in Information Systems.

Enhancement of Learning:

- Substitution. Allowing students to determine on their own, which technologies are appropriate in a creative project for completing processes and tasks in Information Systems.
- Augmentation. Students understand the advantage of using an improved technology solution to boost or make a process more functional or cost-effective.

Transformation of Learning:

- Modification. Students overhaul processes and activities of information systems to use and demonstrate newly-acquired technology skills.
- Redefinition. Students are innovating and creating original content and solutions that they developed to solve the information systems' problems (Frydenberg & Andone, 2018).

Frydenberg and Andone (2018), concluded from their TalkTech project experience since its inception in 2008, that students gained critical and computational thinking skills and the ability to rapidly learn new technology when they actively engaged in their learning activities. Similar elements of the TalkTech project and its use of the SAMR framework for enhancing and transforming learning could be applied in information systems projects (Frydenberg & Andone, 2018).

The current uses of the SAMR Model and how it was implemented using the four phases of the model are as follows:

- Substitution,
- Augmentation,
- Modification,
- Redefinition.

4.3.1 Substitution

Caukin and Trail (2019), said that when educators first started incorporating technology in the classroom, Substitution was typically the best way to apply, as it did not change the nature of teaching or learning. For example, with Substitution, students moved from handwriting their papers to typing them in a Word document, or from reading the textual content to reading the whole document online. Although Substitution was known to be the most basic form of technology incorporation in the classroom, it could be an excellent addition to the classroom, when viewed closely.

The question that educators would ask themselves was, "What will I benefit from replacing the task with technology?" Learning from one of their classrooms, researchers noticed that using the approach of substituting paper content and giving students preference of their mode of study, proved inspiring. Teachers understood that when students had a choice, it helped them to meet their needs and involved them more in the class. Learners who struggled to get ideas down on pen and paper, might feel more confident with a computer screen. However, students might start missing the use of pen and paper when teachers moved to only technology. Therefore, allowing students to choose what to use gave them control, let them participate more in their learning, and was a good way of differentiated teaching. This still allowed Substitution and in some tasks, the instructor would need to substitute paper with software. It was important to acknowledge that when technology was used simply to achieve the same objective that would otherwise be achieved, it fitted into the Substitution category.

The authors Caukin and Trail (2019), now answered the question, "What has been gained by replacing the task with technology?" In the examples, as a digital platform, differentiation in instruction and evaluation and ease of feedback were all gained through the use of Substitution.

Dowling and Chell (2014), said at the level of Substitution of the SAMR Model, the SHC technology acceptance and integration were demonstrated, which at first included the quest for different apps that could be used as pedagogical resources. SHC instructors initially started with activities that they felt safe working with, such as modifying existing materials to give students access to them through an iPad. It was noticed that applications substituted the Microsoft Office Suite: Word pages, Excel numbers, and PowerPoint keynote. A motivated and interested instructor took a lesson, which included the use of

different apps, and then conducted a training session on how to use the iPad and different applications. In the study of Fabian and Maclean (2014), a word processor on the tablet was used to create a short story of about 50 words in groups and this was usually done using paper and pen. Again the students used the LearnEnglish Grammar app to do multiple-choice exercises in pairs. This was as per the SAMR Model in line with Substitution.

4.3.2 Augmentation

Augmentation is substitution with a change in the task, in other words, the software substitutes the textbook and/or paper with features that cannot be provided by a textbook and/or paper. Augmentation focuses on areas in which software can enhance the students' learning experience when usability occurs where it might not otherwise occur. The question for this phase is, "Does the technology add new features that improve the task?" (Caukin & Trail, 2019).

Caukin and Trail (2019) said teachers could use a tool to ask students to apply what had been taught via the virtual platform. The software was Skitch and allowed students to use a device to take photos, tag them, and then submit them. Students could, for example, take photographs of objects in the environment and then mark or trace the geometric figures they saw. They could use Skitch to capture impressions and collect data, or they took pictures of a place on campus, which they wanted to recreate and then make model sketches on the image using marks.

Dowling and Chell (2014), in their study, demonstrated the Augmentation of the SAMR Model, through the Sharjah Higher Colleges of Technology teachers in the United Arab Emirates, who had to adapt to a new level and acquire skills to transform their resources into interactive ones. Experiments with the software Adobe Reader and NeuAnnotate demonstrated that the general text style could now quickly be included in the highlighting, underlining, clicking, adding types, pictures and pages and using the duration tool. Puntedura (2006), considered growth in technology, not just as a substitute but an augmentation.

Fabian and Maclean (2014), added Socrative, a classroom response system, which teachers used to ask a number of questions and students keyed in responses using the app; this was usually done using a classroom with students raising their hands and answering the teacher's questions orally, and this, when mapped, fell in the Augmentation phase of the SAMR Model.

4.3.3 Modification

Caukin and Trail (2019), said Modification made it possible to use software to redesign a significant task; the phase had to answer the question, "Is the task changing significantly with the use of technology?" Students who collaborated on multiple devices in a presentation in Google Drive or Office 365 using slides, papers, files, forms or sheets in real-time or asynchronously, might recreate a project in which they worked on a presentation independently or on a single device during the course. Students created digital books using bookcreator.com to demonstrate and curate their learning; this enabled a significant improvement in the task as students moved up the SAMR Model and Blooms Taxonomy (Caukin & Trail, 2019).

According to Dowling and Chell (2014), iFiles, an interface for Blackboards Learn, a learning management system, was launched by the SHC IT and EdTech department. This ensured that students were able to report research, using Blackboard digital devices, boards, forums and journals, allowing teachers and others to comment. Written essays were traditionally either provided for input from the instructor or correction as part of a few tasks. The editing process was improved as students could now seek their peers and teachers' reviews and criticism. By using technologies to improve the teaching/learning cycle, the student had important aspects modified to achieve new objectives he/she had not accomplished before (Puntedura, 2012).

Fabian and Maclean (2014), said students used the tablets to capture videos of themselves having a conversation with another student. They then played back this recording and tried to critique the conversations they had recorded and performed by using a video camera and multimedia player. This was done initially using only audio recording, one at a time. Also, students used a tablet to browse the internet, take photographs and create their portfolio, using the online web service Infolio. Initially, before it was modified, the technology and the Infolio system, were difficult for students to access, interact and collaborate with. Students also used separate cameras to take photographs and upload them into their portfolios and this fell in the Modification phase of the SAMR Model.

4.3.4 Redefinition

Redefinition is the development of educational experiences that can only exist if the software is implemented. The question in this phase is, "Does the software allow a previously impossible new function to be created?" A university on this level was actually at the higher levels of Bloom's Taxonomy and this stage of the SAMR Model. If, for example, a field trip was not possible to achieve, virtual field trips could take place by using technology. A Skype call could be used on the other side of the world for

classroom activities, or an interview with an author, or a museum across the country. These were opportunities available to students through Redefinition (Caukin & Trail, 2019).

Dowling and Chell (2014), in their study with the SAMR Model for e-learning adoption, used the applications iMovie, KeyNote, and Creative Book Maker, for project-based learning events. This had not only proved extremely effective with respect to inspiring the students but also extensively used technologies in the SAMR Model as Redefinition, which was the creation of a new task, previously inconceivable (Puentedura, 2006). At the end of each learning session, mini-projects were provided to the students. Such assignments included small group activities in which students made a presentation of iMovie or Keynote, to demonstrate their knowledge of a subject and their vocabulary.

Several students took on iMovie and created rich and original videos, which they showed in their classrooms and even in large groups. Through apps, such as iMovies, queries were addressed, and feedback from colleagues could illustrate how learning activities using technology could be redefined. Once iMovie was developed and introduced, students became content developers and animators, who conveyed knowledge to their classmates for educational purposes.

For the level of Redefinition, Fabian and Maclean (2014), said the students created a comics story using the app and the tablet's camera and for this purpose, there was no other alternative. The students also used the tablet's camera to go around taking photographs and thereafter back in the classroom showcased the pictures that they had captured. In this study, students also used an app to help them see if they used the right colour and quality options for a product.

In the app, students made a number of choices and then pressed submit to see if their choices were right. The result of dealing with chemicals and the colouring of hair was, therefore, more precise and healthier. The software was used for case studies and also for clients in the beauty salon. This device was mounted on one's phone and the classroom computer. Previously students used books to assist with colour choices in case studies. There was no way to check if the choices were right until they reached the point, where they spoke to the rest of the class about their choices (Fabian & Maclean, 2014).

4.4. Considerations for implementation in SA

A few universities in South Africa have implemented the SAMR Model for e-learning adoption and usage. Murire and Cilliers (2019), evaluated the use of social media in teaching and education at the University of Fort Hare in the Eastern Cape, South Africa. The theoretical basis for this analysis was the Substitution, Augmentation, Modification and Redefinition Model (SAMR). The study found that social

media use could be put on level two of the traditional university (Augmentation), whereas the technology use was further at the Modification stage in the classroom. Obstacles to discourage lecturers from teaching via social media, included a lack of managerial support, inadequate resources, insufficient preparation and resistance to change (Murire & Cilliers, 2019).

According to Mihai (2017), the study of the SAMR Model towards the adoption of e-learning was also conducted in trying to determine the success factors and challenges of the ICT network deployment. An interactive ICT network was founded in April 2008 in Mpumalanga, South Africa. The network consisted of the establishment of smart interactive whiteboards and collaboration between a leading school and several less popular schools. The principal goal was to reach rural schools in the area to improve education for grade 12 students in science and mathematics.

Mihai (2017), said the SAMR Model had been designed to help educators to incorporate teaching and learning technology. In Mpumalanga's interactive whiteboards project, the IWBs provided to schools made the *redesign* of important tasks possible from the beginning, as teachers were trained to use the new technologies. The project was a benefit to the students especially those that were from the class of Science which brought a transformation to their daily class activities where learners could now get access to experiments which were only accessible thru the use of learning old magazines. Teachers had *redefined* activities, where the technology added value to the learning process. Leading school teachers produced new lessons to be shared, using a variety of resources to *enhance* the learning process. Learners relied on the use of technology and their attention was captured by supplying information in various formats. The interactive whiteboards (IWBs) made it possible to deliver the programme material more seamlessly than ever. Their versatility helped teachers to spontaneously react to what happened during a lesson.

According to the study of Mihai (2017), results showed that this project's focus was not simply technology incorporation, but the improvement in pedagogy and learner efficiency. Interactive whiteboards (IWBs) helped to change teacher pedagogics in schools and provided better opportunities for students to learn. IWBs had many benefits, but also some drawbacks that were discussed. As theoretical frames for this analysis, the Four Balance and SAMR models and matrix handling were adapted.

Nkonki and Ntlabathi (2016), conducted a study to evaluate the Blackboard learning management system on teaching and learning at the institutes of higher learning in South Africa and used the model to interpret the study's findings. The study concluded that the essence of the Blackboard developments appeared to be shallower at Substitution and Augmentation. The small improvement in curriculum

design and implementation showed a lack of substantive change in the results of Modification and Redefinition.

Nkonki and Ntlabathi (2016), in their analysis categorised their study findings into the SAMR Model's four, namely Substitution, Augmentation, Modification and Redefinition:

Substitution: The data showed that technology substituted the old way of doing things. The lecturers, for example, stated that they would have digital rather than printed materials available for students. This approach did not appear to change the norm or deviate from instruction that did not include Blackboard. Students could always and anywhere navigate their content. Content could be found and used again from Blackboard, in case printed content was lost (Nkonki & Ntlabathi, 2016).

Augmentation: With Augmentation, improved flexibility enhanced the way the tool was used. Many lecturers have used the tool with few changes. Students could interactively use Blackboard for learning content. It was possible for students to communicate with the content when they viewed the material. Likewise, as they would have access to more reading materials and the communications level was increased, it indicated that Blackboard was to be turned into educational practices. Although providing students with reading materials improved their communication skills, putting more reading material online, this did not necessarily mean communicating and engaging with the students with these materials. However, steps should be put in place to check whether the students did read these articles. Students could sum up and send the text to the teacher to check that they were indeed reading the content (Nkonki & Ntlabathi, 2016).

Modification: Modification included the creation of materials and activities to fit and improve the efficiency of Blackboard. The Blackboard tool allowed students to submit on time and there were new changes in how lecturers approached the classes and also how students engaged with their lecturers. The tool also enabled students to understand plagiarism, which spoke to understanding and improving students' writing skills. The discussion forum activities brought about by Blackboard reflected improvements on the on-line discussion forum design process. The forum discussions were a good way to illustrate the Modification taking place at the SAMR Model's transformative stage. In this situation, the teacher tried to move to a higher level of technology use in the classroom (Nkonki & Ntlabathi, 2016).

Redefinition: Redefinition allowed new tasks and materials to be produced and the entire course to be reconceptualised. But the data provided no evidence of any improvements Blackboard's capacity at this stage of the teaching and learning harmonisation. Many, if not all, teachers at the point of

Redefinition, had not achieved the transformation stage by developing teaching and learning tasks and methods (Nkonki & Ntlabathi, 2016).

4.5. Lessons learnt

The literature review for this study provided insight into the current trends of e-learning adoption and usage in the world, including South Africa. There is a huge gap in South Africa when applying any model or methodology for e-learning adoption and usage. As a whole the literature provided evidence of a few studies in South Africa supporting the SAMR Model, which the researcher agreed with, such as Hamilton et al. (2016), saying that in the SAMR Model, the focus rested on the stages of teachers' use of technology throughout, moving along the ladder of the SAMR Model, from the bottom to the top of technological usage.

All universities in South Africa have access to a network and most of them had implemented e-learning but no models were in place to analyse and assist the adoption and usage of the implemented Learning Management Systems. Some universities had policies as guidelines on using e-learning. Most universities provided tablets to students to use e-learning but there was no tracking of the impact that the gadgets had made on the students' learning and the teaching activities.

Caukin and Trail (2019), said that several aspects should be considered when looking at the SAMR Model, as a tool for measuring the technical level of integration. At Walter Sisulu University, there was no model to assist the university with the e-learning integration into learning and teaching, but studies were published on the use of the WiseUp (Blackboard) Learning Management System that the university deployed in 2009. WSU started a programme whereby tablets were given to students to be able to use e-learning and also access WiseUp.

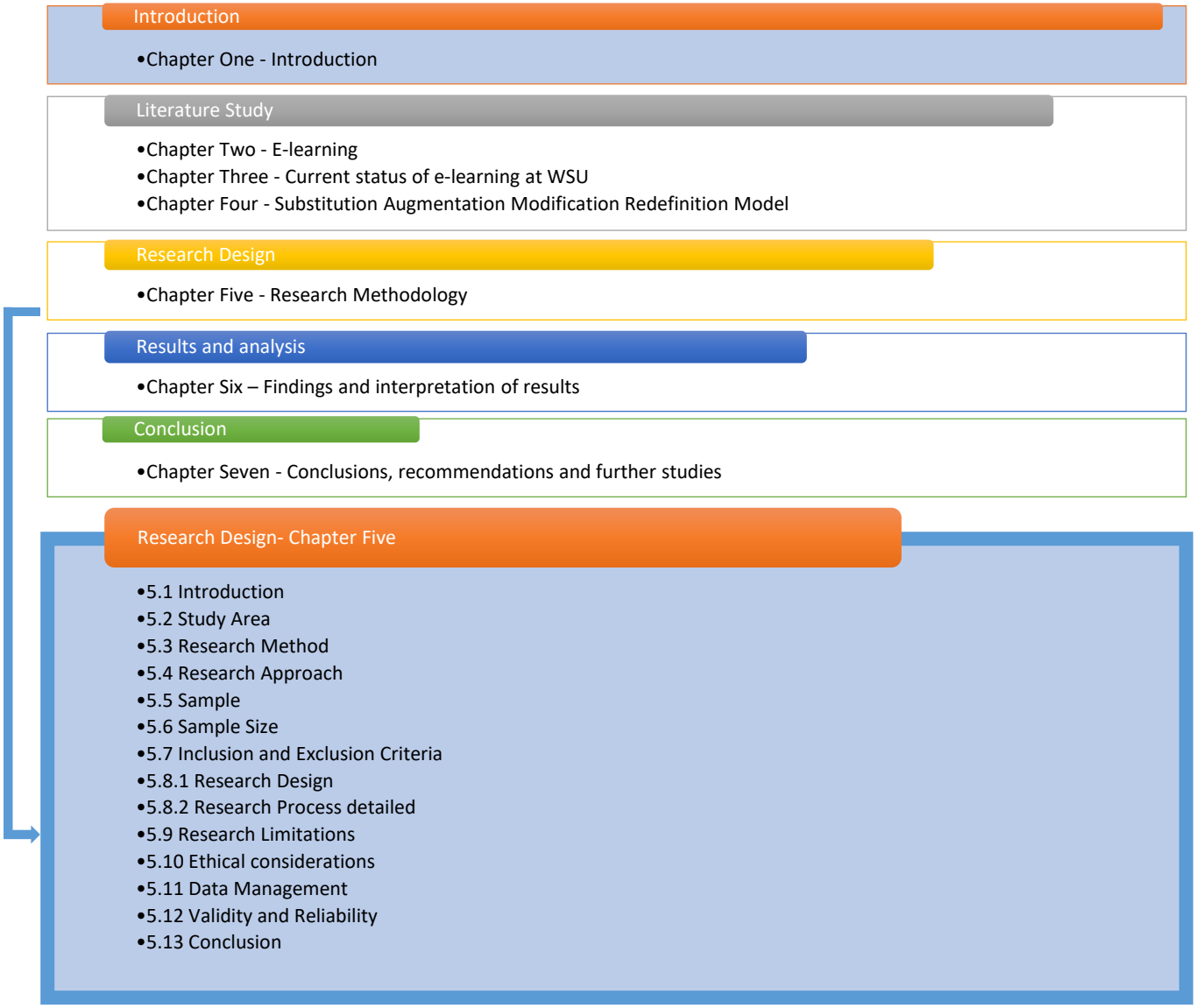
According to Mavuso et al. (2019), students used the tablets for sending and receiving e-mails, accessing the lecturer's course material and searching for internet information. Some minor challenges also came with new technology. Mavuso et al. (2019), said that one of these challenges for both students and teachers were typically distractions for students, which also caused a major problem for teachers. Instead of paying attention and engaging in a classroom lesson, students used the devices to access social networks while the teacher was lecturing.

4.6 Conclusion

This chapter discussed an overview and more details of the SAMR Model as well as its uses in other countries and how it was applied and used for the integration of teaching and learning into technology. The model's four levels of technology integration to teaching and learning were each discussed and examples were provided sharing published studies on the SAMR Model.

The chapter also shared literature regarding South Africa to consider using the model and revealed some publications with regard to the application of the SAMR Model. Nkonki and Ntlabathi (2016), conducted a study to evaluate the Blackboard learning management system on teaching and the University of Fort Hare using the SAMR Model. The study's findings revealed that the university, in terms of technology integration to teaching and learning, fell in modification and redefinition. Similarly, Mihai (2017), discussed a school in Mpumalanga in South Africa, where the SAMR Model was applied to help educators to incorporate teaching and learning technology. These included some of the few published studies regarding the use of the SAMR Model. This meant that South Africans were starting to consider the model for e-learning adoption and usage.

Chapter Five



5. Research Methodology

5.1 Introduction

This chapter entails the research process that was followed when conducting the research. A broader understanding of the methods that were used to come up with accurate and clear results are provided. The chapter also demonstrates the stages that were followed in the concerned study, which also included data collection methods. The process of how data was collected from the target sample, including the data analysis, is also explained. The research methodology of the study was determined by the nature of the main research question and the aim of the study.

The study was based on the system logs from Walter Sisulu University's e-learning system, called WiseUp. For the study, the researcher also used relevant WSU e-learning documents to obtain detailed information of the status quo at WSU relating to e-learning adoption and usage rates. This data was later interpreted to have a clear view of the usage of the WiseUp system from the two approaches. The researcher believed that this was the best way of conducting the study since the modern generation, revolves around technology, everything is technology-based, and most data and processes are system-orientated.

Obtaining the system logs could save everyone from travelling saving costs in the process and answering questionnaires that at times would not be possible for some participants (Lefever, Dal, & Matthíasdóttir, 2007). Sometimes participants would not answer truthfully, maybe because of being afraid of being exposed, for example, if the participant was not computer literate, and computer literacy-related questions were posed. The participant would then be uncomfortable and answer dishonestly so that he/she could not be seen as someone who was not computer literate. The researcher does note that this method of gathering data depends on the system setup, whether there are active logs, to give meaning to the research findings.

This section entails the study area, research methods and approach, data collection methods, the sample selection, inclusion and exclusion criteria, the research process and limitations, the ethical considerations and data management of the study.

WSU'S WiseUp e-learning system had a feature of logs, which the university later embedded after deploying the WiseUp platform, called the Blackboard Analytical Tool (BbAT), in 2009. The platform assisted the university in checking and analysing access logs on the system, including the cause activity logs. The researcher used the logs from the tool (Dwayi, 2011).

For the study, the logs needed to be obtained, an advanced background of how the system worked was required, as well as access to the back-end of the system. A formal email requesting data access logs was sent to the department responsible for the WiseUp back-end management.

5.2 Study Area

The study was conducted at Walter Sisulu University (WSU), one of South Africa's rural-based universities and situated in the Eastern Cape. The university was formed on 1 July 2005, as a result of the merger of former institutions Border Technikon, the University of Transkei, and Eastern Cape Technikon. Walter Sisulu University, as part of the restructuring of HE (Higher Education) and was the last university to be merged by the Minister Of Education (Jack, 2007). Shwababa (2014), said that

Walter Sisulu University was initiated based on the Act no. 101 of 1997 of Higher Education as a new, comprehensive university. According to the report WSU Enrolments per Campus (Walter Sisulu University [WSU], 2018) the institution enrolled more than 32716 students and was divided into four campuses, namely Queenstown, having 3189 enrolled students, Mthatha Campus 15294 enrolments, Butterworth Campus 6683 students and Buffalo City having 7550 students.

5.3 Research Method

For this study, the researcher used a quantitative approach, which entailed collecting and analysing the numerical data. The chosen method enabled a rich and broad understanding of WSU's current situation regarding its level of adoption and use of e-learning when applied to the SAMR Model. In some cases, researchers decided to use a mixed approach. According to Johnson and Christensen (2014), mixed methods were chosen when the researcher(s) decided to use a combination of two methods, namely the quantitative and qualitative methods, in a single study. The researcher of this study decided on a quantitative method, with specific methods, including the WiseUp access logs, WSU documents (LTD Policies and strategy documents), higher education reports and relevant WSU WiseUp usage publications.

The reason for the chosen research method was because that the researcher based the study on the WSU access logs ,no participants were given questionnaires to answer. The data collection included relevant e-learning documents that supported WSU's e-learning adoption and usage. The available WSU WiseUp usage publications were also considered, which included reports from higher education. The SAMR Model was used in analysing the study findings, which assisted in the actual analysis of the level of e-learning adoption and usage applicable to WSU.

5.4 Reason for choosing the SAMR Model

According to Romrell, Kidder, and Wood (2014), the SAMR Model, when it was introduced by Puentedura, at the "Maine Learning Technologies Initiative" in 2006, had a critical purpose, similar to what WSU experienced. The model's intention was to encourage teachers to enhance education quality through the use of technology, using the four levels the model provided. According to published studies on the WiseUp usage, it had been revealed that WSU still had some challenges that resulted in stakeholders not using the system, therefore, the researcher selected this model.

The researcher discussed other models that are/were applied in some universities for the integration of teaching and learning into ICT. The researcher found the SAMR Model as suitable because according to

the published studies, it was not as complicated as most other models to implement and the model's levels were clear and straightforward for any organisation to implement and adopt.

5.5 Research Approach

The research approach that was used for this research was inductive, meaning that this study was concerned with the generation of new theory, evolving from the data collected from the target group (Sauls, 2016). In this approach, researchers started by observing previous theories and collected data to come up with new theories and recommendations, as a result of the research undertaken. The inductive approach was chosen because it considered the context of where the research effort was active, and it was also most appropriate for small samples that produced qualitative data (Sauls, 2016).

Greener (2008), provided a detailed explanation and the difference between the inductive and deductive approach, namely that a deductive approach only focused on the theory, from which it produced a hypothesis, related to the research undertaken, as seen in figure 17.

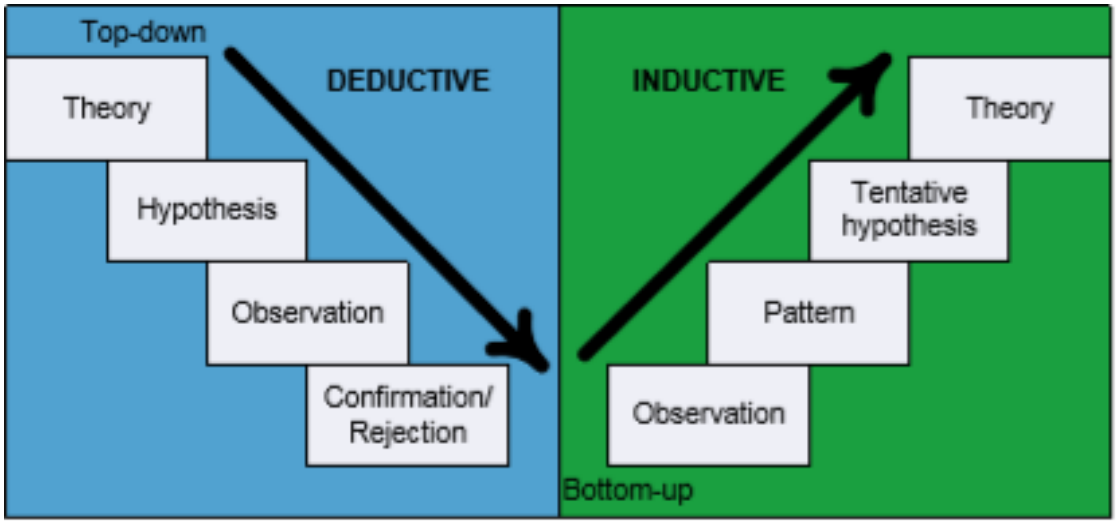


Figure 17: Distinction between the Deductive and Inductive approach (Othman & Tawfik, 2013)

After that, the researcher tested the theory in the research. When it came to the inductive approach that was chosen for this study, Greener (2008), said that induction started by looking at the focus of the research, the targeted sample of a given population and with the use of various research methods, new theories would then be generated. Othman and Tawfik (2013), on the other hand, explained the deductive and inductive approach distinctively, saying that the induction was the bottom-up logical process starting from the specific details of the research to the general (theory) of the research's end results. The deductive approach was the other way around compared to the inductive and took the

top-down reasoning approach. The study is deductive because the study starts by analysing the existing theory from the published WiseUp publications, WiseUp access logs including WSU Policies and strategies ,the data from the documents is analysed and observed to come up with the recommendations at the end of the study.

5.5 Sample

Johnson and Christensen (2014), defined sampling as the process of drawing a small size from a population for a research. They further explained that when the sample was completed, the authors studied the characteristics of the subdomain, called the sample, which would be extracted from a large group, called a population and in the case of this study, WSU students and lecturers that were enrolled on WiseUp and from 2018 and 2019. When the researchers had understood the characteristics or findings within the sample, these were then generalised into the population. This meant the research was based on a sample of the population; the advantage of the chosen sample was that it was smaller than the actual population, therefore, it saved money and time to complete the study.

As the study was based on WiseUp access logs, including documents on WSU e-learning strategies, these formed the sample. The number of WSU WiseUp active users from 2018 to 2019, was the base of the sample, which would be analysed against the student enrolments. The study did not focus on a specific campus, faculty or qualification. The researcher's idea was to go straight to the core system logs of the e-learning system that the university used and applied the SAMR Model to analyse the findings.

The study focused on all four WSU's campuses, namely Queenstown, Mthatha, Butterworth and Buffalo City, as the WiseUp platform was deployed for usage by the whole university at large. According to WSU ICT reports, as shown in figure 18, the University had 32716 students enrolled in 2018. The four different campus populations were different in size. The sample for the study was not targeted at individuals, such as students and lecturers. The study results was determined by the number of access logs that the WiseUp system had from 2018 to 2019 against student headcount enrolments for WSU. According to WSU Reports, (2019) WSU had 32716 enrolments in 2018 meaning student academic registration and the numbers increased to 33638 in 2019, that is WSU in 2019 registered more students than 2018.

The researcher considered the enrolment numbers when analysing the results tried to compare the enrolments against the WiseUp usage logs, to present a clear view of the current usage trends of WiseUp at WSU.

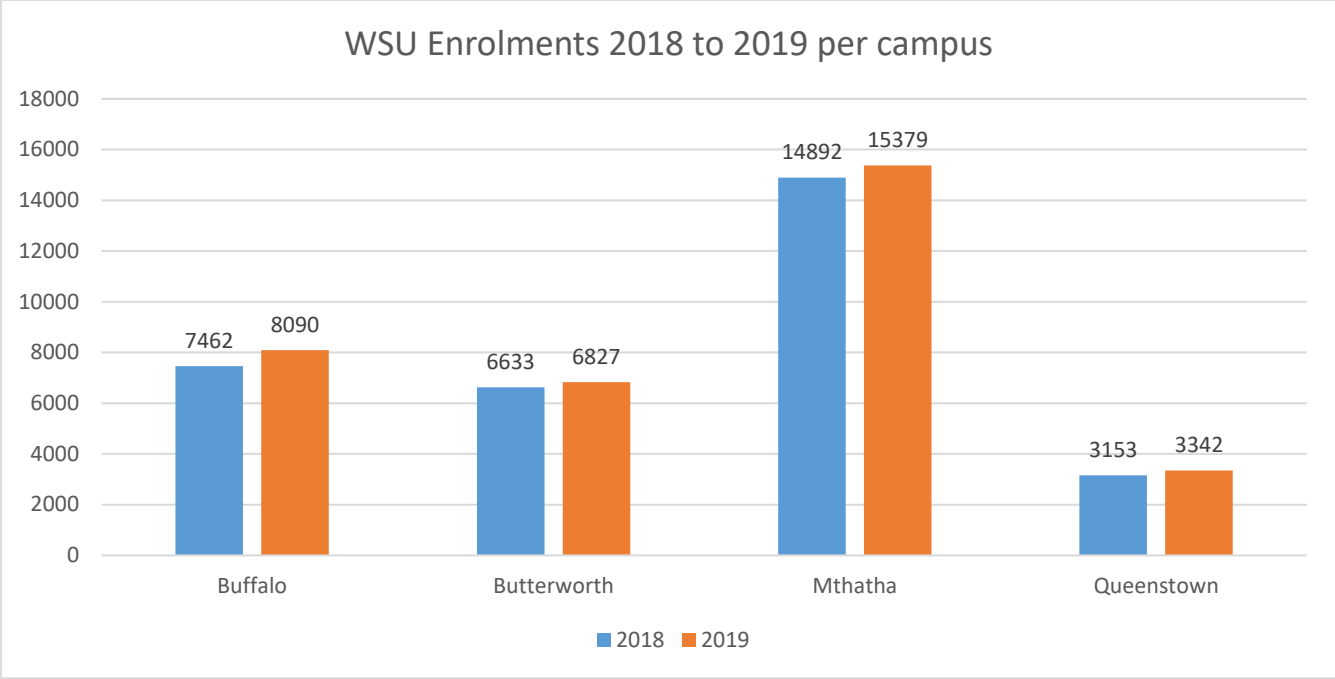


Figure 18: WSU 2018-2019 Enrolments per campus (Walter Sisulu University [WSU], 2019)

The sample included lecturers and students accessing the WiseUp e-learning platform, as participants of the study. As WSU is spread across the Eastern Cape, each campus had faculties, namely Mthatha with five faculties, Butterworth with three and Buffalo City and Queenstown, two each.

According to Walter Sisulu University [WSU], (2018) the University had 12 faculties, as illustrated in Table 2. All 12 faculties were represented in the sample and those not presented were not yet using WSU's platform of e-learning. That is why this study took this approach of obtaining the true reflection of the WiseUp usage from the system logs. The researcher decided on this approach, instead of sending questionnaires to participants, as some of the studies previously conducted regarding the adoption and usage of e-learning, already did so.

Table 2: WSU Faculties (Walter Sisulu University [WSU], 2018)

Business Sciences
Science, Engineering & Techno
Butterworth Campus
Education Butterworth
Engineering and Technology
Management Sciences
Mthatha Campus
Commerce and Administration
Educational Sciences
Health Sciences
Humanities, Soc. Sci and Law
Natural Sciences
Queenstown Campus
Economics&Info Sys Technology
Education (Queenstown)

5.6 Sample Size

According to the Blackboard Analytical Tool (BbAT) (2019), the number of active students in the system was 1561 and active lecturers 1300. The study focused on the actual logs of the system, which then meant the number of lecturers and students combined, namely 2861, made up the sample size. The study also analysed documents, analysing the e-learning strategy and policies of WSU, accompanied by WSU WiseUp usage publications.

5.7 Inclusion and Exclusion Criteria

In the data analysis, the users that were included, the study sample, were active in WiseUp during 2018 and 2019. When analysing the data, the 2018 and 2019 enrolments were compared to the active WiseUp users, to provide a clear view of the extent to which the university was using the solution of e-learning, implemented in 2009. The data of WSU enrolments and active users before the year 2018 as well as the throughput rate statistics of students graduating at WSU through the use of WiseUp, were both not included in the study. No participants answered questionnaires in this study, as the study was

based on system logs and WSU e-learning strategic documents, including the WSU WiseUp usage publications.

5.8.1 Research Design

Yencken, Fien, and Sykes (2003) said that the research process which is detailed in the following subsections was a more generic model of carrying out research. In a nutshell, the representation of the processes did not always follow what is demonstrated in figure 19. Some of the researchers might not follow all the stages as precisely.

Figure 19 demonstrates the research processes followed from the project initiation to the study write-up.

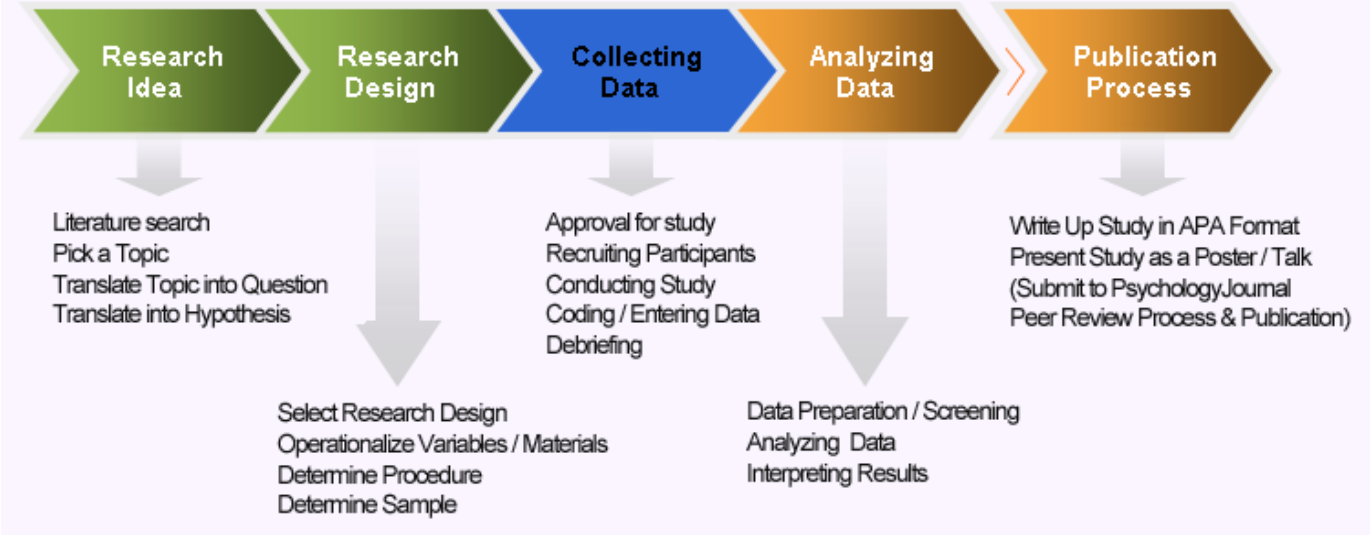


Figure 19: Research Process overview (Brendan J Gomez, n.d., para.1)

Figure 19 shows an overview of the research process that the researcher followed. A more detailed research process is demonstrated in figure 20, illustrated by a diagram. The detailed research process starts from number one, the selection of the topic, followed by number two, reviewing the literature, then number three, the development of theoretical and conceptual frameworks. Number four is the clarification of the research question/hypothesis, followed by number five, research design and number six, data collection, ending with number seven data analysis and eight, drawing conclusions.

5.8.2 Research Process detailed

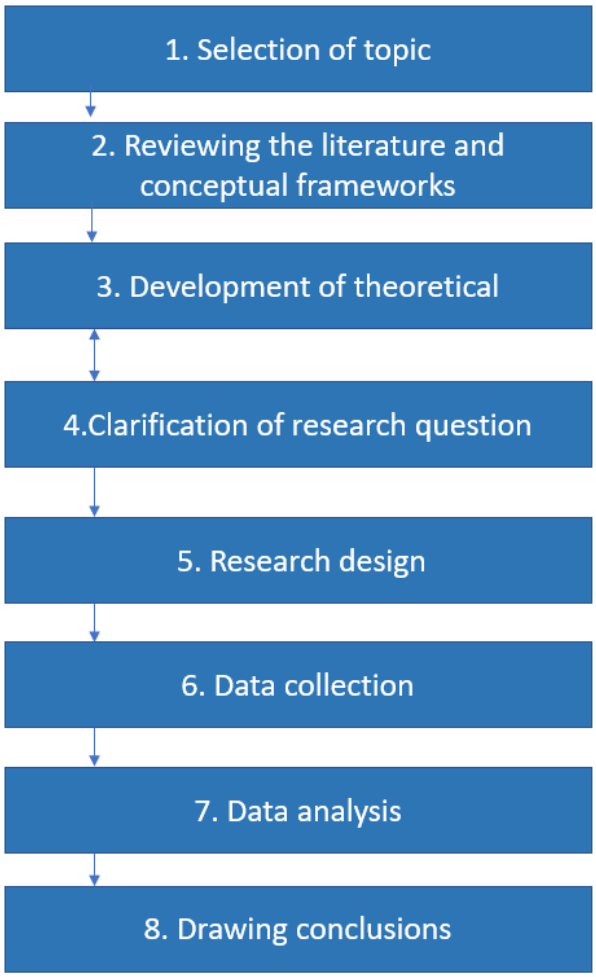


Figure 20: Research Process detailed

- **Stage 1. Selection of topic**

This is the research stage that takes most of the time when the research and selection of a topic is performed, a preliminary research question is created and study goals are set. This stage is critical and a priority as choosing an unacceptable topic, can often lead to difficulties to withdraw it at a later stage; therefore, it is advised to deal with this section wisely and carefully (Yencken, Fien, & Sykes, 2003).

- **Stage 2. Reviewing the literature**

This stage consists of the literature review, which is essential for good research results as these require critical reading and research about the chosen topic, doing a broad evaluation of and reading already existing literature on the chosen topic. Relevant keywords need to be used to assess the chosen current

topic's status worldwide, but this may depend on resources, such as library access or the internet. By now, the researcher should make sure that he/she is mastering the chosen field. The literature review is done parallel to the development of the theoretical and conceptual frameworks (stage three of the research process). By reading wide and not limiting oneself to a number of papers, the researcher has the advantage of being able to see whether much similar research had been carried out (Yencken et al., 2003).

- **Stage 3. Development of theoretical and conceptual frameworks**

Yencken et al. (2003), argued that as the researcher studied the literature, this stage should allow exposure to more theoretical material, continual development of the field or topic chosen and refining the theoretical work and conceptual framework. This was an important stage not to miss for data collection and a crucial part of the research process, alerting potential problems before they even occur.

- **Stage 4. Clarification of the research question**

Yencken et al. (2003), said the research stages one, two and three of the process, takes quite some time at first to compete and it becomes a circular process, back and forth; this usually happened when initially chosen research questions were rejected to be further refined.

Stages one to three could also take longer than expected as some researchers at times gave up, thinking that they were not fit enough to do the research and they become discouraged trying to find a good research question. There were no easy options and methods to easily come up with a direct clear research question at the beginning, but once the supervisor had approved the research question, the rest focuses on answering the question (Yencken et al., 2003).

- **Stage 5. Research design**

In this stage, when the attention to and focus of the research question have been identified, two questions need to be considered:

- What data needs to be collected to answer this question?
- What is the best way to collect this data?

  These questions are then broken down into more detail:
- What overall research design should be used?

- Will, for example, a cross-sectional, experimental or longitudinal design be used?
- Will primary data need to be collected, or will suitable secondary data be there to use?
- What methods, for example, interviews, questionnaires, surveys and so forth will be used?
- Which will be the best ones to collect the primary data?
- Who should participate in the research, and how will they be accessed?
- What are the exact procedures that should be adopted in the data collection to ensure reliability and validity? (Yencken et al., 2003).

- **Stage 6. Data collection**

When the previous stages four and five have identified and addressed the issues concerned, the researcher, at this level, should be in a position to choose the data collection methods within the methodology (Yencken et al., 2003). These are as follows:

At this stage of data collection, the WSU WiseUp logs, as the method, was not the only main data source for this study. The researcher also performed a document analysis, which included WSU-relevant Department of Education reports, covering the University's status quo concerning e-learning usage and its readiness for e-learning. The study also looked into the WSU e-learning documents that shared e-learning policies and strategies, including its plans. Using the WSU WiseUp published papers, was also another data collection source.

All these specified methods used were accompanied by the SAMR Model, the main tool for analysing the level of the university regarding e-learning adoption and usage. The researcher used Microsoft Excel to analyse log data, which were extracted from the WiseUp e-learning platform. In the past, most researchers did conduct research at WSU on e-learning usage, but they collected their data from the system's end-users. For this study, it was quite different because the researcher decided to obtain the actual reflection from the core system, containing every day's activity logs.

Literature Review: This level assisted the researcher through the use of published papers, book surveys, scholarly articles, and any other sources relevant to the issue. The area of the paper concerned, for example, provided a description, summary, and critical evaluation of the previous research problems of the topic being investigated. The literature review allowed and guided the researcher towards a clear view of the gaps of the topic concerned, by showing what had been done and what not. The literature also provided detail as to how the SAMR Model had been used and applied to teaching and learning

integration into technology worldwide, including South Africa. This also showed the importance of this stage.

Desktop Research: A desktop study was done in the research process, with the existing information from the internet, and including the data contained in the WSU student records system. System access logs for the WiseUp e-learning system were also analysed to derive the actual most meaningful logs that made sense within the system, to check those features, not utilised and to produce some recommendations. The data were used to come up with a clear view of the students' and lecturers' level of e-learning usage, using WSU's current deployed e-learning Management System.

Stage 7. Data analysis and discussion of the findings

The previously collected data from stage six were analysed at this stage to provide answers to the specified main research question and the corresponding sub-questions. The data analysis methods were always interlinked to the research objectives, to allow the research methods to answer the main research question and sub-research questions. In the discussion of the results, the findings and recommendations were linked to the literature review, specified in stage two (Yencken et al., 2003).

The data analysis is crucial as it provides a clear view of the study's results. The data collected from the students and lecturers of WSU's four different campuses and their WiseUp logs were analysed and interpreted, using Blackboard Analytical Tool (BbAT) that exports to MS Excel and the SAMR Model. The other identified methods used for study analysis had another component, namely the Department of Higher Education reports and the WSU WiseUp e-learning usage publications. The data collected through the desktop study were grouped and coded into related themes. These techniques enabled the researcher to understand the findings to make recommendations concerning the study's main purpose.

The SAMR Model was used in the analysis of the study's findings. As the model was divided into four levels, the study's analysis phase used the model to classify where WSU was situated on the technology integration levels. The SAMR Model started at the basic level of technology integration into learning and teaching, which was Substitution; this was then followed by the Augmentation level that would have a substitution of functions but with a small portion of functional improvement. Going up to the more advanced levels would be Modification, which involved task redesigning for an organisation on that level. Lastly, is the Redefinition, the top level of the model, where tasks were newly created, which were not possible without technology.

- **Stage 8. Drawing conclusions**

This stage should relate to the focused research question, where the researcher with the help of the findings, was able to answer the study's main research question and its sub-questions; also, now the researcher was able to provide recommendations. At this stage, the answer to the research question(s) should be detailed. This level in the process allows for the success that the research objectives achieved, to be evaluated and the research strengths and weaknesses to be highlighted. At this stage, recommendations could be extracted from the research (Yencken et al., 2003). The results of the study ended with the research write-up, and peer-reviews once approved.

5.9 Research Limitations

As in every study, this dissertation has the following limitations:

- The study was conducted among a sample of WSU active users within the Blackboard platform and used enrolment headcounts, but no questionnaires.
- The study focused on the core data related to WSU's e-learning adoption and usage and there was no interaction with the participants in terms of the data collection.
- The study did not include any interviews.

5.10 Ethical considerations

Anonymity was considered when conducting the study when it came to the data collected from the logs. The WiseUp logs required some kind of authentication to be used; they were not easy to obtain and the system's back-end interface needed to be accessed. A formal email requesting data from the WiseUp logs was sent to the WSU's department responsible for the management of the system's back-end functionality.

The student number/s or name of the users that might give clues as to the users' identity was not to be included in the data access. This anonymity was considered also in the desktop study. The study adhered to and complied with the Nelson Mandela University (NMU) and Walter Sisulu University ethical clearance policies. The study considered the participants' identity as anonymous and respected the ethical human rights of the WSU students and staff, as the study did not deal with the participants' demographics, qualifications and student numbers; therefore, no one's identity would be compromised.

The data were treated with confidentiality and all the results extracted from the WiseUp logs, including the policies, were kept confidentially. Relevant sources of information were verified and validated.

5.11 Data Management

The information collected from the sample group was stored in a secure area, only accessible to the researcher and the research supervisor(s) concerned. The data is kept for five years, in case there would be a need for access to the study's data and results. Only permitted people would be able to have access to the gathered data (Gao & Zare, 2017).

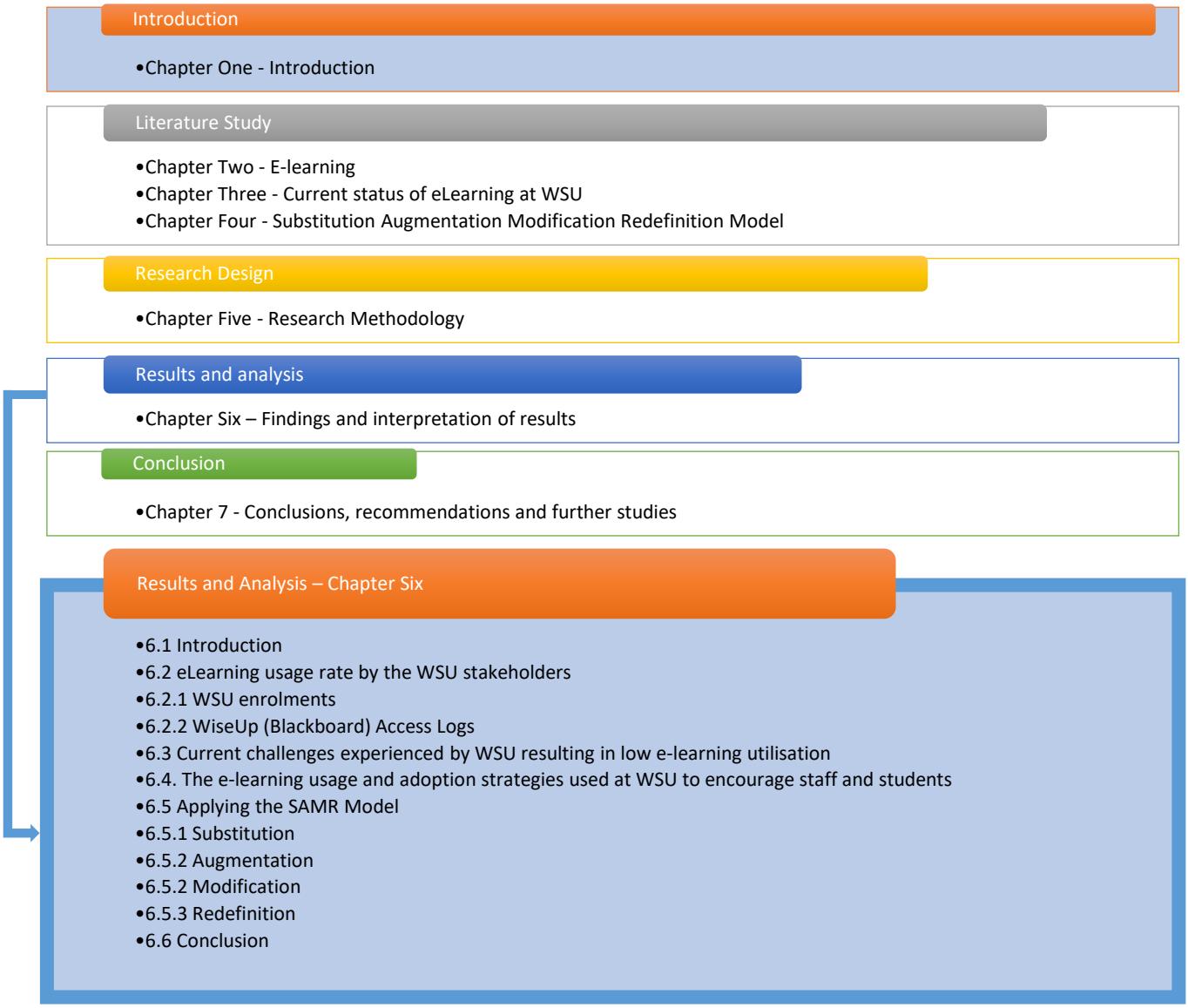
5.12 Validity and Reliability

Reliability refers to the consistency of the data, and validity refers to the accuracy of the assumptions you draw of the data (Johnson & Christensen, 2014). As reported by Cocea & Weibelzahl, (2009) using system logs to analyse and evaluate the usage of a system you will get validated and reliable results of the study because most LMS store information almost the learner's activities in log records, something that gives nitty gritty data around learner interactions with the system. The sample data of the study is data extracted from the reliable and validated source which is WiseUp in use by WSU in the period from 2018 to 2019 and the data analysed in the study is from published studies that talk with WiseUp usage.

5.13 Conclusion

This chapter provided an overview of the methodologies used in a research process and all the affected stages where discussed. The chosen research design and methodology for this study were described in detail and every choice justified. The study used a quantitative research method. The researcher used an inductive approach, where the generation of new theory was gathered from existing WiseUp usage publications and WiseUp logs, including available supporting documents. The study sample was based on active WiseUp users with data that that is reliable and valid as it was requested from the relevant WSU Section in charge of WiseUp. This data from the WiseUp logs does confirm that the study does have validation and reliability. This chapter described the research methodology, including data collection instruments, as well as strategies to ensure that the ethical standards of the study were met.

Chapter Six



6. Analysis and Results

6.1 Introduction

In this chapter the researcher discusses and applies the SAMR Model to answer the study's main research question, namely "How can the SAMR Model be applied to enable e-learning adoption and usage at WSU?" The following sub-sections in this chapter assisted the researcher to obtain the actual levels of technology integration into teaching and learning, where WSU was located. In the analysis, the SAMR Model was applied using all four different levels, starting with Substitution, and followed by Augmentation, Modification and Redefinition.

The way, in which the model was applied, was determined by the study's findings. The researcher also answered and discussed the sub-questions from Chapter One, using the identified various methods that were explained in Chapter Five, and these enabled the researcher to answer those questions.

When the SAMR Model is applied to an organisation, it would know its level of technology integration into learning and teaching.

The levels according to Puentedura, (2012) were interpreted as follows:

- Substitution: Technology serves as a direct resource replacement, without any alteration in functionality. Among all the SAMR Model levels, this is the lowest level of technological integration. At this point, technology substitutes an operation that may have been carried out before using a different method. One of the examples may involve word processing for a student's written assignment, rather than writing it on paper. Whereas this is the lowest level, it could still be a great use of technology.
- Augmentation: Technology serves as a basic substituting tool for operational enhancement. This next step involves the Augmentation stage, going up one level above Substitution on the ladder. It is important to remember that, according to the SAMR Model, this step is still at the enhancement level, together with the Substitution level. The technology has improved the learning experience at this stage, by adding functionality that would not have been possible without technology. An example of technology integration in teaching on this level, is when students are educated to use various tools, such as word count, and grammar checks, in a word processing document.
- Modification: Technology encourages massive task redesign. The technology has the ability, at this point, to improve the look and feel of what the students do. The transformation has just started now and this stage needs further work and effort from the facilitator. This could include writing a shared group assessment in a Google Doc, so that peer editing and collaboration can take place anytime and anywhere.
- Redefinition: Technology allows the development of new activities, previously impossible without technology. According to the SAMR Model, this last level of technology integration into teaching and learning, forms part of the transformation. When technology integration is on this level, the lectured audience could go beyond the school and use the available collaborative video conference tools to include the community, state, country or world. The lesson could have virtual instructors. Students would perhaps curate and create their own content for other

students to use. Another ideal scenario would be an exercise that allowed students to use Google Custom Search to build their own search engine.

The application of this model is a critical decision that most organisations have to consider. According to Gorman (n.d.), transforming technology into a hybrid learning experience had become a must for those educators who want to participate in student-centred learning in the 21st-century classroom. As teachers' welcome technology to the classroom, it has become apparent that as learners themselves, they were going through the formative stages, as they became professional in the integrated environment.

This chapter entails the findings of the overall study, accompanied with the data analysis, gathered as a result of the previous chapter that dealt with research methodology. The study has to produce the findings that were analysed in this chapter and gathered using the WSU WiseUp access logs, the relevant e-learning policies, including those of the Department of Higher Education and the WiseUp e-learning usage publications. The data collected from WiseUp were analysed using MS Excel. The relevant documentation that assisted the research in obtaining the study's results, was obtained online, by using "WSU WiseUp adoption", "challenges", and "usage" as search words.

This chapter started by discussing the findings as per the study's sub-questions in a categorical way, introducing the types of findings as per the information gathered. These findings were linked back to the study's Chapter One to ensure that the study's problem statement was indeed addressed. The findings' categories are shown in figure 21 as follows:

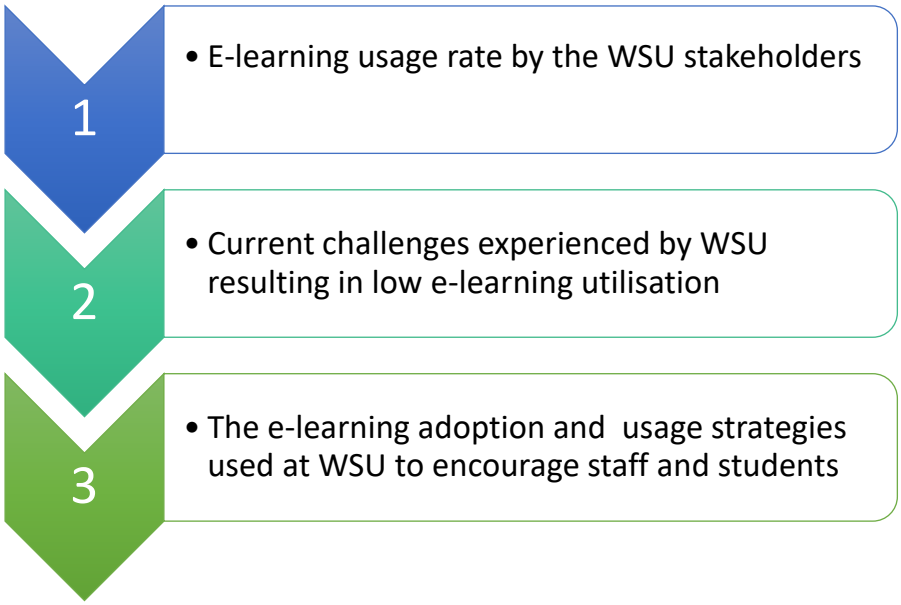


Figure 21: Graphical representation of results' process

The results are discussed according to figure 21 and later the researcher applies the SAMR Model to analyse the overall findings of the study.

6.2 E-learning usage rate by WSU stakeholders

In this section, the current rates of e-learning usage by WSU stakeholders are discussed. This was one of the study's objectives in Chapter One. In this section, WiseUp logs are used.

6.2.1 WSU enrolments

According to the WSU logs report (2019), Walter Sisulu University, one of the Eastern Cape's rural universities enrolled more than 32000 students every year. The overall total number of the university is distributed into four different campuses, separated by more than 100 km. The university's campuses are situated in four different towns. The Butterworth Campus is situated in Butterworth under the Mnquma Local Municipality, Buffalo City Campus is based in East London under the Buffalo City Metropolitan Municipality, and the Queenstown Campus in Queenstown under the Chris Hani Municipality. These campuses consist of sub-sites at least five to 20 km apart from one another (Mgweba, 2017).

Figure 22 below represents the total number of enrolments at WSU.

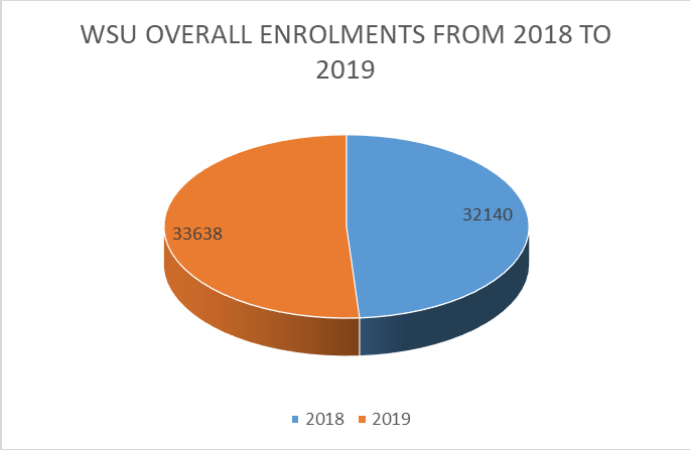


Figure 22: WSU Enrolments 2018-2019

When looking at figure 22, it is quite clear that the number of students at the institution grew as the years have passed. The number from 2018 to 2019 increased by 1498 (4.45%).

According to Ncayiyana (2011), the university offered teaching and learning on four campuses, sharing 12 faculties among them, as the towns are apart and the faculties spread across them. Some campuses shared the same faculties, such as the Faculty of Engineering in Butterworth, which was also represented at Buffalo City Campus with a different department head. This was a very good placement of the faculties,

as in this way the university covered several towns in surrounding rural areas in the Eastern Cape. This is why the university had this huge number of enrolments. If a student resided at the Queenstown Campus and wished to study Business Studies at WSU, there was no need to go to the Mthatha Campus, as the same qualification was offered at the Queenstown Campus.

6.2.2 WiseUp (Blackboard) Access Logs

The study used different methods to retrieve the WSU data; one of them was to obtain system logs from the institution's WiseUp e-learning system that had information about registered active users and courses for teaching and learning purposes. According to Dwayi (2011), WSU installed the analytical tool, named Blackboard Analytical Tool (BbAT) on WiseUp. The tool presented the institution with a view of the extent to which the WSU community used WiseUp. In this study, the tool was used to assess the e-learning usage at WSU.

WSU adopted the use of Blackboard in 2009. The institution had a number of intentions to ensure that the system was fully utilised, which in reality looking at the WiseUp logs of the actual e-learning platform, were not quite enough. WSU only partially used the platform; if fully utilised it would have benefitted the institution substantially more. Since the institution is spread out wide, some lecturers, resided in another town and had to travel from one town to another to conduct classes. For example, a number of lecturers resided in East London and were challenged to travel to and from Butterworth. This had an impact on their travelling expenses. The WSU WiseUp platform access logs used for the study, reflected the activities from 2018 to 2019. The system's logs were a true reflection of the WSU's as-is situation. Figure 23 below shows the number of active courses and users on the WSU e-learning platform.

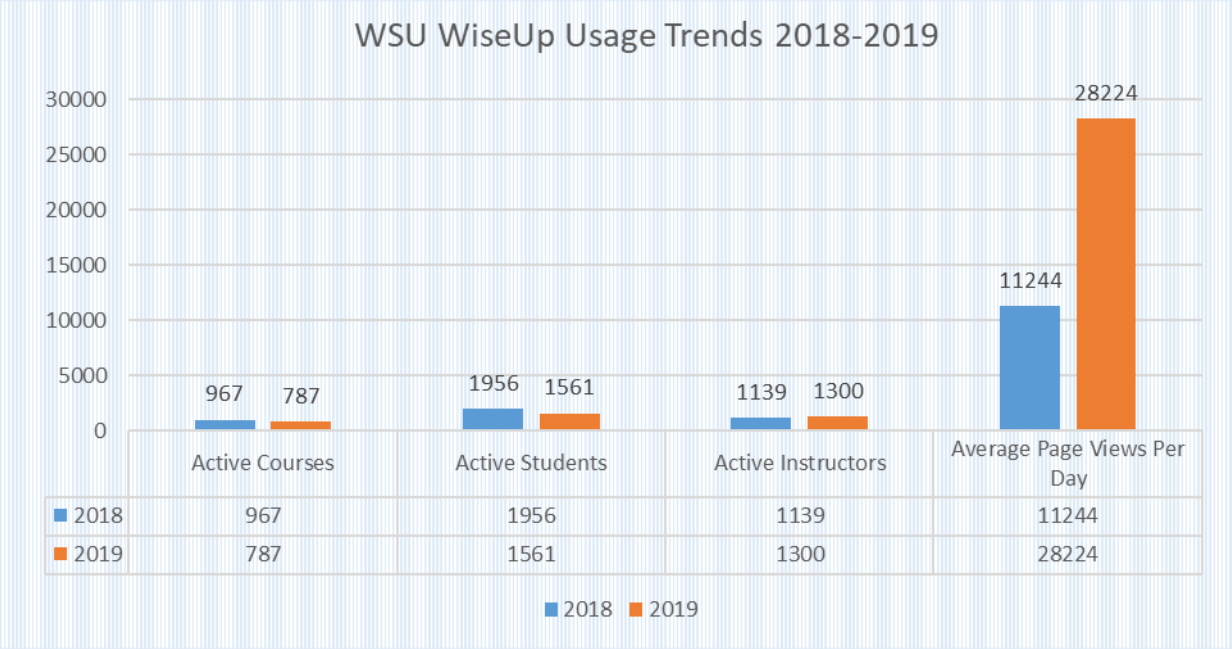


Figure 23: WiseUp Usage Logs

Figure 23 displays a bar graph that demonstrates the trends of WiseUp usage from 2018 to 2019. The representation of the graph is discussed below and the active indicator, the active category on the e-learning platform, meant that 32000 students might have been uploaded on the system, but only 1956 used the WiseUp platform:

- **Active courses:** The active courses were a broader view of the active number of courses on WiseUp from 2018 to 2019. According to the WSU WiseUp logs (2019), in 2018, a total of 967 courses were active and for some reason, the number decreased to 787 in 2019. This might be because of the academic structure reorganisation in 2018 towards an integrated curriculum at WSU in 2019. According to one of the WSU continuing students, when WSU introduced the online registration system, minor problems were encountered. When, for example, a student from the Queenstown Campus, which offered ND: Public Management level one, wanted to register at Buffalo City Campus for level two, the online system would not recognise the subject codes as they were campus-based, but this was solved later on.

- **Active students:** This number of active students using the WiseUp WSU e-learning platform from 2018 to 2019 were presented. In this scenario, the numbers dropped from 1956 students in 2018, with 395, to 1561 active students. This was a 20% decrease in numbers regarding the system's adoption and usage rates according to active users, which indicated a system problem in 2019.

- **Active instructors:** This was so interesting because the numbers of instructors did increase from 1139 on WiseUp in 2018 to 1300 in 2019, an increase of 161 (12.38%). This meant that WSU was trying to offer more workshops and training for the WSU academic staff.

This increase was because the WSU LTD (Learning and Teaching Division) was trying, by all means, to equip staff by organising Professional Academic Development (PAD) workshops, such as WiSeUp, accompanied by the ICDL (International Computer Driving Licence). This WSU programme trained and taught lecturers computer literacy, such as the MS Office suite, and how to use the internet and emails, and also to explore the computer file structure (Mayisela, 2014).

- **Average page views per day:** WSU WiseUp page views per day drastically increased, according to the WiseUp logs in figure 23, from 11244 in 2018 to 28244 views in 2019, an increase of 17000 views per day. Interestingly, the number of people that did visit the site increased over the years, but this did not reflect the usage of the system, as these were just persons clicking the link to just look at the WiseUp system; these numbers were not helping to indicate usage. It could at least be said that WSU catered for the awareness and visibility of the platform, meaning many people were starting to know about the platform, but the reason for the low usage needed to be explored.

WSU did ensure that their WiseUp e-learning platform was placed on the landing page of the main University website. For awareness this ensured that whoever visited the WSU site did see the WiseUp icon on the landing page. According to WSU (2019), the system was also integrated with the central authentication system, meaning the system supported the single sign-on feature. Students used their login details, supplied to them at registration, and which they used to access their normal email account. At registration WSU students automatically received an email address.

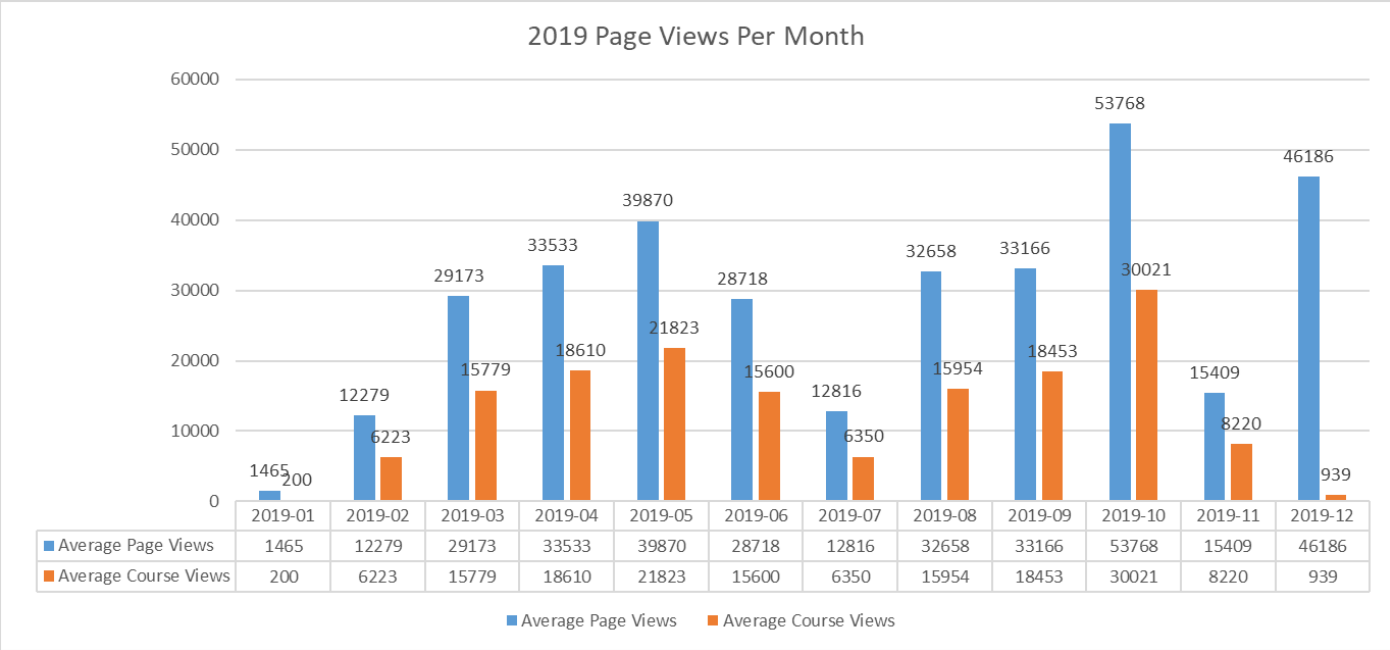


Figure 24: 2018 Page Views per month

Figure 23 demonstrated that the WiseUp usage was not as expected and quite low and, therefore, the researcher investigated the detailed information concerning the usage of e-learning in 2018 and 2019. Figure 24 demonstrates the trends of WiseUp usage using the average page and course views per month, extracted from the WiseUp logs. The trends in figure 24 were a clear demonstration that the platform was indeed in use, even though the adoption and usage were still low.

It should be noted that on the graph from January, the page and course views were low but did increase moving towards month two and three and so forth. In May, it peaked as this was a busy time to prepare for semester one's student examinations. This indeed showed the true reflection of WSU's academic calendar, as in June the university usually closed and opened early July, when the graph went up again and the students and lecturers were back and accessing the system.

Figure 25 again shows a drastic growth in October, a busy month for the preparation for the year-end examinations. By October, lecturers had to all make sure that the marks were ready for the examinations, as these now included all academic block codes (year and semester courses) ,this was why these two

bars' average page and course views were the highest for these months, compared to the others.

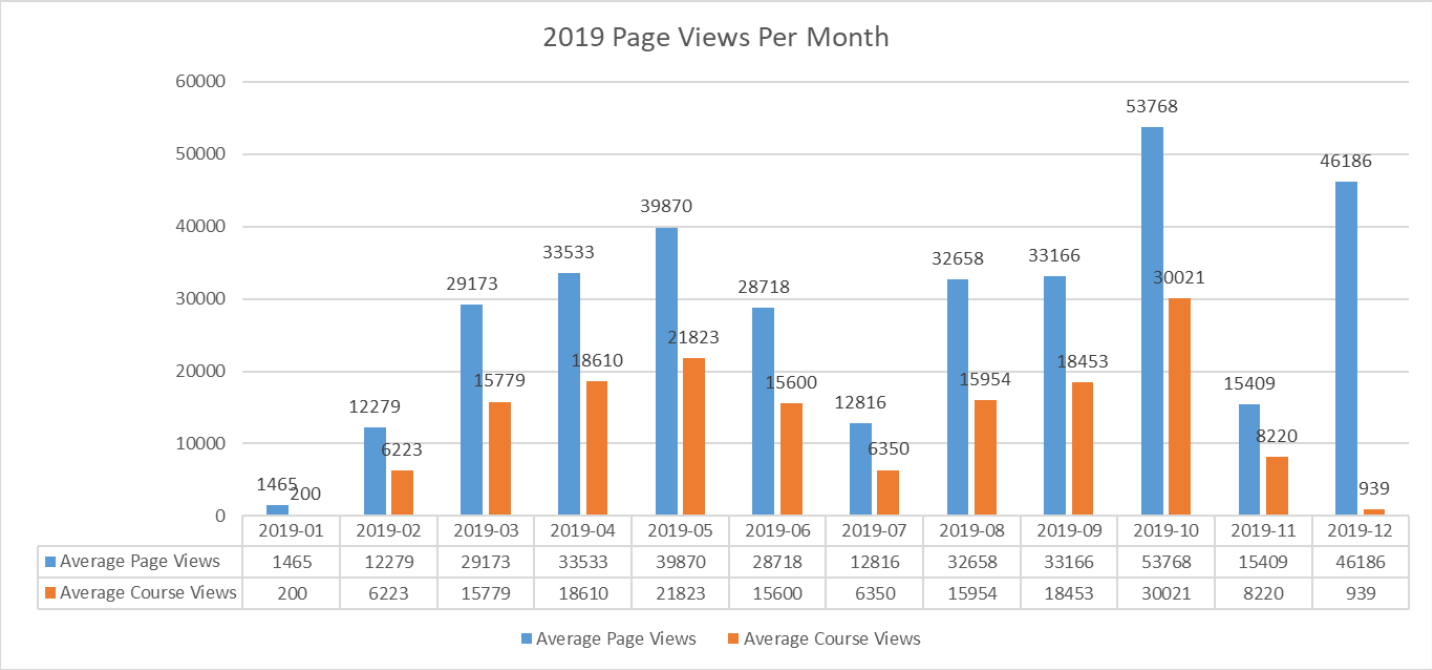


Figure 25: 2019 Page Views per month

Figure 25 demonstrates the WiseUp usage trends for 2019; the categories are as per the WiseUp logs for the average page and course views per month. This graph does represent a clear, most likely activity on WiseUp, because in January, the usage in terms of courses and page views was low, which was expected as the university just opened. The logs changed gradually towards February and so forth. In May, the average page views went up to 39870 and the average course views to 21823, which showed that at this point, the lecturers pushed exercises on the system, so that the student marks would be ready for the midterm examinations, taking place in June for semester courses.

The usage dropped in June as the institution at this point was busy with examinations and after that, recess started and in July everyone returned. A low number of people accessed and used the platform during July. In August the usage increased again with lecturers continuing with lectures on the platform for semester two, as the academic calendar would have commenced at this time. The graph in October rises drastically, which again meant that the lecturers would be fast-tracking the year-marks for the examinations department for preparation for the year-end examinations. At this time the bar is higher than the one in May, in preparation for semester one students. At this point in October, all students wrote examinations for both semester and year courses. This means lecturers at this time used the platform more than in the other months. The students visited WiseUp mostly at this time to do assignments, including obtaining reading material from the WSU's Learning Management System.

The WiseUp logs when comparing figure 24 and figure 25, showed that in 2019, the average page and course views per month had grown from 21796 in 2018 to 53768, a difference of 32002. The total average course views in 2019 were 30021 compared to 11914 in 2018, showing an increase of 18107.

6.3 Current challenges experienced by WSU resulting in low e-learning utilisation

In this section, the researcher discussed a number of challenges that WSU experienced as a result of the low WiseUp usage. This section's findings were drawn from the WiseUp e-learning usage publications using the previously conducted studies at WSU. This assisted the researcher in obtaining a clear view of the current challenges that WSU experienced, resulting in them having a low e-learning utilisation.

According to Mgweba's (2017) study results regarding the impact of social media and technology for communication to university stakeholders, most of the participants preferred using social media platforms. Almost everyone had a smartphone, so they believed that if communication was done on social media they would receive the message immediately. The respondents did not feel comfortable though, as most of them were not aware of the newly introduced technologies at WSU, such as the WiseUp platform as the e-learning platform. The findings indicated that WSU still had to do more if the WiseUp platform was intended as a supplement to the daily classroom face-to-face lectures. Students did not prefer WiseUp, but rather social networks, as the best communication tool. On the other hand, staff members preferred using emails for communicating with another.

The use of social media according to Mgweba (2017), had grown to form part of university students' personal or university-related use, because the university even had an official social media platform to communicate with students. WSU did implement strategies to encourage students to adopt and use WiseUp as the e-learning platform, but according to the respondents, the obstacle was that using WiseUp was time-consuming.

The study revealed that communication sometimes did not filter down to most people when management conveyed information to the WSU community. The study showed that the university's most used communication were notice boards, email and social media, but the university seems to be unaware of the fact that some of its stakeholders are not familiar with those platforms. The other critical communication channel found to be less utilised at WSU, was the intranet, another core internal communication tool; almost all the students at WSU were not using the intranet site. The lecturers ended up using other types of channels (Mgweba, 2017).

Though these identified barriers to smooth communication existed at WSU, Mgweba (2017), stated that the university did make use of social media, such as Twitter, Facebook and Instagram for students and

staff communication. The challenges at WSU were also explored by Mafuna and Wadesango (2012), and according to their findings, the unavailability of the WSU resources for most students was a challenge. The students indicated that there was a lack of support on matters relating to ICTs (qualified staff, e-learning centres, internet, time and computers).

In line with Mafuna and Wadesango (2012) some students had never even used WiseUp since they were trained. Many students feared that the introduction of WiseUp came to expose their technological incompetence. The study found that the availability of WIFI coverage where the students lived was another challenge, because when on campus they could access the network, but most did not have access where they lived. The study concluded with the challenge of a shortage of teaching and learning centres. This challenge was as a result of the measurement of computer-student ratio which LTD department had undertaken, the study revealed that one computer can be used by six students meaning that in a learning centre one computer accommodates six students per centre.

According to Dwayi (2011), some challenges were faced during the higher education development at WSU, which resulted in the needs' analysis conducted in 2008. It was identified that at the start of their university career, many students had poor computer and general academic skills. Many lecturers lacked the teaching methodology skills at the start of their careers too. The lack for a centred institutional e-learning system was also seen as a challenge hence the institution saw this challenge as one of the motivations of getting LMS.

Among these challenges, at times, the students did become another barrier to the utilisation of e-learning for teaching and learning. Mavuso, Jere, and Hendrick (2016) provided some of the challenges that learners and lecturers faced when WSU introduced tablets to extended programmes. Students' tablet use was typically a disturbance for learning but was also a big challenge for lecturers. Students used the tablets for social networks and internet connectivity while in the classroom, instead of paying attention and taking part in the lecture and following the lecturer's instructions. The stakeholders noted that the full implementation and adoption of WiseUp would be beneficial to the University.

According to Mayisela (2014), the lecturers feared to introduce WiseUp, saying it could reduce face-to-face contact with their students, something they were familiar with for years. Development of material for the system was time-consuming according to the participants and the staff lacked IT skills. The study also revealed a lack of support in terms of workload distribution from top management. The lecturers were complaining about the standard of the computers they used as well, saying these were not in good condition and that internet downtime was a challenge.

The lecturers were concerned regarding access to the online material and mentioned the fact that WiseUp training would simultaneously take place with classes, which resulted in a lack of training. The lack of computer laboratories was also identified, as these would have been an enabler for students to access online materials anytime. The lecturers also complained about the delay of loading the student registration data on the WiseUp platform when the year began. The other challenge was lecturers' lack of motivation to commit themselves to load the material onto WiseUp.

6.4. The e-learning adoption and usage strategies used at WSU to encourage staff and students

In this section, the WSU e-learning strategy documents that were analysed include publications that related to the WiseUp e-learning usage. This approach was used to answer sub-question three in Chapter One, whose objective was to evaluate the strategies at WSU enhancing e-learning adoption and usage strategies among staff and students.

According to Dwayi (2011), WSU LTD had a section called the Education Technology and Innovation Unit (ETIU), with goals and objectives of making sure that the University fully utilised e-learning and that the structure, was not campus-based but institutional. The unit had a bigger role to play in integrating ICT with teaching and learning and also worked closely with the ICT department as they were responsible for advising the institution on how technology could be used to support teaching and learning. WSU's e-learning was formed as a result of the Netherlands-Fund project in 2007 that ran until 2011.

As a result, the above project complementing the WSU's e-learning strategy had the following four main elements:

- Establishing and preserving the e-learning environment,
- University stakeholders' understanding of the learning environment and the incentives these give to them,
- Empowering the e-learning academic personnel,
- Ensuring the engagement of students in e-learning.

The above elements formed the key objective of the WSU e-learning implementation project, which was tested against these elements. The team, that engaged in projects' execution, set targets arising from the "e-learning Implementation Plan 2011" (Dwayi, 2011):

- In particular, academic staff recognised the Centre for Learning and Teaching Development (CLTD) and ETIU as the place to go for e-learning questions (including Blackboard) by 2010.
- Through 2011, e-learning was part of the strategic approaches around WSU.

- In 2011, there was a single online location where students/readers would learn about the institution's classes and lesson materials.
- Both students and lecturers had to have access to WiseUp by 2011.
- In 2011, 50% of lecturers used slideshow tools in their classrooms (such as PowerPoint).
- By 2011, 100 per cent of the lecturers had developed their courses on WiseUp.
- A total of 25% of the lecturers used WiseUp as a resource by 2011 (at least: put their PPTs on WiseUp).
- In 2011, e-learning methods were to be applied to all first-year students.
- Multi-campus teaching was often conducted using e-learning (video-conferencing or WiseUp) to improve the standard of education on multiple campuses.

This shows that everything was all in place with WSU's e-learning implementation and it was prepared for rolling out the e-learning platform.

The LTD section, in addition to having those targets for implementing LMS, also developed an e-learning strategic document to assist in achieving the targets. According to WSU (2016), LTD developed a strategy, which had the following key targets.

key targets:

- LTD aimed to make e-learning part of WSU's management approaches by 2019/20
- LTD to be well-recognised by all WSU stakeholders, including academic staff and students as the place to go for e-learning questions
- Have a single web site where students/readers can go to for information about the university, courses and lesson materials by 2019/20
- All students and teachers should be able to use WiseUp by 2019/20
- By 2019/20 all lecturers in their courses should use demonstration tools (such as PowerPoint)
- All lecturers would have to use the WiseUp platform 100% as a learning and teaching tool in the year 2019/20
- Both students and lecturers would have to be exposed to e-learning activities by 2019/20
- By 2019, multi-campus teaching would be achieved by WiseUp and virtual smart boards to encourage better education on various campuses
- Increased constructive learning methodologies in the schools
- Study into the success of the application of e-learning should be carried out
- Through 2019, at least 50% of the university campus would be wirelessly linked to the virtual learning experience (VLE) for employees and students.

WSU's steps taken to make sure that e-learning was used for daily teaching and learning activities were reported. This was supported by the CHE Institutional feedback report (2017), regarding improvements at WSU, a statement in the report addressed what the CLTD department tried to improve for the institution, namely *"The University is, quite rightly, very proud of the work the Centre for Learning and Teaching Development (CLTD) has done and this was confirmed in interviews with different staff groups. The establishment of the CLTD to champion academic development has proved to be a very good decision because this Centre has been successful in designing and implementing structures, systems and processes for academic staff development. However, the wide scope of the CLTD's responsibilities, coupled with human resource challenges, has proved to be a stumbling block in the implementation of the wide variety of teaching development undertakings."*

The report did complement the CLTD's work so far in implementing the e-learning platform to support academic development. LTD also tried means to accommodate 380 staff members that went to unit standard-based train in 2015, using the Teaching Development Grant funds for staff development. The LTD department organised the International Computer Driver's License that catered for 50 enrolled staff members.

Also, WSU provided academic staff members with personal computers and projectors for e-learning to assist the institution to further integrate technology into learning and teaching. With all these motivations by the institution, the report said the progress was slower in using and adopting technology for teaching and learning than anticipated. The report further said that this might have been caused by internal and external issues, such as the institution's poor understanding of their stakeholders, lack of access or funding.

The CHE Institutional feedback report (2017), also applauded the LTD at WSU's initiative. LTD ensured that faculty-based orientation programmes for new students were conducted at WSU. The main objective of this activity was to ensure that new students were introduced to the University's culture and student life, including academic support programmes. This period allowed the LTD and other academic supporting departments to introduce themselves and provided the new students with a broader view of what they offered. Usually, the library supporting department accompanied the LTD department. When lectures commenced the academic department heads sent students to the library and the LTD for specialised computer skills' programmes and training.

In terms of academic staff awareness, according to the CHE Institutional feedback report (2017), new WSU staff members, when they joined the University, were offered an induction programme, which was not compulsory. The LTD department requested a list of new appointees from department heads' offices

and the Deans. The LTD department would then ask the HODs for the release of the new members for a specified date for the induction meetings, where the department would introduce their way of working to assisting the University's academic curriculum and e-learning platform.

The focus of this induction was institutionally-based whereby the Human Resources department addressed general HR matters and then the CLTD would have a slot for its representatives to induct academic staff members about the operations that LTD was responsible for. The LTD department would motivate and advise the staff members to register for the professional excellence programme consisting of four Short Learning Programme (SLP) modules. According to WSU (2016), the SLP was approved by the Senate, to be offered as from 2013. Capacitating e-learning would enable lecturers to use it as a vehicle for curriculum responsiveness and redesign, as, on the other hand, they were trained in Outcomes-Based Education (OBE) principles and Material Development techniques by the Continuous Professional Development Unit (CPDU).

With all that in place for e-learning strategies, implementation plans to support the e-learning usage and the adoption of the CHE Institutional feedback report (2017), it was suggested that at WSU the evaluation and monitoring of teaching should be a Key Performance Area for HODs and Deans. This meant that they should be able to report on whether the tool WiseUp was even doing what the management expected. The report further said that this was an ongoing process as this suggestion was built into the HODs' training. Monitoring, evaluation and reporting of learning and teaching constituted one of the key performance areas for all levels of academic leadership and management (HODs, Faculty Deans and Campus Rectors). The report said that as of then the challenge was to ensure that WSU's management carried out this critical role as required.

In promoting awareness at the institution, according to Mayisela (2014), the lecturers were trained at the basic and intermediate stages of e-learning and lecturers were continuously assisted with e-learning expert mentoring sessions. In 2010, there were 328 active courses and 586 in 2011, where lecturers had submitted content and students engaged with learning materials. Five outreach activities and three e-learning conferences were organised, in which trained lecturers presented best practices in e-learning and foreign participants exchanged their expertise and experience.

WSU indeed tried to encourage the students to adopt and use e-learning. According to Mavuso et al., (2019), nearly 1000 students from WSU's four campuses benefitted from a multi-million-Rand tablet project, designed to improve teaching and learning in the institutions' extended qualifications. Lecturers and students using these tablets in the lecture halls made information distribution easy. The research found that students benefitted from the tablet's portability and considered it a large asset helping them

to carry and access their notes everywhere. Another advantage was the freedom to perform their assignments, even though they were not on the University premises.

WSU encouraged the stakeholders to use WiseUp and the LTD department from the different campuses marketed WiseUp using Facebook, which the students liked most.

This was one of the strategies that the university embarked on. Some of the pages created as a marketing strategy for WiseUp are shown in figure 26, representing three campus sites, namely Mthatha-NMD, Mthatha-Zamakulungisa and Queenstown Campus.

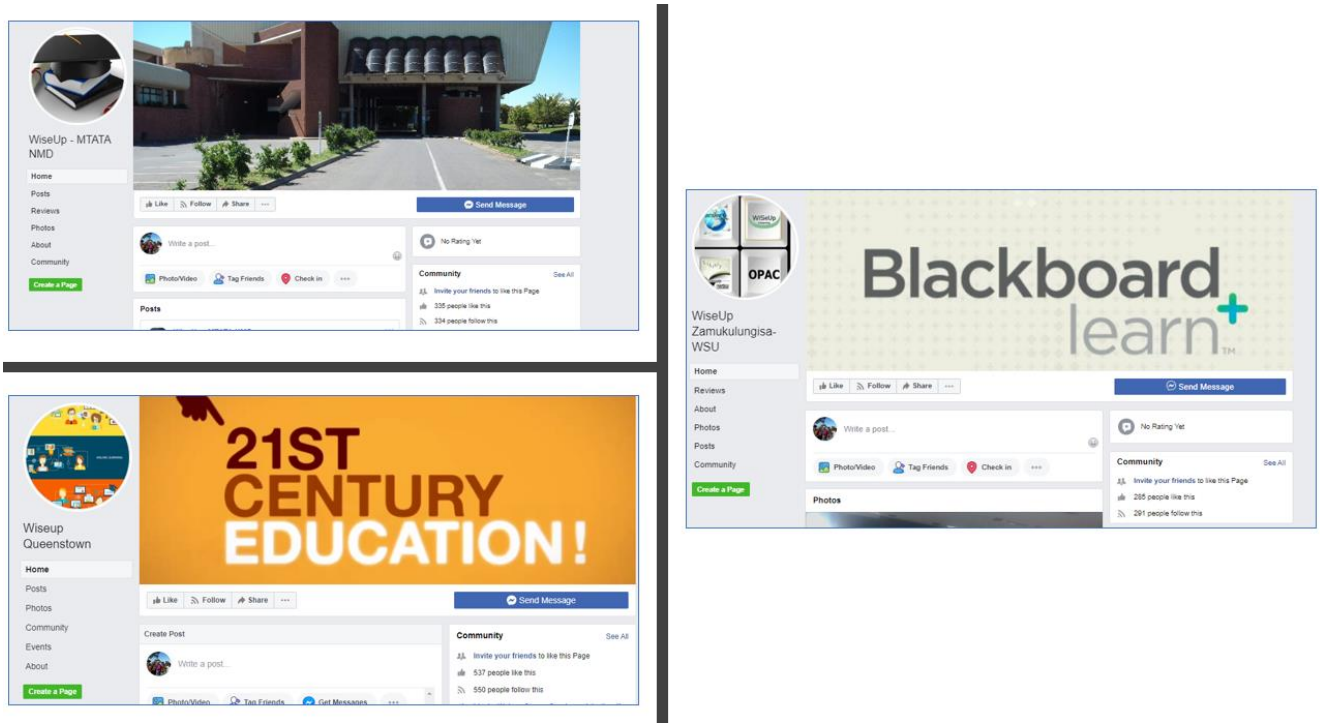


Figure 26: WiseUp Facebook pages per campus.

6.5 Applying the SAMR Model

The results from the above sections revealed that something was done at WSU regarding the pedagogical integration of ICT. In this study, the SAMR Model by Puentedura, (2012), was used to check the integration of technology for learning and teaching according to the model's four levels. According to Puentedura, (2012), the ICT adoption and usage could fall on these different levels, namely Substitution, Augmentation, Modification, and Redefinition of the SAMR Model. This model was found to be suitable because it had a unique way of describing the relevant stages of ICT integration into learning and teaching and it was developed based on the teaching and learning integration processes into ICT, which is the core of this study.

6.5.1 Substitution

According to Aprinaldi, Widiaty, and Abdullah (2018), the substitution level was the lowest of the SAMR Model. In Substitution, the technology substituted the previous tools without changing their functions. In this study, using this level would check whether any related statements might fall on this level at WSU's technology integration of learning and teaching.

According to Jude et al. (2014), the Substitution level implied the organisation's efforts to replace manual traditional ways by using technology-based activities of learning and teaching, with no functional improvements in the function, for example, to replace old typewriters with Microsoft Word. The WiseUp Usage Logs in figure 23, did show that WSU had started using the Learning Management System to change traditional classes into electronic classes, usually classes with low student numbers.

According to WSU (2016), LTD had a section named Materials Designer (MD), with a role to assist lecturers to integrate multimedia elements into the teaching, learning and research material on WiseUp. The MD also planned the course layouts, which could in the long term, be standard for all WSU courses. Other role players at LTD also included an e-learning administrator and e-learning specialist, whom the administrator assisted with administrative and technical activities and this as it started had not stopped its continuing activities for the institution. For those tasks beyond their knowledge and skills, they would seek assistance from the ICT Services department. The MD assisted lecturers to integrate multimedia elements into the teaching, learning and research material. This process was on this level because the activities that involved these role players were a result of the Substitution level in the SAMR Model, having content that used to viewed on traditional chalkboards and then having it accessible online via the WiseUp e-learning system.

The enrolments of WSU were 33638 in 2019, but when checked on WiseUp the active users were limited to only 1561. The university used the system for students to access reading material as supported by WSU (2016). The LTD strategy said that the implemented e-learning electronically accommodated students with the submission of assessments, which usually needed a student to sit down and read the question paper and write down answers. This process was now substituted by WiseUp, where lecturers prepared assignments and posted them online and students would answer and submit online. Thereafter the feed-back mechanism would kick in to enable students to check their scores online.

The Substitution level was indeed demonstrated by these results, which revealed that the institution did move through this level of technology integration to teaching and learning, when WiseUp was

deployed and lecturers used it for reading material instead of printing and distributing it to students. Lecturers would upload assignments on WiseUp for students to answer and submit.

Figure 27 below, is another demonstration of WSU's usage of technology for their notices to students. This was supported by Mgweba (2017), saying that social media and technology use for communication purposes within WSU, had grown drastically. The study found that the participants preferred using social media platforms for communication. This was also an indication that when the SAMR Model was applied, the University had components on the Substitution level, therefore Facebook pages were created for marketing and publicising relevant e-learning communication.

Figure 27: WSU Notices

6.5.2 Augmentation

Jude et al. (2014), interpreted Augmentation as the level whereby technology was used to substitute traditional ways of teaching and learning with small functional improvements. An example in-learning and teaching would be whereby the organisation would use a Microsoft Word processor to substitute a typewriter. The organisation, in the process of deploying the word processor, activated the functionality of a spell checker to remove finger error typos from the typed document, either for notes or for assessments.

WSU, since the deployment of WiseUp in 2009, provided the use of a collaborative tool. According to WSU (2018), the WiseUp platform was improved so that students could collaborate on their group work. The LTD team called LTwT said this improvement would allow students to collaborate using features, such as video-conferencing, which came with the upgrade and virtual class conduction.

On this level of the SAMR Model, the **augmentation** existed because the LTD department improved WiseUp by adding additional functional improvement from the initial substitution of having online reading material and assignments submitted online. In the current situation, students were able to collaborate their work online, using the recently installed collaborative tool in 2018. Figure 28 demonstrates the tool interfaces.

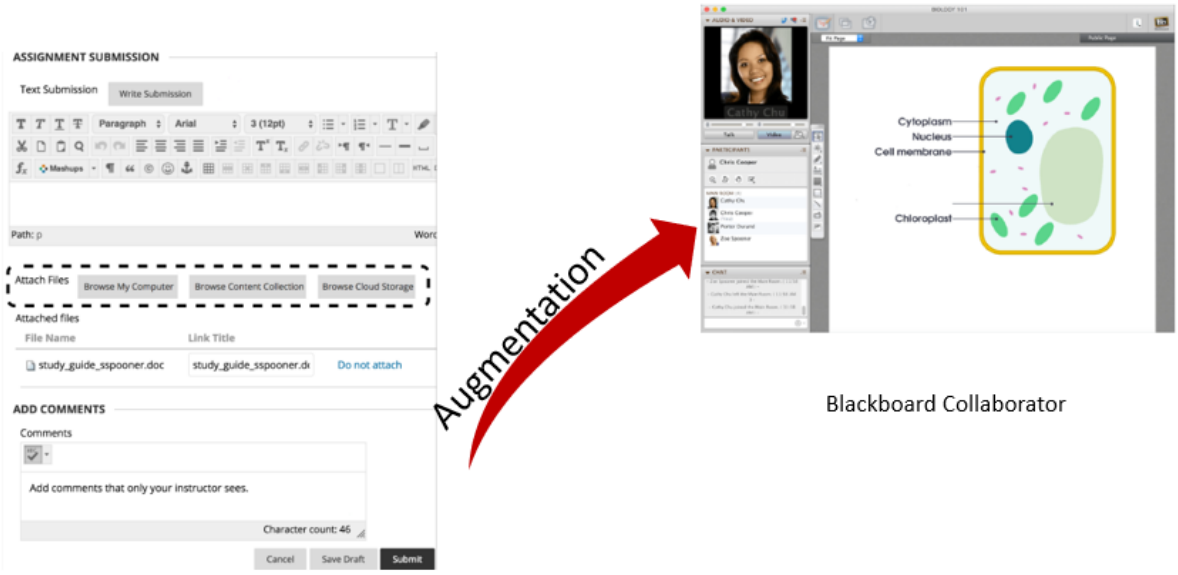


Figure 28:Collaborator tool

No evidence on the tool usage was found even though it was confirmed that the tool was deployed.

6.5.2 Modification

According to Puentedura (2012), the Modification was whereby technology allowed for significant task redesign.

The study's findings revealed that WSU did improve WiseUp and redesigned the way the students were used to access the WiseUp-loaded reading material. According to WSU (2018), the LTD department deployed a Blackboard-mobile app that could be downloaded on Google Play or the app store, to ensure that the students were encouraged to use the system at their comfort anywhere and anytime. Figure 29 shows the mobile app's different interfaces and the web browser interface.

This shows that WSU did much but according to the WiseUp logs it was not yet enough. This shows a partial technology integration into teaching and learning at WSU, which confirmed a level of Modification as per the SAMR Model.

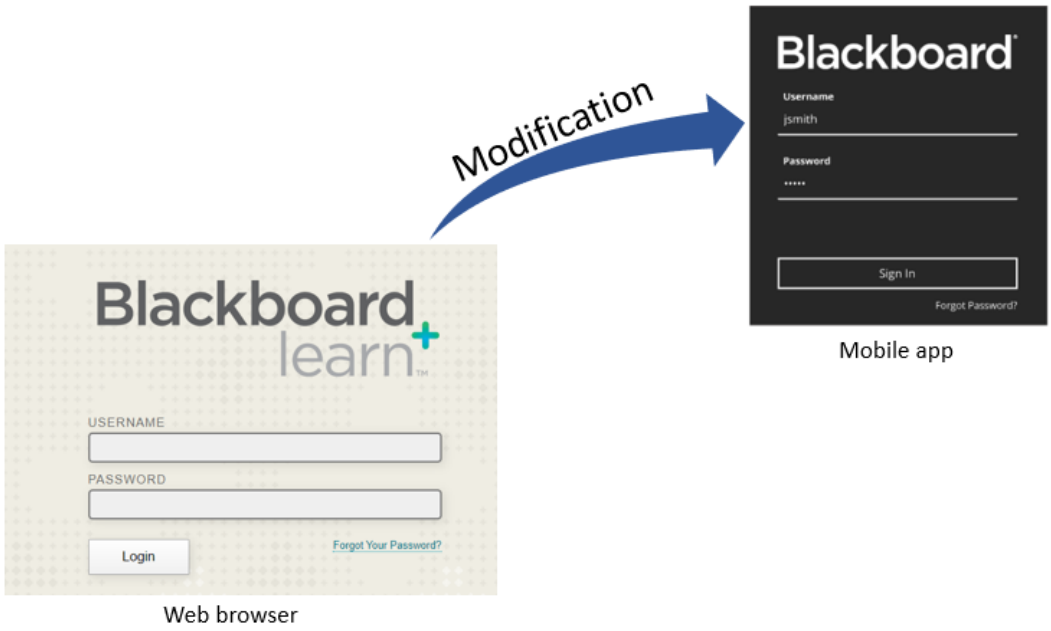


Figure 29: Blackboard (WiseUp) Mobile App

6.5.3 Redefinition

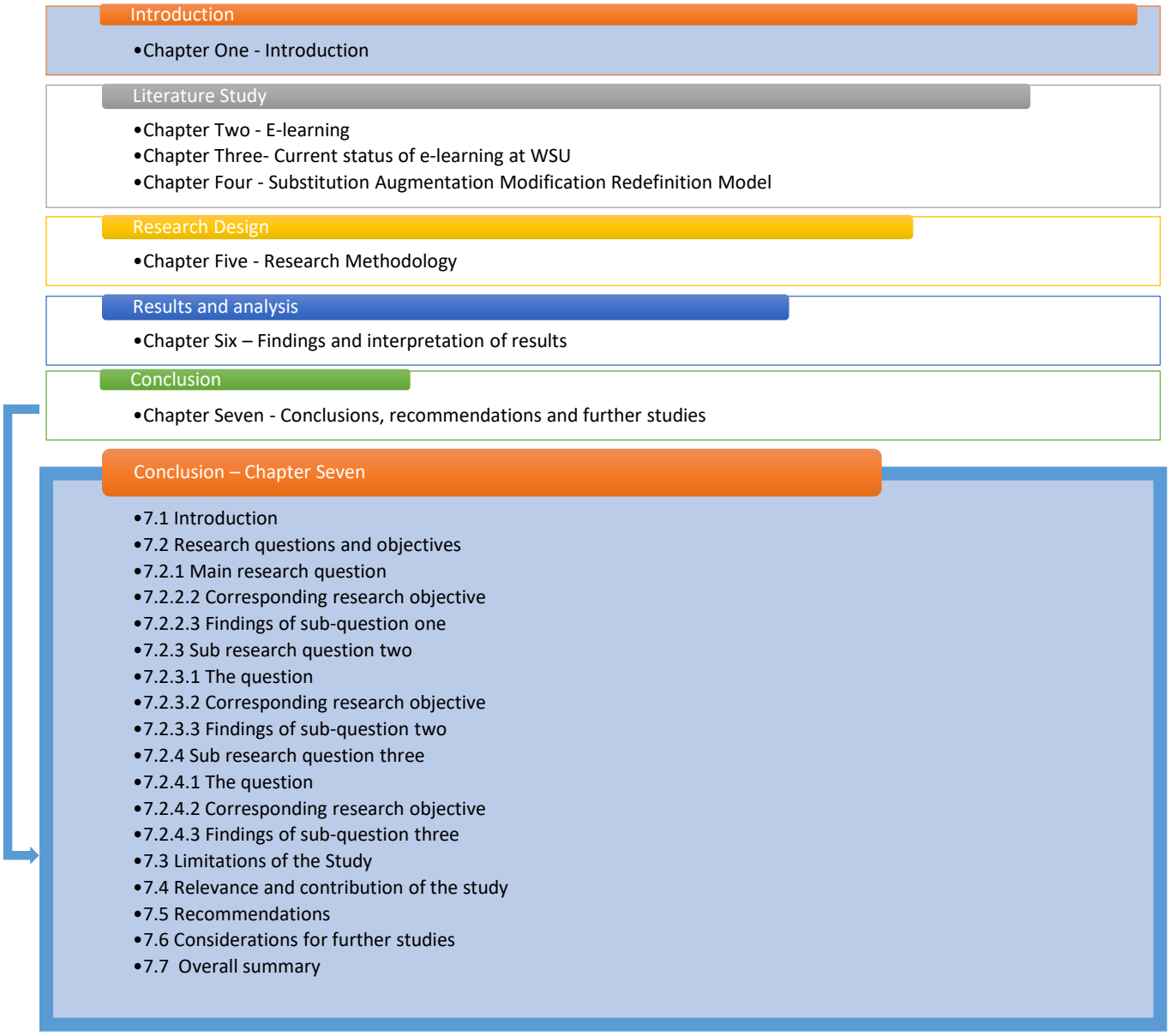
According to Puentedura (2012), at the Redefinition stage, technology allowed for the creation of new tasks, previously implausible. At this stage, WSU was not yet on this level, as it was still trying to bring everyone on board into adopting and using the Wise-Up adopted e-learning platform. WSU, according to the study results, was slowly but surely trying to have stakeholders adopting and using the system.

6.6 Conclusion

The study's findings were discussed and analysed in this chapter. When discussing the findings, the researcher ensured that the results were linked back to Chapter One, where the research and sub-research questions were discussed at length and using sub-sections relating to Chapter One. The use of WiseUp logs and WSU e-learning usage publications, including the available WSU e-learning documents, informed the discussion of the findings.

The researcher indeed applied the SAMR Model to ascertain where WSU's integration of ICT to teaching fell within the SAMR Model levels. The chapter revealed that WSU was mostly on the Enhancement level of ICT integration into teaching and learning. It also revealed that the WSU's adoption and usage of e-learning were still very low, according to the different methods the University used with some effort.

Chapter Seven



7. Conclusions, recommendations and further studies

7.1 Introduction

The previous chapter discussed the results and analysed the data gathered for the study. The study used the SAMR Model to evaluate WSU's level of technology integration into teaching and learning, with the focus and objective of extracting what the data revealed from the different methods. The different data gathering elements involved a quantitative method and the WiseUp (Blackboard) access logs and the e-learning policy documents. These were accompanied by the Department of Higher Education reports on the current status of WSU's e-learning and the LTD department's achievements at WSU and what needed to be done further.

The SAMR Model's four levels of technology integration into teaching and learning were used to determine the status of WSU's technology adoption and usage. The levels of the SAMR Model, which are Substitution, Augmentation, Modification and Redefinition, were analysed in the previous chapter and a finding was established on which levels of technology integration into teaching and learning the University fell. In the following sections, this will also be discussed according to the study's research questions and objectives.

This chapter aims to visit the main research problem that the study proposed to address in Chapter One. This chapter provides a conclusion regarding the sub-questions of the study, as well as a detailed view of how the study's objectives and sub-objectives were addressed.

The chapter also shares a few limitations that the study identified, as well as the study's relevance and the value it adds to the already available body of knowledge.

Later in this section, recommendations, based on the results and analysis, will be provided. These will be of large assistance to Walter Sisulu University and to any university that wishes to apply the SAMR Model for e-learning adoption and usage. This chapter also provides a section that elaborates and highlights some considerations for further studies, just before the study's overall summary, the closing section.

7.2 Research questions and objectives

The following subsections are each broken down as per Chapter One, with the main research question and the sub-questions. Each sub-section interlinks with Chapter One and shares the results drawn from the previous chapter, analysing the results of the study's findings. These are followed by the closing remarks to provide a clear understanding as to whether the study addressed the posed research problems as well as the sub-research questions.

7.2.1 Main research question

The study focused on applying the SAMR Model for the adoption and usage of e-learning at Walter Sisulu University situated in the Eastern Cape; therefore, the study's main research question is as follows:

"How can the SAMR Model be applied to enable e-learning adoption and usage at WSU?"

As a result of the research question above, the researcher had to look into the current practices, including the tangible evidence that the University was indeed able to apply the model for teaching and learning integration into technology.

Hereafter, as the result of the study's approach, the main objective and main question answered is:

"To apply the SAMR Model to enhance e-learning adoption and usage at WSU"

In the previous chapter, the analysed results revealed that when the SAMR Model was applied at WSU, the University's technology integration into learning and teaching in terms of the levels in the SAMR Model by Puentedura (2012), fell between the three levels. These levels included the bottom basic levels of **Substitution, Augmentation and Modification** of technology integration into teaching and learning. The results revealed that the University was mostly in an **Enhancement level** of the SAMR Model.

- **Substitution:** Chapter Six revealed that according to the WiseUp Usage Logs, WSU had started using the e-learning Management System to supplement traditional classes using WiseUp. These classes were usually done before using normal face-to-face ones but now some classes used WiseUp. This showed that WSU had a technology integration into teaching and learning related to the **Substitution** level. The researcher, according to the results in Chapter Six, noted that the University stakeholders' actual usage was still at a low level as per the WiseUp logs. The LTD section was equipped with several ready to serve specialists who assisted the University in making sure that the institution's e-learning adoption and usage did grow.

  According to WSU (2016), LTD had a section, named Materials Designer (MD), which role was to assist lecturers to integrate multimedia elements into the teaching, learning and research material into WiseUp. The MD also planned the course layout, which could in the long term, be standard for all WSU courses. Other role players at LTD included an e-learning administrator and e-learning specialist, assisted by the administrator who dealt with administrative and technical activities. This LTD department's process was done at this level because the activities that involved these role players were a result of the **Substitution** level in the SAMR Model. Content that used to be viewable on traditional chalkboards was now accessible online via the WiseUp e-learning system.

- **Augmentation:** The study did reveal that WSU made some improvement in technology, which was how Puentedura (2012) described the level, where technology acted as a substitute with a

few functional improvements in teaching and learning using technology. According to WSU (2019), in recent years up to 2018, since the platform was deployed in 2009, WiseUp was improved. WSU's LTD department added improvement that would have allowed students to also be able to collaborate among themselves using features such as video-conferencing, which came with the upgrade and presenting virtual classes. Regarding the purpose of this study, however, there was no evidence that the virtual classes and video conferencing were taking place, but the infrastructure was there.

According to Dwayi (2011), WSU also introduced Blackboard Analytical Tool (BbAT), and the enhancement was installed at WSU to allow the university's users to see the usage of Blackboard. The added improvement of the collaboration tool, which was added on top of the initially configured features of normal submission of assignments on the platform, was an indicator that the University had represented the **Augmentation level** for teaching and learning integration.

- **Modification:** According to Puentedura, (2012), the modification is whereby technology allowed for significant task redesign. Based on the report's results, it was found that WSU had enhanced WiseUp and revamped the way that students accessed WiseUp loaded material and reading content to be able to use the Mobile App. According to WSU (2018), LTD made means of ensuring that students were able to use the system in their comfort zone at any time. The department had introduced a Blackboard-mobile app that could be downloaded from the Google Play or app store. This finding indicated that the University had a bit of technology integration that fell into the **Modification level** of the SAMR Model.

7.2.2 Sub-research question one

7.2.2.1 The question

The rates of current e-learning usage at Walter Sisulu University were discovered by using this sub-question below, which is:

"What is the current e-learning usage rate by WSU stakeholders since it was implemented?

7.2.2.2 Corresponding research objective

The corresponding research objective of sub-question one is: To establish the extent of e-learning use by WSU stakeholders.

7.2.2.3 Findings of sub-question one

The study revealed that LTD played a huge part to encourage e-learning adoption and usage among the WSU stakeholders. According to the CHE Institutional feedback report (2017), WSU received some grant from the Department of Higher Education called the 'Teaching Development Grant'. WSU LTD section made use of the grant to enhance academic staff development in teaching practices, assessment and modernisation of teaching and learning. LTD department in 2015 sent 380 staff members to unit standards-based training. A total of 50 staff members enrolled for the International Computer Driver's Licence.

The University's LTD provided the staff members with personal computers and projectors for e-learning, further enhancing and promoting the integration of technology in teaching and learning. The students from the extended programmes received tablets (smartphones). The report from the Department of Higher Education indicated WSU's lower than expected usage rates of educational technology in teaching and learning.

The low e-learning adoption and usage revealed in the previous chapter supported and confirmed the CHE Institutional feedback report, (2017) statement. The WSU WiseUp access logs revealed that the WiseUp e-learning usage rates were very low. A total of 33638 students were enrolled in 2019 of whom only 1561 were active on the WiseUp e-learning platform, a very low percentage of 4.6 %. This then means that the sub-question was addressed in Chapter Six. The conclusion for this sub-question was that the university e-learning usage rates by WSU stakeholders were very low.

7.2.3 Sub research question two

7.2.3.1 The question

The findings of sub-question one revealed that WSU still had a low adoption and usage rate, regarding the e-learning integration into teaching and learning. This resulted in sub-question two related to this section to be answered, which asked:

"What are the current challenges experienced by WSU resulting in low e-learning utilisation?

7.2.3.2 Corresponding research objective

The corresponding research objective of sub-question two was to investigate the current challenges that WSU stakeholders experienced resulting in a low e-learning utilisation.

7.2.3.3 Findings of sub-question two

The findings, according to this sub-question two, have revealed that according to the CHE Institutional feedback report (2017), the institution did not yet have a formal approved structure to monitor its performance, which would be the one to assist in checking whether the WiseUp implementation had any contribution in teaching and learning. This was because the report stated that executive management signed the approval for conducting performance management. The report noted performance management was at that time not yet filtered down to the lower levels and relevant University stakeholders.

The report said that the University was still in consultation with other universities, including Rhodes University, about the evaluation of teaching and learning in the classroom. WSU was also involved with ways of learning regarding the Dutch systems, working with Nuffic. The report also noted that the University suggested that the evaluation of teaching should be a KPA for HODs and Deans and did work on integrating this suggestion into the HODs' training.

When it came to universities, the monitoring, evaluation and reporting of teaching and learning, created one of the important performance parts for all levels of academic leadership and management (HODs, Faculty Deans and Campus Rectors). The report found that WSU was still challenged to ensure that this important function was carried out properly, for the University to be able to adopt and use initiatives brought by WSU's ICT and LTD. These two departments as enablers needed the University management's support. This finding by the CHE was critical because the University needed management to commit to their sections' policies to be enforced, otherwise, no smooth teaching and learning integration growth would be happening.

According to Mgweba (2017), WSU was facing challenges regarding standardising the communication channels from top management to the operational level. The research revealed that students preferred social media for communication, which had grown drastically. WSU, for internal communication, used email, notice boards and the website, including social media, as communication tools for students and

staff. However, the University did not consider that not all stakeholders were familiar with those platforms.

WSU WiseUp users were still not all using the platform, as some of the students' knowledge and understanding of WiseUp were very low; some had only been trained on how to use the programme and since then, never used it (Mafuna & Wadesango, 2012). According to Mayisela (2014), lecturers feared the introducing of WiseUp, saying it could reduce face-to-face contact with their students, something they had been familiar with for years. Development of the system's material was time-consuming according to the participants, staff lacked IT skills and the study also revealed top management's lack of support in terms of workload distribution.

Lecturers complained about the standard of the computers they used, saying these were not in good condition and internet downtimes were also identified as a challenge. The lecturers were concerned regarding accessing the online material and mentioned that WiseUp training schedules would simultaneously take place with their periods of classes, which resulted in a lack of training (Mayisela, 2014).

Another issue is part of the challenges of utilising the e-learning platform at WSU as per sub-question two. WSU, when implementing or deploying a new system, should consider the change management aspect, as supported and emphasised by Dwayi (2011), who said change was a complete, homeostatic process that involved many inter-reliant components. These had to include the system users as all the affected stakeholders had to be consulted when a new system was adopted. From the system's perspective, successful, change management should result in improved relationships between the facilitating and the client systems, a unity of purpose, alignment, resource utilisation, discovery, and transformation.

7.2.4 Sub research question three

7.2.4.1 The question

Sub-question three addresses some of the problems that resulted in the previous sub-questions because for any organisation to have any end-users using and adopting the system, policies and procedures were needed to guide the user about the adopted or implemented system in the organisation. This section intended to reveal the WSU's role in making sure that the University used and adopted WiseUp, therefore, the sub-research question related to this section asked:

"What are the e-learning adoption and usage strategies used at WSU to encourage staff and students?"

7.2.4.2 Corresponding research objective

The corresponding research objective of research sub-question three was the evaluation of e-learning adoption and usage strategies used at WSU to enhance the staff and students' usage of e-learning.

2.4.3 Findings of sub-question three

The University introduced several initiatives to make sure that the e-learning adoption and usage were enhanced. In Chapter Six it was revealed that the University in its e-learning strategic document according to WSU (2016), had some timelines three years regarding where the University wanted to see itself. Some targets were not reached, but only partially.

According to the CHE Institutional feedback report (2017), the University made sure that induction was done for new staff members, which was not compulsory. The LTD section with the help of the faculty's Dean/HOD, obtained a list of newly-appointed academic staff members and conducted training and introduced the department's operations offered for teaching and learning. The LTD department also ensured that staff on the day of training was motivated to take part and register in the Professional Excellence Programme. The LTD was applauded in the report of the Department of Higher Education as it was accompanied by the library, another WSU teaching and learning supporting department.

These two departments organised and gave first-year students a walkthrough into the university's life, culture and available operations they offered. This orientation continued with these two sections requesting times from the HODs, to offer computer-related courses and training programmes to the students, after the classes started. LTD also ensured that mostly final year students were employed as student laboratory assistants, to help students in the laboratory and to keep it up to standard. Any computer that the assistants could not assist with troubleshooting had to be reported to the administrator and assistants had to ensure that attendees completed the attendance register.

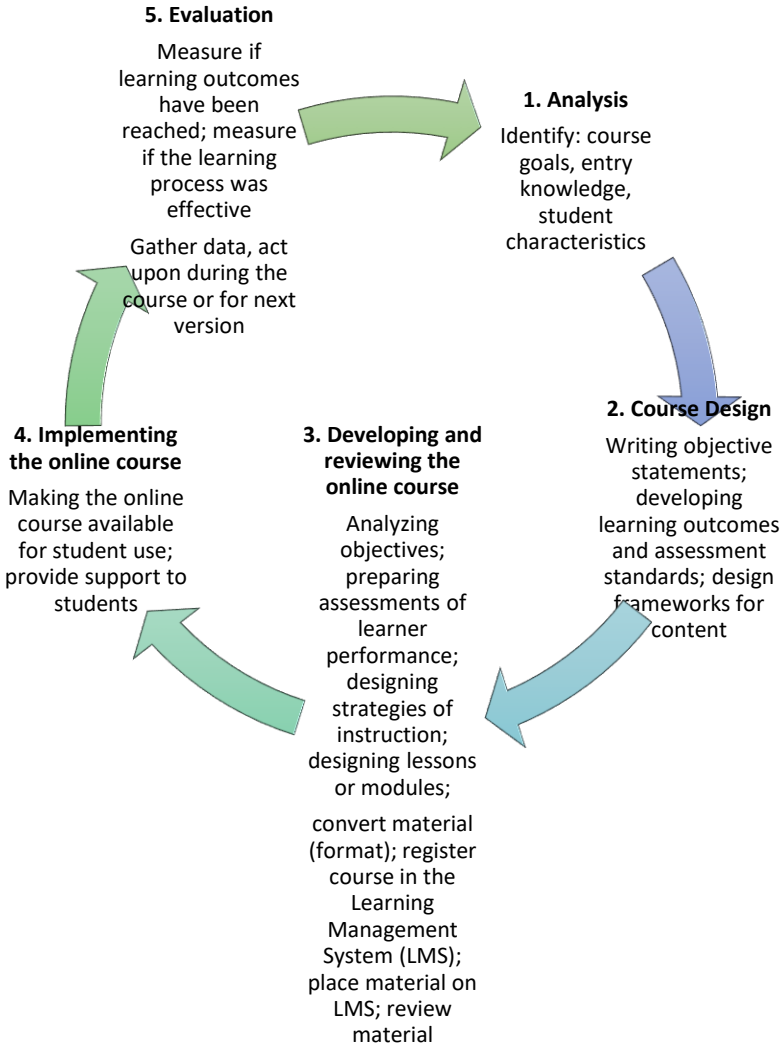


Figure 30: instructional design model

The LTD department had an instructional design model demonstrated in figure 30, which shows the steps to be taken relating to the instruction to loading online course material content on WiseUp, which followed a cyclical design model. The University did not have a model to assist them in technology integration into teaching and learning, hence the researcher's proposed study.

The steps in figure 30 form a procedure that had to be followed when one prepared and uploaded online content to WSU's WiseUp e-learning platform. This was another initiative done to encourage the lecturers to use the system.

7.3 Limitations of the study

This dissertation has the following limitations:

The study was conducted with a sample of WSU active users within the Blackboard platform and the headcounts of WSU enrolments, which was the study population, as the study did not have questionnaires.

The study focused on the core data that related to the e-learning adoption and usage at WSU and there was no interaction with participants in terms of data collection. The study did not include interviews.

The absence of questionnaires was the study's most identified limitation, as questionnaires would have provided an in-depth understanding of both logs and users' views of the system. In this case, as illustrated in the research methodology, previous researchers gathered data using interviews and/or questionnaires. The researcher, in this study, decided to work with the University's core data relating to the use and adoption of e-learning rates at WSU, as the saying goes: "Data never lies".

The study also did not focus on the graduation rates as from the year that the e-learning platform was deployed at WSU, which would have also shown the impact of the adoption and usage rates and this could be considered by other studies after this research. This study, after the researcher analysed the WiseUp logs, focused on applying the SAMR Model to the University, as to measure the level that the institution was at in terms of the e-learning adoption and usage.

The study, in applying the SAMR Model to WSU, to enhance the e-learning adoption and usage, did not include the checking of the relevant system integration that contributed to teaching and learning. The WiseUp platform was, for example, fed by the institutions' ITS (Integrated Tertiary System) system, which WSU used as their ERP system. The study did not include the systems' integration process from registration to writing examinations, as the focus at that stage was not there yet, according to the WiseUp access logs. The logs revealed that the institution had to do more about the adoption and usage rates of the Learning Management System that was deployed for supplementing daily teaching and learning activities at WSU since 2009.

7.4. Relevance and contribution of the study

According to the study's literature review, it was noted that very little research had been conducted on South Africa universities that focused on using a model to measure their e-learning adoption and usage. The application of the SAMR Model, which assisted in technology integration into teaching and learning, when applied to an organisation, according to the literature, was the best way. This is because when the model is used, there would be a transparent view of the level on which the integration technology

into teaching and learning technology fell, and this would enable the management to respond as early as possible and perform the necessary interventions.

If WSU could adopt and use the SAMR Model, the study's findings could assist the University in making sure that they try ways to move up from the current levels of technology integration, which were at most, on the Enhancement level. A small number of literature studies related to the application of the SAMR Model to e-learning integration into pedagogy at South African universities. This means the study will be contributing to the small body of knowledge currently available.

7.5. Recommendations

The study focused on the active users, courses and page views of WiseUp, which were from the installed plugin from Blackboard, known as the Blackboard Analytical Tool (BbAT). The study was conducted over two years, 2018 to 2019. For the further improvement of the study, it would be recommended that this should be broader explored and that the time span should cover the stage from when the system was deployed up to the present. The LTD department would need to invest more on advancing the Blackboard Analytical Tool (BbAT) so that they could monitor the number of clicks per student per qualification, as well as access the times spent on a specific course or forum on the e-learning platform. In this way, they could see the most visited types of content on the system, by obtaining analysed data represented in a graphical format. This could also be used as a presentation to the Deans and HODs because the intention of the system's deployment was to make sure that the University produced a large number of graduates with the system's help.

The researcher recommended that the university made use of the SAMR Model, applied it at WSU and add it to the e-learning strategic policy, which would be a baseline for teaching and learning technology integration. By doing this, the relevant stakeholders would be responsible and ensure that they played their part and the e-learning strategy set targets would be reached with the SAMR Model alignment in their minds.

7.6. Considerations for further studies

A number of considerations could be applied if a study of this type were to be repeated, based on the analysed data and results. If ever the study would be expanded, the most critical aspects that needed to be considered are as follows: This study did not involve questionnaires and interviews; therefore, one would have to add these to provide a broader understanding of what the users would recommend for further system improvement. This would also assist the WSU management to improve WiseUp, which

this study might have left out. Even more detailed information would have catered for more components of the logs, besides only focusing on the active courses and users on the WiseUp system. At the time of the study, these seemed to be the only logs used for this study, but hopefully, in the near future, the current version of WiseUp would have been upgraded.

It is suggested that a future study would cover a longer testing period of the adoption and usage of e-learning at WSU, rather than two years, such as 2018 to 2019 in this case, which might have been insufficient to determine the previous years of usage. This might even have assisted the management to see whether investing in the system was worth it. Maybe they would even have to benchmark WSU against other universities, who had successfully implemented and adopted the use of the current available LMSs. This would provide future researchers with a clear view right from the start when WiseUp was deployed for use at WSU.

The researcher felt that if the SAMR Model was identified as a suitable model, WSU's low adoption and usage of e-learning would have substantially improved. The researcher also revealed that if he was to choose another Model besides the SAMR Model, according to the literature, the researcher would have chosen the TAM Model. Park (2015), said TAM was the best tool to be used when an organisation faced the challenges of low e-learning usage, such as those at WSU. This model assists the organisations in explaining and understanding the behavioural intention of users to use and adopt e-learning. Similarly, Suryawanshi and Suryawanshi (2015), said when TAM was applied, the users' behaviour determined the actual system acceptance. External factors sometimes might have caused the users not to use the system and to have negative attitudes against its usage. This would have been a good model to check and drill down to the users and obtain the cause of negative behaviour against using and adopting e-learning.

7.7 Overall summary

In conclusion, the aim of this research study was to answer the question, "How can the SAMR Model be applied to enable e-learning adoption and usage at WSU?" At the very end of the study, after looking at the study's literature review, research findings and analysis, the researcher concluded that the use and adoption at WSU were still at a low level. This was supported by the system's WiseUp access logs, which revealed that the system's number of active users, was very low. This was based on the fact that 33638 students were registered at WSU in 2019, compared to the active users found on WiseUp, which were only 1561, revealing that the University still needed to do much towards e-learning adoption and usage.

It should be noted that WSU was using ways to encourage the students to adopt and use WiseUp, and as a result, according to Mavuso et al. (2019), WSU supplied the extended programme students with tablets to assist them to access the WiseUp platform in their comfort, anywhere and anytime, but this seemed to be not enough as per the findings of Chapter Six.

The study, as it applied to the SAMR Model for enhancing e-learning at WSU, revealed that the University was situated at the lower levels of technology integration into teaching and learning, according to Puentedura (2012), whose model had four levels of technology integration. When the SAMR Model was used, an organisation could be measuring its adoption and usage rates of technology for the purpose of teaching and learning for students and academic staff members. The SAMR Model has four levels divided into two main phases, namely Substitution and Augmentation, which make up Enhancement and after that, the two levels of technology integrations, form the Transformation level, namely Modification and the last top-level is called Redefinition.

According to Chapter Six, it was revealed that WSU was at the **Enhancement level** of technology integration into teaching and learning. This was because mostly the level of technology integration to teaching and learning was found to be in Substitution and Augmentation and a small portion on the Modification level. The researcher noted that the usage was indeed at the lowest level, but believed that the University could use the SAMR Model for enhancing the adoption and usage.

This could be done whereby management would enforce the model to the University and have the stakeholders, namely the relevant HODs and Deans, comply with it, as they were the ones supposed to be monitoring and evaluating teaching and learning. If this model could be implemented at the University and they would ensure that the model was adhered to, it would also help the LTD department with the projected targets of their e-learning strategic policies, which would be reached if the model was used.

It seems evident that as there might be less transparency regarding the adoption and usage levels, this would be a good model to provide clarity and transparency. In concluding the study, it should be noted that the research had reported on the study's relevant results, which were found in the chapter's overall summary. In this chapter, recommendations and limitations were provided, including the improvements that could be made if there would be a need to extend the study. The research had noted that not much literature was published relevant to this study in South Africa, which then meant that this study would contribute to the body of knowledge as described in the contribution section of this chapter.

8. References

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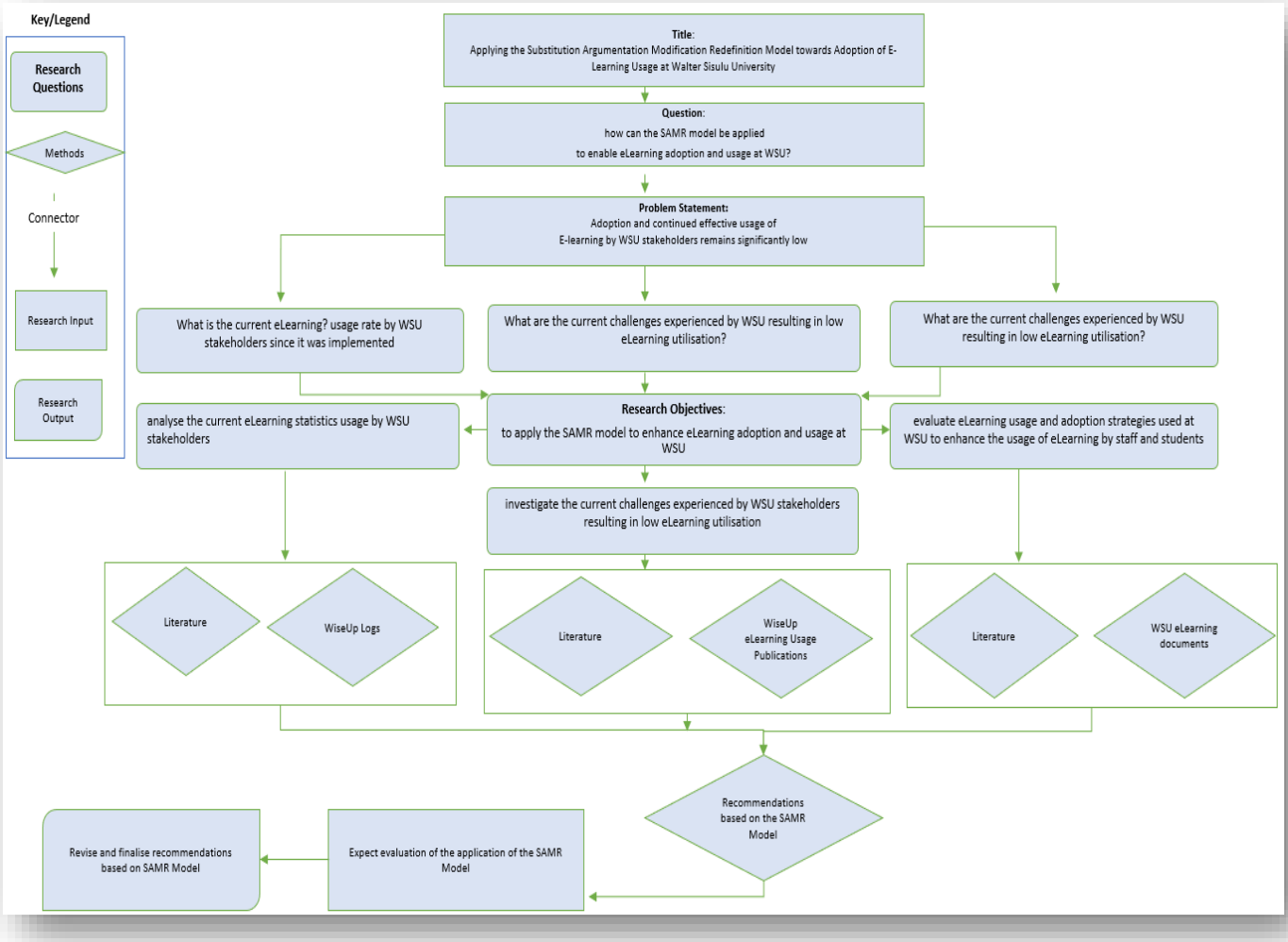
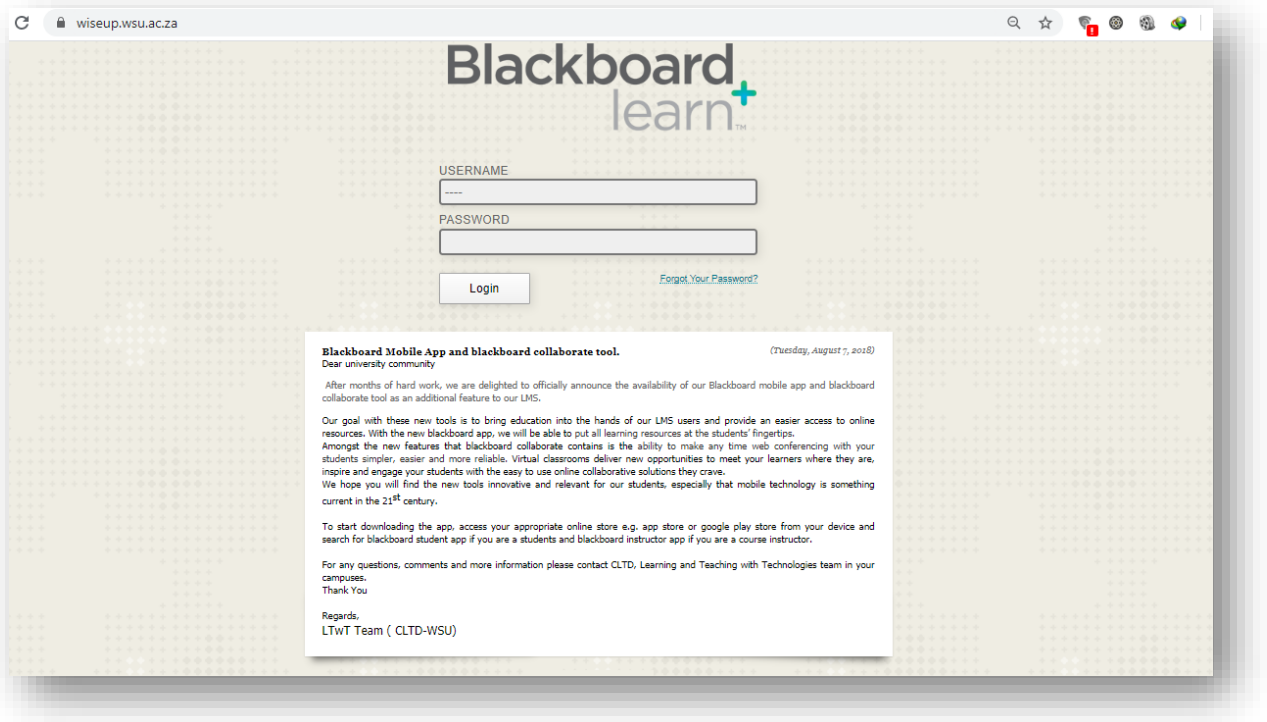
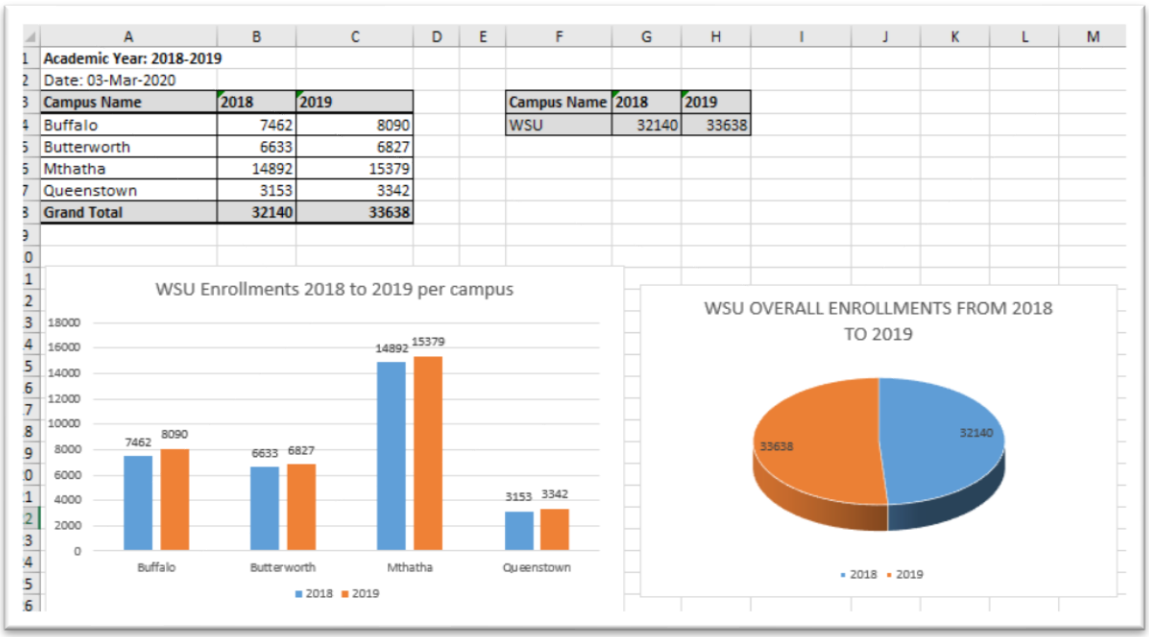
APPENDIX A: Research Process



APPENDIX B: WiseUp



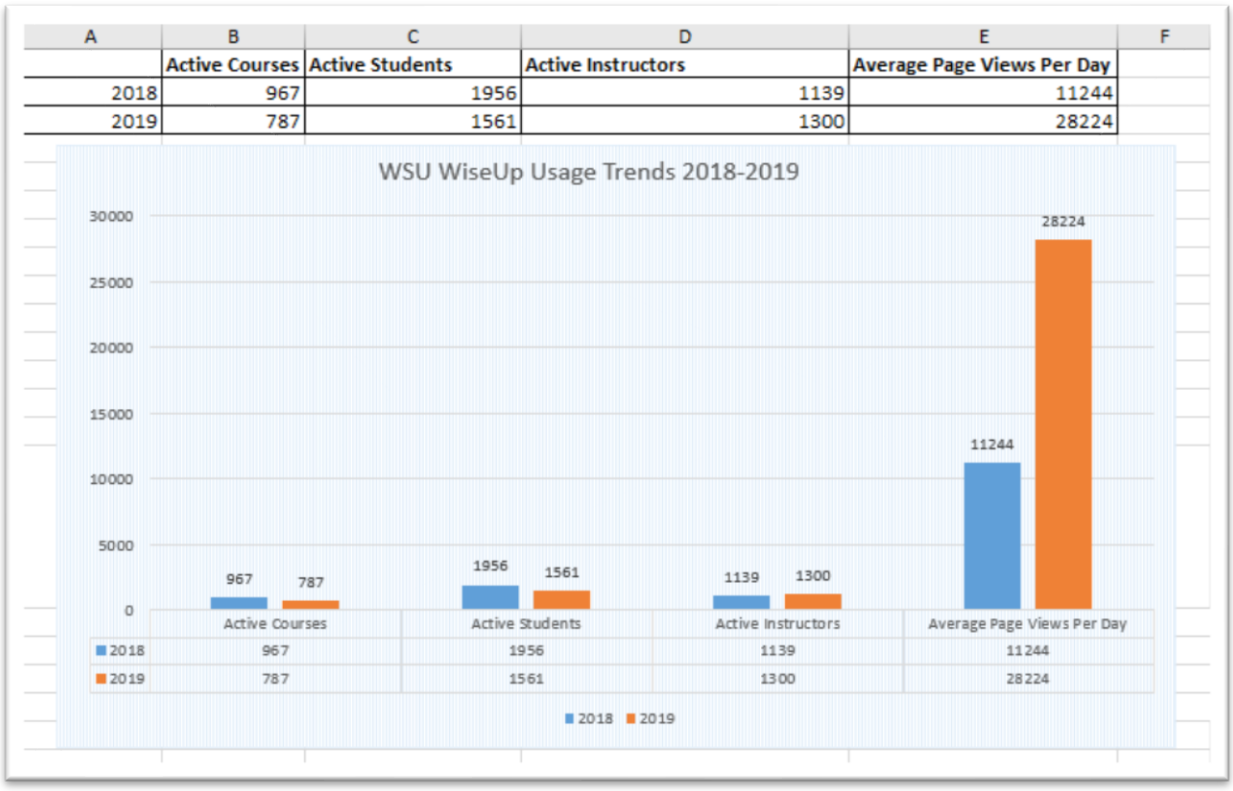
APPENDIX C: 2018-2019 WSU Enrolments



Academic Year: 2018-2019		
Date: 03-Mar-2020		
Campus Name	**2018**	**2019**
Buffalo	7462	8090
Butterworth	6633	6827
Mthatha	14892	15379
Queenstown	3153	3342
Grand Total	**32140**	**33638**

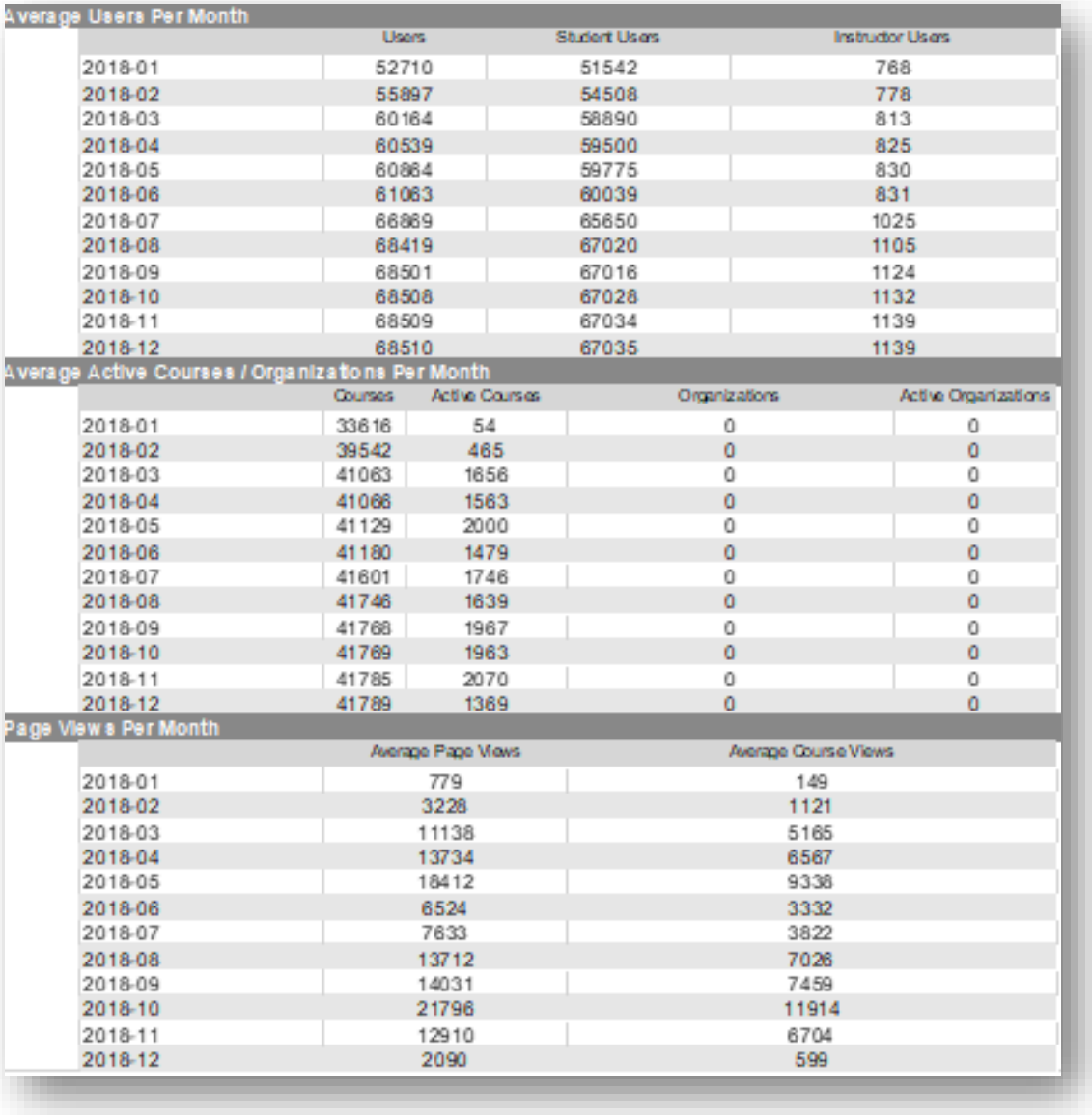
Campus Name	2018	2019
WSU	32140	33638

APPENDIX D: 2018-*2019* WiseUp logs



	Active Courses	Active Students	Active Instructors	Average Page Views Per Day
2018	967	1956	1139	11244
2019	787	1561	1300	28224

APPENDIX E: 2018 Monthly WiseUp report



Average Users Per Month

	Users	Student Users	Instructor Users
2018-01	52710	51542	768
2018-02	55897	54508	778
2018-03	60164	58890	813
2018-04	60539	59500	825
2018-05	60864	59775	830
2018-06	61063	60039	831
2018-07	66869	65650	1025
2018-08	68419	67020	1105
2018-09	68501	67016	1124
2018-10	68508	67028	1132
2018-11	68509	67034	1139
2018-12	68510	67035	1139

Average Active Courses / Organizations Per Month

	Courses	Active Courses	Organizations	Active Organizations
2018-01	33616	54	0	0
2018-02	39542	465	0	0
2018-03	41063	1656	0	0
2018-04	41066	1563	0	0
2018-05	41129	2000	0	0
2018-06	41180	1479	0	0
2018-07	41601	1746	0	0
2018-08	41746	1639	0	0
2018-09	41768	1967	0	0
2018-10	41769	1963	0	0
2018-11	41785	2070	0	0
2018-12	41789	1369	0	0

Page Views Per Month

	Average Page Views	Average Course Views
2018-01	779	149
2018-02	3228	1121
2018-03	11138	5165
2018-04	13734	6567
2018-05	18412	9338
2018-06	6524	3332
2018-07	7633	3822
2018-08	13712	7026
2018-09	14031	7459
2018-10	21796	11914
2018-11	12910	6704
2018-12	2090	599

APPENDIX F: 2019 Monthly WiseUp report

Average Users Per Month

	Users	Student Users	Instructor Users
2019-01	69315	67842	1140
2019-02	74817	73350	1164
2019-03	76445	74958	1209
2019-04	76683	75153	1223
2019-05	76883	75244	1240
2019-06	76938	75286	1248
2019-07	77013	75338	1253
2019-08	77088	75381	1273
2019-09	77185	75465	1290
2019-10	77217	75485	1295
2019-11	77226	75494	1298
2019-12	77239	75506	1300

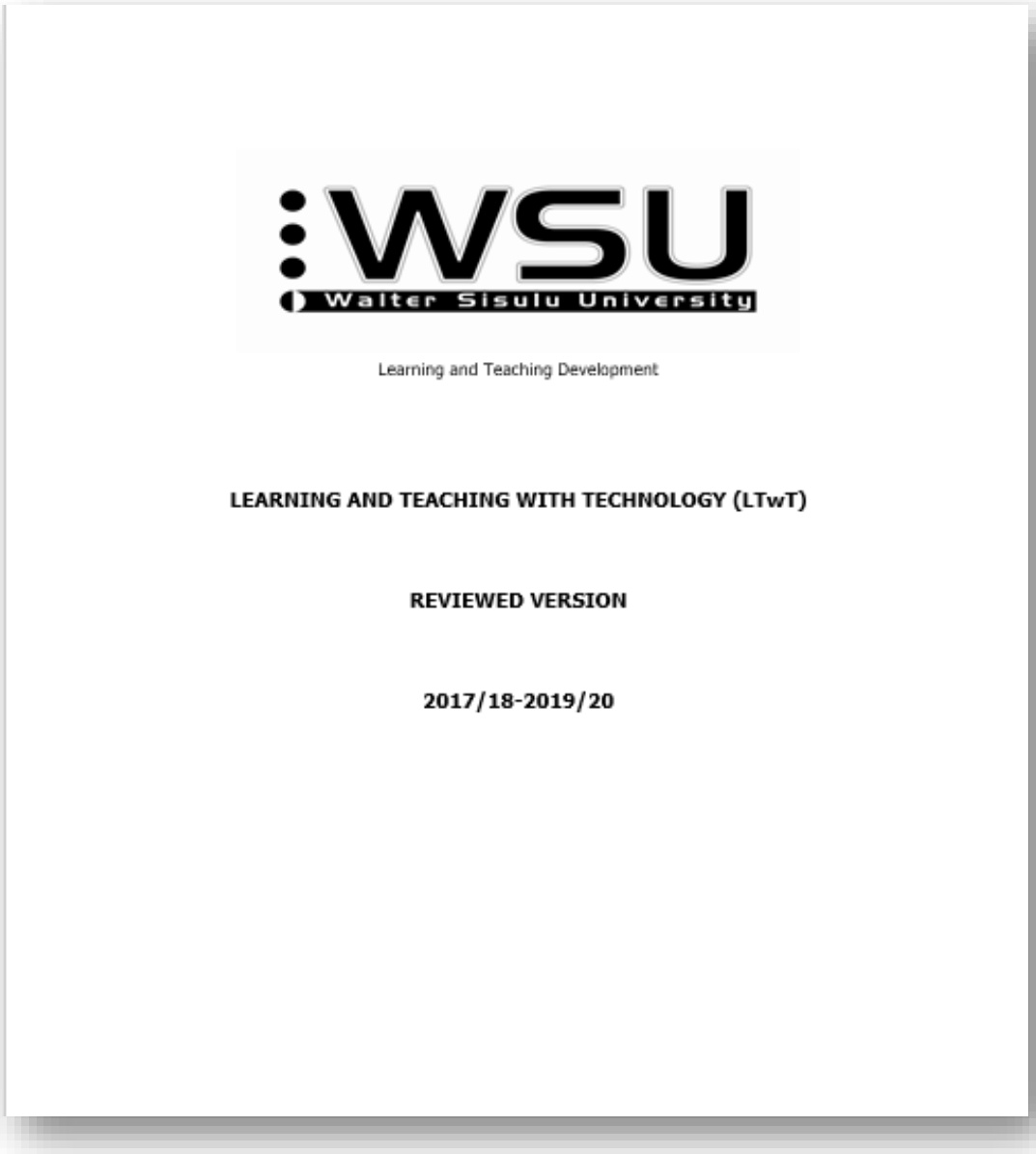
Average Active Courses / Organizations Per Month

	Courses	Active Courses	Organizations	Active Organizations
2019-01	48533	381	0	0
2019-02	49098	1093	0	0
2019-03	49221	2541	0	0
2019-04	49234	2376	0	0
2019-05	49261	2574	0	0
2019-06	49272	2538	0	0
2019-07	49285	2437	0	0
2019-08	49310	2329	0	0
2019-09	49323	2732	0	0
2019-10	49331	2692	0	0
2019-11	49340	2559	0	0
2019-12	49345	1475	0	0

Page Views Per Month

	Average Page Views	Average Course Views
2019-01	1465	200
2019-02	12279	6223
2019-03	29173	15779
2019-04	33533	18610
2019-05	39870	21823
2019-06	28718	15800
2019-07	12816	6350
2019-08	32658	15954
2019-09	33166	18453
2019-10	53768	30021
2019-11	15409	8220
2019-12	46186	939

APPENDIX G: E-learning Strategy document



WSU
Walter Sisulu University

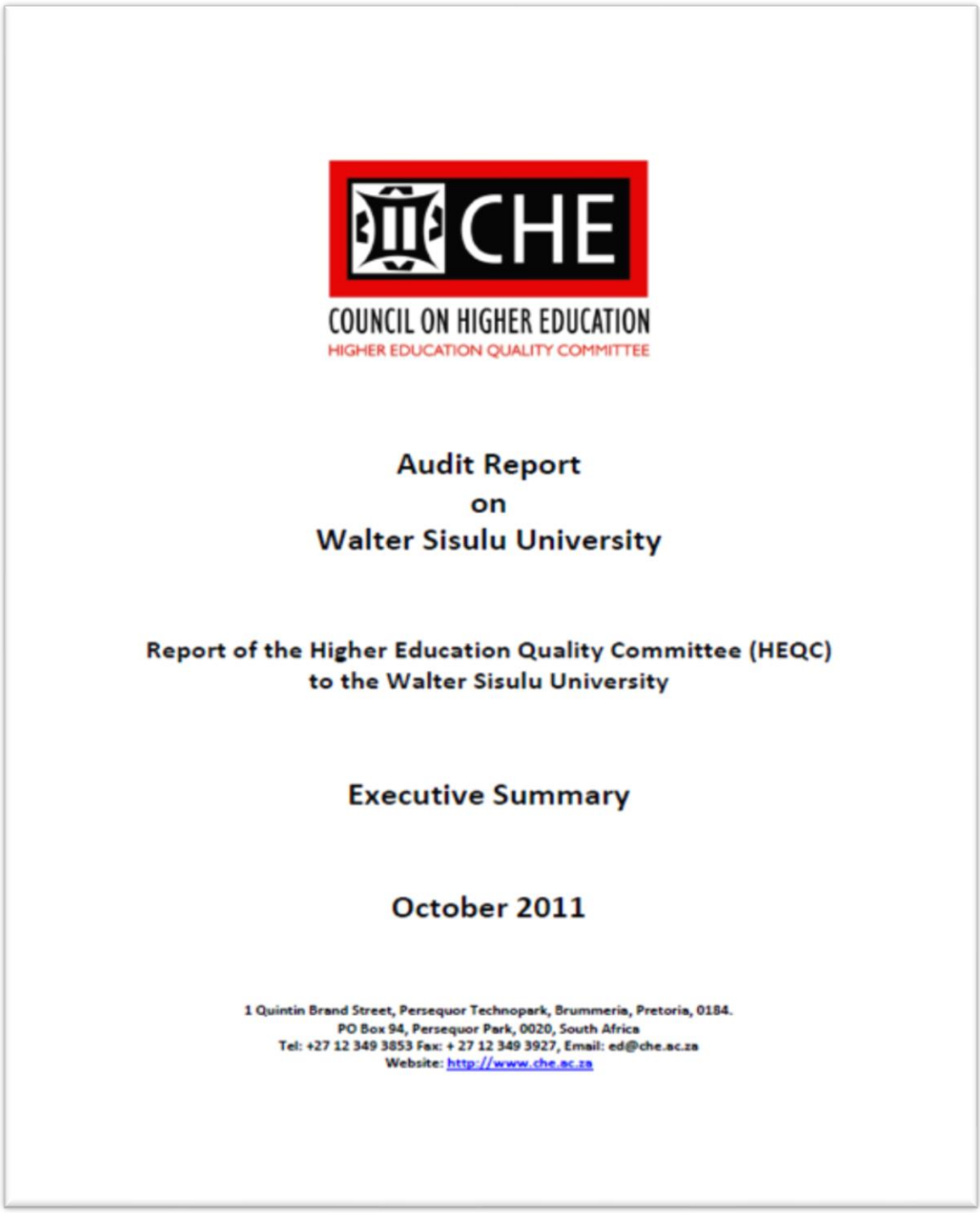
Learning and Teaching Development

LEARNING AND TEACHING WITH TECHNOLOGY (LTwT)

REVIEWED VERSION

2017/18-2019/20

APPENDIX H: CHE 2011 Audit Report on WSU



COUNCIL ON HIGHER EDUCATION
HIGHER EDUCATION QUALITY COMMITTEE

Audit Report
on
Walter Sisulu University

Report of the Higher Education Quality Committee (HEQC) to the Walter Sisulu University

Executive Summary

October 2011

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PO Box 94, Persequor Park, 0020, South Africa
Tel: +27 12 349 3853 Fax: + 27 12 349 3927, Email: ed@che.ac.za
Website: http://www.che.ac.za

APPENDIX I: 2016 CHE institutional feedback report

CHE
COUNCIL ON HIGHER EDUCATION

Quality Enhancement Project

Institutional feedback report

Name of Institution	Walter Sisulu University
Date of institutional visit	16 August 2016
Names of peer reviewers	Prof Hester Geyser Prof Linda van Ryneveld
Name of CHE person involved in the visit	Prof Diane Grayson
Date draft report submitted to institution	24 March 2017
Date of final report	1 June 2017